GEI Consultants

Geotechnical
Environmental
Water Resources
Ecological

Final Site Characterization Report

Manhasset Former Hortonsphere Site

High Street
Manhasset, New York
AOC Index No. : A1-0595-08-07
Site # 130182

Submitted to:
National Grid
175 East Old Country Road
Hicksville, NY 11801

Submitted by:
GEI Consultants, Inc.
455 Winding Brook Drive
Glastonbury, CT 06033
860-368-5300

August 2011
093000-8-1801

Jerry Zak
Project Manager

Table of Contents

Abbreviations and Acronyms iv

Executive Summary vi

1. Introduction 1
- 1.1 SC Objectives and Scope 2
- 1.2 Site Description 2
  - 1.2.1 Current Ownership and Use 3
  - 1.2.2 Surrounding Property Use 3
  - 1.2.3 Site History 3
- 1.3 Physical and Environmental Setting 4
  - 1.3.1 Regional Geology 5
  - 1.3.2 Regional Hydrogeology 5
  - 1.3.3 Water Use 6
  - 1.3.4 Climatology 6
- 1.4 Previous Investigations 6

2. Site Characterization Scope of Work 7
- 2.1 SC Field Work 7
- 2.2 Field Methods 8
  - 2.2.1 Utility Mark Out 8
  - 2.2.2 Soil Sampling and Monitoring Well Installation 9
  - 2.2.3 Stormwater Channel Sediment Sampling 12
  - 2.2.4 Groundwater Sampling 12
  - 2.2.5 Soil Vapor and Ambient Air Sampling 13
  - 2.2.6 Survey 14

3. Site Geology and Hydrogeology 16
- 3.1 Geology 16
- 3.2 Site Hydrogeology 16

4. Findings 18
- 4.1 Surface Soil 19
- 4.2 Subsurface Soil 19
- 4.3 Stormwater Sediment 20
- 4.4 Groundwater 21
- 4.5 Soil Vapor 22
- 4.6 Non-Aqueous Phase Liquids (NAPL) 22

5. Qualitative Human Health Exposure Assessment 23
- 5.1 Exposure Pathways 23
  - 5.1.1 Surface Soil 23

5.1.2 Subsurface Soil 24
5.1.3 Stormwater Sediment 24
5.1.4 Groundwater 24
5.1.5 Soil Vapor 25
5.2 QHHEA Conclusions 25

6. Fish and Wildlife Resources Impact Analysis 26

7. Conclusions 29

References 32

Table of Contents (cont.)

Tables

1 Climatological Norms and Means – LaGuardia Airport
2 Sample Rationale
3 Monitoring Well Construction Data
4 Final Groundwater Parameters
5 Surface Soil Analytical Results for Detected Compounds
6 Subsurface Soil Analytical Results for Detected Compounds
7 Stormwater Sediment Analytical Results for Detected Compounds
8 Groundwater Analytical Results for Detected Compounds
9 Soil Vapor and Ambient Air Analytical Results for Detected Compounds
10 Soil Analytical Data Statistical Summary
11 Groundwater Analytical Data Statistical Summary
12 Typical Background Concentrations of Metals in Soil
13 Fish and Wildlife Resources Impact Analysis Decision Key

Figures

1 Site Location Map
2 Existing Conditions and Sample Location Summary
3 1966 Aerial Photograph of Site and Vicinity
4 1976 Aerial Photograph of Site and Vicinity
5 Cross section A-A′
6 Cross section B-B′
7 Groundwater Contours (December 27-28, 2007)
8 Groundwater Contours (January 28, 2008)
9 Groundwater Contours (January 14, 2010)
10 Surface Soil Analytical Summary (mg/kg)
11 Subsurface Soil Analytical Summary (mg/kg)
12 Stormwater Sediment Analytical Summary (mg/kg)
13 Dissolved Phase Groundwater Analytical Summary (ug/L)

Appendices

A Work Plan Approval Letter and Change Order
B Representative Site Photographs
C Historical Documents
D Soil Boring, Monitoring Well Logs and Map of Water Table Elevations in Vicinity of Manhassett, New York
E Data Usability Summary Report and Electronic Data Deliverables (Electronic Only)

Abbreviations and Acronyms

AOC	Administrative Order on Consent
bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CAMP	Community Air-Monitoring Plan
COPC	Contaminants Of Potential Concern
DER-10	Technical Guidance for Site Investigation and Remediation
DO	Disolved Oxygen
DUSR	Data Usability Summary Report
EDR	Environmental Data Resources
ELAP	Environmental Laboratory Approval Program
EPA	United States Environmental Protection Agency
FCO	Field Change Order
FSP	Field Sampling Plan
FWRIA	Fish and Wildlife Resource Impact Analysis
GEI	GEI Conultants, Inc.
GPR	Ground Penetrating Radar
GPS	Global Positioning System
ID	Inner Diameter
KeySpan	KeySpan Corporation
LILCO	Long Island Lighting Company
MGP	Manufactured Gas Plant
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NAD	North American Datum
NAPL	Non-aqueous Phase Liquids
NAVD	North American Vertical Datum
NOAA	National Oceanographic and Atmospheric Administration
NY LS	New York State-Licensed Land Surveyor
NYSASP	New York State Analytical Services Protocol
NYS SCGs	New York State Ambient Water Quality Standards and Guidance Values
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
ORP	Oxidation/Reduction Potential
OSHA	Occupational Safety and Health Administration
PAH	Polycyclic Aromatic Hydrocarbon
PEL	Pemissible Exposure Limit
PCB	Polychlorinated Biphenyl

Abbreviations and Acronyms

PID	Photoionization Detector
PVC	Polyvinyl chloride
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QHHEA	Qualitative Human Health Exposure Assessment
Sanborn	Sanborn Fire Insurance Map
SC	Site Characterization
SCOs	New York State Soil Cleanup Objectives
SCWP	Site Characterization Work Plan
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
USCS	Unified Soil Classification System
U.S.	United States
USDOT	United States Department of Transportation
VOC	Volatile Organic Compound
6NYCRR	Title 6, Chapter 100, Part 700-705 Of The New York State Code Of Rules And Regulations

UNITS OF MEASURE

cm/s	Centimeter Per Second
°F	Degrees Farenheight
ft/d	Feet Per Day
L	Liter
mg/kg	Milligram Per Kilogram
mL	Milliliters
mph	Miles Per Hour
ppm	Parts Per Million
ug/L	Microgram Per Liter

Executive Summary

On behalf of National Grid, GEI Consultants, Inc. (GEI) conducted a Site Characterization (SC) to assess environmental conditions at the former Manhasset Hortonsphere Site in Manhasset, New York. The SC evaluated potential environmental impacts associated with the former Hortonsphere. It was conducted in accordance with the Administrative Order on Consent (AOC) Index No. A1-0595-08-07 and with New York State Department of Environmental Conservation (NYSDEC)-approved SC and supplemental SC (SSC) work plans.

The Hortonsphere was an aboveground gas storage vessel located on a small portion of the property to the south of High Street and along Community Drive in Manhasset, Nassau County, New York (Figures 1 and 2). The property is primarily undeveloped, overgrown, and wooded. A small portion of the property is used as parking for the Mount Olive Baptist Church, the current owner of the property. The original "footprint" of the former gas operations and equipment occupies a portion of the property currently owned by the church.

The Long Island Lighting Company (LILCO), a predecessor of National Grid, operated and used the Hortonsphere to store and locally distribute natural gas and manufactured gas from 1929 until 1960. The Bay Shore former manufactured gas plant (MGP) likely supplied gas to the Hortonsphere based upon a review of historical records. In 1960, the Hortonsphere and regulator house were dismantled and removed. The gas piping was abandoned in-place. No additional historical or operational information has been located for the Manhasset Hortonsphere.

The current property, including the former Manhasset Hortonsphere Site, was sold to the Mount Olive Baptist Church in 1961. Sometime between the late 1960s and mid 1970s, the soils at the property were reworked, areas of the property were filled, and trees and vegetation were cleared, based on 1966 and 1976 aerial photographs (Figures 3 and 4). Trees and other vegetation have subsequently grown back. The property is zoned for residential use.

The objectives of the SC included evaluating the potential for human and ecological exposure to chemical constituents at the Site. To achieve these objectives, soil borings were drilled, groundwater-monitoring wells were installed, surface- and subsurface-soil samples, stormwater sediment samples, soil vapor samples, and groundwater samples were collected and analyzed to identify impacts that might be associated with the former Hortonsphere.

Chemicals potentially related to former Hortonsphere operations include volatile organic compounds (VOCs) [including benzene, toluene, ethylbenzene, and xylenes (BTEX)], semi-volatile organic compounds (SVOCs) [including polycyclic aromatic hydrocarbons (PAHs)],

polychlorinated biphenyls (PCBs), and lead. Concentrations of PAHs, pesticides and metals were detected in reworked soils and fill material outside the footprint of the former Hortonsphere.

Detected compound concentrations in surface soil, subsurface soil, and stormwater channel sediments were compared to Title 6, Chapter 100, Part 700-705 of the New York State Code of Rules and Regulations (6NYCRR), Part 375 Restricted Residential Use Soil Cleanup Objectives (the "Residential SCOs") (NYSDEC, 2006). The concentrations of compounds detected in groundwater were compared to New York State Ambient Water Quality Standards, Guidance, and Criteria (NYS SCGs) for GA Groundwater.

VOCs (including BTEX compounds), PCBs, pesticides and herbicides were either not detected or were detected below the Residential SCOs in surface soil, subsurface soil, and stormwater channel sediments. Chromium and lead were present in surface soil at concentrations above Residential SCOs. All other metals detected in soils and sediment were below the Residential SCOs.

A few individual PAHs – a subset of SVOCs - were detected in three out of nine surface soil samples, five out of twenty-eight subsurface soil samples, and two out of four stormwater sediment samples. Lead was also detected in one surface soil sample just above the Residential SCOs in a grassed area adjacent to High Street. The origin of PAHs and lead present at concentrations above the Residential SCOs does not appear to be former gas operations. They are primarily found in surface and shallow subsurface soils at locations where soils were reworked, fill materials were encountered, and/or vehicles have been parking in recent years, separate from the gas operations "footprint". The sediment PAH impacts appear to have originated off-site, at an up-gradient location, and were transported onto the site and deposited by stormwater.

VOCs (including BTEX compounds), PCBs, pesticides and herbicides were either not detected or were detected below NYS SCGs in groundwater. Metals were detected at concentrations above the SCGs in all groundwater samples. Most of these metals occur naturally and commonly in groundwater. The presence of other metals, such as lead and arsenic, were most likely present due to turbidity. Groundwater flow direction at the site varies, but dissolved phase impacts are low or not detectable and off-site migration is not regarded as a concern.

Groundwater is located more than 45 feet below ground surface beneath the Hortonsphere and ranges from 14 below ground surface adjacent to Community Drive to over 65 feet at eastern property boundary limiting potential contact to these metals. The Manhasset-Lakeville Water Company supplies potable water to the area. The closest downgradient water supply wells are located more than ½ mile to the north-northwest and are not screened either in the deeper

Magothy or Lloyd aquifers. Therefore, there is no potential exposure through consumption of the groundwater beneath the property.

Although there is no apparent on-site source, low levels of VOCs were detected in soil vapor at all soil vapor sample locations. Most of the sampling locations were situated away from the footprint of the former Hortonsphere, in areas of reworked soils and areas where fill materials were encountered. The VOCs are consistent with petroleum hydrocarbons (including gasoline) and chlorinated solvents. Chlorinated compounds are not typically associated with the operation of Hortonspheres. One "deep" soil vapor sample collected in native soil beneath reworked shallow soil contained VOCs at lower concentrations than the shallow sample. Because surface soil, subsurface soil, and groundwater generally lacked VOC impacts, it does not appear there is an on-site source of VOCs.

There is no potential for soil vapor intrusion at the Site because there are no on-site structures where indoor air quality could be impacted. However, construction, utility and other workers could be exposed to low levels of VOCs within soil vapor if soils are disturbed.

A Qualitative Human Health Exposure Assessment determined that limited potential exists for human receptors to encounter several PAHs, lead and chromium compounds above screening values because the Site is infrequently accessed and posted with no trespassing signs that restrict access.

The low-level and infrequent detections of chemical constituents in surface soils did not warrant the completion of a Fish and Wildlife Resource Impact Analysis according to NYSDEC's guidance, and the low-level surface soil detections pose no potential threat to the ecology.

These findings adequately characterize the site and demonstrate that former Hortonsphere operations are not an apparent source of the minor impacts in site media.

1. Introduction

On behalf of National Grid, GEI Consultants, Inc. (GEI) conducted a Site Characterization (SC) to assess environmental conditions at the Manhasset former Hortonsphere Site, located to the south of High Street in Manhasset, Nassau County, New York (Figure 1). The Manhasset former Hortonsphere site (Site) encompassed a small portion of the current property as shown in Figure 2.

The SC was performed pursuant to an Administrative Order on Consent (AOC) (Index No. A1-0595-08-07) with the New York State Department of Environmental Conservation (NYSDEC), requiring environmental assessment for this and other gas facilities including former Hortonsphere locations. The Manhasset former Hortonsphere Site is identified in Exhibit A of the AOC. National Grid is responsible for the SC because a predecessor company, the Long Island Lighting Company (LILCO), operated the Hortonsphere to store manufactured gas and natural gas for use in the surrounding community. Former gas storage may have generated waste products with the potential to affect human health and the environment. These products could include volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) polycyclic aromatic hydrocarbons (PAHs – a subset of SVOCs), polychlorinated biphenyls (PCBs), and lead.

GEI submitted the Site Characterization Work Plan in November 2007 to the NYSDEC, which approved the SCWP in a letter dated November 16, 2007 (Appendix A). Following the review of the SC data, NYSDEC requested supplemental investigation. GEI submitted a Supplemental Site Characterization (SSC) Work Plan on January 28, 2009 to the NYSDEC. NYSDEC approved the SSC Work Plan in letter dated February 3, 2009.

GEI prepared a Site Characterization Data Summary on behalf of National Grid, and integrated all data and information acquired during both site characterization studies. The summary was submitted to NYSDEC on July 13, 2009. NYSDEC provided a conditional acceptance letter on October 7, 2009. The acceptance was contingent on submittal of this final SC report.

The remainder of Section 1 discusses the SC objectives and scope (subsection 1.1), presents a description and current use of the Site and surrounding properties, the history of the Site (subsection 1.2), and discusses the physical and environmental setting of the Site (subsection 1.3). Section 2 discusses the SC scope of work and methods employed during the field investigation. Section 3 discusses the geology and hydrogeology underlying the property. Section 4 presents the findings of the investigation, including field observations and chemical data collected, and interprets these findings. Section 5 presents a Qualitative Human Health

Exposure Assessment (QHHEA). Section 6 presents an ecological evaluation. Section 7 presents a summary of the key findings and conclusions.

1.1 SC Objectives and Scope

There were four objectives of the SC, as follow:

- Determine if environmental impacts were present in soil, groundwater, stormwater sediment, and/or soil vapor.
- Determine which impacts were related to the historic Hortonsphere operation.
- Identify the potential for human exposure to impacts.
- Identify the potential for ecological exposure to impacts.

The SC scope of work consisted of:

- Environmental records database search with radius map performed, and historic aerial photographs and Sanborn Fire Insurance (Sanborn) maps provided by Environmental Data Resources of Milford, Connecticut (EDR).
- Search of the on-line NYSDEC Searchable Spills or Environmental Remediation databases.
- Multiple site visits.
- Identification and mark out of underground utilities.
- Surface soil sampling.
- Advancement of soil borings and collection of subsurface soil samples.
- Collection of stormwater channel sediment samples.
- Installation of monitoring wells and collection of groundwater samples.
- Installation and sampling of temporary soil vapor points.
- Survey of sample locations.
- Community air monitoring.
- Preparation of a QHHEA.
- Ecological evaluation.

Contaminants of potential concern (COPC) identified in the SCWP that may be associated with the former Hortonsphere include VOCs, SVOCs, PCBs, and lead. In addition, sulfate and sulfide were included as COPCs as requested in the NYSDEC comment letter dated October 5, 2007.

1.2 Site Description

The former Hortonsphere site is located on High Street on a small portion of the 3.16-acre parcel located to the west of Community Drive and to the south of High Street in Manhasset, Nassau County, New York. The footprint of the former Hortonsphere Site is shown in Figure 2. The undeveloped property currently occupies Section 2 - Block 347 - Lots 16 and 17. The property is

zoned for residential purposes (R-C) by the Town of North Hempstead. The Site conditions are shown in Figure 2. Photographic documentation collected during Site reconnaissance is included in Appendix B.

1.2.1 Current Ownership and Use

The Site is currently owned by the Mount Olive Baptist Church. It is undeveloped and consists of a vacant wooded lot and grassed parking lot (Appendix B). The property is partially enclosed by a chain link fence on the southern property boundary and a locked gate is located at the parking lot on High Street. The property is posted with "No Trespassing" signs along High Street.

1.2.2 Surrounding Property Use

The Site is located in a residential and commercial section of Manhasset. The property is bordered to the south by multiple residential apartment buildings. A playground for a daycare/community center is located to the west. Residential dwellings, a church and High Street are located to the north. Community Drive is located to the east. The entrance to a commercial property and a Nassau County Police Department building and associated parking lots are located to the east of Community Drive.

1.2.3 Site History

GEI developed a history of the Manhasset Hortonsphere Site, current property and surrounding area through Site reconnaissance and review of available Sanborn maps, aerial photographs, topographic maps, site property plans, Hortonsphere photograph, and a drawing entitled "Retirement of Sphere, Governor House & Equipment Manhasset, NY Drawing L-209-Q dated March 29, 1960." Photographic documentation from the SC is included in Appendix B, and the Sanborn maps, aerial photographs, topographic maps, Hortonsphere photograph, site property plans and drawing are included in Appendix C.

LILCO purchased the property and constructed the Manhasset Hortonsphere in 1929. The Hortonsphere served solely as a gas distribution facility, no gas manufacturing occurred at the Site. Site equipment consisted of the Hortonsphere and a regulator (governor) house that controlled the gas pressure.

GEI reviewed and compiled information regarding the distribution of gas by National Grid's predecessor the Long Island Lighting Company (LILCO). The historical information is presented in *Review of Long Island Gas Manufacture and Distribution (1907 to 1950)*, which was provided to the NYSDEC in April 2009 [revised October 2009] (Appendix C). Historical information suggests that the Manhasset Hortonsphere was most likely supplied by the Bay Shore manufactured gas plant (MGP). No other operational data or information has been located for the site.

The former Hortonsphere operations occupied a small portion of the property adjacent to Community Drive as shown in Figure 2. The Hortonsphere and regulator house were first shown on the 1936 Sanborn map. During a search for Site operating information, National Grid discovered a historic photograph (date unspecified) that shows the condition of the Hortonsphere. In the photograph, the Hortonsphere Site consisted of a steel sphere with steel legs that appear to be attached to concrete footings and a one-story brick regulator (pump) house. The area adjacent to the Hortonsphere and regulator house is a grassed area with trees. A copy of the Hortonsphere photograph is provided in Appendix C. The Site remained relatively unchanged in the 1950 Sanborn map. On the 1954 aerial photograph, the Manhasset Hortonsphere and regulator house are present. The remainder of the property was undeveloped and appears to be grassed and wooded.

The Hortonsphere and regulator house were decommissioned in 1960 according to available LILCO records. LILCO sold the property to the current owner, Mount Olive Baptist Church in October 1961, after which LILCO did not have control over the property. The Hortonsphere and regulator house were absent from the 1966 aerial photograph (Figure 3).

In the 1976 aerial photograph (Figure 4), the trees and vegetation were cleared from the current property, including the Hortonsphere Site, and the soils appear to be reworked across the entire property. By 1980, soils at the former Hortonsphere Site appear reworked on the eastern boundary and areas of vegetation are noted on the remainder of the property. The northwestern portion of the property was used as a parking lot as it is used today. By 1994, the property, including the Hortonsphere Site, was overgrown with vegetation and trees as it remains today.

The Site has remained undeveloped since that time. The property has been subject to unauthorized dumping. Garbage and other debris were observed during a site walk with National Grid, NYSDEC, and GEI on October 30, 2008.

1.3 Physical and Environmental Setting

The Manhasset Hortonsphere property is undeveloped and is primarily wooded with trees and brush. The northwestern portion of the property is used as a parking lot for the Mount Olive Baptist Church. Fill materials including construction debris (asphalt and concrete fragments) were encountered adjacent to the parking lot. The property is located on a steep slope with topographic elevations ranging from 40 feet North American Vertical Datum (NAVD) adjacent to Community Drive to 95 feet NAVD within the parking lot at the western property boundary near the end of High Street. A stormwater drainage channel snakes eastward, adjacent to the southern boundary of the property, and then flows northward through the footprint of the former Hortonshere Site to a catch basin on High Street (Figure 2).

An unnamed tributary to Whitney Lake is located approximately 500 feet to the east of the Site.

1.3.1 Regional Geology

Long Island is within the Atlantic Coastal Plain physiographic province. The geologic units in northern Long Island, in order of shallowest to deepest, include glacial till deposits of the Upper Glacial Aquifer, thick sequences of Cretaceous-aged marine deposits of the Magothy Aquifer, and Cretaceous-aged shallow marine and terrestrial sediments of the Lloyd Aquifer overlying a southward-sloping bedrock surface. Near the Site, the thickness of unconsolidated deposits overlying bedrock is approximately 650 feet (Soren and Simmons, 1985). Surficial soil at the property normally consists of glacial till deposits, but some of these soils may have been reworked and areas filled with material. The SC wells are screened at the water table in the Upper Glacial Aquifer.

The Raritan Clay, an aquitard (a low-conductivity layer that restricts vertical groundwater flow), separates the Magothy Aquifer from the Lloyd Aquifer. The underlying bedrock consists of virtually impermeable Precambrian and Paleozoic-aged crystalline metamorphic and igneous rock. The bedrock surface is regarded as the lowest hydraulic boundary of the groundwater flow system within the study area, as well as for the rest of Long Island (Busciolano, 2002).

1.3.2 Regional Hydrogeology

Three regional groundwater aquifers are present in the Long Island area, in order of increasing depth.

- The Upper Glacial Aquifer consisting of Upper Pleistocene glacial deposits.
- The Magothy Aquifer consisting of the Late Cretaceous Magothy Formation and Matawan Group deltaic deposits.
- The Lloyd Aquifer consisting of the Lloyd Sand Member.

The Upper Glacial Aquifer is generally unconfined (water table); however, it can be locally confined by the presence of silt and clay layers within moraine deposits. Groundwater within the Upper Glacial Aquifer flows north towards Manhasset Bay. The horizontal hydraulic conductivity of glacial outwash deposits of the Upper Glacial Aquifer on Long Island were calculated at 270 feet per day (9.5 $x10^{-2}$ centimeters per second [cm/s]) (Franke and Cohen, 1972 in Cartwright, R.A., 2002). The horizontal hydraulic conductivity for the poorly-sorted moraine deposits is likely in the range of 135 feet per day (4.4 $x10^{-2}$ cm/s) (Buxton and Shernoff, 1995 in Cartwright, 2002).

The Magothy aquifer underlies the Upper Glacial Aquifer and is the thickest hydrogeologic unit on Long Island. It consists of beds and lenses of clay, silt, sand and gravel. The average horizontal hydraulic conductivity ranges from approximately 50 to 67 feet per day (ft/d) (Soren and Simmons, 1985). The Lloyd Aquifer is a confined artesian unit between the bedrock and

overlying Raritan Clay. It also consists of beds and lenses of clay, silt, sand and gravel. The average horizontal hydraulic conductivities range from 40 to 67 ft/d (Soren and Simmons, 1985).

1.3.3 Water Use

The Manhasset-Lakeville Water District currently provides the public water supply to the Site and surrounding area. The Manhasset-Lakeville Water District is serviced by 18 wells that obtain water from the Magothy and Lloyd aquifers (Manhasset-Lakeville Water District, 2008). An EDR commercial database search of environmental records indicated that there are six public water supply wells (public water supply system NYW2902836) located within 1 mile of the Site (Appendix C). Three public water supply wells (Eden 23, Jennings and Campbell 1) are located ¼ to ½ mile to the south-southwest. One well *E. Shore Road* 5 is located ½ to 1 mile to the south, and two wells NYW2902836 (*Parkway 1* and *Parkway 2*) are located ½ to 1 mile to the north-northwest of the Site. These wells are located topographically upgradient of the Site and are screened in the Magothy and Lloyd Aquifers.

1.3.4 Climatology

A summary of the monthly climatologic records collected at LaGuardia Airport in Queens, New York was reviewed. The airport is located approximately 12 miles to the west of the Site and its weather records are considered representative of weather conditions at the Site. Table 1 summarizes the climatologic data for the airport. The average monthly maximum temperature was 62 degrees Fahrenheit (°F) and the average monthly minimum temperature was 48°F. The lowest average monthly maximum temperature was 39°F recorded for January and the highest average monthly maximum was 85°F recorded for July. The average annual precipitation (rainfall) for the area is 44.36 inches with the largest monthly precipitation of 4.41 inches, occurring in July.

During implementation of the SC field program, climatic conditions were monitored as part of the perimeter air-monitoring program (Table 1). In November 2007, the average maximum temperature was 53°F and the average minimum temperature was 41°F. Precipitation was 2.78 inches in November 2007. The average wind speed was 11 miles per hour (mph). The SSC activities were conducted in February 2009. The average maximum temperature was 37°F and the average minimum temperature was 29°F. Precipitation was 0.66 inches. The average wind speed was 13 miles per hour (mph).

1.4 Previous Investigations

No previous environmental investigations related to the Site are known by GEI or National Grid to have been performed. No records of environmental investigations were encountered during our environmental database searches conducted in April and May 2007.

2. Site Characterization Scope of Work

The objective of the SC was to identify the presence or absence of chemical compounds that could potentially be associated with the operation of the former Hortonsphere. The initial SC fieldwork was conducted between in November and December 2007, and SSC fieldwork was conducted in February 2009.

Prior to the preparation of the SCWP, GEI conducted a reconnaissance of the Site and reviewed historic environmental records, information sources such as Sanborn maps, topographic maps, and an EDR Radius Report. The information gathered during these activities determined the type of environmental sampling and the number and location of sampling locations specified in both approved work plans. All sample locations are shown in Figure 2.

The following sections describe the methods used for the sampling in accordance with the NYSDEC-approved work plans and approved field change order. Detailed field procedures were provided in the SC Work Plan. Zebra Environmental, Inc. of Lynbrook, New York, advanced Geoprobe® soil borings, installed soil vapor points and installed shallow monitoring wells (MS-MW-03 and MS-MW-06). Aquifer Drilling and Testing of New Hyde Park, New York, advanced soil borings and installed monitoring wells at depths greater than 45 feet (MS-MW-04A and MS-MW-05) utilizing a hollow stem auger drilling rig.

GEI provided oversight of all field activities, installed soil-gas sampling points, and collected all samples. TestAmerica Laboratories of Shelton, Connecticut, a New York State Environmental Laboratory Approval Program (ELAP) certified laboratory, completed the soil and groundwater sample analyses in accordance with New York State Analytical Service Protocols (NYSASP). Alpha Woods Hole Labs of Westborough, Massachusetts, a New York State Environmental ELAP laboratory, completed the soil vapor sample analysis.

2.1 SC Field Work

The SC Field work included:

- Collection and analysis of nine surface soil samples (MS-SS-01 through MS-SS-09).
- Drilling of twelve soil borings (MS-GP-01 through MS-GP-12).
- Installation of five monitoring wells (MS-MW-03 through MS-MW-06).
- Collection of two groundwater samples with a Geoprobe® groundwater sampler (MS-GW-01 and MS-GW-02).
- Collection of four stormwater sediment samples from a stormwater channel (MS-SED-01 through MS-SED-04).

- Installation of ten soil vapor sampling points (MS-SV-01 through MS-SV-06, MS-SV-07S, MS-07D, MS-SV-08S, and MS-SV-08D).
- Laboratory chemical analysis of twenty-eight subsurface-soil samples was completed on soils collected from twelve boring locations (one to two samples per boring plus two duplicate samples).
- Laboratory chemical analysis of seven groundwater samples collected from four monitoring wells and two grab samples utilizing the Geoprobe® groundwater sampler (one sample per well plus one duplicate sample).
- Laboratory chemical analysis of ten soil vapor samples collected from nine soil vapor points (MS-SV-01 through MS-SV-06, MS-SV-07S, MS-SV-08S, and MS-SV-08D). One duplicate sample was collected. A soil vapor sample could not be collected from MS-SV-07D because of perched groundwater conditions.
- Groundwater elevation measurements in April and December 2009 and January 2010 to assess variations observed in groundwater flow direction between December 2007, January 2008, and February 2009.

Table 2 presents a sample collection rationale and summary of laboratory analyses performed.

During the initial SC, an upwind/downwind air quality-monitoring program was conducted in accordance with the provisions of the Site-specific health and safety plan and the New York State Department of Health's (NYSDOH) Community Air Monitoring Plan (CAMP) requirements (NYSDEC, 2002). The air-monitoring program included the collection of real-time air quality data, time-averaged air quality data, and meteorological data to document potential migration routes of airborne VOCs and particulates. No exceedances of the air monitoring or health and safety action levels action levels were measured at the perimeter of the work zones during the initial SC field program. As such, only work zone air monitoring was conducted during SSC activities, with NYSDEC concurrence. No action levels were exceeded during SSC field activities.

2.2 Field Methods

This subsection describes the sampling procedures and field methods used during the SC. All were in accordance with the SC and SSC work plans, except where noted.

2.2.1 Utility Mark Out

Prior to commencement of intrusive activities, Utility Survey Corp. of New Windsor, New York conducted an underground utility mark-out of proposed boring locations. Ground penetrating radar (GPR) and magnetic induction surveys were applied to identify subsurface features that might be utilities, former structures or footings.

The former Hortonsphere footings and regulator house were not identified during the GPR or magnetic survey during the SC. This is consistent with the removal of the structures previously described in the Site history section above. Utility Survey Corp. did not generate a report as part of the mark out.

2.2.2 Soil Sampling and Monitoring Well Installation

This subsection describes the methodology used to collect soil samples and install monitoring wells during the SC. Table 2 identifies:

- The surface soil, soil boring, and monitoring well locations.
- The rationale for installing each boring.
- The rationale for submittal of each sample for laboratory analysis and the analyses performed for each sample.

Soils were logged and screened in general accordance with the SC and SSC work plans. Boring logs are presented in Appendix D. Each non-dedicated sampling implement was decontaminated in accordance with decontamination procedures described in the Field Sampling Plan (FSP). Quality Assurance/Quality Control (QA/QC) procedures are detailed within the Quality Assurance Project Plan (QAPP) submitted as part of the SC Work Plan. QA/QC samples included blind duplicate soil samples, matrix spike/matrix spike duplicate (MS/MSD) samples, and equipment rinsate blank samples. Trip blanks accompanied each shipment of samples to the laboratory.

Soil samples were placed in certified pre-cleaned containers and stored in ice-filled coolers. The samples were then transported via laboratory courier or shipped via Federal Express to TestAmerica for chemical analysis.

Surface-Soil Sampling

Surface-soil samples were collected at nine locations (MS-SS-01 through MS-SS-09 (Figure 2). The surface-soil samples were collected from the top 0- to 2-inches of mineral soil beneath the vegetative root mat. On November 20, 2007, a Field Change Order (FCO) was agreed upon by the NYSDEC, National Grid and GEI to shift the location of MS-SS-05 closer to the property boundary. The signed FCO is contained in Appendix A.

Soil samples collected from six surface soil sample locations (MS-SS-01 through MS-SS-06) were analyzed for VOCs by United States Environmental Protection Agency (EPA) SW-846 Method 8260; SVOCs by EPA Method 8270C; target analyte list (TAL) metals by EPA Methods 6000/7000 series; sulfide by EPA Method 9034; sulfate by EPA Method 300.0; PCBs EPA Method 8082; pesticides by EPA Method 8081A and for herbicides by EPA Method 8151A as specified in the SCWP.

During the supplemental SC, surface soils were collected to further evaluate of lead and PAHs detected in MS-SS-04 during the initial SC investigation. Three surface soil samples (MS-SS-07 through MS-SS-09) were analyzed for PAHs by EPA Method 8270 and lead by EPA Method 6010.

Table 2 provides a summary of the rationale for surface-soil collection and analysis.

Soil Borings

Twelve borings (MS-GP-01 through MS-GP-12) were advanced using Geoprobe® direct-push methods as part of SC field investigations (Figure 2). This included one additional soil boring (MS-GP-06/MS-MW-06) that was installed as part of a FCO and was agreed upon by the NYSDEC, National Grid and GEI to install the additional well (Appendix A). A conventional hollow stem auger drill rig was used to collect soil information at two locations (MS-GP-04A and MS-GP-05A) because the required boring depth was beyond the limits of the Geoprobe® drilling rig.

The objective of these borings was to evaluate subsurface conditions and to install monitoring wells to evaluate groundwater conditions within the footprint of the Hortonsphere Site and the property. Soil samples were collected using dedicated, disposable sampling sleeves and a decontaminated stainless steel split spoon sampler. All boring locations were cleared by hand augering to 5 feet.

At each boring location, soils were continuously logged, screened with a photoionization detector (PID), headspace samples were collected, and visual and olfactory observations were noted in accordance with the SC work plan.

At each of the six SC borings locations (MS-GP-01 through MS-GP-06), one soil sample was collected for laboratory analyses from the ground surface to approximately 5 feet below grade. If overlying soils did not contain physical evidence of impacts, the second subsurface soil sample in each boring was collected at the apparent water table or from the interval exhibiting the highest PID reading. At MS-GP-01 and MS-GP-02, the second sample interval was collected above the water table due to limitations of the Geoprobe® drilling rig. MS-GP-06/MS-MW-06 was installed topographically downgradient (adjacent to Community Drive) to evaluate groundwater conditions as documented in the NYSDEC approved-FCO (Appendix A).

Soil samples collected from the six borings were analyzed for VOCs by EPA Method 8260; SVOCs by EPA Method 8270C; TAL metals by EPA Methods 6000/7000 series; sulfide by EPA Method 9034; sulfate by EPA Method 300.0; PCBs by EPA Method 8082; pesticides by EPA Method 8081A and for herbicides by EPA Method 8151A as specified in the SC work plan. Refer to Table 2.

Purging

Low-flow sampling and purging was conducted with a peristaltic pump in monitoring wells MS-MW-03 and MS-MW-06. A bladder pump was used in MS-MW-04A and MS-MW-05, with dedicated tubing. Purging rates varied because of groundwater conditions; however, pumping rates generally ranged between 200 milliliters (mL) and 400 mL per minute. Regardless of the purge rate, draw-down of the static water level was minimized at all times.

Groundwater purged from each well was monitored for field parameters (temperature, pH, conductivity, dissolved oxygen [DO], oxidation/reduction potential [ORP], and turbidity) to ensure that representative formation water was sampled. The approximate flow rates and purge volumes were recorded concurrently with field parameter measurements. A groundwater sample was collected from each monitoring well once parameters stabilized in accordance with the FSP, with the exception of MS-MW-06, where the conductivity and ORP were slightly above the 10% range. However, MS-MW-06 was developed prior to sampling and the remaining parameters (temperature, DO and turbidity) were within range; as a result, the sample is considered a representative groundwater sample. Table 4 presents the field parameter readings and physical observations of purge water prior to sampling.

Sampling purge water was containerized and was transported to the National Grid Hicksville Facility for temporary storage until it was disposed of at an approved facility.

Sampling

After each well was purged, groundwater samples were collected and placed into preserved containers provided by TestAmerica Labs. VOC samples were collected using new, clean, disposable bailers in monitoring wells MS-MW-03 and MS-MW-06. The VOC samples were collected directly from the bladder pumps in MS-MW-04 and MS-MW-05.

Groundwater samples were analyzed for EPA Method 8260; SVOCs by EPA Method 8270C; TAL metals by EPA Methods 6000/7000 series; PCBs by EPA Method 8082; pesticides by EPA Method 8081A and for herbicides by EPA Method 8151A as specified in the SC work plan. Monitoring wells were also sampled for sulfide by EPA Method 9034 and sulfate by EPA Method 300.0.

2.2.5 Soil Vapor and Ambient Air Sampling

Five soil vapor samples were collected in November 2007 (MS-SV-01, MS-SV-02, MS-SV-03, MS-SV-04, and MS-SV-05).

Four additional soil vapor points (MS-SV-06, MS-SV-07S, and MS-SV-08 S/D) were installed in February 2009 as part of the SSC activities. These points were added to evaluate VOC concentrations within the reworked soils/ fill and the native soils beneath the fill. Soil vapor

points with the "D" designation were deep soil vapor points installed within the native soils. A fifth proposed sample (MS-SV-07D) could not be collected because perched groundwater was present within the native soils.

One ambient air sample (MS-OA-01) was also collected during soil vapor sampling in February 2009 to evaluate outdoor ambient air concentrations.

Figure 2 shows the soil vapor sample locations. Table 2 presents the sample rationale for each soil vapor point and the analysis completed for each point.

All soil vapor sample points were installed using either a hand auger or Geoprobe® drill rig. At each location, a six-inch stainless steel soil gas point fitted with Teflon tubing was installed and the annulus was then backfilled with clean sand and sealed with bentonite. All of the soil vapor points extended to a depth of approximately 5 to 5.5 feet bgs with the exception of MS-SV-08D. MS-SV-08D was installed at a depth of 12 feet bgs.

The SC soil vapor samples were collected in individually-certified, one-liter SUMMA® canisters with 10-minute flow controllers at a rate of 0.1 Liter (L)/minute. Supplemental SC samples were collected in an individually certified, 6-liter SUMMA® canister equipped with a flow controller at a rate of less than 0.2 L/ min. To ensure that the sampling point was isolated from the ambient air above ground, GEI utilized helium as a tracer gas as described in the NYSDOH Soil Vapor Intrusion Guidance document. SC soil vapor samples were shipped via Federal Express to Alpha Woods Hole Laboratories for analysis. The SSC soil vapor and ambient air samples were analyzed by TestAmerica Laboratories in Knoxville, Tennessee.

The samples were analyzed for VOCs and naphthalene by the modified EPA Method TO-15 (including naphthalene).

2.2.6 Survey

Each soil boring, monitoring well, and soil vapor point was surveyed by a New York State-licensed land surveyor (NY LS) #050146 at the conclusion of the SC field activities. The survey was conducted to A-2 standards of accuracy, with an approximate horizontal and vertical precision of ±0.02 feet. Surveyed well elevations are included in Table 3. Surface soil sample locations were field located relative to surveyed locations.

Point coordinates were referenced to the New York State Plane Coordinate System (Long Island Zone, North American Datum [NAD] 83) as determined by differential Global Positioning System (GPS) observations. Point elevations are expressed as heights above the ellipsoid NAVD 88. This datum is not directly related to sea level; however, the record elevations related to the tidal benchmark at Bridgeport, CT indicate that mean sea level has an NAVD 88 elevation of

-0.22 feet (National Oceanic and Atmospheric Administration [NOAA], 2007), indicating that within the general Site vicinity, the data are essentially synonymous.

3. Site Geology and Hydrogeology

This section documents the Site geology and hydrogeology based on regional information described in Section 1 and site-specific boring and monitoring well data collected during SC activities.

3.1 Geology

Surficial geology at the property was determined through visual inspection of soil samples collected during the field investigation. Soil was described according to the Unified Soil Classification System (USCS). Site stratigraphy consisted predominately of sand that was inter-bedded with layers of silty sand, silt, sandy clay and clay.

Two cross sections (Figures 5 and 6) were developed to illustrate the geology underlying the property. The cross-sections also provide the observed apparent groundwater elevation and summary of selected chemical soil and groundwater testing data. Detailed geologic descriptions are provided in boring logs located in Appendix D. A general description of the stratigraphic units is provided below.

Fill, including brick, coal and glass fragments, was observed in a number of SC and SSC borings located within the parking lot, grassed area, and adjacent to Community Drive. Within the parking lot area, fill was encountered within borings MS-GP-05, MS-GP-07, MS-GP-08, and MS-GP-09 to as deep as 16 feet bgs. Fill was also encountered within borings MS-GP-10 and MS-GP-11 to as deep as 4 feet bgs within the grassed yard area north of the Hortonsphere. Along Community Drive, fill materials were encountered in boring MS-GP-06 to a depth of 1 feet bgs. These areas are identified on Figure 11 and are not associated with the former Hortonsphere footprint. They do not appear to be related to the former gas storage and distribution operations.

Sand encountered was predominantly widely graded fine-to-coarse sand, tan, orange-tan, grayish tan, gray, brown and reddish brown, containing less than 20% fine-to-coarse gravel and 5 to 10% fines. These deposits are consistent with deposits mapped in the region, as described in subsection 1.3.1. Layers of silty sand, silt, clayey sand and clay were observed at MS-GP-04/04A, MS-GP-05/05A, MS-GP-06, MS-GP-07, and MS-GP-08, MS-GP-10, MS-GP-11, and MS-GP-12.

3.2 Site Hydrogeology

Perched groundwater was observed above the silty sand layers in MS-GP-07, MS-GP-04 and MS-GP-11 after heavy rains. The perched groundwater is apparently a function of the dense, lower permeability sandy-silt layers that are present above the groundwater table at the property.

Twenty-eight (28) analytical samples were collected from subsurface soils. VOCs (including BTEX), metals, pesticides, herbicides, and PCBs in all samples were either not detected or were detected below the Residential SCOs.

A few PAH compounds were detected above the Residential SCOs in only five samples (MS-GP-04, MS-GP-05, MS-GP-08, MS-GP-10, and MS-GP-12). All five samples were collected in the 0.0 to 5.0 foot interval where fill was present (Appendix D). The individual concentrations of PAHs (including benz[a]anthacene, benzo[a]pyrene, benzo[b]fluoranthene, chrysene, dibenz(a,h) anthracene and indeno[1,2,3-cd] pyrene) were less than 1.9 ppm. These concentrations slightly exceed the SCOs that are established at or below 1 ppm for the individual PAH compounds (Table 6).

Subsurface samples collected at the Hortonsphere footprint (MS-GP-01 and MS-GP-02) did not contain detectable PAHs.

Sulfate was detected in 12 subsurface soil sample locations at the property ranging from 3.6 ppm at MS-GP-03 (0-5 feet bgs) to 23.9 ppm at MS-GP-04 (0 to 5 feet bgs). There are no SCOs established for sulfate.

4.3 Stormwater Sediment

Four sediment samples (MS-SED-01 through MS-SED-04) were collected from areas of accumulated sediment in the stormwater channel that traverses the property. The channel was generated by stormwater run-off that discharges from upgradient locations onto the property. The conditions of the channel were observed during a site meeting between National Grid, NYSDEC, and GEI on October 30, 2008.

A summary of the detected concentrations is provided on Table 7. The locations are shown on Figure 12.

None of the sediment samples contained concentrations of VOCs, metals, PCBs, pesticides, or herbicides in excess of the Residential SCOs.

Only two PAH compounds were detected at concentrations slightly higher than Residential SCOs in MS-SED-01 and MS-SED-03. MS-SED-01 was collected upgradient of the Hortonsphere and contained one PAH (dibenz[a,h]anthracene) that exceeded the Residential SCO. MS-SED-03 sediment had accumulated behind woody debris in the former Hortonsphere footprint. It contained two PAHs (dibenz[a,h]anthracene and indeno[1,2,3-cd]pyrene) that exceeded the Residential SCOs. MS-SED-04, the downgradient sediment sampling point, did not contain any exceedance of Residential SCOs.

Given that one PAH was present upgradient of the former Hortonsphere, but no PAHs were present downgradient of the former Hortonsphere, it is likely the PAHs were carried onto the Site by stormwater and deposited within the Hortonsphere footprint.

4.4 Groundwater

No evidence of impacts (sheens or odors) was observed during the collection of the groundwater samples from each of the monitoring wells and temporary groundwater sampling points. The compounds detected in groundwater are summarized in Table 8. A summary of analytical results from the sampling event is presented on Figure 13.

VOC, SVOC, and PCB compounds were not detected in groundwater at concentrations above the NYS SCGs.

Concentrations of arsenic, chromium, copper, and lead exceeded the NYS SCGs in samples MS-GW-01 and MS-GW-02 (Figure 13). These were grab samples collected with the Geoprobe® temporary groundwater screen.

It is unlikely that these metals concentrations are attributable to former Hortonsphere operations because the depth to groundwater is more than 45 feet at these locations. In addition, a review of data from other former Hortonsphere sites on Long Island demonstrates that arsenic, chromium, and copper are not Hortonsphere-related metals. Lead is potentially related, but it was not otherwise detected above Residential SCOs at this site. The most likely explanation for the presence of metals in these two samples is entrained sediments due to sample collection through the temporary Geoprobe® sampling point (these metals are absent above the SCGs in the four groundwater samples collected from permanent wells that had been developed and sampled via standard low flow methods).

Iron, manganese and sodium concentrations exceeded their respective NYS SCGs in monitoring wells upgradient and downgradient of the Hortonsphere. These are common and likely represent groundwater conditions within the Upper Glacial Aquifer.

Sulfate was detected in all of the groundwater samples below the NYS SCGs. Sulfide was not detected in groundwater samples except for MS-GW-01, where it was detected at a concentration of 600 micrograms/liter (ug/L); however, this concentration is most likely attributable to sediments entrained in the sample.

Groundwater at the Site has the potential to flow in several directions, as described in subsection 3.2. However, groundwater impacts are generally low, non-existent, or due to sampling techniques. As such, off-site migration of dissolved phase constituents is not regarded as a concern.

4.5 Soil Vapor

Ten soil vapor samples were collected from the soil vapor sampling points. Nine of these points were installed in shallow soil (within reworked soils and areas with fill) to approximately 5 feet bgs. MS-SV-08D was installed to approximately 12 feet bgs, in native soil. One ambient air sample (MS-OA-01) was collected for analysis to evaluate ambient air concentrations.

MS-SV-01 and MS-SV-02 were collected in the footprint of the former Hortonsphere. BTEX was present at low concentrations; naphthalene was not detected in these samples. BTEX and naphthalene are commonly found in association with gas-making/storage operations. Chlorinated compounds, such as 1,3- and 1,4-dichlorobenzene and tetrachloroethene were encountered within soil vapor; however, these compounds are not associated with gas making and storage operations.

Off-site, MS-SV-03, MS-SV-06, and MS-SV-07S were located within the parking lot at the property while MS-SV-04, MS-SV-08S/D were located in the grassed yard adjacent to High Street. Shallow soil vapor samples were collected in areas that contained reworked soils and fill material with the exception of one deep soil vapor sample (MS-SV-08D) which was installed below the fill materials within native soils. Concentrations of VOCs, such as chlorinated compounds, decanes, and nonanes, are consistent with compounds that are found in petroleum and solvents – products that are frequently found in vehicle parking areas. The results of samples MS-SV-08S and MS-SV-08D demonstrate that concentrations of VOCs are greater in shallow impacts than deeper in native material. As such, the shallow impacts have not resulted from any site activities prior to filling and reworking of soils.

Chlorinated compounds are not associated with former gas storage and distribution operations. VOCs (including chlorinated compounds) and naphthalene were not present in surface soil, subsurface soil, sediment, or groundwater (except a minor detection of toluene alone in MS-GW-01) near the Hortonsphere footprint, so the Hortonsphere is not an apparent source for soil vapor impacts at the Site.

4.6 Non-Aqueous Phase Liquids (NAPL)

NAPL was not observed during SC activities.

5. Qualitative Human Health Exposure Assessment

This section evaluates the qualitative potential for exposure posed to human receptors by COPCs detected in surface soil, subsurface soil, stormwater sediment, and groundwater, at the Site at concentrations in excess of the Residential SCOs and NYS SCGs. Tables 5 through 8 provide a summary of the detected concentrations and highlights compounds that exceed criteria values in surface soils, subsurface soils, stormwater sediment, and groundwater. Concentrations of VOCs in soil vapor presented on Table 9 were also evaluated for potential exposure pathways to human receptors.

5.1 Exposure Pathways

An exposure pathway describes the means by which a potential receptor may be exposed to contaminants originating from a site. Assessment of potential exposure pathways includes the following five elements (NYSDEC, 2002):

(1) A contaminant source.
(2) Contaminant release and transport mechanisms.
(3) A point of exposure.
(4) A route of exposure.
(5) A receptor population.

The NYSDEC and NYSDOH consider an exposure pathway complete when all five elements of an exposure pathway are documented. An exposure pathway may be eliminated from further evaluation when any one of the five elements comprising an exposure pathway has not existed in the past, does not exist in the present, and will never exist in the future (NYSDEC, 2002).

5.1.1 Surface Soil

A potentially complete exposure pathway to certain PAH compounds in surface soils exists for the commercial worker, utility worker, adult and child visitors, and trespassers if surface soils are disturbed in the vicinity of MS-SS-04, MS-SS-08, and MS-SS-09 beneath the grassed yard. The potential routes of exposure are ingestion, dermal contact, and inhalation of soil particulates.

Lead was also present in one sample (MS-SS-04) at 433 ppm. This is slightly above the Residential SCO (400 ppm) and eastern U.S. background concentrations (Schacklette and Boerngen, 1984). Surface soil sample MS-SS-03 contained chromium at a concentration of 27.1 mg/kg, which is slightly higher than the Residential SCO of 22 mg/kg. However, this concentration is well below the maximum eastern U.S background concentration of 1000 ppm (Table 12).

A potentially complete pathway for trespassers, visitors, and commercial/utility worker is contingent upon removal of the grass at the affected locations. As such, the potential for actual exposure is minimal. Currently, there is a limited potential for receptors to encounter these compounds because of infrequent access and no trespassing signs that restrict access to the property.

5.1.2 Subsurface Soil

PAHs at concentrations above Residential SCOs were detected in the upper five feet of subsurface soil at borings MS-GP-04, MP-GP-10, and MP-GP-12 near High Street and at MS-GP-05 and MS-GP-08 beneath the parking lot area. PAHs were not present above the Residential SCOs within native soils. As such, a potentially complete exposure pathway to PAHs exists for trespassers, adult and child visitors, and construction and utility workers only if the shallow soils are disturbed. The potential routes of exposure are ingestion, dermal contact, and inhalation of soil particulates for these receptors. These sample locations are within areas of fill material and are not representative of the Hortonsphere operations.

5.1.3 Stormwater Sediment

Isolated concentrations of PAHs above the Residential SCOs were present in stormwater sediments (MS-SED-01 and MS-SED-03). A potentially complete exposure pathway to PAHs exists for trespassers, adult and child visitors, and construction/utility workers. The potential routes of exposure are ingestion, dermal contact, and inhalation of soil particulates if the sediments are disturbed. There is a limited potential for receptors to encounter these compounds because the property is undeveloped, infrequently accessed, and is posted with no trespassing signs.

5.1.4 Groundwater

A potentially complete current and future exposure pathway exists for metals in groundwater for utility and construction workers involved in deep excavations (~14 feet bgs) in the adjacent to Community Drive (Table 8). There are no complete direct exposure pathways to groundwater on the remainder of the Site because groundwater is encountered below 15 feet bgs and as deep as 65 feet bgs at the western property boundary, which is below the depths of typical excavations.

No potable wells are known to be present within a half-mile downgradient of the Site. The Lakeville-Manhasset Water Company provides water to the area surrounding the Site. EDR identified six public supply wells within 1-mile of the Site; however, these supply wells are screened within the deeper Magothy and/or Lloyd Aquifers - not the shallower Upper Glacial Aquifer. Direct ingestion of groundwater at the Site is not considered a potential exposure pathway and groundwater is not likely to be used as a source of drinking water in the foreseeable future.

5.1.5 Soil Vapor

VOCs were detected in all soil vapor samples collected at the site. Construction and utility workers, adult and child visitors, and trespassers could be exposed to the VOCs within soil vapor if they were to disturb the soils. Therefore, potentially complete exposure pathways via inhalation are possible. However, exposure to soil vapor via vapor intrusion cannot occur because there are no Site structures where VOCs could accumulate. Currently, there is a limited potential for receptors to encounter these compounds because the property is undeveloped, is infrequently accessed, and is posted with no trespassing signs.

5.2 QHHEA Conclusions

The QHHEA indicates that there are potentially complete exposure pathways to chemical constituents above the screening criteria for surface soils, subsurface soils, and groundwater. A potentially complete exposure pathway also exists to VOC concentrations in soil vapor. Based upon the current property use, there is a limited potential for receptors to encounter these compounds because the Site is infrequently accessed and posted with no trespassing signs that restrict access.

6. Fish and Wildlife Resources Impact Analysis

The NYSDEC's FWRIA guidance provides a decision key outlining the actual or potential risks for wildlife in the vicinity of a potential hazardous waste site, which might require performance of a FWRIA. According to this key, a FWRIA is not required for the Manhasset Former Hortonsphere Site (Table 13). The remaining portion of this section provides the supporting information for this conclusion.

An EDR Radius Map report provided to GEI indicates there were no reported spills occurring on the Manhasset Former Hortonsphere Site (NYSDEC, 2007), and environmental testing performed as part of the SC identified that there are no elevated concentrations of contaminants of ecological concern present in groundwater, surface soil, or sub-surface soil related to the activities of the Former Hortonsphere. The lack of Hortonsphere-related contamination at the Site, other than localized lead and PAHs detections in surface soil most likely resulting from fill material, indicate that adjacent water bodies, ecological communities, and species of concern are not being impacted by the former processes that occurred at the Site.

The Site is currently a vacant wooded lot in a residential area and is zoned for residential use. The Site is composed of a successional maritime forest cover-type, which is highly disturbed (Edinger et al. 2002). This is consistent with the post Hortonsphere clearing of the site vegetation presented above in the site history summary in subsection 1.2.3. The residential community of Manhasset surrounds the Site directly adjacent to the north, east, and south. Community Drive, a busy roadway, borders the western edge of the Site. Manhasset is a community with a high density of residential and commercial structures nearby including landscaped yards and paved roads.

Correspondence from the New York Natural Heritage Program in conjunction with the New York State Department of Environmental Conservation indicates that there are no endangered species, habitats, or communities of concern at the Manhasset Hortonsphere Site. Only one endangered vascular plant and one habitat/community of concern are reported in the vicinity of the Site. They are described below:

- Pale duckweed (Lemna valdiviana) was reported within 2 miles of the Site, located in a kettlehole pond on the seventh tee of the Deepdale Golf Club. This species requires quiet bodies of surface water with little disturbance (lack of currents, etc.) and have highly specific mineral requirements. Habitat required for this species is not present on the Site, and the identified location is beyond commercial/residential urbanized area and the roadway adjacent to the Site.

- One significant community, an oak-tulip tree forest, occurs within the 2-mile radius of the Site; however, this ecological community is located upgradient of the Site beyond the commercial/residential urbanized area and adjacent roadway.

According to the National Wetlands Inventory database (United States Fish & Wildlife Service, 1994), there are palustrine forested wetlands as well as Whitney Lake, a fresh surface water body, within 2 miles primarily to the northeast of the Site. These waters are classified as "C" under 6NYCRR. Freshwater features classified as "C" are suitable for fish propagation and survival. The water quality is suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes. Whitney Lake is surrounded by residential structures, along with Community Drive to the west. The roadway is also present between the Site and the wetlands. Therefore, there is no direct surface runoff migration pathway for contaminants to move from the Site to the wetlands or lake.

A field reconnaissance survey conducted in October of 2007 revealed no apparent stress on the ecology of the Site, and did not identify the presence of species of concern listed above. The species that were identified within the 2-mile radius of the Site during the field reconnaissance included:

Plant Species:

- pitch pine (Pinus rigida)
- sassafras (Sassifras albidum)
- red maple (Acer rubrum)
- black oak (Quercus velutina)
- white oak (Quercus alba)
- American beech (Fagus gradifolia)
- American elm (Ulmus Americana)
- poison ivy (Toxicodendron radicans)
- wild grape (Vitis spp.)
- silver maple (Acer saccharinum)
- oriental bittersweet (*Celastrus orbiculatus*)
- clipped lawn grasses

Avian Species

- blue jay (Cyanocitta cristata)
- house sparrow (Passer domesticus)
- song sparrow (Melospiza melodia)
- pigeon (Columba fasciata)
- European starling (Sturnus vulgaris)

Mammalian Species

- Racoon (Procyon lotor) [tracks observed]
- Gray squirrel (Sciurus carolinensis)

7. Conclusions

The Site Characterization at the Manhasset Hortonsphere site was undertaken per the terms of the NYSDEC and National Grid executed AOC (Index #A1-0595-08-07) to evaluate soils, soil vapor and groundwater to determine if former Hortonsphere operations may have impacted the environment. The Manhasset Hortonsphere and regulator house were constructed in 1929. In 1960 the Hortonsphere and regulator house were removed and the gas piping was abandoned in-place. No other records regarding its operation were encountered.

In 1961, LILCO sold the property to the Mount Olive Baptist Church after which LILCO did not have control over the property. Sometime between 1966 and 1976, the Hortonsphere property was cleared of vegetation, soils were reworked, and some filling occurred. The Site has since reverted to forestland.

No physical evidence of staining, sheen or odors were observed in soils and groundwater during the SC investigations. Analytical data for these media were evaluated with respect to Residential SCOs because the property is zoned for residential use. A summary of the SC analytical findings is presented below.

Surface Soils

Individual PAH compounds were slightly above the Residential SCOs at sample locations MS-SS-04, MS-SS-08, and MS-SS-09. All three of these samples were located north of the former Hortonsphere footprint within the grassed yard area adjacent to High Street. Surface soil sample MS-SS-03 contained chromium at a concentration of 27.1 mg/kg, which is slightly higher than the Residential SCO of 22 mg/kg, but well below the maximum eastern U.S background concentration of 1000 ppm. MS-SS-04 also contained a concentration of lead slightly above the Residential SCO.

Based on aerial photographs from 1966 and 1976 (Figures 3 and 4), most surface soil at the property was reworked and augmented with fill after LILCO sold the property. The presence of lead and PAHs is attributed to these reworked soils (potential fill material) or dry deposition of lead from vehicle exhaust on High Street. While potential exposure pathways are complete, the actual risk is regarded as minimal because Site access is limited by no trespassing signs.

Subsurface Soils

BTEX compounds were not detected above Residential SCOs in any of the subsurface soils collected. PAHs and PCBs were not detected in the area of the former Hortonsphere or regulator house.

Off site, in the grassed yard area near High Street, concentrations of individual PAHs were slightly above the Residential SCOs; however, reworked soils (fill material) were found in this location outside the footprint of the former Hortonsphere Site at soil borings. A second off-site location within the parking lot area contained individual PAHs that were slightly above the Residential SCOs. This sample was collected in fill material used in the development of the parking lot and is located outside the former Hortonsphere footprint. PAHs were not detected above the Residential SCOs within native materials indicating that the PAHs are isolated to the reworked soils/ fill materials.

A limited exposure pathway exists for adult and child visitors and trespassers, because deliberate digging is required for contact or inhalation/ingestion. For construction and utility workers the potential is limited because the few PAHs and lead were found only in the reworked soils.

Stormwater Sediments

The stormwater channel appears to be formed from surface run-off that enters the property from off-site, to the west, then flows east and north through the footprint of the former Hortonsphere. None of the sediment samples exceeded Residential SCOs for VOCs, metals, PCBs, pesticides, herbicides, sulfate or sulfide.

The stormwater sediments upgradient of and within the footprint of the former Hortonsphere Site did contain PAH concentrations just above the Residential SCOs. As such, there are potentially complete pathways for workers, adult and child visitors, and trespassers.

The sediments were likely transported from upgradient off-site locations and deposited within the footprint of the Hortonsphere. This likelihood is supported by reduced or absent PAH concentrations in surface or subsurface soils collected within the footprint of the Hortonsphere.

A limited exposure pathway exists for receptors to come into contact with these compounds. Qualitative risk is minimal because the area is isolated and the site is posted with no trespassing signs.

Groundwater

VOCs, PAHs, and PCBs were not detected in groundwater at the Site or above the NYS SCGs.

Metals including lead were detected above the NYS SCGs. However, the elevated metal concentrations in groundwater are naturally occurring and may be associated with suspended sediments in the groundwater samples collected with the Geoprobe® groundwater sampler. The metals concentrations are not indicative of dissolved groundwater conditions. A limited exposure pathway exists for construction and utility workers in excavations ~14 feet deep adjacent to Community Drive. The area surrounding the Site is serviced by the Manhasset-Lakeville Water District, so consumption of the groundwater is not likely. Contact with the water is also unlikely since the depth to water ranges from approximately 14 feet bgs at Community Drive to over 65 feet at the western property boundary at the end of High Street.

Groundwater at the Site has the potential to flow in different directions. However, since dissolved phase impacts are low or not detectable and off-site migration is not regarded as a concern.

Soil Vapor and Ambient Air

There is no apparent on-site source of VOCs at the Site. The highest concentrations of VOCs in soil vapor were detected on the property outside the footprint of the former Hortonsphere in areas of reworked soils (potential fill material). Because there are no buildings on the property, soil vapor intrusion cannot occur under current site conditions. Construction, utility, and other workers may be exposed to low levels of VOCs in soil vapor if they were to disturb the soils. However, the low concentrations present a minimal risk.

Fish and Wildlife Resource Impact Analysis Findings

A Fish and Wildlife Resource Impact Analysis decision key was completed as part of this SC. According to this key (Table 13), a FWRIA was not required. The ecological resources in the vicinity of the Site are not being affected by the low-level chemical constituents detected at the Site.

Final Summary

Based on the findings presented in this report, no release of contaminants resulting from the operation of the Hortonsphere has occurred, and there is no evidence that former gas storage operations have affected the Site. On-site reworked soils (containing historic fill material) have minor impacts, but these are commonly encountered in fill and do not pose significant risk. Considering the current and anticipated future use of the Site (residential zoning), no further action is warranted.

References

Busciolano, R., J. Monti, Jr., and A. Chu, 1998. *Water-Table and Potentiometric-Surface Altitudes of the Upper Glacial, Magothy, and Lloyd Aquifers on Long Island, New York, in March-April, 1997, with a Summary of Hydrogeologic Conditions*. United States Geological Survey. Water-Resources Investigations Report 98-4019.

Busciolano, R., 2002. *Water-Table and Potentiometric-Surface Altitudes of the Upper Glacial, Magothy, and Lloyd Aquifers on Long Island, New York, in March-April 2000, with a Summary of Hydrogeologic Conditions*. United States Geological Survey. Water-Resources Investigations Report 01-4165.

Cartwright, R. A., 2002. *History and Hydrologic Effects of Ground-Water Use in Kings, Queens, and Western Nassau Counties, Long Island, New York, 1800s through 1997*. United States Geological Survey Water-Resources Investigations Report 01-4096.

Edinger, G. J., D. J. Evans, S. Gebauer, T. G. Howard, D. M. Hunt, A. M. Olivero. 2002. DRAFT Ecological Communities of New York State: Second Edition, New York Natural Heritage Program, Albany, NY available at: http://www.dec.state.ny.us/website/dfwmr/heritage/EcolComm.htm.

Environmental Data Resources, 2007, EDR Radius Report, Manghasset Hortonsphere Site, 43 High Street, Manhasset, New York, 11030. April 09.

GEI Consultants, Inc., 2007. *Site Characterization Work Plan, Manhasset Hortonsphere Site*. November 2007.

Ken Petro. Chicago Bridge and Iron. Personal Communication. May 2008.

Long Island Lighting Company. March 29, 1960. *Retirement of Sphere, Governor House & Equipment Manhasset, N.Y. Drawing L-209-Q*, Scale 1 inch = 30 feet.

Long Island Lighting Company. Manhasset Hortonsphere Property Plan Parcel Nos. 24.1, 24.2, and 23.

Morgan, Jerome J. 1935. A Textbook of American Gas Practice, Volume 2, Distribution and Utilization of City Gas. Jerome J. Morgan. Maplewood, New Jersey.

Nassau County Department of Assessment. June 24, 2003, Land and Tax Map Section 2, Block 347 Sheet 1 of 1.

National Oceanic and Atmospheric Administration (NOAA), National Ocean Services, Tidal Datums. http://tidesandcurrents.noaa.gov, accessed December 17, 2007.

New York State Department of Environmental Conservation (NYSDEC), 2002, *Draft DER-10 Technical Guidance for Site Investigation and Remediation.*

New York State Department of Environmental Conservation (NYSDEC), 2007, Environmental Site Database Search. http://www.dec.ny.gov/chemical/8437.html Accessed May 2007.

New York State Department of Environmental Conservation (NYSDEC), *New York State Code of Rules and Regulations*, 6NYCRR Title 6, Chapter 100, Part 700-705 and Part 925.6.

New York State Department of Environmental Conservation (NYSDEC). 2006. *Remedial Program Soil Cleanup Objectives*, Environmental Conservation Law, Chapter IV, Subpart 375-6.

New York State Department of Environmental Conservation, 1998. *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations*. Division of Water Technical and Operational Guidance Series (1.1.1), June 1998.

New York State Department of Health (NYSDOH) 2006. *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York.* October 2006. Prepared by the New York State Department of Health, Center for Environmental Health, Bureau of Environmental Exposure Investigation.

New York State Department of Health (NYSDOH) October 2006. *Summary of Indoor and Outdoor Levels of Volatile Organic Compounds from Fuel Oil Heated Homes in New York State, 1997 to 2003. Vapor Intrusion Guidance Appendix C.* Study Conducted by New York State Department of Health.

Poole, A., P. Stettenheim, and F. Gill. Eds. 1992. The Birds of North America, No. 2. Philidelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Shacklette, H.T., and Boerngen, J.G., 1984. *Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States*. U.S. Geological Survey Professional Paper 1270. 105p.

Soren, Julian and Simmons, Dale L., 1985. *Thickness and Hydrogeology of Aquifers and Confining Units Below the Upper Glacial Aquifer on Long Island, New York.* United States Geological Survey. Water-Resources Investigations Report 86-4175.

United States Department of Labor Occupational Safety & Health Administration. http://www.osha.gov/SLTC/pel/standards.html accessed July 15, 2007.

United States Environmental Protection Agency (EPA), November 2002. *Draft Guidance For Evaluating The Vapor Intrusion to Indoor Air Pathway From Groundwater and Soils.* EPA530-F-02-052. www.epa.gov/osw.

Weather Underground, LaGuardia Airport. http://www.underground.com, accessed on February 12, 2008.

Tables

Table 1
Climatological Norms and Means - LaGuardia Airport
Manhasset Former Hortonsphere Site
Manhasset, New York

Month:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Climatic Averages for New York LaGuardia Airport from 1971 to 2000													
Precipitation (inches)	3.56	2.75	3.93	3.68	4.16	3.57	4.41	4.09	3.77	3.26	3.67	3.51	44.36
Average Maximum Temperature (°F)	38.6	41.2	49.6	60	70.6	79.3	84.7	83.1	75.6	64.5	53.6	43.7	62.1
Average Minimum Temperature (°F)	26.5	28.3	35.1	44.4	54.3	63.7	69.5	68.7	61.6	50.9	41.6	32	48.1
Climatic Averages for LaGuardia Airport, New York 2007													
Precipitation (inches)	---	---	---	---	---	---	---	---	---	---	2.78	4.43	---
Average Temperature (°F)	---	---	---	---	---	---	---	---	---	---	47	39	---
Average Maximum Temperature (°F)	---	---	---	---	---	---	---	---	---	---	53	43	---
Average Minimum Temperature (°F)	---	---	---	---	---	---	---	---	---	---	41	34	---
Average Wind Speed (mph)	---	---	---	---	---	---	---	---	---	---	11	12	---
Climatic Averages for LaGuardia Airport, New York 2009													
Precipitation (inches)	---	0.66	---	---	---	---	---	---	---	---	---	---	---
Average Temperature (°F)	---	37	---	---	---	---	---	---	---	---	---	---	---
Average Maximum Temperature (°F)	---	45	---	---	---	---	---	---	---	---	---	---	---
Average Minimum Temperature (°F)	---	29	---	---	---	---	---	---	---	---	---	---	---
Average Wind Speed (mph)	---	13	---	---	---	---	---	---	---	---	---	---	---

Notes:

All data was collected from the U.S. Weather Service weather station located in New York in Queens County, New York. The New York LaGuardia Airport weather station is at an elevation of 11 feet and was established as a weather station on 01 Aug 1935.

Climatic Averages for New York LaGuardia Airport from 1971 to 2000 were obtained from Online Highways, http://www.ohwy.com/ny/w/wx305811.htm, retrieved June 11, 2003.

2007 Monthly average temperature (degrees Fahrenheit) and precipitation data (inches) were obtained from Weather Underground, http://www.wunderground.com, accessed November 17, 2009.

Table 2
Sample Rationale
Manhasset Former Hortonsphere Site
Manhasset, New York

Sample I.D.	Sample Location	Laboratory Sample Description (Sample Depth Feet)	Sample Rationale	Number of Samples				VOCs (EPA 8260B)	SVOCs (EPA 8270C)	TAL Metals (6000/7000)	Herbicides (EPA 8151A)	PCBs (EPA 8082)/ Pesticides (EPA 8081A)	Sulfide (EPA 9034/ 376.1)	Sulfate (EPA 300)	VOCs (Expanded) (Modified TO-15)
				Soil	Soil Vapor	Sediment	Groundwater								
Subsurface Soil Borings, Groundwater Monitoring Points, Monitoring Wells															
MS-GP-01/ MS-GW-01	Central portion of the property (former location of the Hortonsphere)	MS-GP-01 (0-4')	Evaluate soil conditions in the top four feet of soils in the area of the former Hortonsphere.	X				X	X	X	X	X	X	X	
		MS-GP-01 (44-45')	Evaluate soil conditions at the completion of the soil boring in the area of the former Hortonsphere.	X				X	X	X	X	X	X	X	
		MS-GW-01	Groundwater grab sample to evaluate groundwater conditions in the area of the former Hortonsphere.				X	X	X	X	X	X	X	X	
MS-GP-02/ MS-GW-02	Central portion of the property (former location of Hortonsphere Regulator Building)	MS-GP-02 (0-5')	Evaluate soil conditions in the top five feet of soils in the area of the former Hortonsphere and regulator/ pump house.	X				X	X	X	X	X	X	X	
		MS-GP-02 (38-40')	Evaluate soil conditions at the completion of the soil boring in the area of the former Hortonsphere and regulator/ pump house.	X				X	X	X	X	X	X	X	
		MS-GW-02	Groundwater grab sample to evaluate groundwater conditions in the area of the former Hortonsphere and regulator/pump house.				X	X	X	X	X	X	X	X	
MS-GP-03/ MS-MW-03	Eastern property boundary adjacent to Community Drive (topographically downgradient of former location of Hortonsphere)	MS-GP-03 (0-5')	Evaluate soil conditions within the top five feet of subsurface soils topographically downgradient of the former Hortonsphere.	X				X	X	X	X	X	X	X	
		MS-GP-03 (15-17')	Evaluate soil conditions at the watertable topographically downgradient of the former Hortonsphere.	X				X	X	X	X	X	X	X	
		MS-MW-03	Evaluate groundwater conditions downgradient of the former Hortonsphere				X	X	X	X	X	X	X	X	
MS-GP-04/ MS-MW-04	Grassed area adjacent to former Hortonsphere property (Lot 17)	MS-GP-04 (0-5')	Evaluate soil conditions in the top five feet of reworked subsurface soils adjacent to the residence and apartment buildings.	X				X	X	X	X	X	X	X	
		MS-GP-04 (25-27')	Evaluate soil conditions at the apparent perched watertable adjacent to the residence and nearby apartment buildings	X				X	X	X	X	X	X	X	
		MS-GP-04A (43-45')	Evaluate soil conditions at the apparent water table adjacent to the residence and nearby apartment buildings	X									X		
		MS-GP-04A (45-47')	Evaluate soil conditions within the apparent water table adjacent to the residence and nearby apartment buildings.	X				X	X	X	X	X		X	
		MS-MW-04	Evaluate groundwater conditions cross-gradient from Hortonsphere and adjacent to the residence and nearby apartment buildings.				X	X	X	X	X	X	X	X	

Table 2
Sample Rationale
Manhasset Former Hortonsphere Site
Manhasset, New York

Sample I.D.	Sample Location	Laboratory Sample Description (Sample Depth Feet)	Sample Rationale	Number of Samples				VOCs (EPA 8260B)	SVOCs (EPA 8270C)	TAL Metals (6000/7000)	Herbicides (EPA 8151A)	PCBs (EPA 8082)/ Pesticides (EPA 8081A)	Sulfide (EPA 9034/ 376.1)	Sulfate (EPA 300)	VOCs (Expanded) (Modified TO-15)
				Soil	Soil Vapor	Sediment	Groundwater								
MS-GP-05/ MS-MW-05	Western property boundary in the parking lot for the Mount Olive Baptist Church	MS-GP-05 (0-5')	Evaluate soil conditions within fill encountered in the parking lot for the Mount Olive Baptist Church.	X				X	X	X	X	X	X	X	
		MS-GP-05A (71-73')	Evaluate soil conditions at the apparent watertable upgradient of the former Hortonsphere operation.	X				X	X	X	X	X	X	X	
		MS-MW-05	Evaluate groundwater conditions upgradient of the former Hortonsphere operation.				X	X	X	X	X	X	X	X	
MS-GP-06/ MS-MW-06	Southeastern property line adjacent to Community Drive	MS-GP-06 (1-3')	Evaluate shallow subsurface soil conditions topographically topographically downgradient of the former Hortonsphere operation	X				X	X	X	X	X	X	X	
		MS-GP-06 (12-13')	Evaluate soil conditions at the apparent water table topographically downgradient of the former Hortonsphere.	X				X	X	X	X	X	X	X	
		MS-MW-06	Evaluate groundwater conditions topographically downgradient of the former Hortonsphere.				X	X	X	X	X	X	X	X	
MS-GP-07	Western area of property within the parking lot for the Mount Olive Baptist Church.	MS-GP-07 (1-2')	Evaluate fill/ reworked soil.	X				X	X	X					
		MS-GP-07 (19-20')	Confirm native material below Evaluate fill/ reworked soil.	X				X	X	X					
MS-GP-08	Western area of property within the parking lot for the Mount Olive Baptist Church.	MS-GP-08 (1-4')	Evaluate fill/ reworked soil.	X				X	X	X					
		MS-GP-08 (19-20')	Confirm native material below Evaluate fill/ reworked soil.	X				X	X	X					
MS-GP-09	Western area of property within the parking lot for the Mount Olive Baptist Church.	MS-GP-09 (1-5')	Evaluate fill/ reworked soil.	X				X	X	X					
		MS-GP-09 (15-17')	Confirm native material below Evaluate fill/ reworked soil.	X				X	X	X					
MS-GP-10	Grassed area to north of the former Hortonsphere property (Lot 17).	MS-GP-10 (1-2')	Evaluate fill/ reworked soil.	X				X	X	X					
		MS-GP-10 (5.5-6.5')	Confirm native material below Evaluate fill/ reworked soil.	X				X	X	X					
MS-GP-11	Grassed area to north of the former Hortonsphere property (Lot 17).	MS-GP-11 (1-4')	Evaluate fill/ reworked soil.	X				X	X	X					
		MS-GP-11 (9-10')	Confirm native material below Evaluate fill/ reworked soil.	X				X	X	X					
MS-GP-12	Grassed area to north of the former Hortonsphere property (Lot 17).	MS-GP-12 (1-2')	Evaluate fill/ reworked soil.	X				X	X	X					
		MS-GP-12 (7-8')	Confirm native material below Evaluate fill/ reworked soil.	X				X	X	X					

Table 2
Sample Rationale
Manhasset Former Hortonsphere Site
Manhasset, New York

Sample I.D.	Sample Location	Laboratory Sample Description (Sample Depth Feet)	Sample Rationale	Number of Samples				VOCs (EPA 8260B)	SVOCs (EPA 8270C)	TAL Metals (6000/7000)	Herbicides (EPA 8151A)	PCBs (EPA 8082)/ Pesticides (EPA 8081A)	Sulfide (EPA 9034/ 376.1)	Sulfate (EPA 300)	VOCs (Expanded) (Modified TO-15)
				Soil	Soil Vapor	Sediment	Groundwater								
Surface Soil Sample Locations															
MS-SS-01	Located within a wooded area at the central portion of the property adjacent to the former Hortonsphere.	MS-SS-01 (0-2")	Soil sample to evaluate surface soil conditions adjacent to the former Hortonsphere.	X				X	X	X	X	X	X	X	
MS-SS-02	Located within a wooded area at the central portion of the property at the location of the former Hortonsphere	MS-SS-02 (0-2")	Soil sample to evaluate surface soil conditions in the footprint of the former Hortonsphere.	X				X	X	X	X	X	X	X	
MS-SS-03	Located within a wooded area at the location of the former Hortonsphere out building	MS-SS-03 (0-2")	Soil sample to evaluate surface soil conditions at the location of the former Hortonsphere regulator/ pump house building.	X				X	X	X	X	X	X	X	
MS-SS-04	Northern property boundary adjacent to High Street	MS-SS-04 (0-2")	Surface soil sample to evaluate surface soil conditions in a grassed area (within fill area).	X				X	X	X	X	X	X	X	
MS-SS-05	Western property boundary adjacent to the neighboring day-care/ community center playground	MS-SS-05 (0-2")	Surface soil sample to evaluate surface soil conditions adjacent to the neighboring playground for the day care/ community center.	X				X	X	X	X	X	X	X	
MS-SS-06	Located within a grassed area at the location of the former Hortonsphere out building	MS-SS-06 (0-2")	Soil sample to evaluate surface soil conditions near the location of the former Hortonsphere regulator/ pump house building.	X				X	X	X	X	X	X	X	
MS-SS-07	Located to the southwest of MS-SS-04 in Lot 17.	MS-SS-07 (0-2")	Evaluate concentrations of lead and polycyclic aromatic hydrocarbons (PAHs) in surface soils near MS-SS-04.	X					X [PAH Only]	X [Lead Only]					
MS-SS-08	Located to the east of MS-SS-04 in Lot 17.	MS-SS-08 (0-2")	Evaluate concentrations of lead and PAHs in surface soils near MS-SS-04.	X					X [PAH Only]	X [Lead Only]					
MS-SS-09	Located to the northeast of MS-SS-04 in Lot 17.	MS-SS-09 (0-2")	Evaluate concentrations of lead and PAHs in surface soils near MS-SS-04.	X					X [PAH Only]	X [Lead Only]					
Storm water Sediment Samples															
MS-SED-01	Located where the storm water channel discharges onto the property.	MS-SED-01	Sediment sample to evaluate upgradient sediment quality.			X		X	X	X	X	X	X	X	
MS-SED-02	Located up gradient of the former Hortonsphere site.	MS-SED-02	Sediment sample to evaluate sediment quality upgradient of the Hortonsphere.			X		X	X	X	X	X	X	X	
MS-SED-03	Located within the footprint of the former Hortonsphere	MS-SED-03	Sediment sample to evaluate sediment within Hortonsphere footprint.			X		X	X	X	X	X	X	X	
MS-SED-04	Located downgradient of the former Hortonsphere.	MS-SED-04	Sediment sample to evaluate sediment in storm water channel downgradient of the Hortonsphere.			X		X	X	X	X	X	X	X	

Table 2
Sample Rationale
Manhasset Former Hortonsphere Site
Manhasset, New York

Sample I.D.	Sample Location	Laboratory Sample Description (Sample Depth Feet)	Sample Rationale	Number of Samples				VOCs (EPA 8260B)	SVOCs (EPA 8270C)	TAL Metals (6000/7000)	Herbicides (EPA 8151A)	PCBs (EPA 8082)/ Pesticides (EPA 8081A)	Sulfide (EPA 9034/ 376.1)	Sulfate (EPA 300)	VOCs (Expanded) (Modified TO-15)
				Soil	Soil Vapor	Sediment	Groundwater								
Soil Vapor and Ambient Air Sample Locations															
MS-SV-01	Central portion of the property	MS-SV-01	Soil vapor sample to screen the soil conditions at the location of the former Hortonsphere.		X										X
MS-SV-02	Central portion of the property	MS-SV-02	Soil vapor sample to screen the soil conditions at the location of the former Hortonsphere regulator/pump house.		X										X
MS-SV-03	Western boundary of the site	MS-SV-03	Soil vapor sample to screen the soil conditions adjacent to the abutting day-care/ community center.		X										X
MS-SV-04	Northern boundary of the property	MS-SV-04	Soil vapor sample to screen the soil conditions adjacent to the residence and nearby apartment building.		X										X
MS-SV-05	Southern boundary of the property	MS-SV-05	Soil vapor sample to screen the soil conditions adjacent to the nearby apartment buildings.		X										X
MS-SV-06	Located in parking lot along western property boundary.	MS-SV-06	Assess shallow soil vapor quality in parking lot along western property extent in the parking lot.		X										X
MS-SV-07	Located in parking lot along western property boundary.	MS-SV-07S	Assess shallow soil vapor quality in parking lot.		X										X
MS-SV-08	Located in the grassed area in between the residence and MS-SV-04.	MS-SV-08S	Assess shallow soil vapor quality in grassed area along high street.		X										X
		MS-SV-08D	Assess soil vapor in deeper vadose zone below reworked soils and fill materials.		X										X
MS-OA-1	Positioned on-site at breathing height.	MS-OA-1	Assess ambient air quality during soil vapor collection.		X										X

Notes:
Chemical analysis test methods specified are from U.S. EPA SW-846 test methods
EPA TO-15 analysis included VOCs and naphthalene
EPA - Environmental Protection Agency
VOC - volatile organic compounds
SVOC - semi volatile organic compounds
TAL - target analyte list
PCBs - polychlorinated biphenyls

Prepared by: LW

Table 3
Monitoring Well Construction Data
Manhasset Former Hortonsphere Site
Manhasset, New York

Well ID	Lithology of Screened Interval	Depth to bottom (BGS)	Screened Interval (feet below ground surface)		Top of Screen Elevation (Feet above NAVD)	Bottom of Screen Elevation (Feet above NAVD)	Top of Casing Elevation (Feet above NAVD)	Ground Surface Elevation (Feet Above NAVD)	Elevation at Center of Well Screen (Feet above NAVD)	Ground-Water Elevation 12/27-12/28/2007	Ground-Water Elevation 1/28/2008	Ground-Water Elevation 2/20/2009	Ground-Water Elevation 4/9/2009	Ground-Water Elevation 12/30/2009	Ground-Water Elevation 1/14/2010
			Top of Screen	Bottom of Screen											
MS-MW-03	SAND and SILT-SAND	20.02	13	23	28.89	18.89	41.86	41.89	23.89	27.25	27.6	28.24	28.05	28.37	28.47
MS-MW-04	SILT-SAND	33	23	33	36.60	26.60	59.27	59.6	31.60	NM-Dry	NM	NM	NM	NM	NM
MS-MW-04A	SAND and CLAY	46.02	37	47	23.75	13.75	60.75	61.08	18.75	27.52	27.4	28.35	28.11	28.4	28.58
MS-MW-05	SAND	75.41	69	79	24.22	14.22	93.42	93.22	19.22	27.69	26.81	27.75	27.5	27.79	28.02
MS-MW-06	SAND and SILT-SAND	20.85	11	21	30.58	20.58	41.23	41.58	25.58	27.48	27.65	28.63	28.45	28.79	28.89

Notes:

Wells MS-MW-03 and MS-MW-06 were constructed using 2-inch Schedule 40 PVC Geoprobe prepacked (0.010") slotted screens threaded to 2-inch Schedule 40 PVC riser.
Wells MS-MW-04A and MS-MW-05A were constructed using 2-inch Schedule 40 PVC slotted screen (0.010") threaded onto 2-inch Schedule 40 PVC riser.
Well MS-MW-04 was a 1-inch Schedule 40 PVC slotted screen (0.010") threaded to a 1-inch PVC Schedule 40 riser.
BGS - Below Ground Surface
NM - Not Measured
NAVD - North American Vertical Datum

Table 4
Final Groundwater Parameters
Manhasset Former Hortonsphere Site
Manhasset, New York

Sample Location/ Well ID	Date	Flow Rate (mL/min)	Depth to water (feet below TOC at time of sampling)	Groundwater Elevation (feet NAVD at time of sampling)	Parameters								
					Temperature (C)	pH (su)	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Odor	Color	Sheen
MS-MW-03	12/27/2007	400	14.61	27.25	10.65	6.18	0.378	54	4.32	144	none	clear	none
MS-MW-04A	12/27/2007	200	33.23	27.52	10.6	5.83	0.291	>999	4.02	138	none	turbid, grey	none
MS-MW-05	12/28/2007	200	65.73	27.69	11.22	5.83	0.417	473.00	3.21	78	none	turbid, grey	none
MS-MW-06	12/28/2007	200	13.75	27.48	14.05	6.03	0.574	30.0	1.66	25	none	clear	none

Notes:
NAVD - North American Vertical Datum
TOC - Top of Casing
ml/min = milliliters per minute
NTU = nephelometric turbidity units
C = Celsius
su = standard units
mg/L = milligrams per liter
mV = millivolts
mS/cm = milliSiemens per centimeter

Table 5
Surface Soil Analytical Results for Detected Compounds
Manhasset Former Hortonsphere Site
Manhasset, New York

Sample Name: / Sample Interval: / Sample Date:	RESIDENTIAL SCOs	MS-SS-01 (0-2 in.) 11/20/2007	MS-SS-02 (0-2 in.) 11/20/2007	MS-SS-03 (0-2 in.) 11/20/2007	MS-SS-04 (0-2 in.) 11/20/2007	MS-SS-05 (0-2 in.) 11/20/2007	MS-SS-06 (0-2 in.) 11/20/2007	MS-SS-07 (0-2 in.) 2/19/2009	MS-SS-08 (0-2 in.) 2/19/2009	MS-SS-09 (0-2 in.) 2/19/2009
BTEX (mg/kg)										
Total BTEX	NE	ND	ND	ND	ND	ND	ND	NA	NA	NA
PAHs (mg/kg)										
Acenaphthene	100	0.38 U	0.4 U	0.46 U	0.072 J	0.44 U	0.4 U	0.3 U	0.29 U	3.3
Anthracene	100	0.38 U	0.4 U	0.46 U	0.46	0.44 U	0.4 U	0.067 J	0.24 J	11
Benz[a]anthracene	1	0.38 U	0.085 J	0.27 J	2	0.28 J	0.21 J	0.25 J	1	15
Benzo[a]pyrene	1	0.06 J	0.097 J	0.28 J	1.8	0.31 J	0.21 J	0.25 J	1.1	13 J
Benzo[b]fluoranthene	1	0.1 J	0.15 J	0.39 J	2	0.44	0.28 J	0.31	1.3	18 J
Benzo[g,h,i]perylene	100	0.077 J	0.11 J	0.31 J	1.6	0.25 J	0.22 J	0.18 J	0.63	7.2 J
Benzo[k]fluoranthene	1	0.38 U	0.4 U	0.14 J	0.7	0.16 J	0.11 J	0.14 J	0.47	6.5 J
Chrysene	1	0.095 J	0.14 J	0.34 J	2.1	0.36	0.25 J	0.25 J	1	15
Dibenz[a,h]anthracene	0.33	0.38 U	0.4 U	0.07 J	0.38	0.44 U	0.4 U	0.3 U	0.15 J	4.5 J
Pyrene	100	0.11 J	0.17 J	0.43 J	3.3	0.35	0.32 J	0.52	1.4	21
Total PAHs (mg/kg)	NE	0.652	1.161	3.32	21.394	3.15	2.4	2.867	10.68	223.32
Other SVOCs (mg/kg)										
Bis(2-ethylhexyl)phthalate	NE	0.22 J	0.078 J	0.27 J	0.11 J	0.079 J	0.069 J	NA	NA	NA
Carbazole	NE	0.38 U	0.4 U	0.46 U	0.11 J	0.44 U	0.4 U	NA	NA	NA
PCBs (mg/kg)										
Aroclor 1254	NE	0.0064 J	0.0083 J	0.03	0.0045 J	0.02 J	0.033 J	NA	NA	NA
Aroclor 1260	NE	0.02 U	0.021 U	0.024 U	0.019 U	0.023 U	0.025	NA	NA	NA
PCBs, Total	1	0.0064	0.0083	0.03	0.0045	0.02	0.058	NA	NA	NA
Pesticides (mg/kg)										
Alpha-chlordane	0.91	0.002 U	0.0021 U	0.0024 UJ	0.0017 J	0.003 JN	0.0021 JN	NA	NA	NA
Chlordane, trans-	NE	0.0011 J	0.0019 J	0.0024 UJ	0.0019 U	0.0025 JN	0.0021 U	NA	NA	NA
DDD,4,4-	2.6	0.0038 UJ	0.004 UJ	0.0037 JN	0.0037 UJ	0.0045 UJ	0.0037 JN	NA	NA	NA
DDE,4,4-	1.8	0.0038 U	0.004 U	0.0025 JN	0.0037 U	0.008 JN	0.0034 JN	NA	NA	NA
DDT,4,4-	1.7	0.0038 UJ	0.004 UJ	0.0068 J	0.0048 J	0.013 J	0.0057 J	NA	NA	NA
Delta-BHC	100	0.00083 J	0.001 J	0.0024 UJ	0.0019 U	0.0023 J	0.0021 U	NA	NA	NA
Endosulfan II	4.8	0.0038 U	0.004 U	0.0022 J	0.0037 U	0.001 J	0.0041 U	NA	NA	NA
Endosulfan sulfate	4.8	0.00069 J	0.00062 J	0.0046 UJ	0.0037 U	0.0045 U	0.0041 U	NA	NA	NA
Endrin aldehyde	NE	0.0023 J	0.0026 J	0.0067 J	0.0037 U	0.0037 J	0.0042 J	NA	NA	NA
Heptachlor epoxide	NE	0.00032 J	0.0005 J	0.00079 J	0.0019 U	0.0011 J	0.0021 U	NA	NA	NA
Herbicides (mg/kg)										
Herbicides	NE	ND	ND	ND	ND	ND	ND	NA	NA	NA
Metals (mg/kg)										
Aluminum	NE	1760	2150	6950	7690	4220	6130	NA	NA	NA
Arsenic	16	10 U	12 U	3.8 J	2.8 J	7.6	2.8 J	NA	NA	NA
Barium	350	17 J	15.4 J	53.2 J	73.5 J	40.8 J	42.3 J	NA	NA	NA
Calcium	NE	741 J	617 J	2450 J	1660 J	5610 J	1210 J	NA	NA	NA
Chromium	22*	8.8 J	8.2 J	27.1 J	19 J	10.4 J	21 J	NA	NA	NA
Cobalt	NE	2 J	2.7 J	5.1 J	5.6 J	4.4 J	4.2 J	NA	NA	NA
Copper	270	6.2 UJ	7.5 UJ	19.4 J	35.7 J	18.8 J	15.7 J	NA	NA	NA
Iron	NE	8260	7940	13600	18500	9950	11400	NA	NA	NA
Lead	400	9 J	11.8 J	111 J	433 J	58.7 J	88.2 J	12.4 J	31.9 J	44.4 J
Magnesium	NE	401 J	507 J	1400 J	2120	1810	1220 J	NA	NA	NA
Manganese	2000	129	138	355	337	346	252	NA	NA	NA
Mercury	0.81	0.017 J	0.06	0.15	0.1	0.063	0.11	NA	NA	NA
Nickel	140	4.5 J	4.8 J	12.8 J	11.2	10.9 J	10.9	NA	NA	NA
Potassium	NE	200 J	197 J	488 J	714 J	409 J	429 J	NA	NA	NA
Silver	36	3.7 U	4.5 U	1.6 J	2.9 U	4.1 U	1.4 J	NA	NA	NA
Sodium	NE	25.4 J	301 U	37 J	84 J	50.2 J	61.7 J	NA	NA	NA
Vanadium	NE	10.3 J	10.6 J	20.6 J	33.1 J	15.6 J	17.8 J	NA	NA	NA
Zinc	2200	16.6 J	18.4 J	83.6 J	62 J	87.2 J	62.5 J	NA	NA	NA
Other (mg/kg)										
Sulfide	NE	17.4 UJ	18.9 UJ	18.6 UJ	17.4 UJ	17.4 UJ	19.1 UJ	NA	NA	NA
Sulfate	NE	11.6 U	12.1 U	14.1 U	11.2 U	13.6 U	12.3 U	NA	NA	NA

Table 5
Surface Soil Analytical Results for Detected Compounds
Manhasset Former Hortonsphere Site
Manhasset, New York

Notes:

Only detected compounds are presented on this table.
mg/kg - milligrams/kilogram or parts per million (ppm)
BTEX - benzene, toluene, ethylbenzene, and xylene
PAHs - polycyclic aromatic hydrocarbons
SVOCs - semivolatile organic compounds
PCBs - Polychlorinated Biphenyls
Total PAHs and Total PCBs are calculated using detects only.

6 NYCRR -New York State Register and Official Compilation of Codes, Rules and Regulations of the State of New York
6 NYCRR 375 SCO RESTRICTED USE RESIDENTIAL - regulatory comparison against NYCRR, Chapter IV, Part 375-6 Restricted Use Residential Soil Cleanup Objectives (SCOs)
*-There is no established criteria for total chromium. The residential SCO for hexavalent chromium was used for comparison

NE- not established
NA - not analyzed
ND - Not detected

Bolding indicates a detected concentration
Gray shading and bolding indicates that the detected result value exceeds established NYSDEC 375 RESTRICTED RESIDENTIAL USE SCO
Total PAHs (mg/kg)

Validation Qualifiers:
J - estimated value
JN - analyte is presumptively present at an approximated quantity
U - indicates not detected to the reporting limit for organic analysis and the method detection limit for inorganic analysis
UJ - not detected at or above the reporting limit shown and the reporting limit is estimated

Table 6
Subsurface Soil Analytical Results for Detected Compounds
Manhasset Former Hortonsphere Site
Manhasset, New York

Sample Name: / Sample Interval: / Sample Date:	RESIDENTIAL SCOs	MS-GP-04 (0-5) 11/14/2007	MS-GP-04 (25-27) 11/15/2007	MS-GP-04A (43-45) 12/18/2007	MS-GP-04A (45-47) 12/18/2007	MS-GP-05 (0-5) 11/16/2007	MS-GP-05A (71-73) 12/7/2007	MS-GP-06 (1-3) 11/20/2007	MS-GP-06 (12-13) 11/20/2007
BTEX (mg/kg)									
Toluene	100	0.0061 U	0.0054 U	NA	0.0061 U	0.0056 U	0.006 U	0.0055 U	0.006 U
Total BTEX	NE	ND	ND	NA	ND	ND	ND	ND	ND
Other VOCs (mg/kg)									
Acetone	100	0.024 U	**0.0057 J**	NA	0.024 U	**0.016 J**	**0.0045 J**	0.022 U	0.024 U
Carbon disulfide	NE	0.0061 U	0.0054 U	NA	**0.00071 J**	0.0056 U	0.006 U	0.0055 U	0.006 U
PAHs (mg/kg)									
Acenaphthene	100	**0.083 J**	0.34 U	NA	0.4 U	**0.27 J**	0.39 U	0.36 U	0.39 U
Acenaphthylene	100	0.4 U	0.34 U	NA	0.4 U	**0.074 J**	0.39 U	0.36 U	0.39 U
Anthracene	100	**0.25 J**	0.34 U	NA	0.4 U	**0.8**	0.39 U	0.36 U	0.39 U
Benzo[a]pyrene	1	**1.1**	0.34 U	NA	0.4 U	**1.2**	**0.39 U**	**0.068 J**	0.39 U
Benzo[b]fluoranthene	1	**1.5**	0.34 U	NA	0.4 U	**1.4**	0.39 U	**0.097 J**	0.39 U
Benzo[g,h,i]perylene	100	**1.2**	0.34 U	NA	0.4 U	**1**	0.39 U	0.36 U	0.39 U
Benzo[k]fluoranthene	1	**0.6**	0.34 U	NA	0.4 U	**0.6**	0.39 U	0.36 U	0.39 U
Chrysene	1	**1.5**	0.34 U	NA	0.4 U	**1.4**	0.39 U	**0.079 J**	0.39 U
Dibenz[a,h]anthracene	0.33	**0.24 J**	0.34 U	NA	0.4 U	**0.22 J**	0.39 U	0.36 U	0.39 U
Fluoranthene	100	**3.1**	0.34 U	NA	**0.073 J**	**3.1**	0.39 U	**0.14 J**	0.39 U
Fluorene	100	**0.1 J**	0.34 U	NA	0.4 U	**0.45**	0.39 U	0.36 U	0.39 U
Indeno[1,2,3-cd]pyrene	0.5	**1.3**	0.34 U	NA	0.4 U	**1.1**	0.39 U	0.36 U	0.39 U
Naphthalene	100	0.4 U	0.34 U	NA	0.4 U	**0.058 J**	0.39 U	0.36 U	0.39 U
Phenanthrene	100	**1.7**	0.34 U	NA	0.4 U	**3.1**	0.39 U	0.36 U	0.39 U
Pyrene	100	**2.5**	0.34 U	NA	0.4 U	**2.9**	0.39 U	**0.12 J**	0.39 U
Total PAHs	NE	**16.273**	ND	NA	**0.073**	**19.172**	ND	**0.582**	ND
Other SVOCs (mg/kg)									
Bis(2-ethylhexyl)phthalate	NE	**0.079 J**	**0.12 J**	NA	**0.38**	0.36 U	**0.23 J**	0.36 U	0.39 U
Carbazole	NE	**0.21 J**	0.34 U	NA	0.4 U	**0.21 J**	0.39 U	0.36 U	0.39 U
Dibenzofuran	14	0.4 U	0.34 U	NA	0.4 U	**0.18 J**	0.39 U	0.36 U	0.39 U
PCBs (mg/kg)									
Aroclor 1254	NE	0.02 U	0.018 U	NA	0.021 U	0.018 U	0.02 U	**0.0049 J**	0.021 U
Aroclor 1260	NE	0.02 U	0.018 U	NA	0.021 U	0.018 U	0.02 U	0.019 U	0.021 U
Total PCBs	1	ND	ND	NA	ND	ND	ND	**0.0049**	ND
Pesticides (mg/kg)									
Alpha-chlordane	0.91	0.002 UJ	0.0018 UJ	NA	0.0021 UJ	**0.0048 J**	0.002 U	0.0019 UJ	0.0021 U
DDD,4,4-	2.6	0.0039 UJ	0.0035 UJ	NA	0.004 U	**0.0097 JN**	0.0039 UJ	0.0036 UJ	0.004 UJ
DDE,4,4-	1.8	0.0039 UJ	0.0035 UJ	NA	0.004 U *	**0.0049 JN**	0.0039 U	0.0036 U	0.004 U
DDT,4,4-	1.7	0.0039 UJ	0.0035 UJ	NA	0.004 U	**0.0076 J**	0.0039 U	**0.0012 J**	0.004 UJ
Delta-BHC	100	0.002 UJ	0.0018 UJ	NA	0.0021 U	0.0037 UJ	0.002 U	0.0019 U	0.0021 U
Dieldrin	0.039	0.0039 UJ	0.0035 UJ	NA	0.004 U	**0.0032 J**	0.0039 U	0.0036 U	0.004 U
Endrin aldehyde	NE	0.0039 UJ	0.0035 UJ	NA	0.004 UJ	0.0071 UJ	0.0039 UJ	**0.0014 J**	0.004 U
Metals (mg/kg)									
Aluminum	NE	**7460**	**317**	NA	**421**	**5130**	**906**	**2650**	**706**
Arsenic	16	**3.5 J**	8 U	NA	10.1 U	**3.8**	10.4 U	9.8 U	10.7 U
Barium	350	**31.6 J**	**4.3 J**	NA	**4.4 J**	**83.5**	**7.3 J**	**14.8 J**	**6.2 J**
Beryllium	14	2.5 U	2 U	NA	2.5 U	2 U	2.6 U	2.4 U	2.7 U
Calcium	NE	**1370 J**	**27.3 J**	NA	253 U	**1820 J**	**87.8 J**	**408 J**	**80.9 J**
Chromium	22*	**18.6**	**3.7**	NA	**4.9**	**15.6**	**2.5 J**	**11.6 J**	**2.3 J**
Cobalt	NE	**12.7**	2 U	NA	2.5 U	**3.8 J**	2.6 U	**2.5 J**	**0.88 J**
Copper	270	**16.9**	**2.1 J**	NA	**1.6 J**	**30.3**	**0.63 J**	7.3 UJ	6.7 UJ
Iron	NE	**20500**	**1700**	NA	**1740**	**13500**	**566**	**7680**	**3240**
Lead	400	**18.3 J**	**2.5 J**	NA	**2 J**	**136 J**	**2.9 J**	**37.5 J**	**3.3 J**
Magnesium	NE	**1550**	**13.9 J**	NA	95.5 UJ	**797 J**	**48.9 J**	**582 J**	**39.6 J**
Manganese	2000	**684 J**	**9.7 J**	NA	**16.8 J**	**135 J**	**3.6 J**	**164**	**7**
Mercury	0.81	**0.11**	0.052 U	NA	0.057 U	**0.26**	0.059 U	**0.02**	0.057 U
Nickel	140	**9.9 J**	5 U	NA	6.3 U	**9.8**	6.5 U	**6.2 J**	**1.6 J**
Potassium	NE	**531 J**	**103 J**	NA	**77.6 J**	**333 J**	**176 J**	**255 J**	**175 J**
Selenium	36	12.6 U	10 U	NA	12.7 U	9.9 U	13 U	12.2 U	13.3 U
Silver	36	3.8 U	3 U	NA	3.8 U	3 U	3.9 U	**0.38 J**	4 U
Sodium	NE	**41.8 J**	200 U	NA	253 U	**27.6 J**	260 U	244 U	267 U
Vanadium	NE	**26.4**	**5.3 J**	NA	**5.1 J**	**16**	**5.4 J**	**11.5 J**	**6.2 J**
Zinc	2200	**31 J**	20 U	NA	**7.5 J**	**251 J**	26 U	**34.1 J**	26.7 UJ
Other (mg/kg)									
Acid Soluble Sulfide	NE	R	R	R	NA	R	18.3 U	16.2 UJ	18.4 UJ
Sulfate	NE	**23.9**	**9.5**	NA	**10.1**	**16.5**	**14.4**	11.0 U	12.0 U

Table 6
Subsurface Soil Analytical Results for Detected Compounds
Manhasset Former Hortonsphere Site
Manhasset, New York

Sample Name: / Sample Interval: / Sample Date:	RESIDENTIAL SCOs	MS-GP-07 (1-5) 2/19/2009	MS-GP-07 (19-20) 2/19/2009	MS-GP-08 (1-4) 2/19/2009	MS-GP-08 (19-20) 2/19/2009	MS-GP-09 (1-5) 2/19/2009	Duplicate of MS-GP-09 (1-5) 2/19/2009	MS-GP-09 (15-17) 2/19/2009	MS-GP-10 (1-2) 2/20/2009	MS-GP-10 (5.5-6.5) 2/20/2009
BTEX (mg/kg)										
Toluene	100	0.0059 U	0.0054 U	0.0057 UJ	0.0055 U	0.0057 U	**0.00039 J**	0.0054 U	0.0056 U	0.0058 U
Total BTEX	NE	ND	ND	ND	ND	ND	**0.00039**	ND	ND	ND
Other VOCs (mg/kg)										
Acetone	100	0.023 UJ	0.022 U	0.023 U	0.022 U	0.023 UJ	0.024 UJ	0.022 U	0.022 UJ	0.023 U
Carbon disulfide	NE	0.0059 U	0.0054 U	0.0057 U	0.0055 U	0.0057 U	0.0059 U	0.0054 U	0.0056 U	0.0058 U
PAHs (mg/kg)										
Acenaphthene	100	0.31 U	0.28 U	0.3 U	0.3 U	0.3 U	0.3 U	0.28 U	**0.076 J**	0.31 U
Acenaphthylene	100	0.31 U	0.28 U	0.3 U	0.3 U	0.3 U	0.3 U	0.28 U	**0.084 J**	0.31 U
Anthracene	100	0.31 U	0.28 U	0.3 U	0.3 U	0.3 U	0.3 U	0.28 U	**0.3**	0.31 U
Benzo[a]pyrene	1	**0.075 J**	0.28 U	**0.11 J**	0.3 U	**0.12 J**	**0.12 J**	0.28 U	**1.3**	0.31 U
Benzo[b]fluoranthene	1	0.31 U	0.28 U	**0.14 J**	0.3 U	**0.14 J**	**0.12 J**	0.28 U	**1.9**	0.31 U
Benzo[g,h,i]perylene	100	**0.08 J**	0.28 U	**0.43 J**	0.3 U	**0.13 J**	**0.16 J**	0.28 U	**0.77**	0.31 U
Benzo[k]fluoranthene	1	0.31 U	0.28 U	**0.048 J**	0.3 U	0.3 U	**0.051 J**	0.28 U	**0.67**	0.31 U
Chrysene	1	**0.072 J**	0.28 U	**0.13 J**	0.3 U	**0.13 J**	**0.11 J**	0.28 U	**1.5**	0.31 U
Dibenz[a,h]anthracene	0.33	0.31 U	0.28 U	**0.36 J**	0.3 U	0.3 U	0.3 U	0.28 U	**0.17 J**	0.31 U
Fluoranthene	100	**0.1 J**	0.28 U	**0.2 J**	0.3 U	**0.18 J**	**0.15 J**	0.28 U	**3.4**	0.31 U
Fluorene	100	0.31 U	0.28 U	0.3 U	0.3 U	0.3 U	0.3 U	0.28 U	**0.099 J**	0.31 U
Indeno[1,2,3-cd]pyrene	0.5	0.31 U	0.28 U	**0.4 J**	0.3 U	**0.13 J**	**0.14 J**	0.28 U	**0.86**	0.31 U
Naphthalene	100	0.31 U	0.28 U	0.3 U	0.3 U	0.3 U	0.3 U	0.28 U	0.29 U	0.31 U
Phenanthrene	100	0.31 U	0.28 U	**0.1 J**	0.3 U	**0.13 J**	**0.069 J**	**0.091 J**	**1.8**	0.31 U
Pyrene	100	**0.13 J**	0.28 U	**0.15 J**	0.3 U	**0.2 J**	**0.17 J**	**0.083 J**	**1.8**	0.31 U
Total PAHs	NE	**0.528**	ND	**2.188**	ND	**1.27**	**1.19**	**0.174**	**15.929**	ND
Other SVOCs (mg/kg)										
Bis(2-ethylhexyl)phthalate	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	14	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs (mg/kg)										
Aroclor 1254	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PCBs	1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticides (mg/kg)										
Alpha-chlordane	0.91	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDD,4,4-	2.6	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDE,4,4-	1.8	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDT,4,4-	1.7	NA	NA	NA	NA	NA	NA	NA	NA	NA
Delta-BHC	100	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	0.039	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)										
Aluminum	NE	**8840**	**3120**	**3660**	**1730**	**5750**	**5130**	**2880**	**4800**	**5770**
Arsenic	16	**5.2 J**	5.1 UJ	**2.2 J**	**0.72 J**	**2.3 J**	**3.4 J**	**0.89 J**	6.1 UJ	5.2 UJ
Barium	350	**65 J**	**18.9 J**	**49.9 J**	**11.6 J**	**62.8 J**	**63.6 J**	**19.1 J**	**28.3 J**	**15 J**
Beryllium	14	**0.6 J**	**0.23 J**	1.9 U	2 U	**0.4 J**	**0.46 J**	2.1 U	**0.3 J**	**0.39 J**
Calcium	NE	**1900**	203 U	**4210**	195 U	**2850 J**	**20300 J**	**281**	**5710**	**357**
Chromium	22*	**19.4 J**	**8.9 J**	**7.3 J**	**4.8 J**	**14.1 J**	**15.7 J**	**8 J**	**10.6 J**	**10.9 J**
Cobalt	NE	**7.9**	**1.7 J**	**3.9**	**1.2 J**	**5 J**	**9 J**	**2.8**	**5.2**	**3.4**
Copper	270	**26.3 J**	**4.1 J**	**32.2 J**	**2.8 J**	**20 J**	**14.2 J**	**4.5 J**	**11.3 J**	**8.1 J**
Iron	NE	**19900**	**7430**	**8860**	**4790**	**12300**	**13400**	**8260**	**10700**	**11700**
Lead	400	**72.5 J**	**2.7 J**	**62.1 J**	**1.6 J**	**65.2 J**	**78.8 J**	**5.6 J**	**31.4 J**	**4.5 J**
Magnesium	NE	**2450**	**481**	**2500**	**265**	**1820 J**	**9340 J**	**592**	**2950**	**506**
Manganese	2000	**412 J**	**114 J**	**115 J**	**124 J**	**239 J**	**480 J**	**218 J**	**174 J**	**217 J**
Mercury	0.81	**0.17 J**	0.053 U	**0.19 J**	0.055 U	**0.071 J**	**0.078 J**	**0.028 J**	**0.029 J**	**0.018 J**
Nickel	140	**15.6**	**5.1**	**6.4**	**3.4**	**10.5**	**9.9**	**7**	**7.1**	**8.7**
Potassium	NE	**940**	**215**	**305**	**137**	**667**	**511**	**237**	**345**	**307**
Selenium	36	13.3 U	10.1 U	9.6 U	9.8 U	11.3 U	12.7 U	10.6 U	**1.5 J**	10.4 U
Silver	36	4 U	3 U	2.9 U	2.9 U	3.4 U	3.8 U	3.2 U	3.7 U	3.1 U
Sodium	NE	266 U	203 U	191 U	195 U	226 U	254 U	213 U	244 U	209 U
Vanadium	NE	**23.3**	**8.4**	**12.4**	**5.6**	**18.1**	**16.7**	**7.1**	**14.7**	**14.4**
Zinc	2200	**94.7 J**	**9.2 J**	**64.2 J**	**7.3 J**	**70.7 J**	**75 J**	**15.7 J**	**33.4 J**	**12.1 J**
Other (mg/kg)										
Acid Soluble Sulfide	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 7
Stormwater Sediment Analytical Results for Detected Compounds
Manhasset Former Hortonsphere Site
Manhasset, New York

Sample Name: / Sample Interval (ft): / Sample Date:	Residential SCOs	MS-SED-01 (0.67-0.83) 2/20/2009	MS-SED-02 (1.65-1.80) 2/20/2009	Duplicate of MS-SED-02 (1.65-1.80) 2/20/2009	MS-SED-03 (1.45-1.60) 2/20/2009	MS-SED-04 (0.17-0.33) 2/20/2009
BTEX (mg/kg)						
Toluene	100	0.0062 U	0.0054 U	0.0055 U	0.0067 U	0.0057 UJ
Total BTEX	NE	ND	ND	ND	ND	ND
Other VOCs (mg/kg)						
Acetone	100	0.025 U	0.021 U	0.022 U	0.027 U	0.023 U
PAHs (mg/kg)						
Anthracene	100	0.34 U	0.28 U	0.29 U	**0.096 J**	0.3 U
Benz[a]anthracene	1	**0.13 J**	0.28 U	0.29 U	**0.33 J**	0.3 U
Benzo[a]pyrene	1	**0.13 J**	0.28 U	0.29 U	**0.33 J**	0.3 U
Benzo[b]fluoranthene	1	**0.17 J**	0.28 U	0.29 U	**0.41**	0.3 U
Benzo[g,h,i]perylene	100	**0.49**	0.28 U	0.29 U	**0.7**	**0.4**
Benzo[k]fluoranthene	1	0.34 U	0.28 U	0.29 U	**0.15 J**	0.3 U
Chrysene	1	**0.13 J**	0.28 U	0.29 U	**0.39**	0.3 U
Dibenz[a,h]anthracene	0.33	**0.4**	0.28 U	0.29 U	**0.47**	0.3 U
Fluoranthene	100	**0.23 J**	0.28 U	0.29 U	**0.61**	0.3 U
Indeno[1,2,3-cd]pyrene	0.5	**0.46**	0.28 U	0.29 U	**0.66**	**0.37**
Phenanthrene	100	**0.14 J**	0.28 U	0.29 U	**0.4**	0.3 U
Pyrene	100	**0.27 J**	0.28 U	0.29 U	**0.71**	0.3 U
Total PAHs	NE	**2.55**	ND	ND	**5.256**	**0.77**
PCBs (mg/kg)						
Total PCBs	1	ND	ND	ND	ND	ND
Pesticides (mg/kg)						
Alpha-chlordane	0.91	**0.0038 J**	0.0018 U	0.0019 U	**0.0052 JN**	**0.002 JN**
Chlordane, trans-	NE	**0.0026 J**	0.0018 U	0.0019 U	**0.0044 J**	**0.0024 J**
DDD,4,4-	2.6	**0.0031 JN**	0.0035 UJ	0.0036 UJ	**0.0065 JN**	**0.0023 JN**
DDE,4,4-	1.8	**0.0014 JN**	0.0035 U	0.0036 U	**0.0027 JN**	0.0037 U
DDT,4,4-	1.7	**0.0028 J**	0.0035 UJ	0.0036 UJ	**0.0051 J**	R
Delta-BHC	100	**0.0014 J**	0.0018 U	0.0019 U	**0.0012 J**	0.0019 U
Dieldrin	0.039	0.0041 UJ	0.0035 UJ	0.0036 UJ	**0.0013 J**	0.0037 UJ
Heptachlor	0.42	0.0021 U	0.0018 U	0.0019 U	**0.00073 J**	0.0019 U
Heptachlor epoxide	NE	**0.00077 J**	0.0018 U	0.0019 U	**0.0013 J**	0.0019 U
Herbicides (mg/kg)						
Herbicides	NE	ND	ND	ND	ND	ND
Metals (mg/kg)						
Aluminum	NE	**3510**	**3410**	**2620**	**4710**	**1620**
Arsenic	16	5.5 UJ	5 UJ	6.8 UJ	**2.1 J**	6.2 UJ
Barium	350	**17.8**	**14.2**	**10.4**	**32.5**	**7.6**
Beryllium	14	**0.25 J**	**0.25 J**	2.7 U	**0.36 J**	2.5 U
Calcium	NE	**820 J**	**231 J**	**209 J**	**1750 J**	**268 J**
Chromium	22*	**7.6 J**	**6.7 J**	**7 J**	**10.8 J**	**6.4 J**
Cobalt	NE	**4.1**	**3.1**	**2.8**	**4.7**	**1.7 J**
Copper	270	**8.5**	**5.9**	**4.8**	**14.6**	**3.7**
Iron	NE	**10200**	**7760**	**8460**	**10800**	**4850**
Lead	400	**17.9 J**	**7 J**	**7.5 J**	**29.6 J**	**5.8 J**
Magnesium	NE	**832**	**760**	**585**	**1240**	**321**
Manganese	2000	**179 J**	**161 J**	**134 J**	**320 J**	**90.7 J**
Mercury	0.81	**0.026 J**	0.053 UJ	0.05 UJ	**0.082 J**	**0.078 J**
Nickel	140	**7.2**	**6.4**	**5.4**	**10.7**	**3**
Potassium	NE	**255**	**347**	**239**	**424**	**127**
Selenium	36	11 U	10.1 U	13.6 U	**1.3 J**	12.4 U
Vanadium	NE	**11.3**	**8.8**	**8.5**	**16**	**6.7**
Zinc	2200	**34.4 J**	**15.2 J**	**13 J**	**71.2 J**	**15.6 J**
Other (mg/kg)						
Acid Soluble Sulfide	NE	17.8 U	**21.1**	17.7 U	20.7 U	**21.9**
Sulfate	NE	12.4 U	10.7 U	11.0 U	13.4 U	11.4 U

Table 7
Stormwater Sediment Analytical Results for Detected Compounds
Manhasset Former Hortonsphere Site
Manhasset, New York

Notes:

Only detected compounds are shown on this table
mg/kg - milligrams/kilogram or parts per million (ppm)
BTEX - benzene, toluene, ethylbenzene, and xylenes
VOCs - volatile organic compounds
PAHs - polycyclic aromatic hydrocarbons

6 NYCRR -New York State Register and Official Compilation of Codes, Rules and Regulations of the State of New York
6 NYCRR 375 SCO RESTRICTED USE RESIDENTIAL - regulatory comparison against NYCRR, Chapter IV, Part 375-6 Restricted Use Residential Soil Cleanup Objectives (SCOs)
*-There is no established criteria for total chromium. The residential SCO for hexavalent chromium was used for comparison

NE - not established
NA - not analyzed

Bolding indicates a detected concentration
Gray shading and bolding indicates that the detected result value exceeds established NYSDEC 375 RESIDENTIAL USE SCO.

Validation Qualifiers:

J - estimated value
JN - analyte is presumptively present at an approximated quantity
U - indicates not detected to the reporting limit for organic analysis and the method detection limit for inorganic analysis
UJ - not detected at or above the reporting limit shown and the reporting limit is estimated
R - rejected

Table 8
Groundwater Analytical Results for Detected Compounds
Manhasset Former Hortonsphere Site
Manhasset, New York

Sample Location: / Sample Date:	NYS SCGs	MS-GW-01 11/19/2007	MS-GW-02 11/19/2007	MS-MW-03 12/27/2007	MS-MW-04 12/27/2007	MS-MW-05 12/28/2007	MS-MW-06 12/28/2007	Duplicate of: MS-MW-06 12/28/2007
BTEX (ug/l)								
Benzene	1	5 U	5 U	5 U	5 U	**0.4 J**	5 U	5 U
Toluene	5	**0.31 J**	5 U	5 U	5 U	5 U	5 U	5 U
Total BTEX	NE	**0.31**	ND	ND	ND	**0.4**	ND	ND
Other VOCs (ug/l)								
Acetone	50	**1.6 J**	10 U	10 U	10 U	2.5 U	10 U	10 U
Carbon disulfide	NE	5 U	5 U	5 U	**0.76**	5 U	5 U	5 U
Chloroform	7	5 U	5 U	**0.3 J**	5 U	5 U	5 U	5 U
Dibromochloromethane	50	5 U	5 U	**0.5 J**	5 U	5 U	5 U	5 U
Methyl-2-pentanone,4-	NE	10 U	10 U	**0.46 J**	10 U	10 U	10 U	10 U
Tetrachloroethene	5	5 U	**0.36 J**	**0.87**	**0.92**	**0.97**	**0.72**	**0.54**
Total VOCs	NE	**1.91**	**0.36**	**2.13**	**1.68**	**1.37**	**0.72**	**0.54**
Total PAHs (ug/l)								
Total PAHs	NE	ND	ND	ND	ND	ND	ND	ND
PCBs (ug/l)								
Total PCBs	0.1	ND	ND	ND	ND	ND	ND	ND
Pesticides (ug/l)								
Chlordane, trans-	NE	0.052 U	0.056 U	0.05 U	**0.0085 J**	0.05 U	0.05 U	0.05 U
Delta-BHC	0.04	0.052 U	0.056 U	0.05 UJ	0.05 UJ	**0.0095 J**	0.05 U	0.05 U
Total Pesticides	NE	ND	ND	ND	**0.0085**	**0.0095**	ND	ND
Total Metals (ug/l)								
Aluminum	NE	**18000**	**19300**	**100 J**	**1600**	**830**	**190 J**	**180 J**
Arsenic	25	**35**	**29**	25 U	**7 J**	25 U	25 U	25 U
Barium	1000	**180 J**	**210**	**28 J**	**38 J**	**41 J**	**62 J**	**62 J**
Beryllium	3	**1.9 J**	**2.1 J**	5 U	5 U	5 U	5 U	5 U
Calcium	NE	**19500 J**	**17500 J**	**41900**	**38100**	**36200**	**62900**	**61300**
Chromium	50	**710 J**	**640 J**	10 U	**12**	**9.5 J**	**2.4 J**	**2.2 J**
Cobalt	NE	**14 J**	**18 J**	10 U	**3 J**	**15 J**	**4.9 J**	**5 J**
Copper	200	**250**	**220**	10 U	**23 J**	**3.9 J**	10 U	10 U
Iron	300	**161000**	**147000**	**210**	**7200**	**3100**	**7900**	**7300**
Lead	25	**95**	**170**	10 U	**5.6 J**	10 U	10 U	10 U
Magnesium	35000	**7400**	**6800**	**13400**	**7500**	**13600**	**18200**	**18000**
Manganese	300	**2000**	**4800**	**580**	**470**	**370**	**330**	**310**
Nickel	100	**320**	**380**	**22 J**	**23 J**	**17 J**	**120**	**120**
Potassium	NE	**3600 J**	**3200 J**	**1400 J**	**3300 J**	**2800 J**	**6100**	**6100**
Sodium	20000	**8000**	**5600**	**9900**	**6300**	**20700**	**56000**	**55500**
Vanadium	NE	**260**	**430**	5 U	**21 J**	**11 J**	**1.1 J**	5 U
Zinc	2000	**500**	**290**	50 U	**250**	**43 J**	50 U	50 U
Sulfide/ Sulfate (ug/l)								
Sulfate	250000	**20400**	**11100**	**8900**	**25300**	**63500**	**59500**	**57800**
Sulfide	NE	**600 J**	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U

Notes:

NYS SCG- New York State Ambient Water Quality Standards, Criteria and Guidance (SCGs) Values for GA groundwater

NE- not established

ND - not detected; total concentration is listed as ND because no compounds were detected in the group

J - estimated value

U - indicates not detected to the reporting limit for organic analysis and the method detection limit for inorganic analysis

Bold indicates detected result

Shading and bolding indicates that the detected result value exceeds established NYS SCGs

ug/L - micrograms per liter or parts per billion (ppb)

BTEX - benzene, toluene, ethylbenzene, and xylene

VOCs - volatile organic compounds

PAHs - polycyclic aromatic hydrocarbons

PCBs - polychlorinated biphenyls

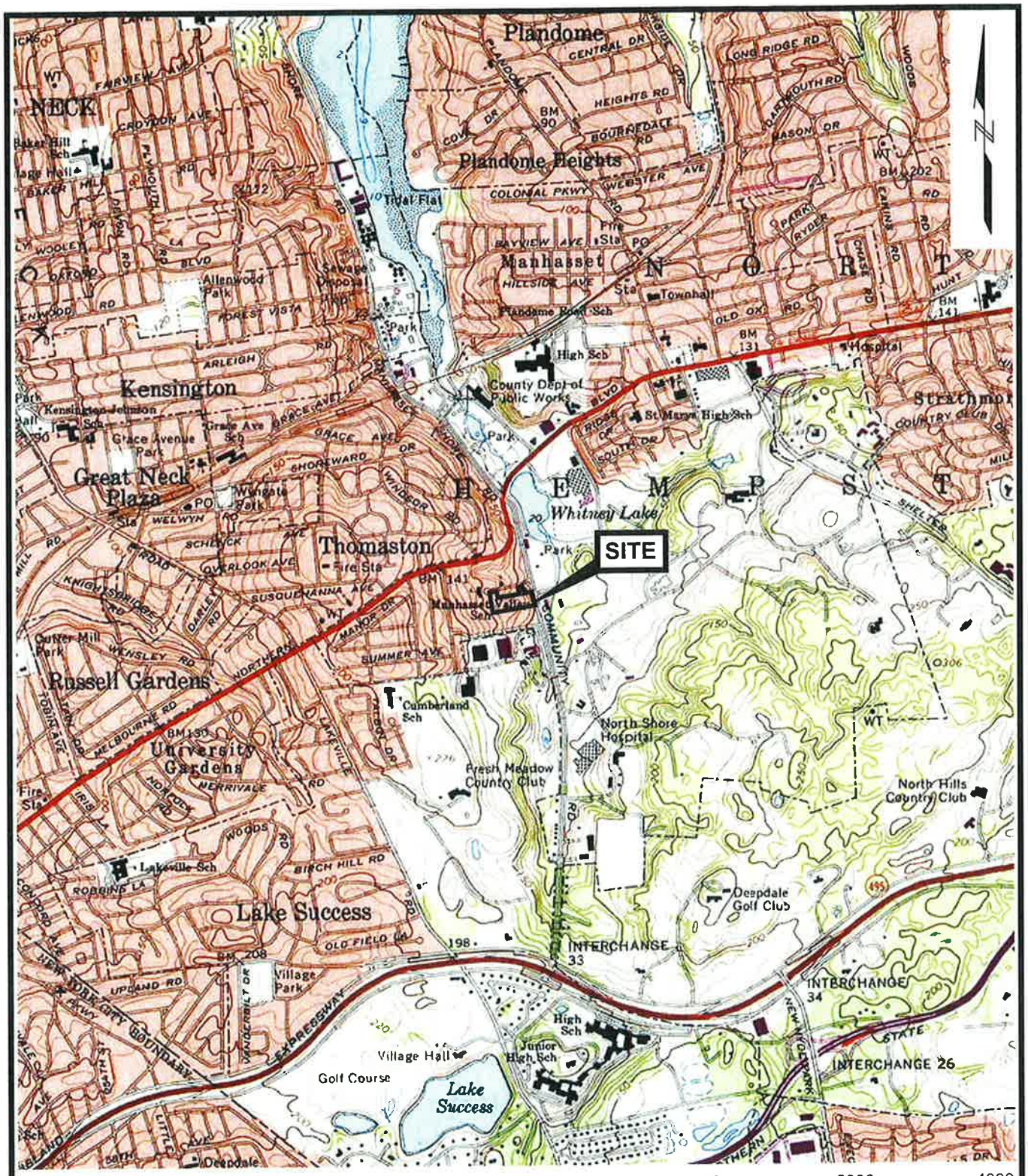
Table 12
Typical Background Concentrations of Metals in Soil
Manhasset Former Hortonsphere Site
Manhasset, New York

Metals	Background Levels - Eastern USA (mg/kg)
Aluminum	0.07 - > 10
Antimony	NE
Arsenic	< 0.1 - 73
Barium	10 - 1,500
Beryllium	< 1 - 7
Cadmium	NE
Calcium	0.01 - 28
Chromium	1 - 1,000
Cobalt	< 0.3 - 70
Copper	< 1 - 700
Iron	0.01 - >10
Lead	> 10 - 300
Magnesium	0.005 - 5
Manganese	< 2 - 7,000
Mercury	0.01 - 3.4
Nickel	< 5 - 700
Potassium	0.005 - 3.7
Selenium	< 0.01 - 3.9
Silver	NE
Sodium	<0.05 - 5
Thallium	NE
Vanadium	<7 - 300
Zinc	< 5 - 2,900

Notes:
NE - Not established
From: H.T. Shacklette and J.G. Boerngen, USGS Professional Paper 1270, 1984

Table 13
Fish and Wildlife Resources Impact Analysis Decision Key
Manhasset Former Hortonsphere Site
Manhasset, New York

	Yes	No
1. Is the site or area of concern a discharge or spill event?		√
2. Is the site or area of concern a point source of contamination to groundwater which will be prevented from discharging to surface water? Soil contamination is not widespread, or if widespread, is confined under buildings and paved areas?		√
3. Is the site and all adjacent property a developed area with buildings, paved surfaces and little or no vegetation?		√
4. Does the site contain habitat of an endangered, threatened, or special concern species?		√
5. Has the contamination gone off-site?		√
6. Is there any discharge or erosion of contamination or the potential for discharge or erosion of contamination?		√
7. Are the site contaminants PCBs, pesticides, or other persistent, bioaccumulable substances?		√
8. Does contamination exist at concentrations that could exceed SCGs or be toxic to aquatic life if discharged to surface water?		√
9. Does the site or any adjacent or downgradient property contain any of the following resources?		
a. Any endangered, threatened, or special concern species or rare plants or their habitats		√
b. Any NYSDEC designated significant habitats or rare NYS ecological communities		√
c. Tidal or freshwater wetlands	√	
d. Streams, creeks, or river		√
e. Pond, lake, or lagoon		√
f. Drainage ditch or channel		√
g. Other surface water features		√
h. Other marine or freshwater habitats		√
i. Forest	√	
j. Grassland or grassy field		√
k. Parkland or woodland	√	
l. Shrubby area	√	
m. Urban wildlife habitat	√	
n. Other terrestrial habitat	√	
10. Is the lack of resources due to contamination?		√
11. Is the contamination a localized source which has not migrated from the source to impact any on-site or off-site resources?	√	
12. Does the site have widespread soil contamination that is not confined under and around buildings or paved areas?		√
13. Does the contamination at the site or area of concern have the potential to migrate to, erode into or otherwise impact any on-site or off-site habitat of endangered, threatened or special concern species or other fish and wildlife resources?		√
14. Fish and wildlife resource impact analysis needed?		√



SOURCE: Map created with TOPO! ® ©2001 National Geographic (www.nationalgeographic.com/topo)

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

nationalgrid

GEI Consultants

Project 093000-8-1801

SITE LOCATION MAP

August 2011 Figure 1

I:\GEI\National Grid\Manhasset\Final-SCR\MANHASSET Location Map.cdr

LEGEND:

PROPERTY BOUNDARY (APPROXIMATE)

FORMER HORTONSPHERE SITE BOUNDARY (APPROXIMATE)

SOURCE:

1966 AERIAL PHOTOGRAPH PROVIDED BY ENVIRONMENTAL DATA RESOURCES, INC., MILFORD, CT., INQUIRY # 1898554.5, INQUIRY DATE : APRIL 10, 2007.

NOTE:

MANHASSET HORTONSPHERE AND PROPERTY WERE SOLD IN 1961.

0 200 400

SCALE, FEET

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

nationalgrid

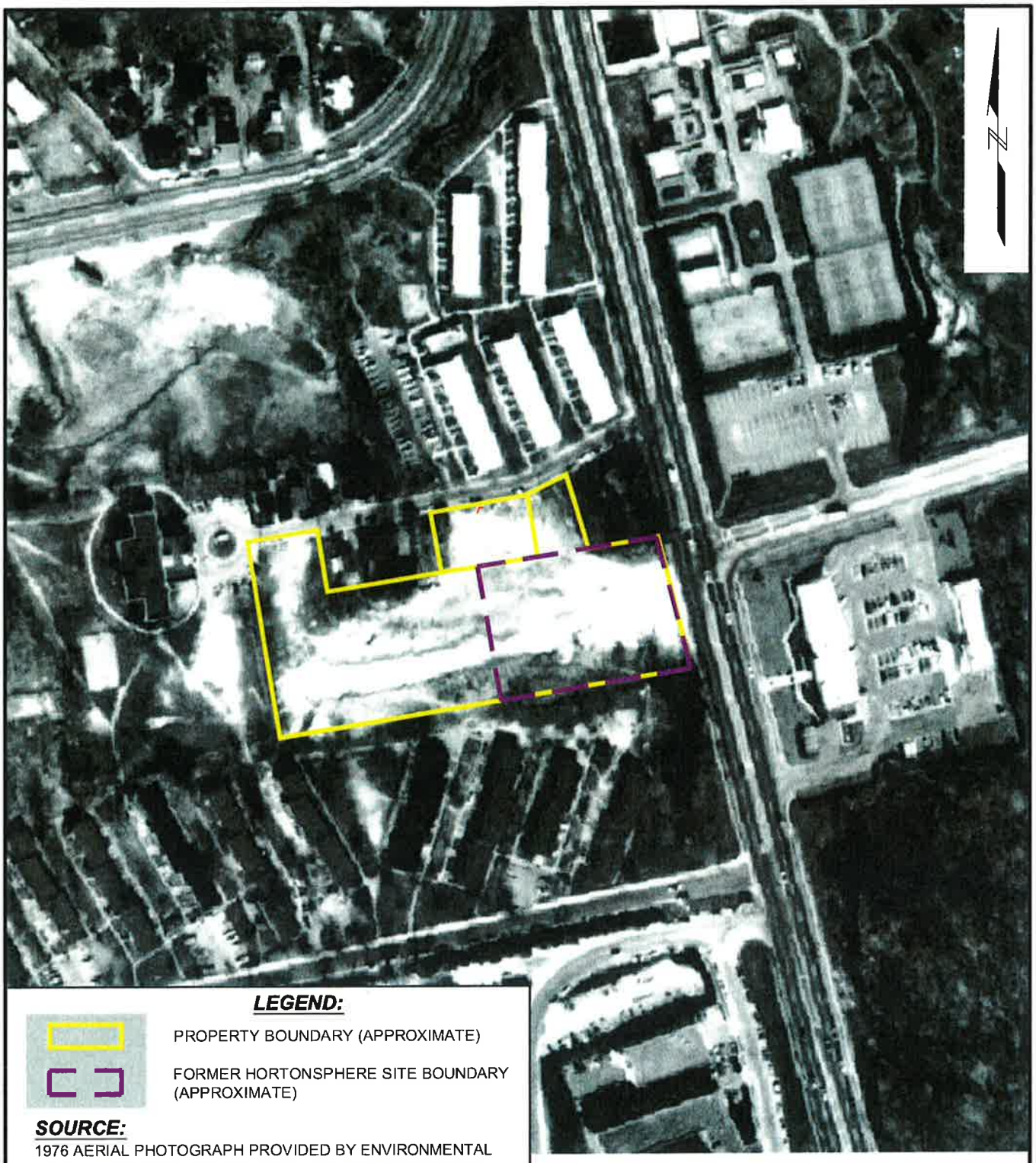
GEI Consultants

Project 093000-8-1801

1966 AERIAL PHOTOGRAPH OF SITE AND VICINITY

August 2011 Figure 3

I:\Project\National Grid\Manhasset\Final-SCR\ Manhasset-Final SCR Figures 08-11.dwg \Aug 11, 2011



LEGEND:

PROPERTY BOUNDARY (APPROXIMATE)

FORMER HORTONSPHERE SITE BOUNDARY (APPROXIMATE)

SOURCE:

1976 AERIAL PHOTOGRAPH PROVIDED BY ENVIRONMENTAL DATA RESOURCES, INC., MILFORD, CT., INQUIRY # 1898554.5, INQUIRY DATE : APRIL 10, 2007.

NOTE:

MANHASSET HORTONSPHERE AND PROPERTY WERE SOLD IN 1961.

0 200 400

SCALE, FEET

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

nationalgrid

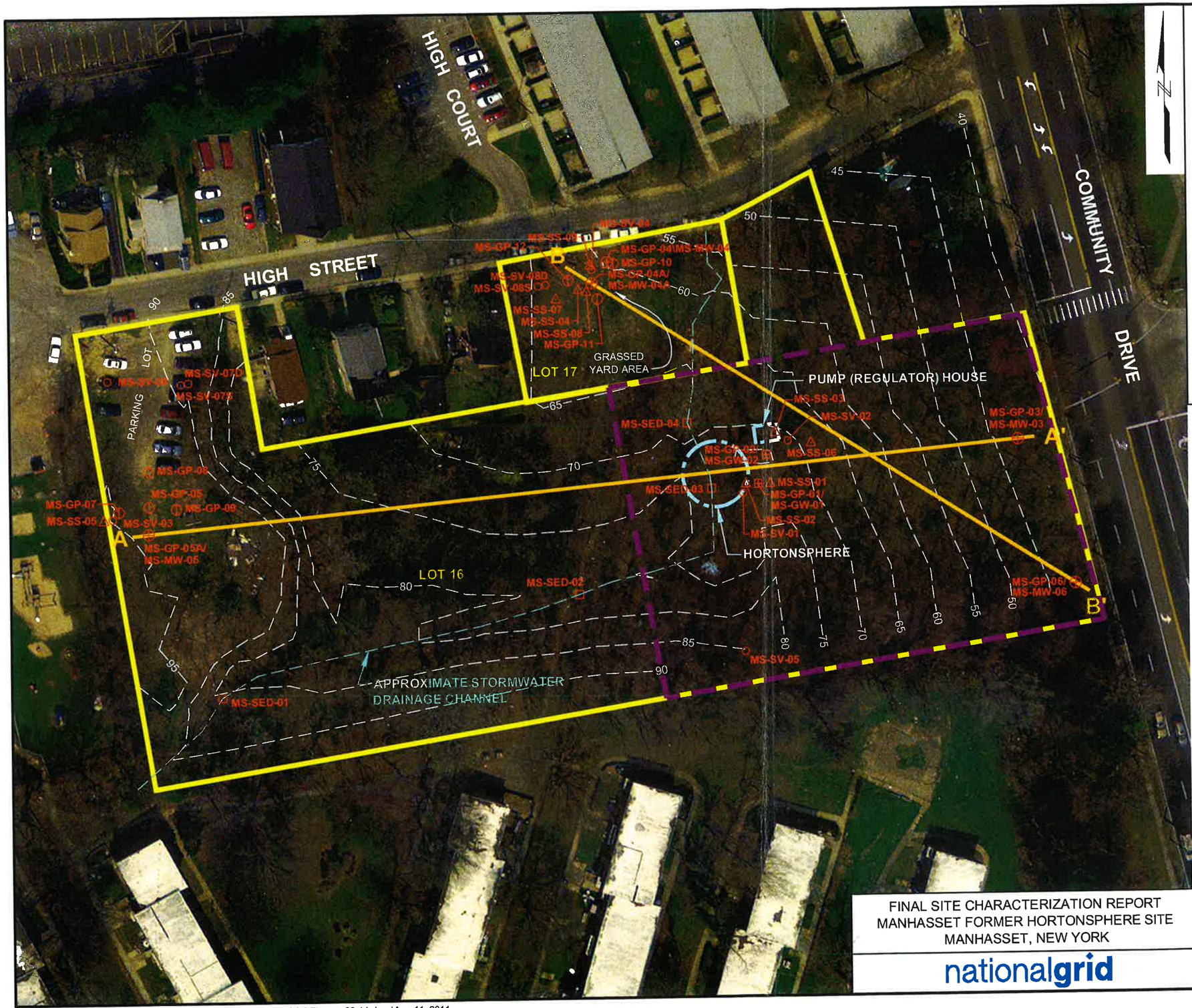
GEI Consultants

Project 093000-8-1801

1976 AERIAL PHOTOGRAPH OF SITE AND VICINITY

August 2011 Figure 4

I:\Project\National Grid\Manhasset\Final-SCR\ Manhasset-Final SCR Figures 08-11.dwg \Aug 11, 2011



LEGEND:

- PROPERTY BOUNDARY (APPROXIMATE)
- FORMER HORTONSPHERE SITE BOUNDARY (APPROXIMATE)
- HISTORIC STRUCTURE LOCATION
- GROUND SURFACE ELEVATION CONTOUR (FEET, NAVD)
- CROSS SECTION LOCATION
- MS-GP-01/ MS-GW-01 — SOIL BORING LOCATION/ GEOPROBE® TEMPORARY GROUNDWATER SAMPLING LOCATION
- MS-GP-03/ MS-MW-03 — SOIL BORING LOCATION/ MONITORING WELL LOCATION
- MS-GP-05 — SOIL BORING LOCATION
- MS-SV-02 — SOIL VAPOR SAMPLE LOCATION
- MS-SS-01 — SURFACE SOIL SAMPLE LOCATION
- MS-SED-01 — SEDIMENT SAMPLE LOCATION

NOTE:
Contour intervals provided on this figure are based upon field survey.

SOURCES:

1. Orthophoto obtained from New York State Interactive Mapping Gateway (http://www1.nysgis.state.ny.us/MainMap.cfm) photo date: 2004, accessed 10/04/07.
2. *Land and Tax Map, Sec. 2, Blk. 347,* Nassau County Department of Assessment, Sheet 1 of 1, Revised date: April 18,, 2003, Scale: 1" = 100', map obtained from: http://www.nassaucountyny.gov.
3. 1950 Sanborn Fire Insurance Map.
4. Manhasset Hortonsphere Property Maps Parcel Nos. 24.1, 24.2, and 23 Long Island Lighting Company, Mineola, N.Y.
5. Survey of existing conditions and sample locations conducted by GEI Consultants, Inc. on 12/10 and 12/18/07. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.
6. Survey of additional sample locations conducted by GEI Consultants, Inc. on 3/11/09. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.

0 60 120

SCALE, FEET

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

nationalgrid

GEI Consultants

Project 093000-8-1801

EXISTING CONDITIONS AND SAMPLE LOCATION SUMMARY

August 2011 Figure 2

I:\Project\National Grid\Manhasset\Final-SCR\ Manhasset-Final SCR Figures 08-11.dwg \Aug 11, 2011

SW
A

NE
A'

MS-GP-05A/
MS-MW-05

MS-GP-05

FORMER
HORTONSPHERE

FORMER
PUMP HOUSE

MS-GP-01/
MS-GW-01

MS-GP-02/
MS-GW-02

COMMUNITY
DRIVE

MS-GP-03/
MS-MW-03

ELEVATION (FT NAVD88)

90
80
70
60
50
40
30
20
10

S ND
S ND
S ND
S ND
S ND
S ND
S ND
S ND
S ND
S 0.4
S 0.31
S ND

LEGEND

MS-GP-04/
MS-GW-04

SOIL BORING/ MONITORING WELL IDENTIFICATION

OBSERVED APPARENT GROUNDWATER TABLE BASED UPON BORING INFORMATION

S — ANALYTICAL SOIL SAMPLE INTERVAL

ND — BTEX (mg/kg) IN SOIL SAMPLE

WELL SCREEN INTERVAL

0.6 — BTEX (µg/L) IN GROUNDWATER

S — GEOPROBE® GROUNDWATER GRAB SAMPLE

CONTACT

CONTACT IS APPROXIMATE

GEOLOGY

- FILL
- SAND
- SILTY SAND
- SILT
- CLAY

NOTES:

BTEX	BENZENE, TOLUENE, ETHLYBENZENE, AND XYLENE
mg/kg	MILLIGRAMS/KILOGRAM OR PARTS PER MILLION (ppm)
µg/L	MICROGRAMS PER LITER OR PARTS PER BILLION (ppb)
ND	NOT DETECTED
NAVD	NORTH AMERICAN VERTICAL DATUM

NOTE: SITE TOPOGRAPHY IS BASED ON SURVEYED LOCATIONS.

10 0 5 10 — VERTICAL SCALE IN FEET

60 30 0 30 — HORIZONTAL SCALE IN FEET

NOTE: VERTICAL EXAGGERATION = 6X

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

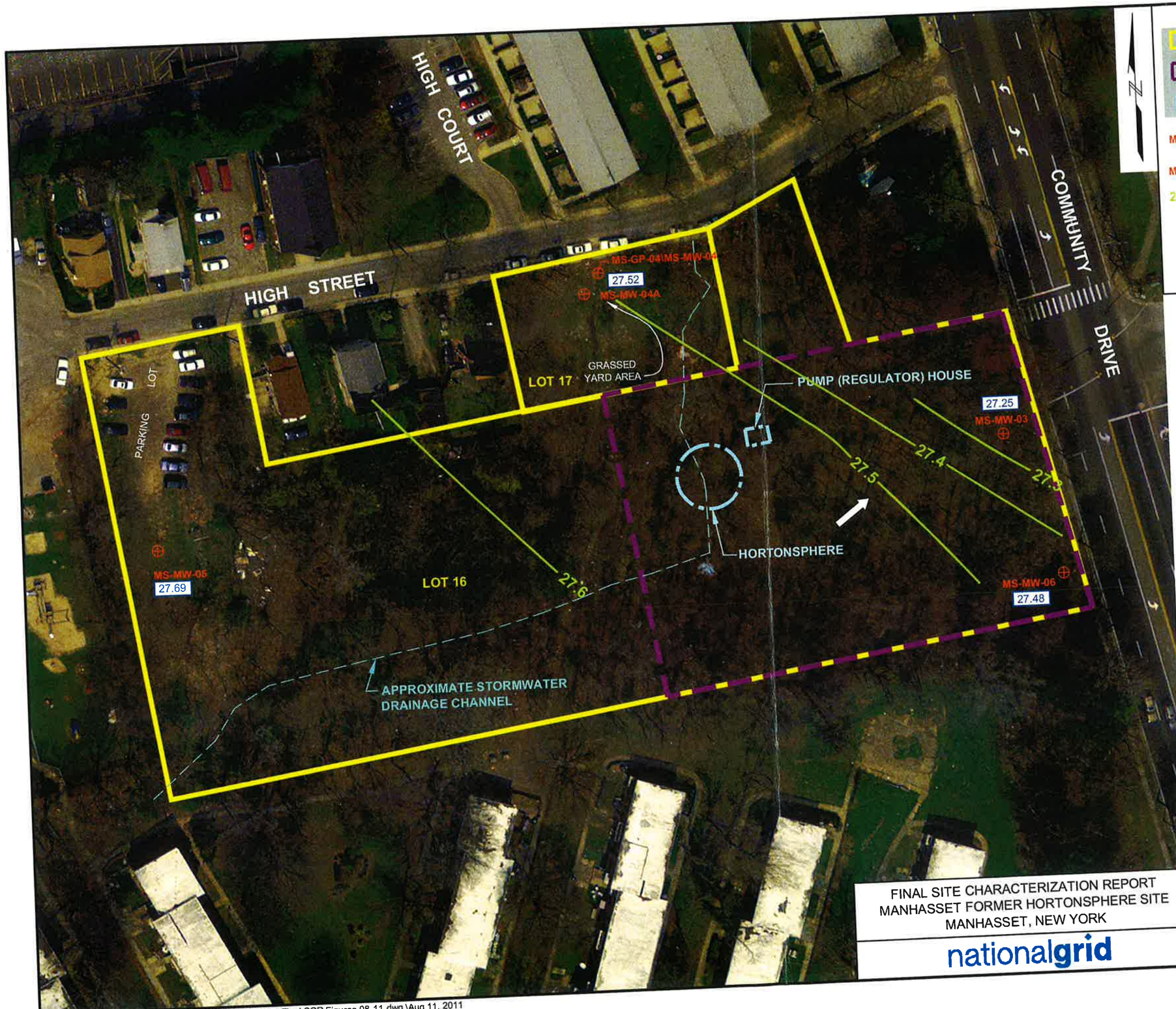
nationalgrid

GEI Consultants

CROSS SECTION A-A'

Project 093000-8-1801 | August 2011 | Figure 5

I:\Project\National Grid\Manhasset\Final-SCR\ Manhasset-Final SCR Figures 08-11.dwg \Aug 11, 2011



LEGEND:

- PROPERTY BOUNDARY (APPROXIMATE)
- FORMER HORTONSPHERE SITE BOUNDARY (APPROXIMATE)
- HISTORIC STRUCTURE LOCATION
- MS-GW-01 — TEMPORARY GROUNDWATER SAMPLING LOCATION
- MS-MW-03 — MONITORING WELL LOCATION
- 27.3 — GROUNDWATER CONTOUR (FEET NAVD)
- 27.25 — GROUNDWATER ELEVATION (FEET NAVD)
- INFERRED GROUNDWATER FLOW DIRECTION
- NAVD — NORTH AMERICAN VERTICAL DATUM

SOURCES:

1. Orthophoto obtained from New York State Interactive Mapping Gateway (http://www1.nysgis.state.ny.us/MainMap.cfm) photo date: 2004, accessed 10/04/07.
2. *Land and Tax Map, Sec. 2, Blk. 347,* Nassau County Department of Assessment, Sheet 1 of 1, Revised date: April 18,, 2003, Scale: 1" = 100', map obtained from: http://www.nassaucountyny.gov.
3. 1950 Sanborn Fire Insurance Map.
4. Manhasset Hortonsphere Property Maps Parcel Nos. 24.1, 24.2, and 23 Long Island Lighting Company, Mineola, N.Y.
5. Survey of existing conditions and sample locations conducted by GEI Consultants, Inc. on 12/10 and 12/18/07. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.
6. Survey of additional sample locations conducted by GEI Consultants, Inc. on 3/11/09. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.

0 60 120

SCALE, FEET

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

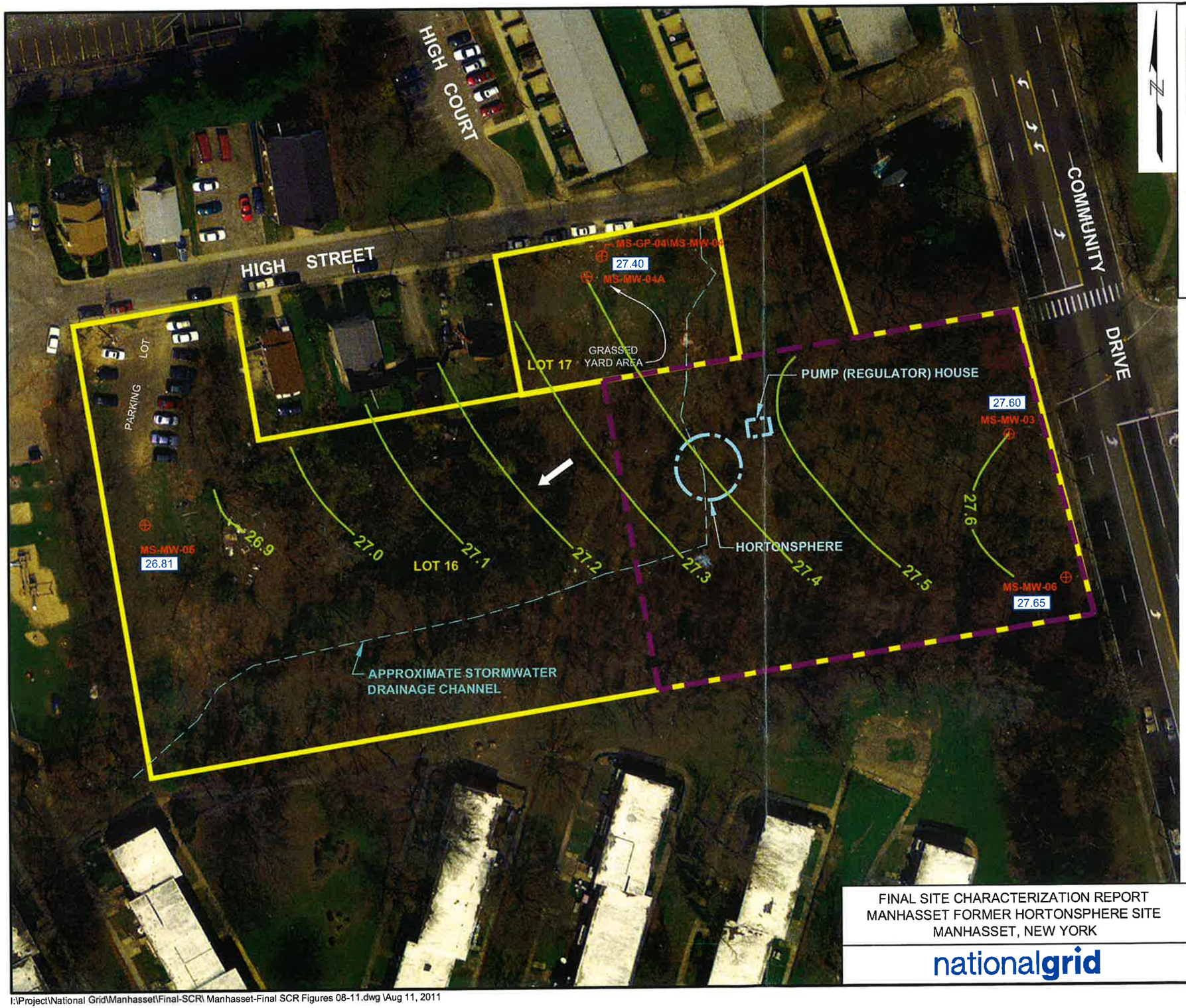
nationalgrid

GEI Consultants

GROUNDWATER CONTOURS (DECEMBER 27 - 28, 2007)

Project 093000-8-1801 | August 2011 | Figure 7

I:\Project\National Grid\Manhasset\Final-SCR\ Manhasset-Final SCR Figures 08-11.dwg \Aug 11, 2011



LEGEND:

- PROPERTY BOUNDARY (APPROXIMATE)
- FORMER HORTONSPHERE SITE BOUNDARY (APPROXIMATE)
- HISTORIC STRUCTURE LOCATION
- MS-GW-01 — TEMPORARY GROUNDWATER SAMPLING LOCATION
- MS-MW-03 — MONITORING WELL LOCATION
- 27.3 — GROUNDWATER CONTOUR (FEET NAVD)
- 27.25 — GROUNDWATER ELEVATION (FEET NAVD)
- INFERRED GROUNDWATER FLOW DIRECTION
- NAVD — NORTH AMERICAN VERTICAL DATUM

SOURCES:

1. Orthophoto obtained from New York State Interactive Mapping Gateway (http://www1.nysgis.state.ny.us/MainMap.cfm) photo date: 2004, accessed 10/04/07.
2. *Land and Tax Map, Sec. 2, Blk. 347,* Nassau County Department of Assessment, Sheet 1 of 1, Revised date: April 18,, 2003, Scale: 1" = 100', map obtained from: http://www.nassaucountyny.gov.
3. 1950 Sanborn Fire Insurance Map.
4. Manhasset Hortonsphere Property Maps Parcel Nos. 24.1, 24.2, and 23 Long Island Lighting Company, Mineola, N.Y.
5. Survey of existing conditions and sample locations conducted by GEI Consultants, Inc. on 12/10 and 12/18/07. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.
6. Survey of additional sample locations conducted by GEI Consultants, Inc. on 3/11/09. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.

0 60 120

SCALE, FEET

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

nationalgrid

GEI Consultants

GROUNDWATER CONTOURS (JANUARY 28, 2008)

Project 093000-8-1801 | August 2011 | Figure 8

I:\Project\National Grid\Manhasset\Final-SCR\ Manhasset-Final SCR Figures 08-11.dwg \Aug 11, 2011

LEGEND:

- PROPERTY BOUNDARY (APPROXIMATE)
- FORMER HORTONSPHERE SITE BOUNDARY (APPROXIMATE)
- HISTORIC STRUCTURE LOCATION
- MS-GW-01 ⊞ TEMPORARY GROUNDWATER SAMPLING LOCATION
- MS-MW-03 ⊕ MONITORING WELL LOCATION
- 27.3 GROUNDWATER CONTOUR (FEET NAVD)
- 27.25 GROUNDWATER ELEVATION (FEET NAVD)
- INFERRED GROUNDWATER FLOW DIRECTION
- NAVD NORTH AMERICAN VERTICAL DATUM

SOURCES:

1. Orthophoto obtained from New York State Interactive Mapping Gateway (http://www1.nysgis.state.ny.us/MainMap.cfm) photo date: 2004, accessed 10/04/07.
2. *Land and Tax Map, Sec. 2, Blk. 347,* Nassau County Department of Assessment, Sheet 1 of 1, Revised date: April 18,, 2003, Scale: 1" = 100', map obtained from: http://www.nassaucountyny.gov.
3. 1950 Sanborn Fire Insurance Map.
4. Manhasset Hortonsphere Property Maps Parcel Nos. 24.1, 24.2, and 23 Long Island Lighting Company, Mineola, N.Y.
5. Survey of existing conditions and sample locations conducted by GEI Consultants, Inc. on 12/10 and 12/18/07. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.
6. Survey of additional sample locations conducted by GEI Consultants, Inc. on 3/11/09. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.

0 60 120

SCALE, FEET

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

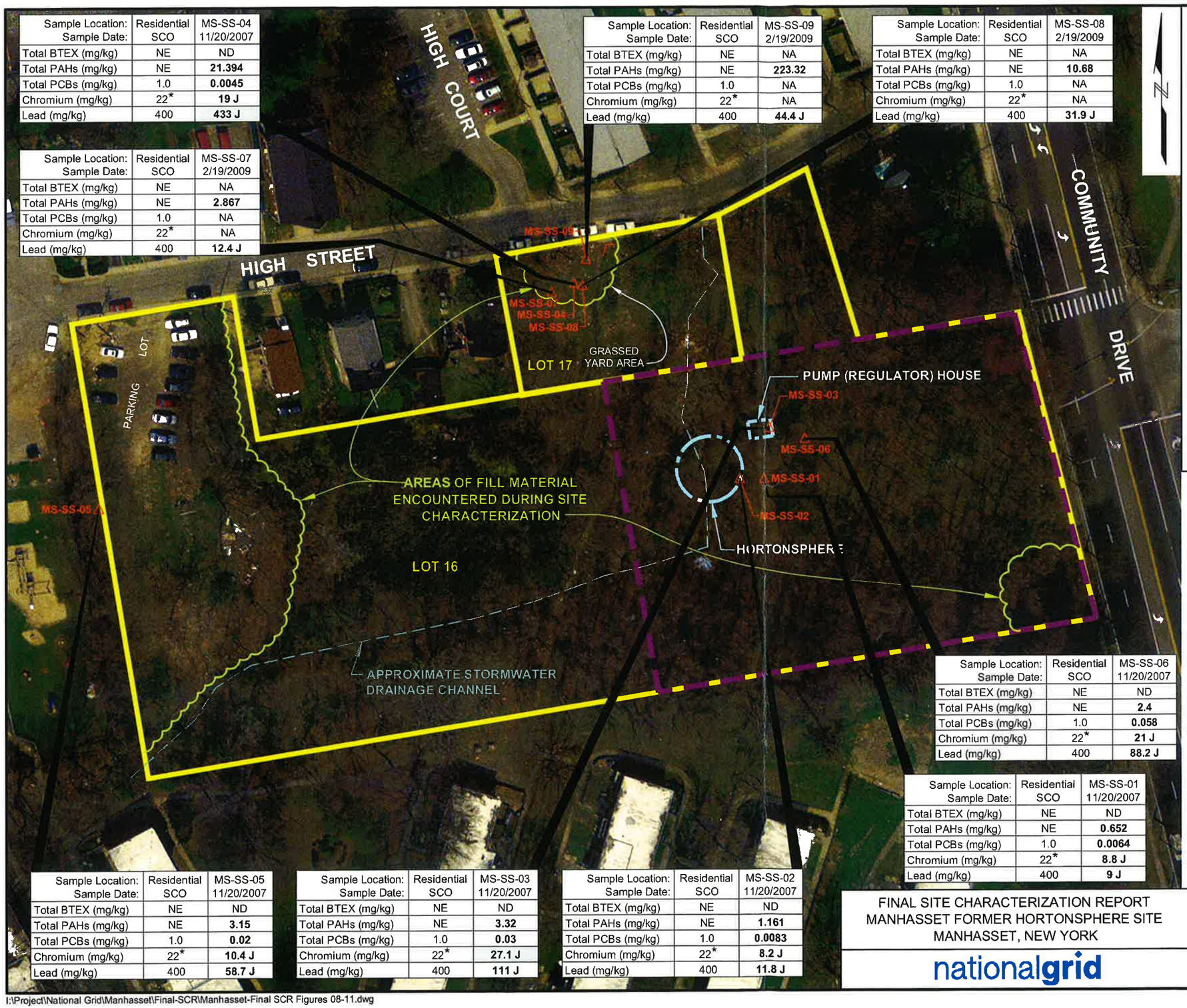
nationalgrid

GEI Consultants

GROUNDWATER CONTOURS (JANUARY 14, 2010)

Project 093000-8-1801 | August 2011 | Figure 9

I:\Project\National Grid\Manhasset\Final-SCR\ Manhasset-Final SCR Figures 08-11.dwg \Aug 11, 2011



Sample Location: / Sample Date:	Residential SCO	MS-SS-04 11/20/2007
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	**21.394**
Total PCBs (mg/kg)	1.0	**0.0045**
Chromium (mg/kg)	22*	**19 J**
Lead (mg/kg)	400	**433 J**

Sample Location: / Sample Date:	Residential SCO	MS-SS-09 2/19/2009
Total BTEX (mg/kg)	NE	NA
Total PAHs (mg/kg)	NE	**223.32**
Total PCBs (mg/kg)	1.0	NA
Chromium (mg/kg)	22*	NA
Lead (mg/kg)	400	**44.4 J**

Sample Location: / Sample Date:	Residential SCO	MS-SS-08 2/19/2009
Total BTEX (mg/kg)	NE	NA
Total PAHs (mg/kg)	NE	**10.68**
Total PCBs (mg/kg)	1.0	NA
Chromium (mg/kg)	22*	NA
Lead (mg/kg)	400	**31.9 J**

Sample Location: / Sample Date:	Residential SCO	MS-SS-07 2/19/2009
Total BTEX (mg/kg)	NE	NA
Total PAHs (mg/kg)	NE	**2.867**
Total PCBs (mg/kg)	1.0	NA
Chromium (mg/kg)	22*	NA
Lead (mg/kg)	400	**12.4 J**

Sample Location: / Sample Date:	Residential SCO	MS-SS-06 11/20/2007
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	**2.4**
Total PCBs (mg/kg)	1.0	**0.058**
Chromium (mg/kg)	22*	**21 J**
Lead (mg/kg)	400	**88.2 J**

Sample Location: / Sample Date:	Residential SCO	MS-SS-01 11/20/2007
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	**0.652**
Total PCBs (mg/kg)	1.0	**0.0064**
Chromium (mg/kg)	22*	**8.8 J**
Lead (mg/kg)	400	**9 J**

Sample Location: / Sample Date:	Residential SCO	MS-SS-05 11/20/2007
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	**3.15**
Total PCBs (mg/kg)	1.0	**0.02**
Chromium (mg/kg)	22*	**10.4 J**
Lead (mg/kg)	400	**58.7 J**

Sample Location: / Sample Date:	Residential SCO	MS-SS-03 11/20/2007
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	**3.32**
Total PCBs (mg/kg)	1.0	**0.03**
Chromium (mg/kg)	22*	**27.1 J**
Lead (mg/kg)	400	**111 J**

Sample Location: / Sample Date:	Residential SCO	MS-SS-02 11/20/2007
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	**1.161**
Total PCBs (mg/kg)	1.0	**0.0083**
Chromium (mg/kg)	22*	**8.2 J**
Lead (mg/kg)	400	**11.8 J**

LEGEND:

- PROPERTY BOUNDARY (APPROXIMATE)
- FORMER HORTONSPHERE SITE BOUNDARY (APPROXIMATE)
- HISTORIC STRUCTURE LOCATION
- MS-SS-01 △ SURFACE SOIL SAMPLE LOCATION

NA	not analyzed
NE	not established
ND	not detected; total concentration is listed as ND because no compounds were detected in the group
J	estimated value
*	there is no established criteria for total Chromium, the Residential SCO for hexavalent chromium is used
BOLD	indicates detected result
BOLD	indicates the result exceeds Residential SCO
mg/kg	milligrams/kilogram or parts per million (ppm)
ft bgs	feet below ground surface
BTEX	benzene, toluene, ethlybenzene, and xylene
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls

NOTE:
Residential SCO – Established in the New York Code of Rules and Regulations, Title 6, Chapter 100, Part 700-705, Subpart 375-6: Remedial Program Soil Cleanup Objectives for Restricted Use Residential

SOURCES:

1. Orthophoto obtained from New York State Interactive Mapping Gateway (http://www1.nysgis.state.ny.us/MainMap.cfm) photo date: 2004, accessed 10/04/07.
2. *Land and Tax Map, Sec. 2, Blk. 347,* Nassau County Department of Assessment, Sheet 1 of 1, Revised date: April 18,, 2003, Scale: 1" = 100', map obtained from: http://www.nassaucountyny.gov.
3. 1950 Sanborn Fire Insurance Map.
4. Manhasset Hortonsphere Property Maps Parcel Nos. 24.1, 24.2, and 23 Long Island Lighting Company, Mineola, N.Y.
5. Survey of existing conditions and sample locations conducted by GEI Consultants, Inc. on 12/10 and 12/18/07. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.
6. Survey of additional sample locations conducted by GEI Consultants, Inc. on 3/11/09. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.

0 60 120

SCALE, FEET

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

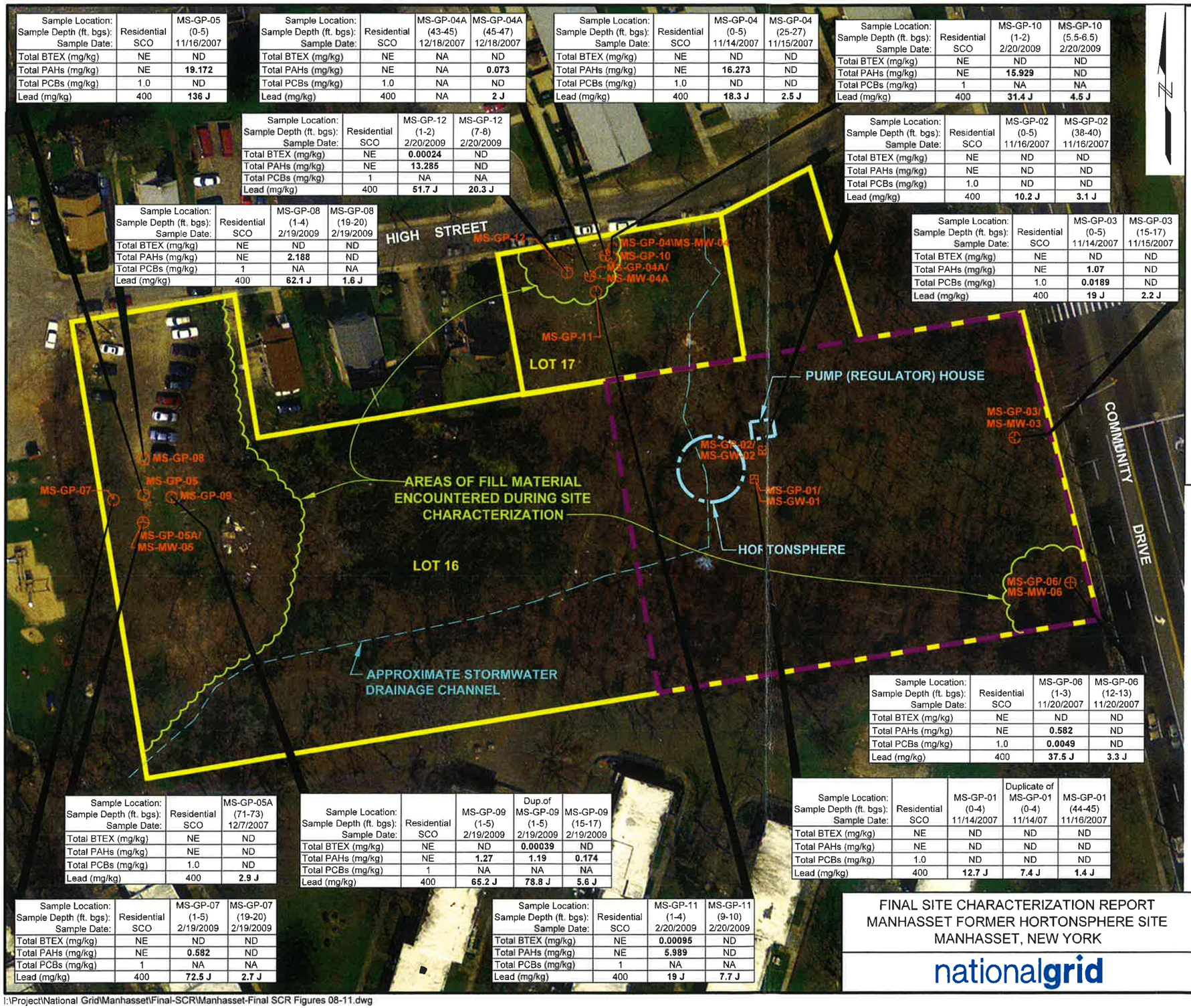
nationalgrid

GEI Consultants

SURFACE SOIL ANALYTICAL SUMMARY (mg/kg)

Project 093000-8-1801 | August 2011 | Figure 10

I:\Project\National Grid\Manhasset\Final-SCR\Manhasset-Final SCR Figures 08-11.dwg



Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-05 (0-5) 11/16/2007
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	**19.172**
Total PCBs (mg/kg)	1.0	ND
Lead (mg/kg)	400	**136 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-04A (43-45) 12/18/2007	MS-GP-04A (45-47) 12/18/2007
Total BTEX (mg/kg)	NE	NA	ND
Total PAHs (mg/kg)	NE	NA	**0.073**
Total PCBs (mg/kg)	1.0	NA	ND
Lead (mg/kg)	400	NA	**2 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-04 (0-5) 11/14/2007	MS-GP-04 (25-27) 11/15/2007
Total BTEX (mg/kg)	NE	ND	ND
Total PAHs (mg/kg)	NE	**16.273**	ND
Total PCBs (mg/kg)	1.0	ND	ND
Lead (mg/kg)	400	**18.3 J**	**2.5 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-10 (1-2) 2/20/2009	MS-GP-10 (5.5-6.5) 2/20/2009
Total BTEX (mg/kg)	NE	ND	ND
Total PAHs (mg/kg)	NE	**15.929**	ND
Total PCBs (mg/kg)	1	NA	NA
Lead (mg/kg)	400	**31.4 J**	**4.5 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-12 (1-2) 2/20/2009	MS-GP-12 (7-8) 2/20/2009
Total BTEX (mg/kg)	NE	**0.00024**	ND
Total PAHs (mg/kg)	NE	**13.285**	ND
Total PCBs (mg/kg)	1	NA	NA
Lead (mg/kg)	400	**51.7 J**	**20.3 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-02 (0-5) 11/16/2007	MS-GP-02 (38-40) 11/16/2007
Total BTEX (mg/kg)	NE	ND	ND
Total PAHs (mg/kg)	NE	ND	ND
Total PCBs (mg/kg)	1.0	ND	ND
Lead (mg/kg)	400	**10.2 J**	**3.1 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-08 (1-4) 2/19/2009	MS-GP-08 (19-20) 2/19/2009
Total BTEX (mg/kg)	NE	ND	ND
Total PAHs (mg/kg)	NE	**2.188**	ND
Total PCBs (mg/kg)	1	NA	NA
Lead (mg/kg)	400	**62.1 J**	**1.6 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-03 (0-5) 11/14/2007	MS-GP-03 (15-17) 11/15/2007
Total BTEX (mg/kg)	NE	ND	ND
Total PAHs (mg/kg)	NE	**1.07**	ND
Total PCBs (mg/kg)	1.0	**0.0189**	ND
Lead (mg/kg)	400	**19 J**	**2.2 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-06 (1-3) 11/20/2007	MS-GP-06 (12-13) 11/20/2007
Total BTEX (mg/kg)	NE	ND	ND
Total PAHs (mg/kg)	NE	**0.582**	ND
Total PCBs (mg/kg)	1.0	**0.0049**	ND
Lead (mg/kg)	400	**37.5 J**	**3.3 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-01 (0-4) 11/14/2007	Duplicate of MS-GP-01 (0-4) 11/14/07	MS-GP-01 (44-45) 11/16/2007
Total BTEX (mg/kg)	NE	ND	ND	ND
Total PAHs (mg/kg)	NE	ND	ND	ND
Total PCBs (mg/kg)	1.0	ND	ND	ND
Lead (mg/kg)	400	**12.7 J**	**7.4 J**	**1.4 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-05A (71-73) 12/7/2007
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	ND
Total PCBs (mg/kg)	1.0	ND
Lead (mg/kg)	400	**2.9 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-09 (1-5) 2/19/2009	Dup.of MS-GP-09 (1-5) 2/19/2009	MS-GP-09 (15-17) 2/19/2009
Total BTEX (mg/kg)	NE	ND	**0.00039**	ND
Total PAHs (mg/kg)	NE	**1.27**	**1.19**	**0.174**
Total PCBs (mg/kg)	1	NA	NA	NA
Lead (mg/kg)	400	**65.2 J**	**78.8 J**	**5.6 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-07 (1-5) 2/19/2009	MS-GP-07 (19-20) 2/19/2009
Total BTEX (mg/kg)	NE	ND	ND
Total PAHs (mg/kg)	NE	**0.582**	ND
Total PCBs (mg/kg)	1	NA	NA
Lead (mg/kg)	400	**72.5 J**	**2.7 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-11 (1-4) 2/20/2009	MS-GP-11 (9-10) 2/20/2009
Total BTEX (mg/kg)	NE	**0.00095**	ND
Total PAHs (mg/kg)	NE	**5.989**	ND
Total PCBs (mg/kg)	1	NA	NA
Lead (mg/kg)	400	**19 J**	**7.7 J**

LEGEND:

- PROPERTY BOUNDARY (APPROXIMATE)
- FORMER HORTONSPHERE SITE BOUNDARY (APPROXIMATE)
- HISTORIC STRUCTURE LOCATION
- MS-GP-01/ MS-GW-01 — SOIL BORING LOCATION/GEOPROBE® TEMPORARY GROUNDWATER SAMPLING LOCATION
- MS-GP-03/ MS-MW-03 — SOIL BORING LOCATION/ MONITORING WELL LOCATION
- MS-GP-05 — SOIL BORING LOCATION

NE	not established
ND	not detected; total concentration is listed as ND because no compounds were detected in the group
J	estimated value
BOLD	indicates detected result
BOLD	indicates the result exceeds Residential SCO
mg/kg	milligrams/kilogram or parts per million (ppm)
ft bgs	feet below ground surface
BTEX	benzene, toluene, ethlybenzene, and xylene
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls

NOTE:
Residential SCO – Established in the New York Code of Rules and Regulations, Title 6, Chapter 100, Part 700-705, Subpart 375-6: Remedial Program Soil Cleanup Objectives for Restricted Use Residential

SOURCES:
1. Orthophoto obtained from New York State Interactive Mapping Gateway (http://www1.nysgis.state.ny.us/MainMap.cfm) photo date: 2004, accessed 10/04/07.
2. *Land and Tax Map, Sec. 2, Blk. 347,* Nassau County Department of Assessment, Sheet 1 of 1, Revised date: April 18,, 2003, Scale: 1" = 100', map obtained from: http://www.nassaucountyny.gov.
3. 1950 Sanborn Fire Insurance Map.
4. Manhasset Hortonsphere Property Maps Parcel Nos. 24.1, 24.2, and 23 Long Island Lighting Company, Mineola, N.Y.
5. Survey of existing conditions and sample locations conducted by GEI Consultants, Inc. on 12/10 and 12/18/07. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.
6. Survey of additional sample locations conducted by GEI Consultants, Inc. on 3/11/09. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.

0 80 160
SCALE, FEET

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

nationalgrid

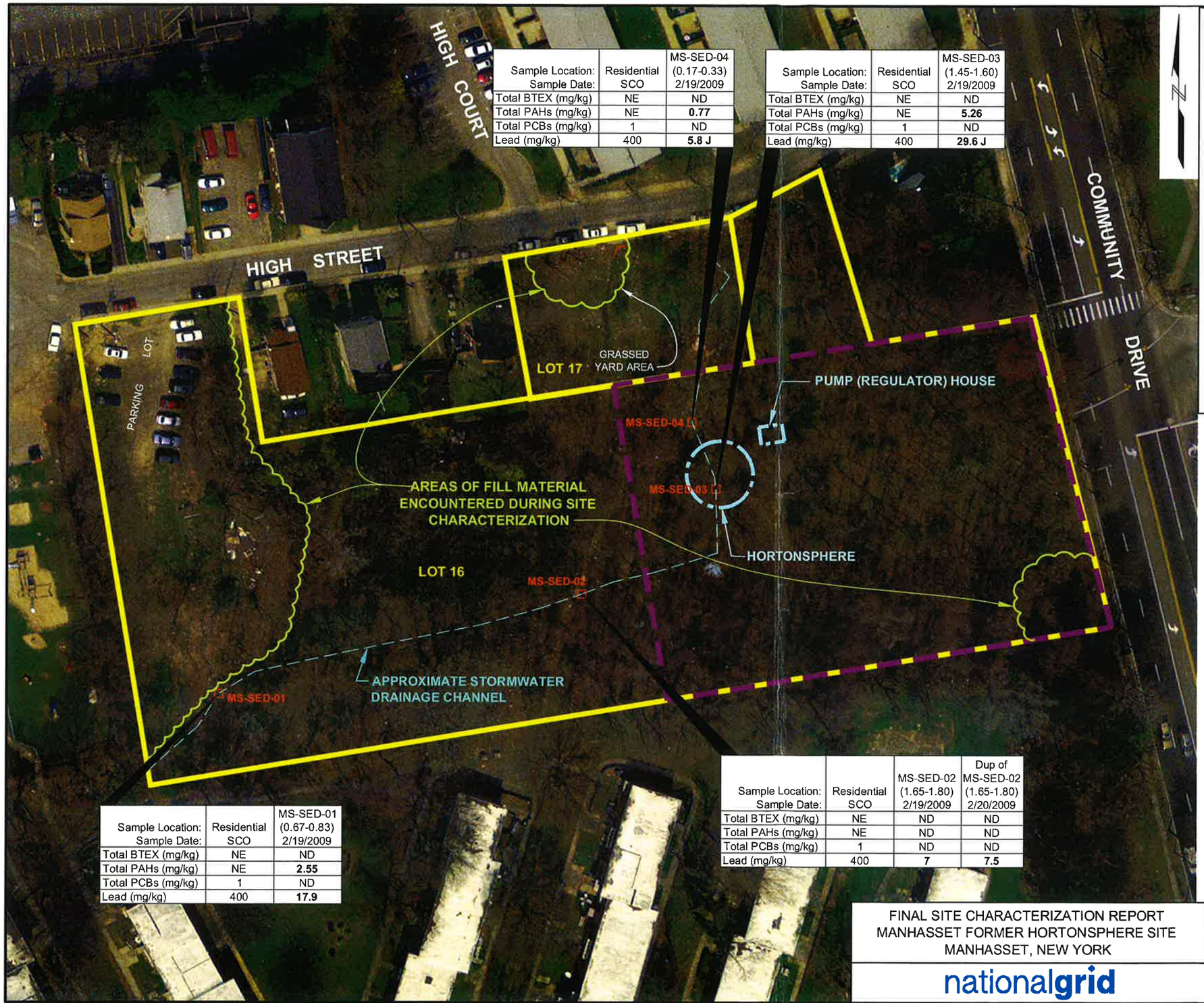
GEI Consultants

Project 093000-8-1801

SUBSURFACE SOIL ANALYTICAL SUMMARY (mg/kg)

August 2011 Figure 11

I:\Project\National Grid\Manhasset\Final-SCR\Manhasset-Final SCR Figures 08-11.dwg



Sample Location: / Sample Date:	Residential SCO	MS-SED-04 (0.17-0.33) 2/19/2009
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	**0.77**
Total PCBs (mg/kg)	1	ND
Lead (mg/kg)	400	**5.8 J**

Sample Location: / Sample Date:	Residential SCO	MS-SED-03 (1.45-1.60) 2/19/2009
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	**5.26**
Total PCBs (mg/kg)	1	ND
Lead (mg/kg)	400	**29.6 J**

Sample Location: / Sample Date:	Residential SCO	MS-SED-01 (0.67-0.83) 2/19/2009
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	**2.55**
Total PCBs (mg/kg)	1	ND
Lead (mg/kg)	400	**17.9**

Sample Location: / Sample Date:	Residential SCO	MS-SED-02 (1.65-1.80) 2/19/2009	Dup of MS-SED-02 (1.65-1.80) 2/20/2009
Total BTEX (mg/kg)	NE	ND	ND
Total PAHs (mg/kg)	NE	ND	ND
Total PCBs (mg/kg)	1	ND	ND
Lead (mg/kg)	400	**7**	**7.5**

LEGEND:

	PROPERTY BOUNDARY (APPROXIMATE)
	FORMER HORTONSPHERE SITE BOUNDARY (APPROXIMATE)
	HISTORIC STRUCTURE LOCATION
MS-SED-01	SEDIMENT SAMPLE LOCATION
NE	not established
ND	not detected; total concentration is listed as ND because no compounds were detected in the group
J	estimated value
BOLD	indicates detected result
BOLD	indicates the result exceeds Residential SCO
mg/kg	milligrams/kilogram or parts per million (ppm)
ft bgs	feet below ground surface
BTEX	benzene, toluene, ethlybenzene, and xylene
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls

NOTE:
Residential SCO – Established in the New York Code of Rules and Regulations, Title 6, Chapter 100, Part 700-705, Subpart 375-6: Remedial Program Soil Cleanup Objectives for Restricted Use Residential

SOURCES:
1. Orthophoto obtained from New York State Interactive Mapping Gateway (http://www1.nysgis.state.ny.us/MainMap.cfm) photo date: 2004, accessed 10/04/07.
2. *Land and Tax Map, Sec. 2, Blk. 347,* Nassau County Department of Assessment, Sheet 1 of 1, Revised date: April 18,, 2003, Scale: 1" = 100', map obtained from: http://www.nassaucountyny.gov.
3. 1950 Sanborn Fire Insurance Map.
4. Manhasset Hortonsphere Property Maps Parcel Nos. 24.1, 24.2, and 23 Long Island Lighting Company, Mineola, N.Y.
5. Survey of existing conditions and sample locations conducted by GEI Consultants, Inc. on 12/10 and 12/18/07. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.
6. Survey of additional sample locations conducted by GEI Consultants, Inc. on 3/11/09. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.

0 60 120
SCALE, FEET

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

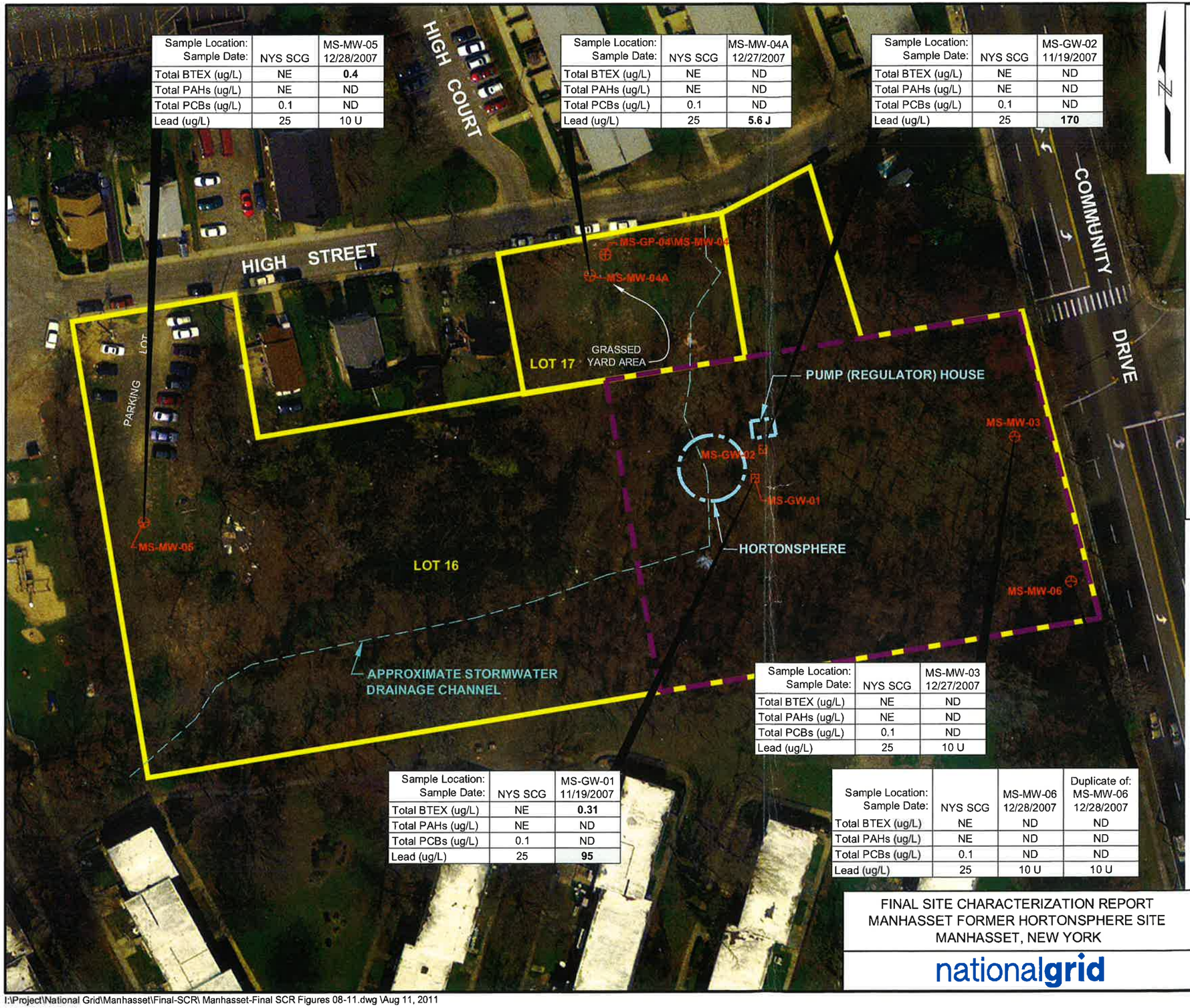
nationalgrid

GEI Consultants

STORMWATER SEDIMENT ANALYTICAL SUMMARY (mg/kg)

Project 093000-8-1801 | August 2011 | Figure 12

I:\Project\National Grid\Manhasset\Final-SCR\ Manhasset-Final SCR Figures 08-11.dwg \Aug 11, 2011



Sample Location: Sample Date:	NYS SCG	MS-MW-05 12/28/2007
Total BTEX (ug/L)	NE	**0.4**
Total PAHs (ug/L)	NE	ND
Total PCBs (ug/L)	0.1	ND
Lead (ug/L)	25	10 U

Sample Location: Sample Date:	NYS SCG	MS-MW-04A 12/27/2007
Total BTEX (ug/L)	NE	ND
Total PAHs (ug/L)	NE	ND
Total PCBs (ug/L)	0.1	ND
Lead (ug/L)	25	**5.6 J**

Sample Location: Sample Date:	NYS SCG	MS-GW-02 11/19/2007
Total BTEX (ug/L)	NE	ND
Total PAHs (ug/L)	NE	ND
Total PCBs (ug/L)	0.1	ND
Lead (ug/L)	25	**170**

Sample Location: Sample Date:	NYS SCG	MS-MW-03 12/27/2007
Total BTEX (ug/L)	NE	ND
Total PAHs (ug/L)	NE	ND
Total PCBs (ug/L)	0.1	ND
Lead (ug/L)	25	10 U

Sample Location: Sample Date:	NYS SCG	MS-GW-01 11/19/2007
Total BTEX (ug/L)	NE	**0.31**
Total PAHs (ug/L)	NE	ND
Total PCBs (ug/L)	0.1	ND
Lead (ug/L)	25	**95**

Sample Location: Sample Date:	NYS SCG	MS-MW-06 12/28/2007	Duplicate of: MS-MW-06 12/28/2007
Total BTEX (ug/L)	NE	ND	ND
Total PAHs (ug/L)	NE	ND	ND
Total PCBs (ug/L)	0.1	ND	ND
Lead (ug/L)	25	10 U	10 U

LEGEND:

- PROPERTY BOUNDARY (APPROXIMATE)
- FORMER HORTONSPHERE SITE BOUNDARY (APPROXIMATE)
- HISTORIC STRUCTURE LOCATION
- MS-GW-01 — TEMPORARY GROUNDWATER SAMPLING LOCATION
- MS-MW-03 — MONITORING WELL LOCATION
- 27.3 — GROUNDWATER CONTOUR (FEET NAVD)
- 27.25 — GROUNDWATER ELEVATION (FEET NAVD)
- INFERRED GROUNDWATER FLOW DIRECTION
- NAVD — NORTH AMERICAN VERTICAL DATUM
- NE — no exceedances of specified NYSDEC standard
- ND — not detected; total concentration is listed as ND because no compounds were detected in the group
- J — estimated value
- U — indicates not detected to the reporting limit for organic analysis and the method detection limit for inorganic analysis
- **BOLD** — indicates detected result
- **BOLD** — indicates that the detected result value exceeds established NYS SCGs
- ug/L — micrograms per liter or parts per billion (ppb)
- BTEX — benzene, toluene, ethlybenzene, and xylene
- PAHs — polycyclic aromatic hydrocarbons
- PCBs — polychlorinated biphenyls

NOTE:

NYS SCG - New York State Department of Environmental Conservation Standards, Criteria, and Guidelines Ambient Water Quality Standards for GA Groundwater

SOURCES:

1. Orthophoto obtained from New York State Interactive Mapping Gateway (http://www1.nysgis.state.ny.us/MainMap.cfm) photo date: 2004, accessed 10/04/07.
2. *Land and Tax Map, Sec. 2, Blk. 347,* Nassau County Department of Assessment, Sheet 1 of 1, Revised date: April 18,, 2003, Scale: 1" = 100', map obtained from: http://www.nassaucountyny.gov.
3. 1950 Sanborn Fire Insurance Map.
4. Manhasset Hortonsphere Property Maps Parcel Nos. 24.1, 24.2, and 23 Long Island Lighting Company, Mineola, N.Y.
5. Survey of existing conditions and sample locations conducted by GEI Consultants, Inc. on 12/10 and 12/18/07. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.
6. Survey of additional sample locations conducted by GEI Consultants, Inc. on 3/11/09. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.

0 60 120

SCALE, FEET

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

nationalgrid

GEI Consultants

DISSOLVED PHASE GROUNDWATER ANALYTICAL SUMMARY (ug/L)

Project 093000-8-1801 | August 2011 | Figure 13

I:\Project\National Grid\Manhasset\Final-SCR\ Manhasset-Final SCR Figures 08-11.dwg \Aug 11, 2011

Appendix A

Work Plan Approval Letter and Change Order

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region One
Stony Brook University
50 Circle Road, Stony Brook, New York 11790 - 3409
Phone: (631) 444-0240 • **FAX:** (631) 444-0248
Website: www.dec.state.ny.us

Alexander B. Grannis
Commissioner

October 5, 2007

Thomas Campbell
Manager - MGP Programs, L.I.
KeySpan Corporation
175 East Old Country Road
Hicksville, NY 11801

Re: Draft Site Characterization Work Plan
Manhasset Hortonsphere Site
43 High Street
Manhasset, New York

Dear Mr. Campbell:

The New York State Department of Environmental Conservation (the Department), the New York State Department of Health (NYSDOH) and the Suffolk County Department of Health Services (SCDHS) have reviewed KeySpan Corporation's (KeySpan) Draft Site Characterization Work Plan for the Port Jefferson Hortonsphere site. The plan was developed by KeySpan's Consultant, GEI. Based on the review, the Department offers the following comments:

General Comments:

1. GroundWater Flow Direction: The proposed site characterization work plan includes the installation of five (5) temporary groundwater monitoring points, MS-GW-01 through MS-GW-04. Following installation, the points are to be surveyed for location and elevation. It is suggested that a synoptic round of water level measurements be collected from the monitoring points and the direction of the groundwater flow determined. Section 4.2 of the plan states the anticipated direction of groundwater flow is to the east.

2. TAL Metals: The metals analysis that is proposed for the soil samples collected as part of this investigation is the Target Analyte List (TAL) Metals by EPA 6000/7000 series. To be consistent, it is suggested that TAL metals be included as part of the parameter list for the ground water samples that are to be collected as part of the investigation, not eight (8) RCRA metals that is currently proposed.

3. Sulfur Analysis: The manufactured gas that was stored in the Manhasset Hortonsphere was most likely processed natural gas that was tasteless and odorless. Before this gas was distributed to end-users, it was often odorized by adding small amounts of odorants, such as dimethyl sulfide and other sulfur compounds, to assist in leak detection. Thus, it is suggested that sulfur be included in the analysis of samples collected as part of this investigation.

4. Hortonsphere filling/distribution Process information: To ensure we have properly investigated the former Manhasset Hortonsphere site, it is recommended that a detailed discussion of the technology and operational information that was used in the storage and distribution of the gas be provided. Information should include, but not limited to; storage volume, storage tank maintenance requirement and supply network. In addition, details regarding the piping distribution system, such as the location of condensate traps, should be provided.

5. Soil Vapor Sampling: The proposed work plan includes the collection of a total of four temporary soil vapor sampling points. It is suggested that a fifth soil vapor sampling point, located along the southern portion of the site, be included. In addition, Please revise the text to include that the vapor samples are to be collected in accordance to New York State Department of Health's "*Guidance for Evaluating Soil Vapor Intrusion in the State of New York*".

Specific Comments:

1. MS-SS-06: Section 5.3.3 indicates that a minimum of six surface soil samples and Table 2 discusses the rationale and sample description of MS-SS-06. Only five proposed samples location are depicted on Figure 2. Please revise Figure 2 to include the proposed location of MS-SS-06.

2. MS-GP-02: MS-GP-02 is incorrectly labeled on Figure 2 as MS-GP-03. Please revise Figure.

3. Soil Boring Investigation: Please clarify in Section 5.3.1 that if impacts are observed 10 feet below the water table, the boring will be advanced to approximately five feet beyond observed visual impacts to a maximum depth of 40 feet below the water table.

4. Soil Vapor Sampling: The proposed depth of the soil vapor samples that are to be collected as part of this plan is approximately two feet below grade. In accordance to New York State Department of Health's Guidance for Evaluating Soil Vapor Intrusion in the State of New York, soil vapor samples collected at depths shallower than 5 feet below grade may be prone to negative bias due to infiltration of outdoor air. The Department is suggesting that the soil vapor probes be advance to a depth of five (5) feet below grade to ensure a representative vapor sample is obtained . In Addition, the work plan should clarify the volume of summa canisters and the reporting limits for the laboratory results.

5. Figure 3: The Nearby Land Use Map, Figure 3, should identify the surrounding buildings that are depicted on the map, including the nearby day care facility.

Please call me at (631)-444-0242 if you have any questions.

Sincerely,

John C. Sheehan
Engineering Geologist I

ec: W. Parish, NYSDEC
C. Vasudevan, NYSDEC
G. Bobersky, NYSDEC
R. Weitzman, NCDH
R. Ockerby, NYSDOH
G. Iadarola, GEI

ec: W. Parish, NYSDEC
C. Vasudevan, NYSDEC
G. Bobersky, NYSDEC
R. Weitzman, NCDH
R. Ockerby, NYSDOH
T. Leissing, KeySpan
G. Iadarola, GEI
L. Willey, GEI

Sincerely,

John C. Sheehan
Project Manager

ec: W. Parish, NYSDEC
C. Vasudevan, NYSDEC
G. Bobersky, NYSDEC
R. Weitzman, NCDH
R. Ockerby, NYSDOH
T. Leissing, National Grid
J. Zak, GEI
L. Willey, GEI

1. Temporary Groundwater Monitoring Well MS-MW-05: The SC Summary Package indicates in Section 3.4, *Groundwater*, that groundwater samples were collected from the four site monitoring wells. Please include monitoring well MS-MW-05 in the list of four monitoring wells; monitoring well MS-MW-03 is listed twice.

2. Conclusions: The SC summary package indicates in Section 4.0, *Conclusions*, that "the lack of VOCs in soil and groundwater samples indicates that there is no on-site source for the VOCs in soil vapor and there are no occupied buildings on the site, and therefore no exposure pathway from soil vapor". The lack of contaminants in soil and groundwater samples does not definitely exclude the possibility of an on-site source for the VOCs in soil vapor. The Department is requesting that the conclusion be revised to potentially state "there is no apparent on-site source for the VOCs detected in the soil vapor." While there may not be a VOC source located on-site and since there are no buildings on the property, the potential for exposure via soil vapor intrusion on-site does not exist. However, construction, utility and other workers can be exposed to soil vapor if they were to disturb the sub surface soils. The final bullet item should be revised to reflect this potential exposure pathway.

3. Table 5, Soil Vapor and Ambient Air Analytical Results Summary: The SC summary package presents in Table 5, *Soil Vapor and Ambient Air Analytical Results Summary*, the results of the soil vapor samples collected as part of the SC. The Department is requesting that the table be revised in order to assist in evaluating the data collected. To help evaluate the data, please amend the table by moving the column presenting the Outdoor Air (MS-OA-01) results from 2/24/2009 adjacent to the correlating soil vapor samples collected on that same day (2/24/2009).

The objective of the SC was to implement all of the necessary tasks to evaluate soils, groundwater and soil vapor at the site to determine if the operation of the former Hortonsphere had impacted the environment. With the submittal and subsequent approval of the draft Final SC report, the Department will be satisfied that the objective of the SC was achieved and thus the characterization of the Manhasset Hortonsphere site will have concluded and we can proceed to the next element of the project.

Pursuant to Paragraph II.E of the above referenced Order, and 6 NYCRR 375-1.6(d)(3), please notify the Department within fifteen (15) days whether National Grid elects to modify the draft SC report consistent with all the comments noted above or whether National Grid elects to invoke dispute resolution. If National Grid elects to modify the draft SC Report, please provide a revised submittal addressing all of the above comments no later than thirty (30) days after such election.

Should you have questions or would like to discuss the above comments, please contact me at (631)-444-0247 or via email at jcsheeha@gw.dec.state.ny.us. Thank you for your cooperation regarding this matter.

Sincerely,

John C. Sheehan
Project Manager

ec: W. Parish, NYSDEC
C. Vasudevan, NYSDEC
G. Bobersky, NYSDEC
R. Ockerby, NYSDOH
B. Weitzman, NCHD
T. Leissing, National Grid
J. Zak, GEI
L. Willey, GEI

Appendix B

Representative Site Photographs

GEI Consultants, Inc.

PHOTOGRAPHIC RECORD

Project: Manhasset Hortonsphere
Site Characterization
Location:: High Street, Manhasset, NY

Photographer: K. Barber
Date: 10/25/07
Photo No.: 1
Direction: NE

Comments:
Photograph of the drainage channel.

Photographer: G. Iadarola
Date: 5/23/07
Photo No.: 2
Direction: S

Comments:
Photograph of the entrance to site on High Street, former Hortonsphere location in the distance.

GEI Consultants, Inc.

PHOTOGRAPHIC RECORD

Project: Manhasset Hortonsphere
Site Characterization
Location:: High Street, Manhasset, NY

Photographer: G. Iadarola
Date: 5/23/07
Photo No.: 3
Direction: S

Comments:
Photograph of the entrance to site on the western end of High Street.

Photographer: G. Iadarola
Date: 5/23/07
Photo No.: 4
Direction: E

Comments:
Photograph of the western wooded area of the site.

GEI Consultants, Inc.

PHOTOGRAPHIC RECORD

Project: Manhasset Hortonsphere
Site Characterization
Location:: High Street, Manhasset, NY

Photographer: G. Iadarola
Date: 5/23/07
Photo No.: 5
Direction: W

Comments:
Photograph of the adjacent playground.

Photographer: G. Iadarola
Date: 5/23/07
Photo No.: 6
Direction: N

Comments:
Photograph of the western portion of the site and High Street.

Appendix C

Historical Documents

EDR® Environmental
Data Resources Inc

The EDR Aerial Photo Decade Package

Manhasset Hortonshpere Site
43 High Street
Manhasset, NY 11030

Inquiry Number: 1898554.5

April 10, 2007

The Standard in Environmental Risk Information

440 Wheelers Farms Road
Milford, Connecticut 06461

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

EDR Aerial Photo Decade Package

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDRs professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

When delivered electronically by EDR, the aerial photo images included with this report are for ONE TIME USE ONLY. Further reproduction of these aerial photo images is prohibited without permission from EDR. For more information contact your EDR Account Executive.

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

Date EDR Searched Historical Sources:

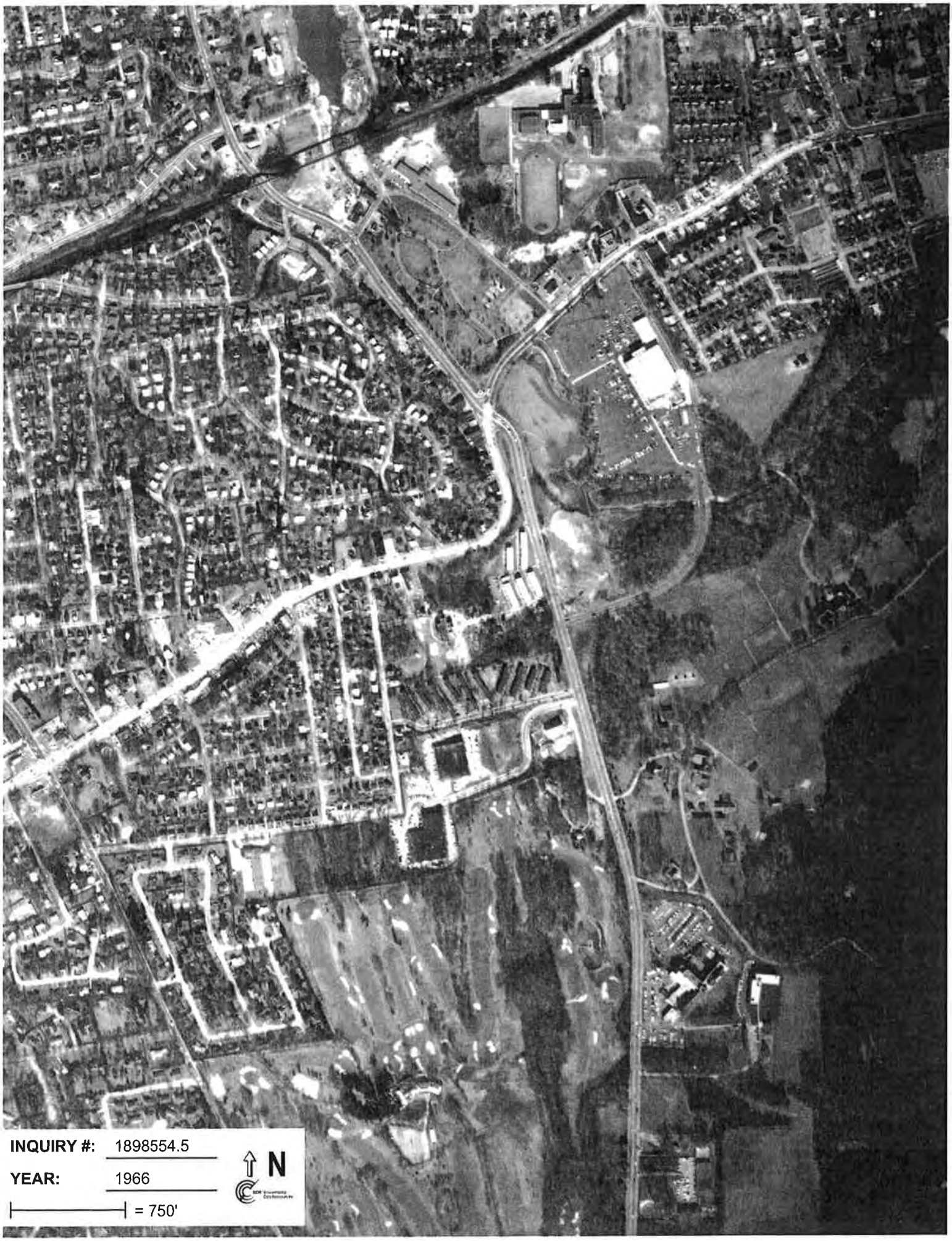
Aerial Photography April 10, 2007

Target Property:

43 High Street
Manhasset, NY 11030

Year	*Scale*	*Details*	*Source*
1954	Aerial Photograph. Scale: 1"=750'	Panel #: 2440073-G6/Flight Date: February 19, 1954	EDR
1966	Aerial Photograph. Scale: 1"=750'	Panel #: 2440073-G6/Flight Date: February 23, 1966	EDR
1976	Aerial Photograph. Scale: 1"=750'	Panel #: 2440073-G6/Flight Date: March 29, 1976	EDR
1980	Aerial Photograph. Scale: 1"=750'	Panel #: 2440073-G6/Flight Date: April 06, 1980	EDR
1994	Aerial Photograph. Scale: 1"=833'	Panel #: 2440073-G6/Flight Date: April 04, 1994	EDR


INQUIRY #: 1898554.5
YEAR: 1954
= 750'
N


INQUIRY #: 1898554.5
YEAR: 1966
= 750'
N


INQUIRY #: 1898554.5
YEAR: 1976
= 750'
N


INQUIRY #: 1898554.5
YEAR: 1980
= 750'
N


INQUIRY #: 1898554.5
YEAR: 1994
= 833'
N

EDR® Environmental
Data Resources Inc

EDR Historical Topographic Map Report

Manhasset Hortonshpere Site
43 High Street
Manhasset, NY 11030

Inquiry Number: 1898554.4

April 10, 2007

The Standard in Environmental Risk Management Information

440 Wheelers Farms Rd
Milford, Connecticut 06461

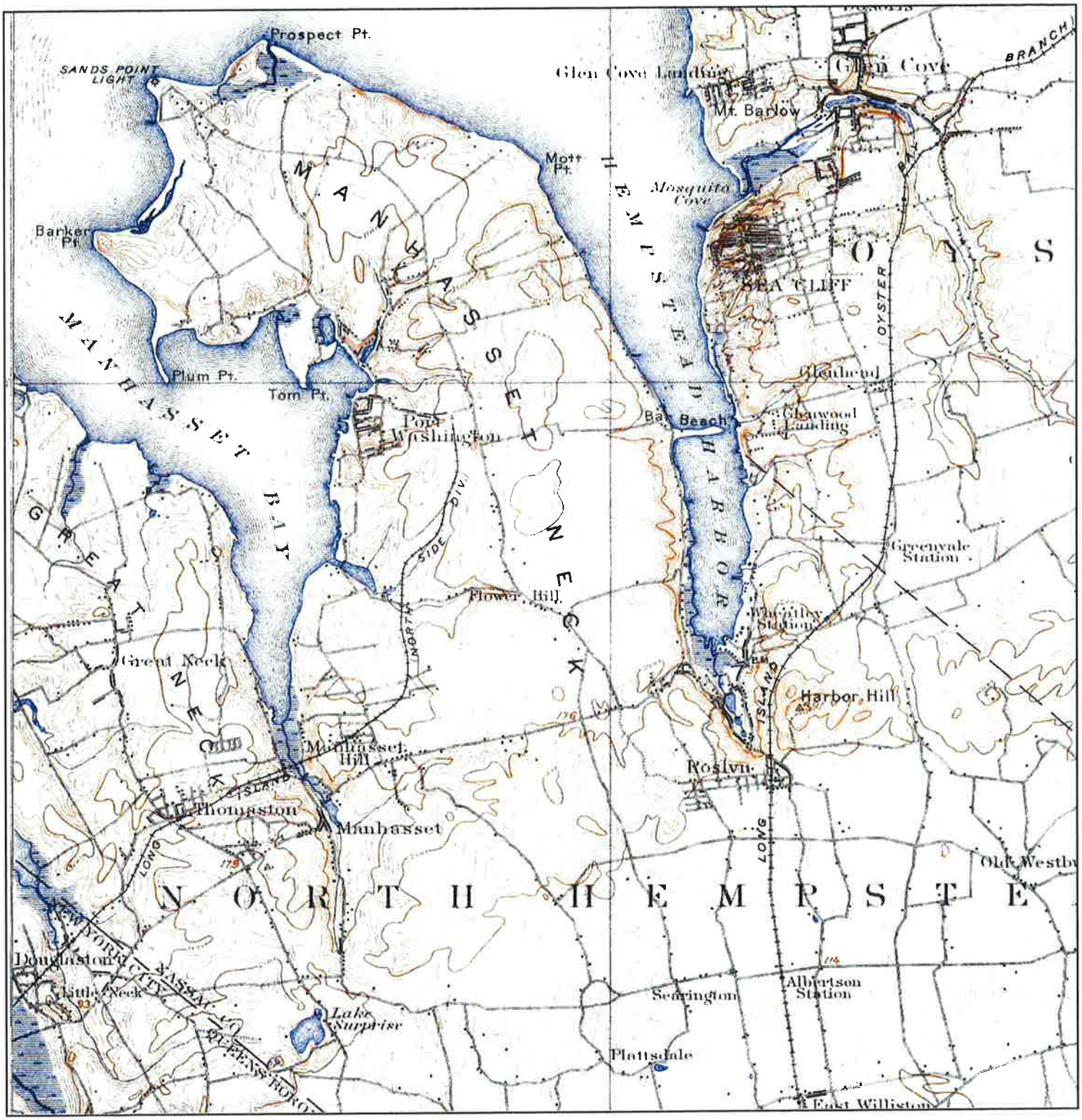
Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

Historical Topographic Map

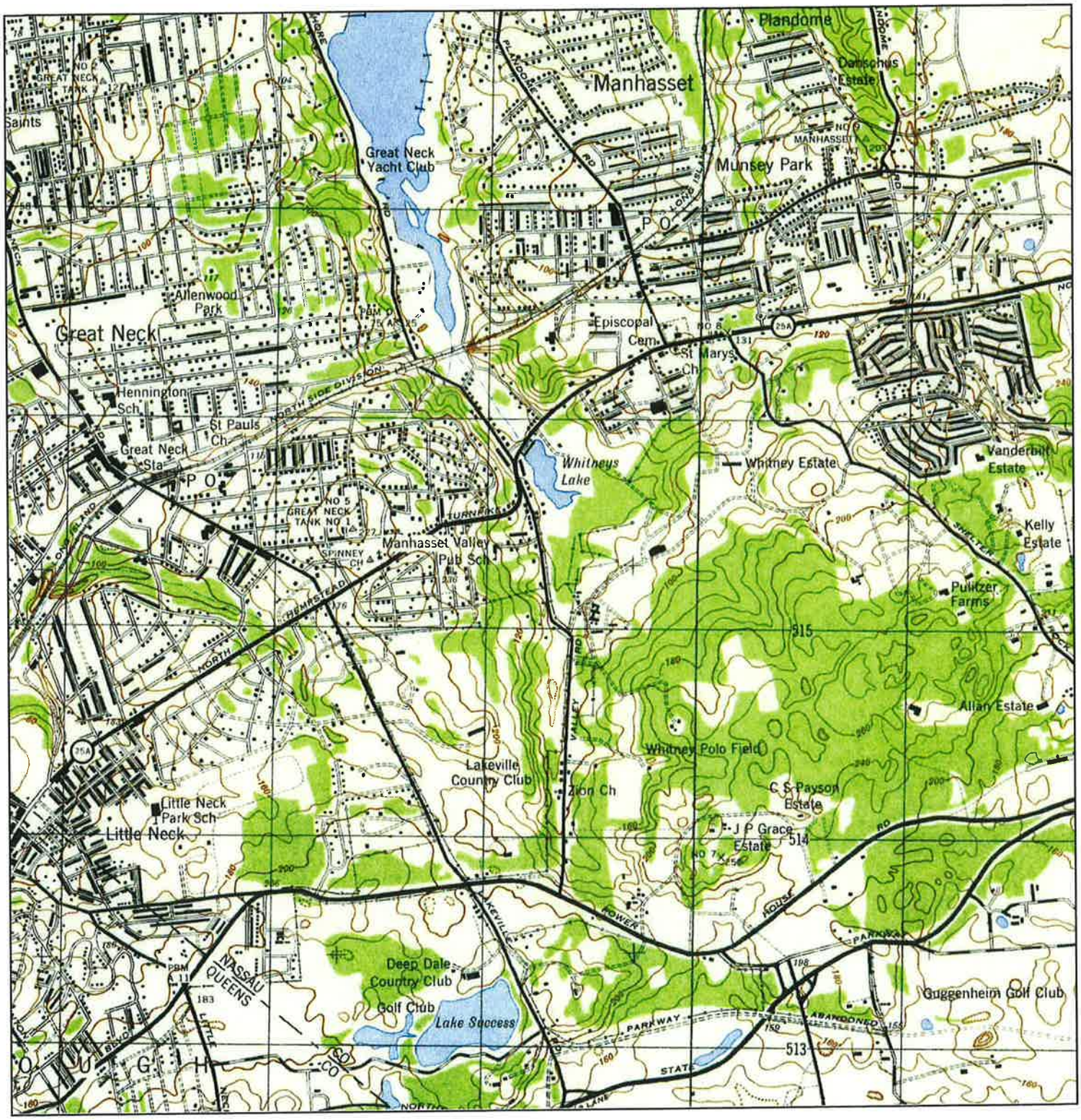
N	TARGET QUAD NAME: OYSTER BAY MAP YEAR: 1900 SERIES: 15 SCALE: 1:62500	SITE NAME: Manhasset Hortonshpere Site ADDRESS: 43 High Street Manhasset, NY 11030 LAT/LONG: 40.7841 / 73.706	CLIENT: GEI Consultants Inc. CONTACT: Lynn Willey INQUIRY#: 1898554.4 RESEARCH DATE: 04/10/2007

Historical Topographic Map



N	TARGET QUAD NAME: CAMP MILLS MAP YEAR: 1918 SERIES: 15 SCALE: 1:62500	SITE NAME: Manhasset Hortonshpere Site ADDRESS: 43 High Street Manhasset, NY 11030 LAT/LONG: 40.7841 / 73.706	CLIENT: GEI Consultants Inc. CONTACT: Lynn Willey INQUIRY#: 1898554.4 RESEARCH DATE: 04/10/2007

Historical Topographic Map

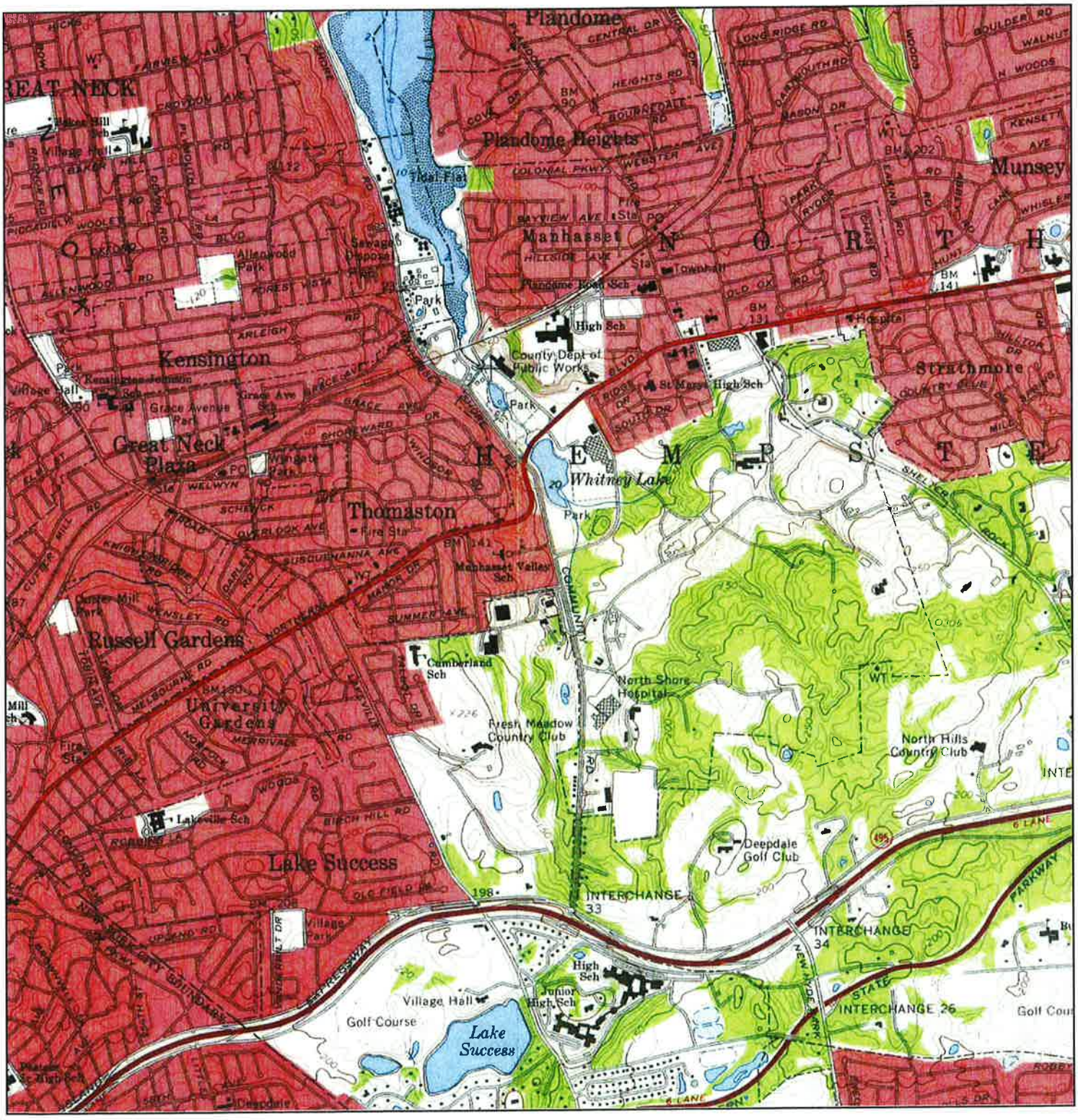


N	TARGET QUAD NAME: SEA CLIFF MAP YEAR: 1947 SERIES: 7.5 SCALE: 1:25000	SITE NAME: Manhasset Hortonshpere Site ADDRESS: 43 High Street Manhasset, NY 11030 LAT/LONG: 40.7841 / 73.706	CLIENT: GEI Consultants Inc. CONTACT: Lynn Willey INQUIRY#: 1898554.4 RESEARCH DATE: 04/10/2007

Historical Topographic Map

N	TARGET QUAD NAME: SEA CLIFF MAP YEAR: 1954 SERIES: 7.5 SCALE: 1:24000	SITE NAME: Manhasset Hortonshpere Site ADDRESS: 43 High Street Manhasset, NY 11030 LAT/LONG: 40.7841 / 73.706	CLIENT: GEI Consultants Inc. CONTACT: Lynn Willey INQUIRY#: 1898554.4 RESEARCH DATE: 04/10/2007

Historical Topographic Map



N	TARGET QUAD NAME: SEA CLIFF MAP YEAR: 1968 SERIES: 7.5 SCALE: 1:24000	SITE NAME: Manhasset Hortonshpere Site ADDRESS: 43 High Street Manhasset, NY 11030 LAT/LONG: 40.7841 / 73.706	CLIENT: GEI Consultants Inc. CONTACT: Lynn Willey INQUIRY#: 1898554.4 RESEARCH DATE: 04/10/2007

Historical Topographic Map

N	TARGET QUAD NAME: SEA CLIFF MAP YEAR: 1979 PHOTOREVISED FROM:1968 SERIES: 7.5 SCALE: 1:24000	SITE NAME: Manhasset Hortonshpere Site ADDRESS: 43 High Street Manhasset, NY 11030 LAT/LONG: 40.7841 / 73.706	CLIENT: GEI Consultants Inc. CONTACT: Lynn Willey INQUIRY#: 1898554.4 RESEARCH DATE: 04/10/2007

gas into the holder when the pressure on the transmission line exceeds 14 pounds and feeds back into the line when the pressure in this drops below 10 pounds. A control switch in series stops the compressor when the holder pressure reaches 60 pounds. By means of long distance gages the operation of this automatic station can be observed by the engineer in the main plant compressor room 2 miles away.

Spherical High Pressure Gas Holders. Spherical steel tanks for the storage of gas under high pressure were introduced by the Chicago Bridge and Iron Works. They were named **Hortonspheres** after George T. Horton, president of that firm. In a paper [51] describing them, Horton has shown that it is necessary in a cylindrical tank with hemispherical ends to make the walls of the cylindrical section twice as thick as those of the hemispherical ends in order to withstand the same pressure, and that hence the weight, W, of steel for a given storage capacity, S, is smallest when the cylindrical section is of zero length, that is, when the hemispherical ends meet forming a sphere. While it is an admitted fact that the cost of construction outside of the materials is somewhat greater for the spherical form than the cylindrical form, experience shows that in spherical tanks this increase in construction costs is considerably less than the saving in steel.

An interesting relationship is that if we assume a joint efficiency of 78.5 per cent and a working stress of 13,750 pounds per square inch for the steel, which allows a factor of safety of 4, the weight, W, in pounds of the steel in the sphere, without including the weight of the joints and supports, **is equal to the storage capacity,** S, in cubic feet.

$$W = S$$

Further, the storage capacity of a given sphere varies directly with the absolute pressure, and the thickness of the walls necessary to withstand the pressure also varies directly with the absolute pressure. Hence in a given size of sphere the weight of steel increases directly with storage capacity. Again, if the pressure is kept constant, the storage capacity or volume varies with the *cube* of the radius. Now the stress, and hence the thickness of the steel to withstand a given pressure, varies *directly* with the radius, and the area to be covered with steel varies with the *square* of the radius. Hence the weight of steel to withstand a given pressure in spheres of different sizes increases with the cube of the radius or of the diameter, just the same as does the volume or storage capacity at constant pressure. Therefore, if we disregard the weight of steel in the joints and supports, the amount of **steel necessary for a given storage capacity** in spherical

high pressure tanks **is independent of the number and diameter of the spheres.** To illustrate, if we wish to store 500,000 cubic feet of gas, we might do it at 30 pounds pressure in one sphere 78 feet in diameter, in two spheres 62 feet in diameter, or in three spheres 54 feet in diameter, the volume in each of these cases being 250,000 cubic feet. The thickness of the steel necessary to withstand the 30 pound pressure would be respectively 0.64, 0.51, and 0.44 inch. We might also store 500,000 cubic feet of gas under 45 pounds pressure in one sphere 69 feet in diameter, in five spheres 40 feet in diameter, or in six spheres 37 feet in diameter. Each of these combinations gives a volume of 167,000 cubic feet. The thickness of the steel necessary in these cases to withstand the 45 pound pressure is respectively 0.85, 0.49 and 0.46 inch.

In **considering the construction,** 78 and 69 foot spheres with steel 0.64 and 0.85 inch thick would require butt strap joints, while the other spheres with steel from 0.44 to 0.51 inch could have lap joints. It will be found then that the weight of steel for the 500,000 cubic foot storage capacity would be about 45 per cent greater than the theoretical 500,000 pounds for the spheres which require butt strap joints and about 35 per cent greater for those with lap joints. Horton finds the maximum economy is obtained with steel of $\frac{7}{16}$ to $\frac{9}{16}$ inch in thickness. With this material the cost for a given storage in various sizes and numbers of spheres does not vary more than 10 per cent. This permits a great **flexibility in the erection of these holders,** allowing them to be built in sizes and numbers that best suit the conditions of the available sites and at different times to suit the need of storage capacity. These holders are also fabricated with butt welded joints which reduces the amount of steel required to approximately the theoretical figure above mentioned.[52] For a more detailed discussion of design problems in connection with these holders reference should be made to Horton's paper [51] and to the article by Milbourne.[53] Figure 27 illustrates a Hortonsphere erected for the Long Island Lighting Co. at Farmingdale, New York. It is 57 feet 6 inches in diameter and is designed to store 400,000 cubic feet of gas at 60 pounds gage pressure.

These holders also have the **advantage of requiring only moderate foundations.** On account of their shape and the fact that gas pressure within tends to keep them spherical, slight settling of the foundations is not serious. Since there are no moving parts and no liquid seals, they require practically no attention, and their maintenance is small. These advantages, together with the fact that a sphere painted with

FIG. 27. Hortonsphere High Pressure Gas Holder, 57.5 feet in Diameter. (Courtesy of Chicago Bridge & Iron Works, Chicago, Ill.)

aluminum or a suitable colored paint may be **easily made to harmonize with the landscape,** make the Hortonsphere especially adapted to use for outlying holders in residential districts. Figure 28 shows how well one of these holders, which is 40 feet in diameter and stores 135,000 cubic feet of gas at 60 pounds pressure, blends with the surroundings.

Purging of High Pressure Holders. In the purging of high pressure holders there are no moving parts and no sealing liquids to complicate matters. The purging is therefore only a matter of replacing the gas content of a closed container. Figure 29 shows the principal **connections to be made for purging** horizontal cylindrical and spherical high pressure holders. The connections for a vertical cylindrical holder are similar to those for a spherical holder. In addition test cocks should be provided around the spherical or vertical cylindrical holder about one-third of its vertical height from the top, and at points on the top of the horizontal holder at maximum distances from the standard vent or vents. In the removal of a holder from service

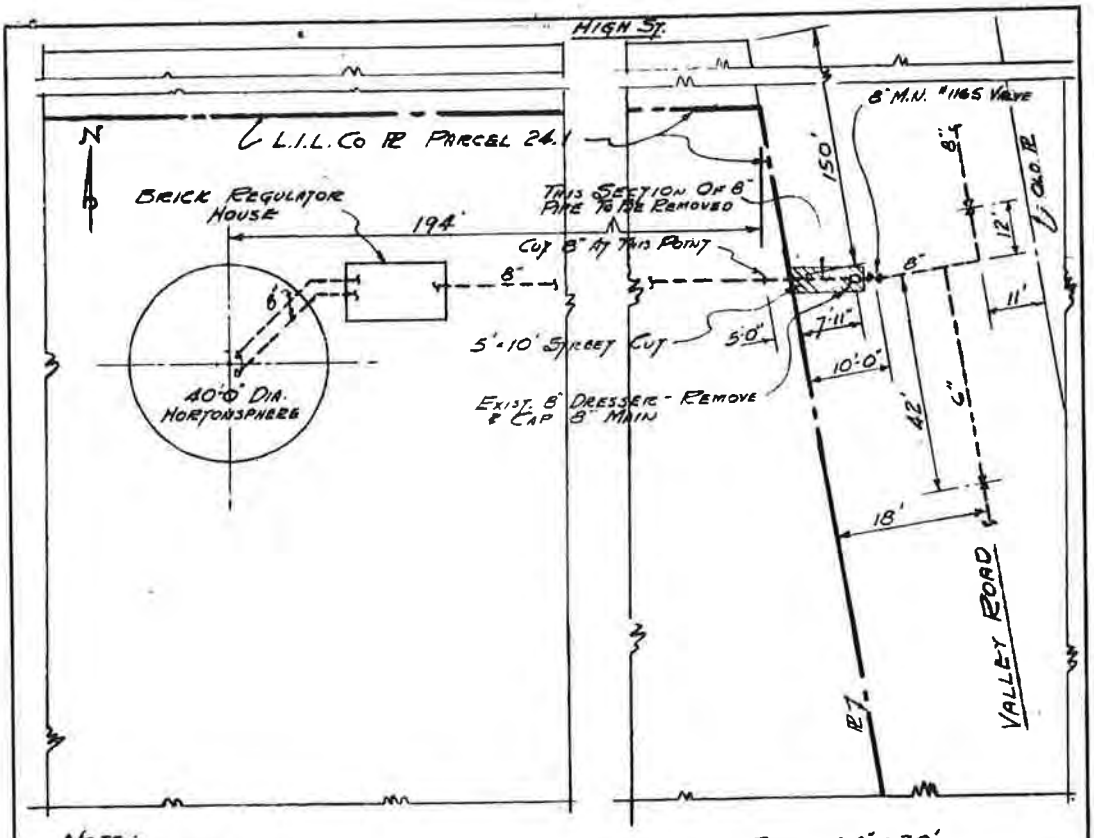
FIG. 28. Hortonsphere High Pressure Gas Holder, 40 feet in Diameter, Blends Well with Background. (Courtesy of Chicago Bridge & Iron Works, Chicago, Ill.)

any oil present must be drawn off and the gas pressure reduced to about 6 inches water gage before purging operations are begun. With these exceptions the principles of purging of these holders may be easily inferred from our discussion of purging low pressure holders. Exact **details of operation** are given in the procedure recommended by the American Gas Association [19] and this should be consulted previous to any attempt to purge such holders.

Underground Storage of Gas. Natural gas occurs, as we have already indicated,[1] stored under pressure in the pores of the so-called gas sands. These are really sedimentary rocks which have a porosity averaging from 8 to 22 per cent, although sands with a porosity up to 35 per cent are known. In its occurrence the natural gas is stored in the pores of the rock either alone under high pressures, or dissolved

28. Braine, J. H. Repair of leaks in sectional gas holders. *A. G. A. Monthly*, 9, 1927, 71–6.
29. Editorial. Recrowning an inflated holder. *Gas Journal*, December 1930, 854.
30. Metzdorff. Repairing the cup of a filled gas holder by welding. *Gas- und Wasserfach*, 74, 1931, 9; translated by L. M. Van der Pyl, *Gas Age-Record*, 67, 1931, 266–8.
31. Alrich, H. W. Lessons learned from gas holder and other explosions. *A. G. A. Monthly*, 1929, 467–8 and 498.
32. Bullard, J. E. Visualizing service by a graphic device. *Gas Age-Record*, 57, 1926, 291.
33. Willis, J. H. The M. A. N. waterless gas holder. *Gas Journal*, May 1930, 312–4.
34. Murray, J. L. A new development in the waterless gas holder. *Gas Age-Record*, 69, 1932, 745–8; also later figures on capacity of holders in Bartlett-Hayward Company's advertisement, *Idem.*, October 7, 1933.
35. Miller, A. S. Building the first waterless holder in America. *A. G. A. Monthly*, 1925, 135–7.
36. Anon. Construction of world's largest gas holder. *A. G. A Monthly*, 1929, 215–8.
37. Murray, J. L. A new development in the waterless gas holder. Abstracts, *Gas Journal*, 199, 1932, 35–6, and *Gas World*, 96, 1932, 692–4.
38. O'Keefe, J. G. Some experiences in the operation of waterless holders. *Proc. A. G. A.*, 1926, 1244–9; also *A. G. A. Monthly*, 1926, 699–702.
39. Lechler, P. Sealing the piston of waterless gas holders. *Gas World*, May 1926, 441.
40. Prentice, F. Experiences with a waterless gas holder. *Gas World*, June 1930, 663–7; and *Gas Journal*, June 1930, 771–5.
41. Bruce, H. Discussion of paper by O'Keefe (reference 38). *Idem*, 1248.
42. Klönne, M. The Klönne waterless gas holder. *Gas Age-Record*, 67, 1931, 957–60.
43. Anon. Klönne gasholder for York Gas Company first in the British Isles. *Gas World*, August 1929, 197.
44. Anon. Syracuse has world's largest dry seal holder. *Gas Age-Record*, 69, 1932, 480–1 and 485.
45. Anon. New developments in waterless holder design in Germany. *Gas Age-Record*, 64, 1929, 45.
Knauss, W. Neuerungen im Scheibengasbehälterbau. *Gas- und Wasserfach*, 72, 1929, 976–8.
Wagner, R. Vorschlage für Neuerungen an Scheibengasbehältern. *Gas- und Wasserfach*, 72, 1929, 1001–5.
Thau, A. Wasserlose Gasbehälter. *Idem*, February 1930, 200–2.
46. Thompson and Bridge. New type holder in operation. *American Gas Journal*, May 1922, 444.
47. Whitney, W. H. A new type of high pressure gas storage system. *Gas Age-Record*, 57, 1926, 185–6.
48. Bridges, A. F. Economics of pressure gas storage. *A. G. A. Monthly*, 1926, 761–6.
49. News Item. Four pressure storage holders under construction. *Gas Age-Record*, 70, 1932, 201.

50. Spencer, A. M. An automatically controlled high pressure holder installation. *Gas Age-Record*, 63, 1929, 711–2.
51. Horton, G. T. High pressure gas holders. *Gas Age-Record*, 58, 1926, 727–9 and 732.
52. Anon. Gas Company uses butane as standby. *Petroleum Engineer*, November 1933, 21–2.
53. Milbourne, S. M. Spherical gas holders. *Gas Journal*, April 1929, 196–200 and 253–5.
54. Meals, S. W. Storing and measuring large quantities of gas. *American Gas Journal*, March 1929, 171–5. Underground storage of gas. *American Gas Journal*, March 1929, 82 and 84; and *Gas Age-Record*, 64, 1929, 645–6. Storing gas in earth's natural reservoirs. *Idem*, 65, 1930, 595–6.
55. Anon. Surplus in gas output stored in old wells. *Gas Age-Record*, 66, 1930, 811.



NOTE:
DISCONNECT ALL PIPING AT SPHERE & IN REGULATOR HOUSE & REMOVE TO 6" BELOW GRADE
DEMOLISH SPHERE & REGULATOR HOUSE & ALL CONCRETE FOOTINGS & FOUNDATIONS TO 6" BELOW GRADE
AFTER COMPLETION OF ABOVE REMOVE ALL DEBRIS & ROUGH GRADE AREA OF SPHERE & HOUSE
ALL UNDERGROUND PIPING TO BE ABANDONED IN PLACE EXCEPT AS NOTED

SCALE: 1" = 30'

Transmitted by Johnson

Transmittal No. 2

Work Order No. 46606

Date 8-19-60

REFERENCE DWGS:
F-6387 - GOVERNORS & CONNECTIONS
F-6055 - 40' HORTONSPHERE, LOCATION PLAN
F-6428 - GOVERNOR HOUSE, ELEV. & SECT.

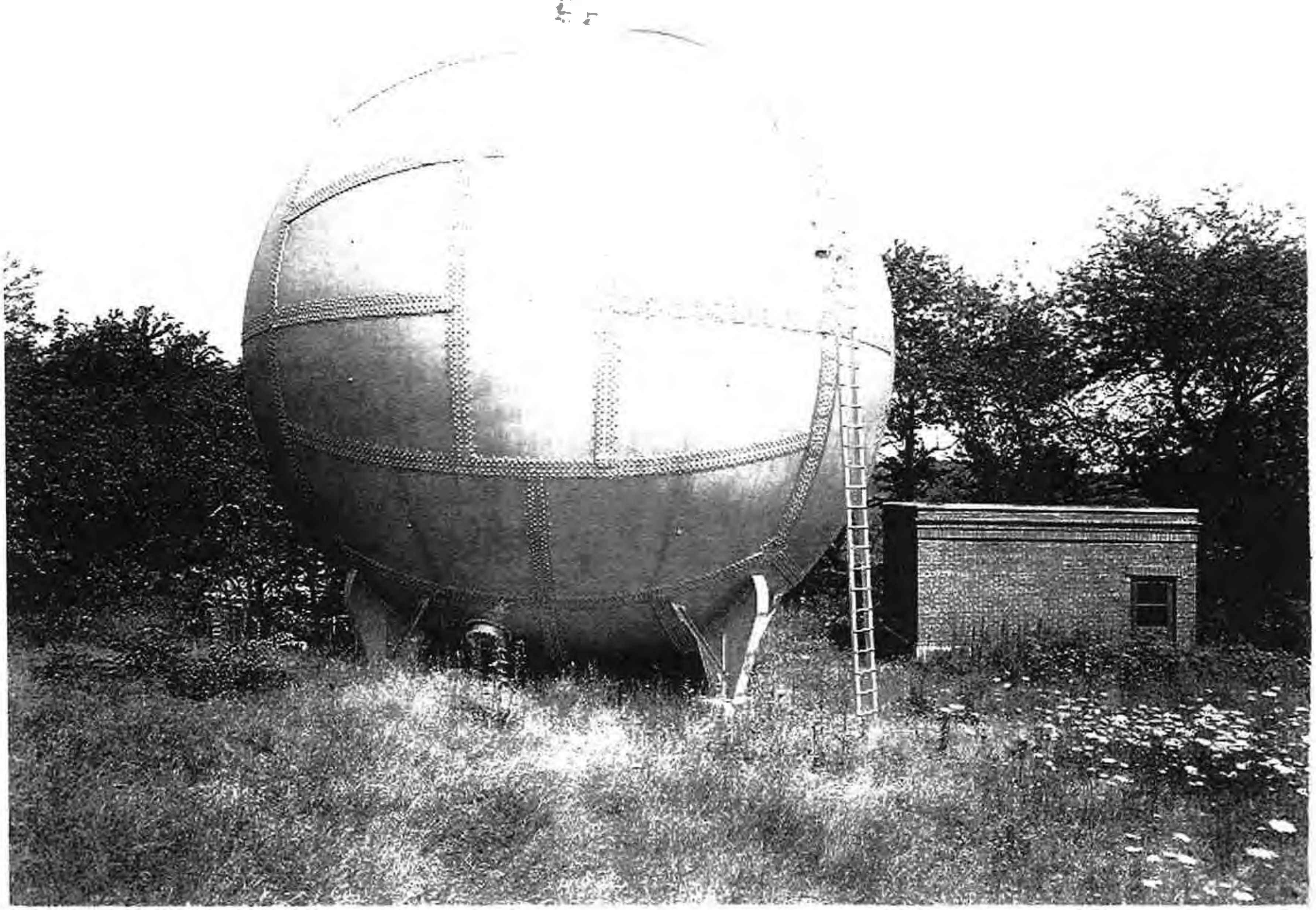
No	Date	Revision	M.G.Y. Drwn	H.W.T. Appd.
1	8-17-60	Rev. Cut Off In Street		

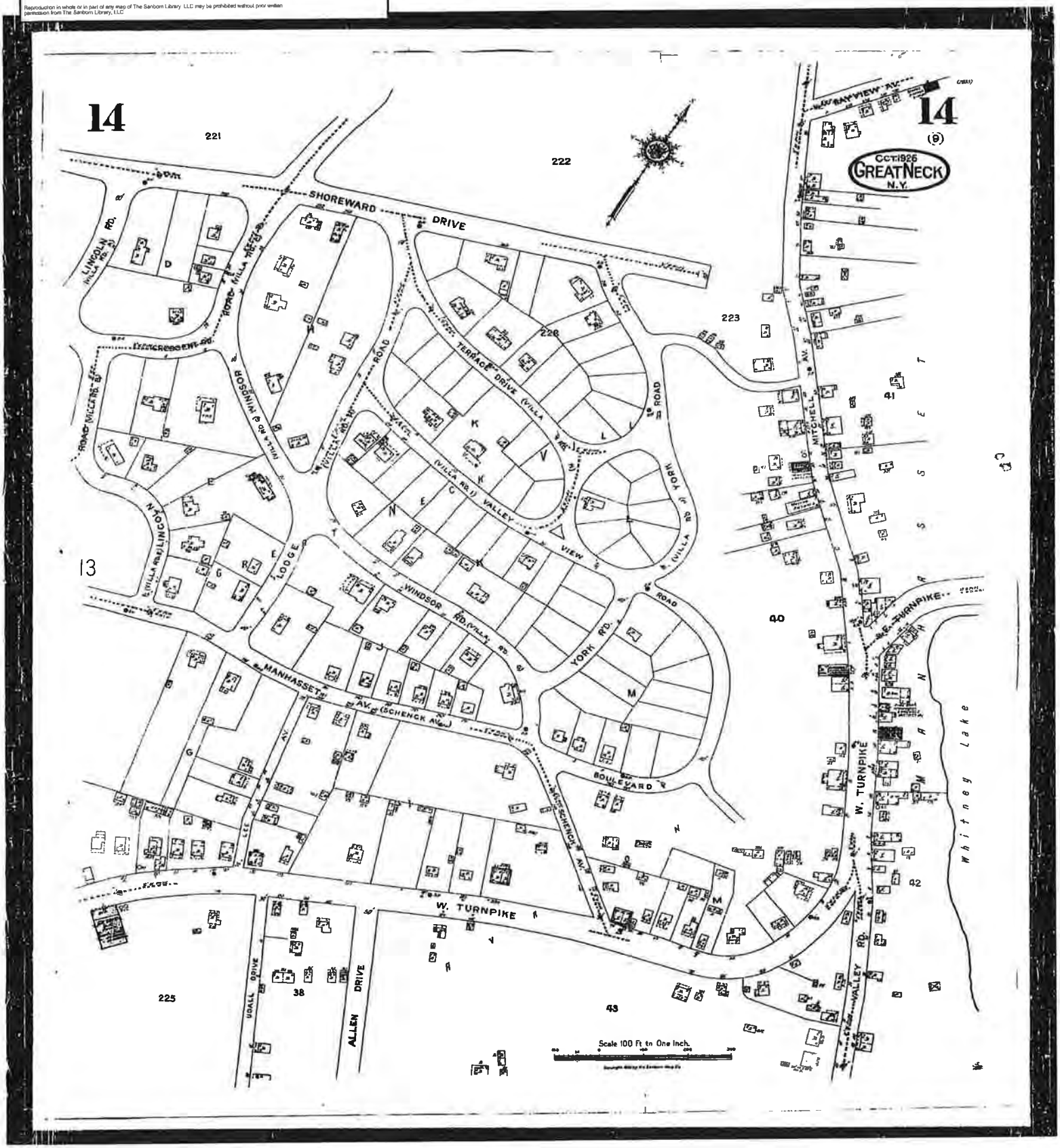
RETIREMENT OF SPHERE, GOVERNOR HOUSE & EQUIPMENT MANHASSET, N.Y.

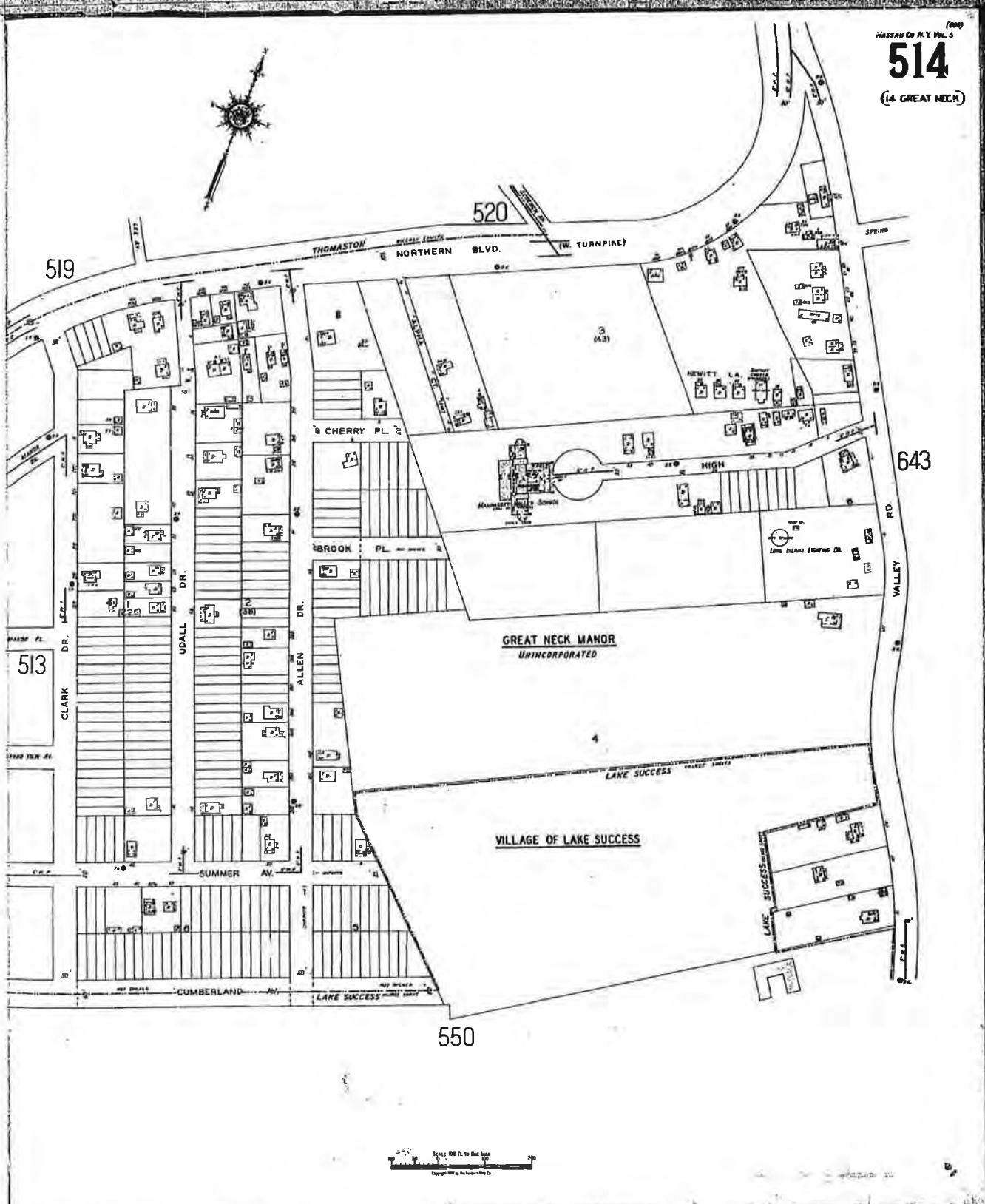
W. O. No. 46606
Drawn by W. YOGEL
App'd by H.W.T.

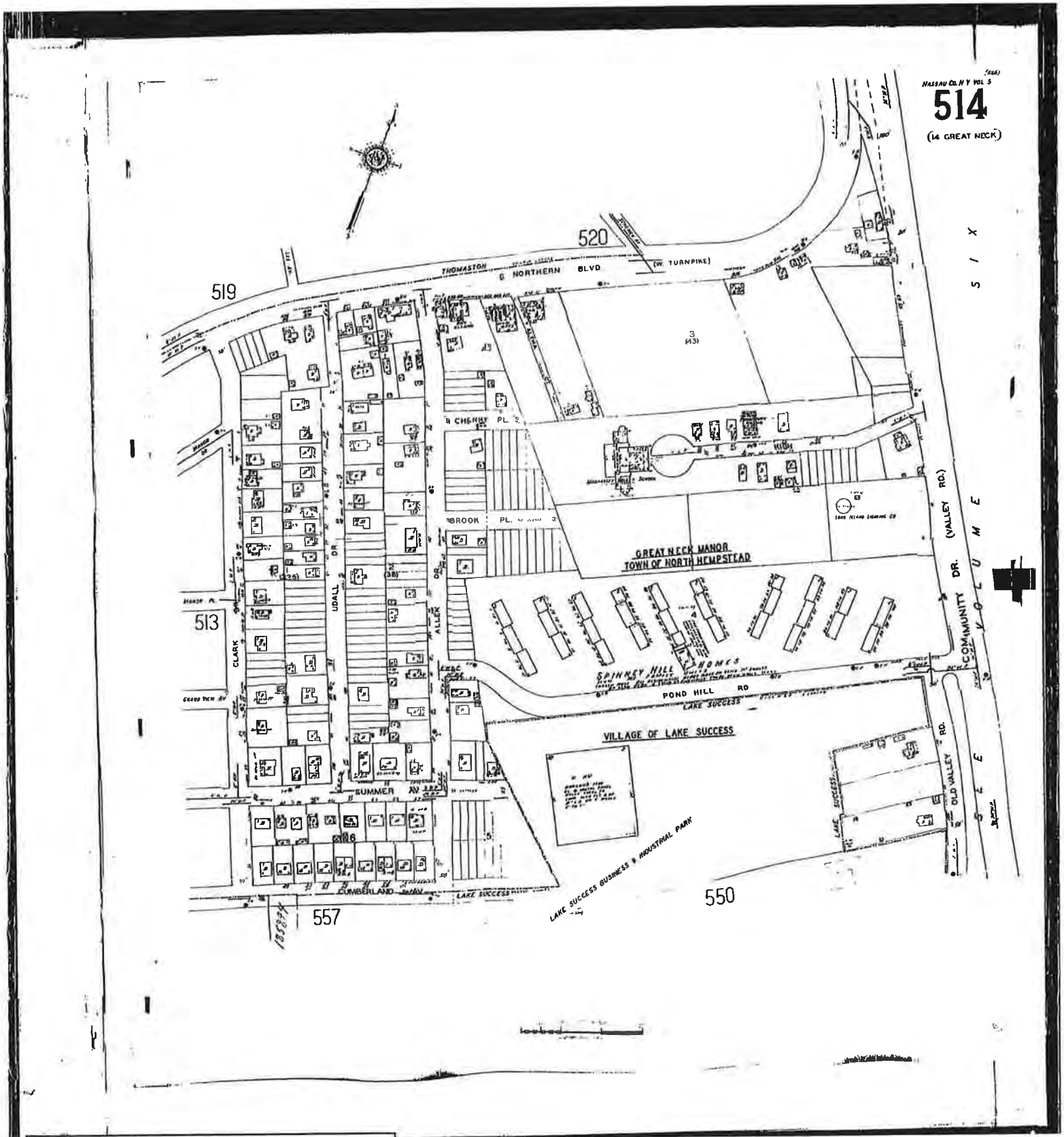
LONG ISLAND LIGHTING COMPANY
175 OLD COUNTRY ROAD
HICKSVILLE, NEW YORK
Engineering Department

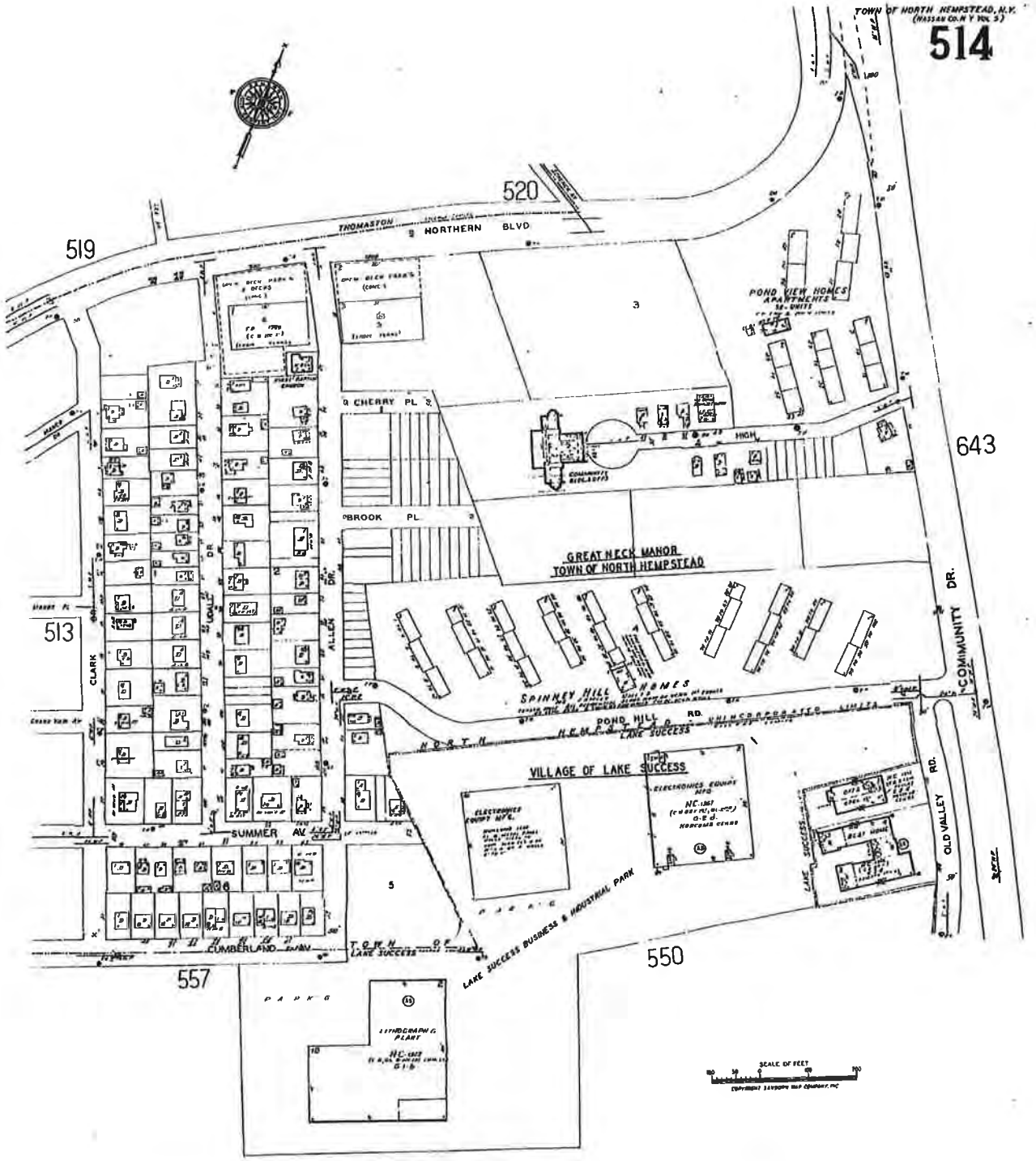
Date 3-29-60
Dwg. L-209-Q











Review of Long Island Gas Manufacture and Distribution (1907 – 1950)

Submitted to:

National Grid
175 East Old County Road
Hicksville, NY 11801

Submitted by:

GEI Consultants, Inc.
455 Winding Brook Drive
Suite 201
Glastonbury, CT 06033
860-368-5300

April 2009
Revised October 2009

Dennis Unites
Sr. Vice President

Introduction

GEI Consultants, Inc. (GEI) has conducted a review of the history of the Long Island Lighting Company (LILCO) to provide a better understanding of the manufactured gas operations and distribution. The primary objective of the review has been to determine the location of gas manufacturing plants and, secondarily, to understand the part played by the Hortonspheres in the distribution system. GEI has reviewed previously published corporate histories, the history of the MGP operations produced by Atlantic Environmental Services, Inc., (1996), annual reports on the file in the New York State Archives, and Public Service Commission (PSC) annual reports provided by National Grid. Given the passage of time, change of companies from year to year, and older recordkeeping methodologies, research is difficult and information about each location is a function of those documents that could be located.

Since 1907, utilities in New York have been required to file annual reports with the PSC. These reports have changed in format over the years, but generally require a summary of ownership, finance, and operation of the utility for the reporting year. They include a listing of major capital equipment such as gas manufacturing plants, storage tanks and gas transmission lines. While these are company prepared reports, they were subject to audit by the public service commission.

The history of LILCO is one of financial and operational consolidation that mirrored the utility industry in the rest of the United States. The period from 1910 through 1932 saw the consolidation of many small gas and electric companies into large holding companies of national or even international scope. At the same time, gas and electric generation was moving away from a model of small operations close to the energy users to larger more centralized facilities with distribution to the centers of usage.

The Long Island Lighting Company

LILCO was incorporated on December 31, 1910 as a consolidation of Amityville Electric Light Co., Islip Electric Light Co., Northport Electric Light Co., and Sayville Electric Co.[1] All of these companies sold electricity exclusively; however, Islip used a producer gas engine for generation.[2] Subsequently, the company acquired by purchase or merger, the following companies listed in Table 1, below.

Table 1
Companies Acquired by
The Long Island Lighting Company

Company	Year Acquired
Babylon Electric Light Co.	1915
Suffolk Gas & Electric Light Co.	1917
South Shore Gas Co.*	1917

[1] Moody's, 1995. p. 670.
[2] Carpenter, [n.d.]. p73

Table 1 (Continued) Companies Acquired by The Long Island Lighting Company	
Company	**Year Acquired**
Huntington Light & Power Co.	1919
Huntington Gas Co.*	1919
North Shore Electric Light & Power Co.	1919
Consumers Gas Co. of Long Island	1922
Riverhead Electric Light Co.	1922
Southold Lighting Co.*	1922
Suffolk Light, Heat & Power Co.	1922
Nassau Light & Power Co.	1922
Long Island Gas Corp.*	1924
Patchogue Gas Co.*	1924
Sag Harbor Electric Light & Power Co.	1924
Sea Cliff and Glen Cove Gas Co.*	1924
East Hampton Electric Light Co.	1926
Public Service Corp. of Long Island	1927
Clinton Gas Co.*	1930
Liland Corp.	1933
Queens Borough Gas & Electric Co.*	1950
Nassau & Suffolk Lighting Co.*	1950
Long Beach Gas Co., Inc.	1950
Shelter Island Light & Power Co.	1959
Patchogue Electric Light Co.	1964

* indicates companies with gas manufacturing operations.

Queens Borough Gas & Electric and Nassau & Suffolk Lighting were consolidated into LILCO in 1950; however, LILCO had controlling interest in these operating companies since 1923.

Gas Manufacture and Distribution

In the beginning of the manufactured gas era, gas was manufactured in small plants close to where it was used. Table 2 lists the original gas works that later made up the LILCO system. Over LILCO's history, these local gas manufacturing companies were consolidated into three operating companies:

Nassau & Suffolk Lighting Company, Queens Borough Gas and Electric Company, and Long Island Lighting Company. Figure 1 shows the growth of the system. The following sections provide a brief history of each of the operating companies.

Table 2
Gas Plants in the LILCO Holding Company System

Gas plant	Years of Operation	Operating Company
Sag Harbor	1859-1928[3]	LILCO predecessor
Garden City	1874?--1906(?)	Nassau & Suffolk predecessor
Babylon	1884-1904(?)	LILCO predecessor
Hempstead Clinton	1860-1904	Nassau & Suffolk predecessor
Hempstead Intersection Street	1904-1950s	Nassau & Suffolk
Rockaway	1880-1950s	Queens Borough Gas and Electric
Far Rockaway	1895-1904(?)	Queens Borough Gas and Electric predecessor
Huntington (Halesite)	1893-1925[4]	LILCO
Glen Cove	1904-1927[5]	LILCO
Bay Shore	1889-1970s	LILCO
Southold	1906-1921	LILCO predecessor
Clinton (East Hampton)	1904-1930	LILCO predecessor
Patchogue	1904-1914[6]	LILCO predecessor

[3] Last gas reported made February 1928. An auditor's note in the 1934 report indicates no manufacture after October 1932 for Huntington, Patchogue, Sag Harbor and Glen Cove.
[4] Last reported gas manufacture 1925.
[5] After 1926 PSC records show all gas purchased from Public Service of Long Island.
[6] PSC reports show no significant gas manufacture after 1914.

Nassau & Suffolk Lighting Company

One of the earliest manufacturers of gas in Nassau & Suffolk Counties occurred at the Clinton Street plant which was later to become part of the Nassau & Suffolk Lighting Company system. In all, three gas works operated in the company's territory. On January 23, 1860, gas was first produced in Hempstead at a plant constructed on the east side of Clinton Street, just north of Front Street.[7] The plant operated until circa 1904 when it was apparently replaced by the plant at Intersection Street. [8] The Garden City gas works, the third plant, was acquired in 1906. Gas was produced only at the Hempstead Intersection Street facility after 1906 until the system was converted to natural gas in the 1950s.

In addition to gas storage at the manufactured gas plant, gas was stored at the Stewart Avenue holder station, constructed in 1929 and the Bellmore Hortonsphere, put into service in 1928.

Because of its location, Nassau & Suffolk served as a "middleman" in the LILCO system in the later years of gas manufacturing. It purchased large volumes of gas from Queens Borough Gas and Electric and sold large volumes to LILCO. Table 3 provides Nassau & Suffolk Intra-Company gas sales for selected years. Note that both Public Service Company of Long Island and Long Beach Gas Company were solely distribution companies, which only purchased gas throughout their corporate histories.

Table 3
Nassau & Suffolk Annual Intra Company Gas Sales

Year	Sold to	Volume (mmcf)*	Purchased from	Volume (mmcf)*	Gas Made at Plant (mmcf)*
1915	Public Service Corp of LI	32		None	226
	Long Beach Gas Co.	339mcf			
1920	Public Service Corp of LI	131	Southshore Gas Co.	66mcf	512
	Long Beach Gas Co.	15			
	Masapequa Gas Electric Light & Power	413mcf			
1925	Public Service Corp of LI	233	LILCO	120mcf	846
	Long Beach Gas Co.	73			
	Masapequa Gas Electric Light & Power	2			
1930	LILCO	754	LILCO	30mcf	864
			Queens Borough Gas and Electric	964	
1935	LILCO	807	Queens Borough Gas and Electric	1082	794
1940	LILCO	1380	Queens Borough Gas and Electric	1769	1003

* mmcf = million cubic feet, mcf = thousand cubic feet

[7] Carpenter,[n.d.]. P. 4.
[8] Atlantic Environmental Services, Inc., 1996. P. 4-11.

Queens Borough Gas and Electric Company

Queens Borough Gas and Electric was made up of a number of small companies which went through several changes of ownership prior to the formation of Queens Borough Gas and Electric in 1902. There were two plants - Rockaway and Far Rockaway.

The first works was built in Rockaway in 1880 but did not appear to begin production until 1894.[9] A second works operated in Far Rockaway from 1895[10] until some time prior to 1908. PSC records for 1908 show the existence of the Far Rockaway works but do not indicate any production. Production at these works is not noted in subsequent reports.

Off plant gas storage facilities in the Queens Borough system were the Lynbrook Holder, a water sealed holder constructed in 1904 and decommissioned in 1932[11] and the Inwood holder, a large water sealed holder constructed in 1924.[12]

The Rockaway plant was used as a source of gas for much of the LILCO system. From the late 1920s onward, roughly half of the gas produced was sold to affiliated companies, primarily Long Beach Gas and Nassau & Suffolk. Based on Nassau and Suffolk records, it is likely that some of this gas was further sold into the LILCO distribution system. Table 4 provides a listing of selected intra company sales. 1924 was selected as the starting date because of gaps in the available PSC records.

Table 4
Queens Borough Gas and Electric Intra Company Sales

Year	Sold to	Volume (mmcf)*	Purchased from	Volume (mmcf)*	Gas Made at Plant (mmcf)*
1924		None		None	1082
1930	Nassau &Suffolk Lighting	964			2593
	Long Beach Gas Co.	188			
1935	Nassau & Suffolk Lighting	1082			2469
	Long Beach Gas Co.	156			
1940	Nassau & Suffolk Lighting	1769			3470
	Long Beach Gas Co.	177			
1945	Nassau & Suffolk Lighting	2000			3967
	Long Beach Gas Co.	236			
1945	Nassau	2000			3967

* mmcf = million cubic feet, mcf = thousand cubic feet

[9] Carpenter, [n.d.]. Pp. 37-43.
[10] Carpenter, [n.d.] P 43.
[11] PSC 1932 auditors note.
[12] PSC 1924.

Long Island Lighting Company

The Long Island Lighting Company (LILCO) name was used for both the overall holding company and the operating company which provided gas and electric services to the eastern part of the service area. It was of greater geographic extent than the other two holding companies and has a more complex history of consolidation.

South Shore Gas Company was the first gas holding incorporated into the LILCO holding company and operating company in 1917. This company owned plants in (West) Babylon and Bay Shore. The Babylon plant apparently had ceased general production prior to 1907 (when PSC reporting began), as the plant is shown as part of the capital equipment but no production records are provided.

A third plant, Halesite, was added to the system in 1919 when LILCO acquired the Huntington Gas Company. This plant operated until 1925. An auditor's note in the 1934 PSC report indicated that this plant and three others had ceased making gas in October of 1932. This note appears to indicate that subsequent to 1932 they were no longer used as a standby reserve.

Southold Lighting Company was acquired along with the Southold acetylene plant in 1922.

The Patchogue, Glen Cove, and Sag Harbor Plants were added to the system in 1924 with the acquisition of Patchogue Gas Company, Sea Cliff and Glen Cove Gas Company and the Long Island Gas Company respectively. In the case of Patchogue, regular gas manufacture had essentially ceased around 1914 and gas was purchased from a LILCO subsidiary. Glen Cove and Sag Harbor ceased regular manufacture within a few years of purchase. All three of these plants were the subject of the 1934 auditor's note that indicated no gas manufactured after October 1932.

The acquisition in 1930 of the Clinton Gas Company and its gasoline vaporization works in East Hampton was the final purchase of a gas plant. Operations at all of the ancillary plants had ceased by 1932. By then, all gas was either provided from the Bay Shore plant or purchased from the other operating companies.

The distribution system for the LILCO system was complex as befits the large geographic extent of the companies. Water sealed holders, at active or inactive plants, made up one part of the distribution system. The 1930 PSC report shows holders at: Bay Shore, Huntington, Sag Harbor, Patchogue and, Glen Cove.

High pressure tanks constructed between 1918 and 1928 also provided storage for the distribution system. The 1935 PSC report shows a total of 47 such tanks located in: Amityville (5), Sayville (3), Huntington (10), Patchogue (7), Northport (3), Southampton (3), Sag Harbor (3), Hicksville (5), and Glen Cove (8). These holders were horizontal cylinders. One point of potential confusion is that several of these storage sites, which have no history of gas manufacture, are shown on some Sanborn maps as "Electric and Gas Plants" (see for example, Amityville).

Hortonspheres also provided high pressure storage. Nine of these were constructed and incorporated in the system between 1927 and 1931. The 1935 PSC report shows the following: Farmingdale (1927), Huntington (1928), Patchogue (1927), Port Jefferson (1930), East Hampton (1930), Sag Harbor (1931), Glen Cove (1927), Manhasset (1929), and Oyster Bay (1930).

During the earlier years, LILCO was a small net exporter of gas (Table 5), selling to Patchogue Gas and Nassau & Suffolk Lighting. After 1930, its exports were limited, and some years more gas was imported than was produced at Bay Shore. In 1935 there was an inter company purchase as a relatively small amount of gas was purchased from Nassau and Queens Gas Company, A Consolidated Edison subsidiary.

Table 5
LILCO Intra Company Sales

Date	Sold to	Volume (mmcf)*	Purchased from	Volume (mmcf)*	Gas Made at plants (mmcf)*
1915		None		None	None
1920	Patchogue Gas Co.	30		None	169 Bay Shore 17 Huntington
	Nassau & Suffolk Lighting Co.	77mcf			
1925	Patchogue Gas Co.	50			364 Bay Shore 31 Huntington
	Nassau & Suffolk Lighting Co.	103 mcf			
1930	Patchogue Gas Co.	32			882 Bay Shore
	Nassau & Suffolk Lighting Co.	31 mcf	Nassau & Suffolk Lighting Co.	513	
1935			Nassau & Suffolk Lighting Co.	807	888 Bay Shore
			New York and Queens Gas co.	116mcf	
1940			Nassau & Suffolk Lighting Co.	1380	1254 Bay Shore
1945			Nassau & Suffolk Lighting Co.	1511	2011 Bay Shore

* mmcf = one million cubic feet, mcf = one thousand cubic feet

Conclusions

The history of LILCO was one of consolidation of gas companies and smaller plants. Based on a review of the PSC records, thirteen gas plants were identified as operating in the early 1900s. By 1930, these had been reduced to three main plants: Rockaway, Hempstead Intersection Street, and Bay Shore. The Hortonspheres were part of the distribution system and, except for Glen Cove, Sag Harbor, Patchogue and Huntington, they were built away from existing gas plants.

Figure 2 provides a layout of the entire system at the maximum extent of gas manufacturing in 1950. The Riverhead gas cracking facility apparently began production in 1948. The figure does not depict the

Glenwood gas cracking facility which was constructed by 1949, perhaps because it did not actually go on-line until sometime in 1951.

As to the source of gas for any particular Hortonsphere, one can assume that most of the time the gas would have been supplied by that operating company's base load plant.

That is, Hempstead would have supplied Bellmore, and Bay Shore would have supplied the rest. However, considering the intra company sales and purchase and the internal links of the distribution system, any Hortonsphere could have been supplied by any plant.

The approach used has a number of limitations. The archives do not have records for all of the companies that ultimately were merged or acquired by the LILCO holding company. Saltaire did not appear in any of the PSC reports. The information about each location is also limited. While the Hortonspheres are identified in the capital equipment lists, there is not any other information provided about the Hortonsphere locations. These limitations notwithstanding, the available information provides a better insight into the history and operation of the system.

References

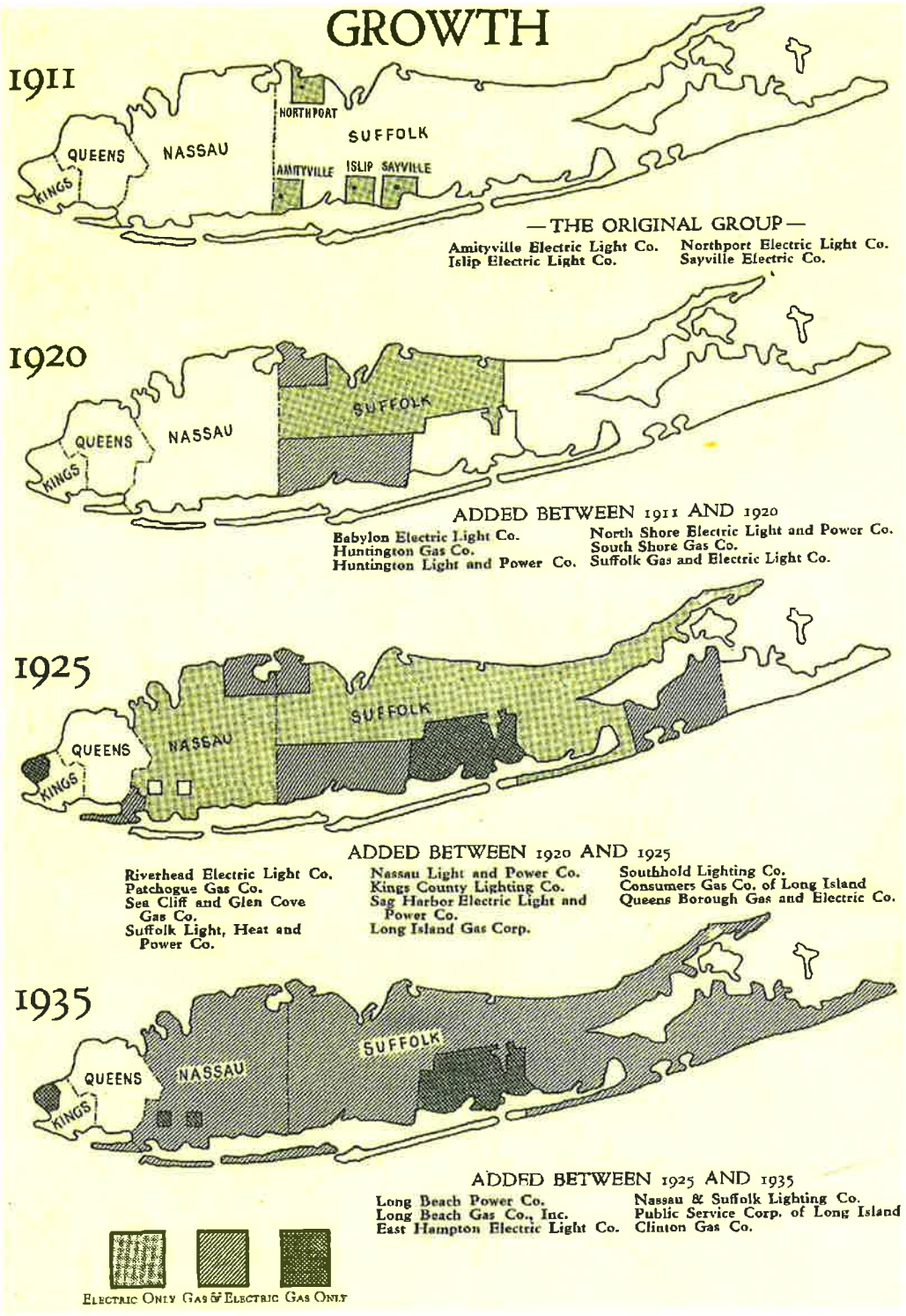
Moody's, Public Utility Manual. Volume 1, Moody's Investors Service, Inc. New York, New York, , 1995, p. 670.

Carpenter, James W, 1960., *Lighting Long Island*, Hicksville, New York, Long Island Lighting Company..

Atlantic, June 26,1996. Historic Review of MGP Plants on Long Island, Final Report, Atlantic Environmental Services, Colchester CT.

Twenty Five Years of the Long Island Lighting System 1911-1936, By The Long Island Lighting System , 1936, p. 17

H:\WPROC\Project\KEYSPAN\11 Site Characterizations\PSC Research\Lilco history Oct 09.docx

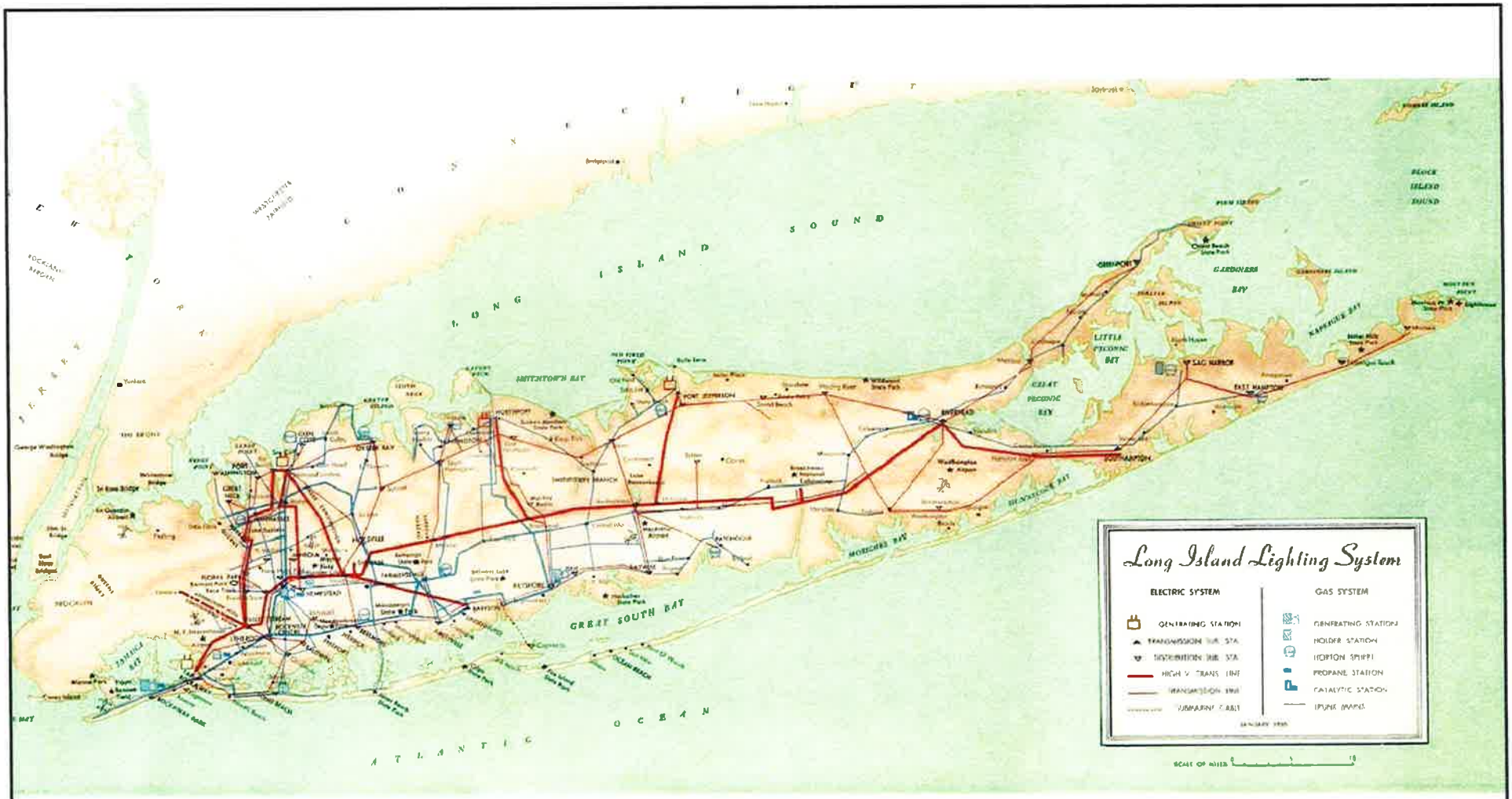


SOURCE:

TWENTY FIVE YEARS OF THE LONG ISLAND LIGHTING SYSTEM 1911 - 1936, BY THE LONG ISLAND LIGHTING SYSTEM ©1936, PAGE 17.

LILCO PSC REVIEW LONG ISLAND, NEW YORK	GEI Consultants	**GROWTH OF THE LILCO SYSTEM**
nationalgrid	Project 090230	March 2009 Figure 1

I:\GEI\National Grid\11 Sites PSC Research\LILCO PSC Figures.dwg



LILCO PSC REVIEW LONG ISLAND, NEW YORK	GEI Consultants	**1950 SYSTEM CONFIGURATION**
nationalgrid	Project 090230	March 2009 Figure 2

I:\GE\NATIONAL GRID\11 SITES PSC RESEARCH\LILCO PSC-FIGURES.DWG

EDR® Environmental
Data Resources Inc

The EDR Radius Map
with GeoCheck®

Manhasset Hortonshpere Site
43 High Street
Manhasset, NY 11030

Inquiry Number: 1898554.2s

April 09, 2007

The Standard in Environmental Risk Information

440 Wheelers Farms Road
Milford, Connecticut 06461

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

FORM-STD-PVC

Peak flow data count:	Not Reported	Water quality data begin date:	Not Reported
Water quality data end date:	Not Reported	Water quality data count:	Not Reported
Ground water data begin date:	Not Reported	Ground water data end date:	Not Reported
Ground water data count:	Not Reported		

Ground-water levels, Number of Measurements: 0

F41
South
1/2 - 1 Mile
Higher

NY WELLS **NYWS006131**

Well Id:	NY2902836	System name:	MANHASSET LAKEVILLE W.D.
System Id:	N-09308	Well name:	E. SHORE RD. 5
Type:	WL	Active?:	A
County:	NASSAU COUNTY	Latitude:	404632 000
Longitude:	734214 000	Slec_type_:	AC
Agency:	SCHRADER, PAUL		
Address:	P.O. BOX 359		
City/State/Zip:	MANHASSET NY 11030		
Phone:	516-627-9454		

G42
NNW
1/2 - 1 Mile
Lower

FED USGS **USGS2115088**

Agency cd:	USGS	Site no:	404732073423701
Site name:	N 854. 1		
Latitude:	404732		
Longitude:	0734237	Dec lat:	40.79232335
Dec lon:	-73.70985303	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	36
State:	36	County:	059
Country:	US	Land net:	Not Reported
Location map:	NC 716 2 66	Map scale:	Not Reported
Altitude:	8.0		
Altitude method:	Level or other surveying method		
Altitude accuracy:	0.1		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Northern Long Island. New York. Area = 915 sq.mi.		
Topographic:	Not Reported		
Site type:	Ground-water other than Spring	Date construction:	Not Reported
Date inventoried:	Not Reported	Mean greenwich time offset:	EST
Local standard time flag:	N		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	GLACIAL AQUIFER,UPPER		
Well depth:	150.	Hole depth:	150.
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	Not Reported	Daily flow data begin date:	Not Reported
Daily flow data end date:	Not Reported	Daily flow data count:	Not Reported
Peak flow data begin date:	Not Reported	Peak flow data end date:	Not Reported
Peak flow data count:	Not Reported	Water quality data begin date:	Not Reported
Water quality data end date:	Not Reported	Water quality data count:	Not Reported
Ground water data begin date:	Not Reported	Ground water data end date:	Not Reported
Ground water data count:	Not Reported		

Ground-water levels, Number of Measurements: 0

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Agency cd:	USGS	Site no:	404733073423803
Site name:	N 869. 1		
Latitude:	404733		
Longitude:	0734238	Dec lat:	40.79260113
Dec lon:	-73.71013082	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	36
State:	36	County:	059
Country:	US	Land net:	Not Reported
Location map:	NC 716 2 66	Map scale:	Not Reported
Altitude:	8.0		
Altitude method:	Level or other surveying method		
Altitude accuracy:	0.1		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Northern Long Island. New York. Area = 915 sq.mi.		
Topographic:	Not Reported		
Site type:	Ground-water other than Spring	Date construction:	Not Reported
Date inventoried:	Not Reported	Mean greenwich time offset:	EST
Local standard time flag:	N		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	GLACIAL AQUIFER,UPPER		
Well depth:	150.	Hole depth:	150.
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	Not Reported	Daily flow data begin date:	Not Reported
Daily flow data end date:	Not Reported	Daily flow data count:	Not Reported
Peak flow data begin date:	Not Reported	Peak flow data end date:	Not Reported
Peak flow data count:	Not Reported	Water quality data begin date:	Not Reported
Water quality data end date:	Not Reported	Water quality data count:	Not Reported
Ground water data begin date:	Not Reported	Ground water data end date:	Not Reported
Ground water data count:	Not Reported		

Ground-water levels, Number of Measurements: 0

G54
NNW
1/2 - 1 Mile
Lower

NY WELLS **NYWS006079**

Well Id:	NY2902836	System name:	MANHASSET LAKEVILLE W.D.
System Id:	N-04243	Well name:	PARKWAY 2
Type:	WL	Active?:	A
County:	NASSAU COUNTY	Latitude:	404733 000
Longitude:	734238 000	Slec_type_:	AC
Agency:	SCHRADER, PAUL		
Address:	P.O. BOX 359		
City/State/Zip:	MANHASSET NY 11030		
Phone:	516-627-9454		

G55
NNW
1/2 - 1 Mile
Lower

FED USGS **USGS2115101**

Agency cd:	USGS	Site no:	404733073424001
Site name:	N 7966. 1		
Latitude:	404733		
Longitude:	0734240	Dec lat:	40.79260113
Dec lon:	-73.71068639	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	36
State:	36	County:	059
Country:	US	Land net:	Not Reported
Location map:	NC 706 2	Map scale:	Not Reported
Altitude:	15.0		
Altitude method:	Level or other surveying method		
Altitude accuracy:	0.1		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Northern Long Island. New York. Area = 915 sq.mi.		
Topographic:	Not Reported		
Site type:	Ground-water other than Spring	Date construction:	Not Reported
Date inventoried:	Not Reported	Mean greenwich time offset:	EST
Local standard time flag:	N		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	GLACIAL AQUIFER,UPPER		
Well depth:	141.	Hole depth:	Not Reported
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	Not Reported	Daily flow data begin date:	Not Reported
Daily flow data end date:	Not Reported	Daily flow data count:	Not Reported
Peak flow data begin date:	Not Reported	Peak flow data end date:	Not Reported
Peak flow data count:	Not Reported	Water quality data begin date:	Not Reported
Water quality data end date:	Not Reported	Water quality data count:	Not Reported
Ground water data begin date:	Not Reported	Ground water data end date:	Not Reported
Ground water data count:	Not Reported		

Ground-water levels, Number of Measurements: 0

G56
NNW
1/2 - 1 Mile
Lower

NY WELLS **NYWS006078**

Well Id:	NY2902836	System name:	MANHASSET LAKEVILLE W.D.
System Id:	N-03905	Well name:	PARKWAY 1
Type:	WL	Active?:	A
County:	NASSAU COUNTY	Latitude:	404733 000
Longitude:	734240 000	Slec_type_:	AC
Agency:	SCHRADER, PAUL		
Address:	P.O. BOX 359		
City/State/Zip:	MANHASSET NY 11030		
Phone:	516-627-9454		

G57
NNW
1/2 - 1 Mile
Lower

FED USGS **USGS2115111**

Appendix D

Soil Boring, Monitoring Well Logs and Map of Water Table Elevations in Vicinity of Manhassett, New York

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 1 of 2

MS-GP-01

GROUND SURFACE ELEVATION (FT): 75
LOCATION:
NORTHING: 224992.07 **EASTING:** 1065872.59
TOTAL DEPTH (FT): 45.00
DRILLED BY: Zebra Environmental / Luke Caballero
DATUM VERT. / HORZ.: NAVD 1988 / NAD83 NY Long Island Zone
LOGGED BY: Melissa Felter
DATE START / END: 11/15/2007 - 11/16/2007
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT):

DEPTH FT.	SAMPLE INFO: TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0						MS-GP-01 (0-4)	0 - 4 WIDELY GRADED SAND WITH GRAVEL (SW); ~75% sand, ~20% gravel, ~5% fines; max. size 6 in., moist, tan, cobbles, loose roots 0-0.5', HAND CLEARED.
5	S-1	5.0	27	0.1			5 - 30 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand; ~10% fines, dry, light tan with light orangeish tan, loose
10	S-2	5.0	42	0.1			
15	S-3	5.0	42	0.1			
20	S-4	5.0	34	0.1			

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 2 of 2

MS-GP-01

DEPTH FT.	SAMPLE INFO TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
25	S-5	5.0	36	0.1			
30	S-6	5.0	34	0.1			30 - 35 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand; ~10% fines, dry to moist, light tan with light orangeish tan.
35	S-7	5.0	33	0.1			35 - 45 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand; ~10% fines, moist, light tan with light orangeish tan
40							
45				0.2		MS-GP-01 (44-45)	Bottom of borehole at 45.0 feet. Drove Geoprobe groundwater sampler to 60 feet and collected MS-GW-01

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG
PAGE 1 of 2
MS-GP-02

GROUND SURFACE ELEVATION (FT): 76.06
NORTHING: 225009.58 EASTING: 1065877.71
DRILLED BY: Zebra Environmental / Luke Caballero
LOGGED BY: Melissa Felter
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT):

LOCATION:
TOTAL DEPTH (FT): 40.00
DATUM VERT. / HORZ.: NAVD 1988 / NAD83 NY Long Island Zone
DATE START / END: 11/16/2007 - 11/16/2007

DEPTH FT.	SAMPLE INFO TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0						MS-GP-02 (0-5)	0 - 5 WIDELY GRADED SAND (SW); ~85% sand; ~5% fines, ~10% fine to coarse gravel, max. size 1 in., dry, brown, loose, HAND CLEARED.
5	S-1	5.0	60	0.1			5 - 10 WIDELY GRADED SAND (SW); ~85% sand; ~5% fines, ~10% fine to coarse gravel, max. size 1.5 in., dry, brown, dense.
10	S-2	5.0	44	0.1			10 - 12 WIDELY GRADED SAND (SW); ~90% sand; ~5% fines, ~5% fine gravel, max. size 0.5 in., dry, brown, dense.
							12 - 25 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand; ~10% fines, dry, light tan with light orangeish tan.
15	S-3	5.0	42	0.1			
20	S-4	5.0	36	0.1			

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 2 of 2

MS-GP-02

DEPTH FT.	SAMPLE INFO TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
25	S-5	5.0	35	0.1			25 - 30 WIDELY GRADED SAND WITH SILT (SW-SM); ~90% sand; ~10% fines, dry, light tan with light orangeish tan.
30	S-6	5.0	35	0.1			30 - 40 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand; ~10% fines, dry, light tan with light orangeish tan.
35	S-7	5.0	30	0.1		MS-GP-02 (38-40)	
40							Bottom of borehole at 40.0 feet. Drove Geoprobe groundwater sampler to 63 feet and collected MS-GW-02

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 1 of 2

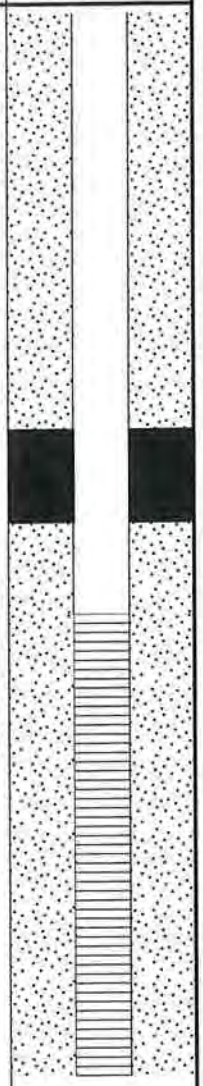
MS-GP-03/ MS-MW-03

GROUND SURFACE ELEVATION (FT): 41.89
NORTHING: 225017.18 EASTING: 1066031.74
DRILLED BY: Zebra Environmental / Luke Caballero
LOGGED BY: Melissa Felter
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT): ▽ 15.00

LOCATION:
TOTAL DEPTH (FT): 25.00
DATUM VERT. / HORZ.: NAVD 1988 / NAD83 NY Long Island Zone
DATE START / END: 11/15/2007 - 11/15/2007

DEPTH FT.	SAMPLE INFO: TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0						MS-GP-03 (0-5)	0 - 0.5 WIDELY GRADED SAND WITH SILT (SW-SM); ~90% sand, ~10% fines; brown, organics/roots, leaves, loose, HAND CLEARED. 0.5 - 5 SAND (SW); ~85% sand, ~10% gravel, ~5% fines; max. size 2 in., moist, light tan, loose, HAND CLEARED.
5	S-1	5.0	47	0.1			5 - 15 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand; ~10% fines, dry to moist, light tan and light orangeish tan, loose, 1" silt lens at 4'.
10	S-2	5.0	45	0.1			
▽ 15	S-3	5.0	42	0.1		MS-GP-03 (15-17)	15 - 20 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand; ~10% fines, wet, light grayish tan and light orangeish tan, loose.
20	S-4	5.0	44				20 - 25 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand; ~10% fines, wet, light grayish tan with light orangeish tan, loose.

WELL CONSTRUCTION DETAILS



NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG
PAGE 2 of 2
MS-GP-03/ MS-MW-03

DEPTH FT.	SAMPLE INFO: TYPE and NO.	SAMPLE INFO: PEN FT.	SAMPLE INFO: REC IN.	SAMPLE INFO: PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION	WELL CONSTRUCTION DETAILS
				0.1				
25							Bottom of borehole at 25.0 feet.	

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 1 of 2

MS-GP-04/ MS-MW-04

GROUND SURFACE ELEVATION (FT): 59.6
NORTHING: 225128.61 EASTING: 1065781.53
DRILLED BY: Zebra Environmental / Luke Caballero
LOGGED BY: Melissa Felter
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT):

LOCATION:
TOTAL DEPTH (FT): 35.00
DATUM VERT. / HORZ.: NAVD 1988 / NAD83 NY Long Island Zone
DATE START / END: 11/15/2007 - 11/15/2007

DEPTH FT.	SAMPLE INFO TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION	WELL CONSTRUCTION DETAILS
0						MS-GP-04 (0-5)	0 - 2 WIDELY GRADED SAND WITH SILT (SW-SM); ~80% sand, ~10% gravel, ~10% fines; max. size 2 in., moist, brown, loose, HAND CLEARED. 2 - 5 SILTY SAND (SM); ~70% sand, ~20% fines, ~10% gravel; max. size 3 in., moist, tan, loose, HAND CLEARED.	
5	S-1	5.0	50	0.1			5 - 10 SANDY SILT (ML); ~60% fines, non plastic; ~30% fine to medium sand, ~10% fine to coarse gravel, max. size 1 in., dry, brown and orangeish brown, dense.	
10	S-2	5.0	39	0.1			10 - 16 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand; ~10% fines, dry, light grayish tan and light orangeish tan.	
15	S-3	5.0	32	0.1			16 - 20 SILT (ML); ~95% fines, non plastic; lensed, ~5% fine sand, moist, light gray with light orangeish tan, dense, thin sand lenses.	
20	S-4	5.0	32	0.1			20 - 25 SILTY SAND (SM); ~80% sand; ~20% fines, moist, light grayish tan with light orangeish tan, dense.	

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

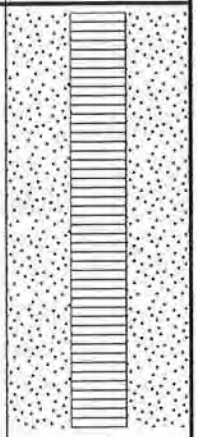
CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 2 of 2

MS-GP-04/ MS-MW-04

DEPTH FT.	SAMPLE INFO: TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION	WELL CONSTRUCTION DETAILS
25	S-5	5.0	32	0.4		MS-GP-04 (25-27)	25 - 33 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand; ~10% fines, moist to wet, light grayish tan with light orangeish tan, dense, perched water table.	
30	S-6	5.0	38	0.1			33 - 35 WIDELY GRADED SAND WITH SILT (SW-SM); ~90% sand; ~10% fines, wet, light grayish tan with light orangeish tan, perched water table.	
35							Bottom of borehole at 35.0 feet.	



NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 1 of 2

MS-GP-04A/ MS-MW-04

GROUND SURFACE ELEVATION (FT): 59.27
NORTHING: 225128.61 EASTING: 1065781.53
DRILLED BY: Aquifer Drilling and Testing
LOGGED BY: Lynn Willey
DRILLING DETAILS: Hollow Stem Auger
WATER LEVEL DEPTHS (FT): ▽ 41.00

LOCATION:
TOTAL DEPTH (FT): 47.00
DATUM VERT. / HORZ.: NAVD 1988 / NAD83 NY Long Island Zone
DATE START / END: 12/18/2007 - 12/18/2007

DEPTH FT.	SAMPLE INFORMATION: TYPE and NO.	PEN FT.	REC IN.	Blows (/6 in.)	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION	WELL CONSTRUCTION DETAILS
0								0 - 35 Boring information from 0-35 feet can be obtained from adjacent boring, MS-GP-04.	
5									
10									
15									
20									

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 2 of 2

MS-GP-04A/ MS-MW-04

DEPTH FT.	SAMPLE INFORMATION TYPE and NO.	PEN FT.	REC IN.	Blows (/6 in.)	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION	WELL CONSTRUCTION DETAILS
25									
30									
35	S-7	2.0	19	2-4-12-14	0.3			35 - 35.21 WIDELY GRADED SAND WITH SILT (SW-SM); ~90% sand, ~10% fines; moist, reddish brown to brown, motted, gray silt stringer.	
	S-8	2.0	15	2-2-4-8	0.7			35.21 - 37 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; homogeneous, wet, tan.	
	S-9	2.0	6	1-1-3-5	0.3			37 - 37.14 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; homogeneous, brown, moist to wet.	
40	S-10	2.0	24	2-6-10-10	2.1			37.14 - 38.07 SANDY LEAN CLAY (CL); ~70% fines, medium plasticity, ~30% sand; moist, gray.	
	S-11	2.0	20	1-13-16-20	2.2		MS-GP-04A (43-45)	38.07 - 39 CLAY (CL); ~100% fines; moist, gray.	
								39 - 41 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; homogeneous, wet, tan.	
45	S-12	2.0	20	5-8-12-16	6.1		MS-GP-04A (45-47)	41 - 41.5 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand, ~10% fines; dark brown to brown, some iron oxide like staining.	
								41.5 - 42.17 CLAYEY SAND (SC); medium plasticity; moist to wet.	
								42.17 - 46.1 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; homogeneous, wet, tan, some iron oxide like banding at 42.17 to 43 feet, banding at 45 feet.	
								46.1 - 46.6 NARROWLY GRADED SAND (SP); ~100% sand; red brown, banded with red and brown bands 0.25" thick.	
								46.6 - 47 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; homogeneous, wet, tan.	
								Bottom of borehole at 47.0 feet.	

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 1 of 2

MS-GP-05

GROUND SURFACE ELEVATION (FT): 93.22
NORTHING: 224982.51 EASTING: 1065501.09
DRILLED BY: Zebra Environmental / Luke Caballero
LOGGED BY: Melissa Felter
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT):

LOCATION:
TOTAL DEPTH (FT): 47.00
DATUM VERT. / HORZ.: NAVD 1988 / NAD83 NY Long Island Zone
DATE START / END: 11/16/2007 - 11/16/2007

DEPTH FT.	SAMPLE INFO: TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0						MS-GP-05 (0-5)	0 - 7 WIDELY GRADED SAND WITH GRAVEL (SW); ~75% sand; ~20% fine to coarse gravel, ~5% fines, ~5% brick, coal and glass, max. size 4 in., dry, brown.
5	S-1	5.0	40	0.2			7 - 10.5 NARROWLY GRADED SAND WITH SILT (SP-SM); ~85% sand; ~10% fines, ~5% fine gravel, <5% coal and glass, max. size 0.5 in., dry, brown and tan, dense.
10	S-2	5.0	49	0.1			10.5 - 17.5 WIDELY GRADED SAND (SW); ~90% sand; ~5% fines, ~5% fine to coarse gravel, max. size 2 in., dry, brown, loose.
15	S-3	5.0	42	0.2			17.5 - 20 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~75% sand; ~10% fines, ~15% fine gravel, max. size 0.5 in., moist to wet, brown, dense, wet at 19'.
20	S-4	5.0	34	0.1			20 - 21 WIDELY GRADED SAND WITH GRAVEL (SW); ~80% sand; ~5% fines, ~15% fine gravel, max. size 2 in., wet, brown. 21 - 25 SILT WITH SAND (ML); ~80% fines; ~20% fine to coarse sand, moist, brown and light tan, very dense.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG
PAGE 2 of 2
MS-GP-05

DEPTH FT.	SAMPLE INFO TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
25	S-5	5.0	31	0.1			25 - 32.5 SILTY SAND (SM); ~80% sand; ~20% fines, moist, light gray and light orangeish tan, dense
30	S-6	5.0	41	0.1			32.5 - 35 SANDY SILT (ML); ~60% fines; varved, ~40% fine sand, moist, dark gray with brown, very dense.
35	S-7	5.0	38	0.1			35 - 38.5 SILTY SAND (SM); ~60% sand; varved, ~40% fines, moist, dark gray with brown, dense 38.5 - 39.5 LEAN CLAY (CL); moist, grayish brown, dense. 39.5 - 40 SILTY SAND (SM); ~70% sand; ~30% fines, moist, grayish brown.
40	S-8	5.0	38	0.1			40 - 47 SILTY SAND (SM); ~80% sand; ~20% fines, moist, light gray and light orangeish tan, dense.
45	S-9	2.0	23	0.1			

Bottom of borehole at 47.0 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

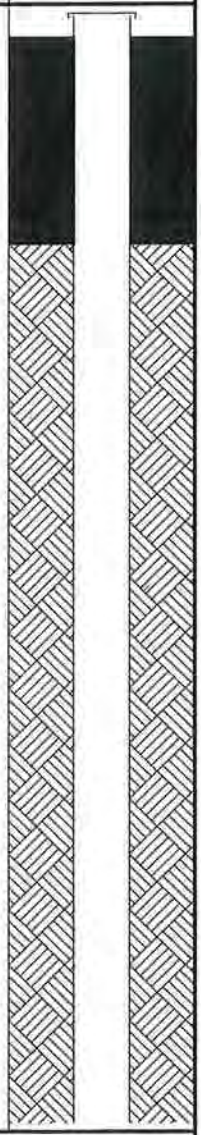
CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 1 of 4

MS-GP-05A/ MS-MW-05

GROUND SURFACE ELEVATION (FT): 93.42
LOCATION:
NORTHING: 224965.75 EASTING: 1065500.72
TOTAL DEPTH (FT): 81.00
DRILLED BY: Aquifer Drilling and Testing
DATUM VERT. / HORZ.: NAVD 1988 / NAD83 NY Long Island Zone
LOGGED BY: Lynn Willey
DATE START / END: 12/7/2007 - 12/8/2007
DRILLING DETAILS: Hollow Stem Auger
WATER LEVEL DEPTHS (FT): ▽ 71.00

DEPTH FT.	SAMPLE INFORMATION: TYPE and NO.	PEN FT.	REC IN.	Blows (/6 in.)	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION	WELL CONSTRUCTION DETAILS
0								0 - 47 Boring information from 0-47 feet can be obtained from adjacent boring, MS-GP-05.	
5									
10									
15									
20									

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG
PAGE 2 of 4
MS-GP-05A/ MS-MW-05

DEPTH FT.	SAMPLE INFORMATION: TYPE and NO.	PEN FT.	REC IN.	Blows (/6 in.)	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION	WELL CONSTRUCTION DETAILS
25									
30									
35									
40									
45									
	S-10	2.0	24	18-15-16-15	0.6			47 - 47.1 SILT WITH SAND (ML); ~85% fines, low plasticity, ~15% sand; homogeneous, moist, grayish brown. 47.1 - 49 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; dry, light tan, with mottling orange at top 2".	
50	S-11	2.0	12	29-33-43-49	1.2			49 - 51 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; dry, reddish brown, mottling	
	S-12	2.0	24	15-14-15-11	0.3			51 - 53 NARROWLY GRADED SAND (SP);	

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG
PAGE 3 of 4
MS-GP-05A/ MS-MW-05

DEPTH FT.	SAMPLE INFORMATION TYPE and NO.	PEN FT.	REC IN.	Blows (/6 in.)	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION	WELL CONSTRUCTION DETAILS
								~95% sand, ~5% fines; dry, orange to reddish brown, banded with 0.125" - 0.25" bands, 0.5" thick grey ML silt layer @ 18".	
	S-13	2.0	13	27-33-29-41	0.9			53 - 56.5 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; dry, reddish brown, banded with 0.125" bands.	
55	S-14	1.5	18	34-38-44-50/2"	0.2				
								56.5 - 59 Refusal - Auger to next samle interval @ 59'.	
	S-15	2.0	19	12-18-21-13	0.2			59 - 61 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; moist, orange brown, varying color bands - tan to white.	
60	S-16	2.0	24	12-11-16-21	0.1			61 - 61.6 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; moist, white to gray.	
	S-17	2.0	24	16-21-25-28	0.2			61.6 - 63 SILT (ML); ~90% fines, non plastic, ~10% sand; dry, narrowly graded sand in sporadic layers.	
								63 - 64 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand, ~10% fines, low plasticity; moist.	
65	S-18	1.3	15	23-29-50/3"	0.2			64 - 65 SILT (ML); ~90% fines, ~10% sand; dry, gray.	
								65 - 66.25 SILT (ML); ~90% fines, ~10% sand; dry, gray, sporadic narrowly graded sand partings, slightly moist at bottom.	
								66.25 - 69 Refusal - Auger to next samle interval @ 69'.	
	S-19	2.0	24	16-17-28-31	0.2			69 - 71 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; moist, gray and light gray, banded, wet at tip.	
70 ▽	S-20	2.0	20	12-13-21-26	0.5		MS-GP-05A (71-73)	71 - 73 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; wet, light gray.	
	S-21	2.0	19	8-8-10-9	0.1			73 - 75 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; wet, light gray, banding of orange brown to tan fine sand.	
75	S-22	2.0	21	20-21-23-34	0.2			75 - 79 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; wet, light gray, banding of red brown to orange.	
	S-23	2.0	19	15-16-17-20	0.3				
	S-24	2.0	15	18-20-35-36	0.5			79 - 81 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; homogeneous, wet,	
80									

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN = INCHES
FT = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 4 of 4

MS-GP-05A/ MS-MW-05

DEPTH FT.	SAMPLE INFORMATION					STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION	WELL CONSTRUCTION DETAILS
	TYPE and NO.	PEN FT.	REC IN.	Blows (/6 in.)	PID (ppm)				
80								tan gray.	
								Bottom of borehole at 81.0 feet.	

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS.SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG
PAGE 1 of 2
MS-GP-06/ MS-MW-06

GROUND SURFACE ELEVATION (FT): 41.58
LOCATION:
NORTHING: 224929.08 EASTING: 1066065.85
TOTAL DEPTH (FT): 25.00
DRILLED BY: Zebra Environmental / Luke Caballero
DATUM VERT. / HORZ.: NAVD 1988 / NAD83 NY Long Island Zone
LOGGED BY: Chris Berotti
DATE START / END: 11/20/1997 - 11/20/2007
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT): ▽ 12.75

DEPTH FT.	SAMPLE INFO TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0	S-1	5.0		0		MS-GP-06 (1-3)	0 - 1 WIDELY GRADED SAND WITH SILT; ~80% sand, ~15% fines, ~5% gravel; max. size 0.75 in., brown, roots and leaf material, small amount of asphalt-like material, loose, HAND CLEARED. 1 - 5 WIDELY GRADED SAND WITH SILT; ~80% sand, ~10% fines; ~10% fine to coarse gravel, max. size 1 in., wet, tan brown, wet due to rain, HAND CLEARED.
5	S-2	5.0	56	0			5 - 10 WIDELY GRADED SAND WITH SILT; ~90% sand, ~10% fines; homogeneous, orange brown, loose, moist due to rain.
10	S-3	5.0	38	0		MS-GP-06 (12-13)	10 - 15 SILTY SAND; ~85% sand, ~15% fines; homogeneous, wet, tan.
15	S-4	5.0	27	0			15 - 20 WIDELY GRADED SAND; ~90% sand, ~5% fines; homogeneous, ~5% fine to coarse gravel, wet, orange tan.
20	S-5	5.0	42	0			20 - 25 WIDELY GRADED SAND; ~90% sand, ~5% fines; homogeneous, ~5% fine to coarse sand, max. size 0.75 in., wet, tan.

WELL CONSTRUCTION DETAILS

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)
ppm = PARTS PER MILLION
IN. = INCHES
FT = FEET
NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR
CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 2 of 2

MS-GP-06/ MS-MW-06

DEPTH FT.	SAMPLE INFO: TYPE and NO.	SAMPLE INFO: PEN FT.	SAMPLE INFO: REC IN.	SAMPLE INFO: PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION	WELL CONSTRUCTION DETAILS
25							Bottom of borehole at 25.0 feet.	

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: National Grid
PROJECT NAME: Manhasset Hortonsphre SSC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8

BORING LOG

PAGE 1 of 1

MS-GP-07

GROUND SURFACE ELEVATION (FT): 94.78
LOCATION:
NORTHING: 224979.488 **EASTING:** 1065482.65821
TOTAL DEPTH (FT): 25.00
DRILLED BY: Zebra Environmental / Evan Moraits
DATUM VERT. / HORZ.: NAVD 88 / NAD83 NY Long Island Zone
LOGGED BY: Kim Barber
DATE START / END: 2/19/2009 - 2/19/2009
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT):

DEPTH FT.	SAMPLE INFO TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0		5.0		0.1		MS-GP-07 (1-5)	0 - 3 WIDELY GRADED SAND WITH GRAVEL (SW); ~70% sand, fine to coarse, ~25% gravel, fine to coarse, subangular, ~5% fines; moist, dark blackish brown, concrete, porcelain, HAND CLEARED
							3 - 6 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~75% sand, fine to coarse, ~15% gravel, fine to coarse, subangular, ~10% fines; moist, brown, brick, coal, HAND CLEARED TO 5 ft.
5	S-1	5.0	48	0.1			6 - 7 SILTY SAND (SM); ~80% sand, fine, ~15% fines, ~5% gravel, fine; dry, tan.
							7 - 18.5 WIDELY GRADED SAND WITH SILT (SW-SM); ~85% sand, fine to coarse, ~10% fines, ~5% gravel, fine to coarse, subrounded; dry, orangeish brown, lense of brick at 9 ft., lens of coal at16 ft.
10	S-2	5.0	54	0.1			
15	S-3	5.0	54	0.1		MS-GP-07 (19-20)	18.5 - 20 WIDELY GRADED SAND WITH GRAVEL (SW); ~75% sand, fine to coarse, ~20% gravel, fine to coarse, subrounded, ~5% fines; moist, orangeish brown.
20	S-4	5.0	60	0.1			20 - 21.5 WIDELY GRADED SAND WITH SILT (SW-SM); ~85% sand, fine to coarse, ~10% fines, ~5% gravel, fine to coarse, subrounded; dry, orangeish brown.
							21.5 - 24 WIDELY GRADED SAND WITH GRAVEL (SW); ~75% sand, fine to coarse, ~20% gravel, fine to coarse, subrounded, ~5% fines; moist, orangeish brown, wet from 21.5-22 ft.
25							24 - 25 SANDY SILT (ML); ~55% fines, ~40% sand, fine, ~5% gravel, coarse; varved, moist, orangeish tan.
							Bottom of borehole at 25.0 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG BORING LOGS.GPJ GEI CONSULTANTS.GDT 3/17/09

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: National Grid
PROJECT NAME: Manhasset Hortonsphre SSC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8

BORING LOG
PAGE 1 of 1
MS-GP-08

GROUND SURFACE ELEVATION (FT): 93.16
LOCATION:
NORTHING: 225004.20422 **EASTING:** 1065501.17014
TOTAL DEPTH (FT): 25.00
DRILLED BY: Zebra Environmental / Evan Moraits
DATUM VERT. / HORZ.: NAVD 88 / NAD83 NY Long Island Zone
LOGGED BY: Kim Barber
DATE START / END: 2/19/2009 - 2/19/2009
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT):

DEPTH FT.	SAMPLE INFO TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0		5.0		0.2		MS-GP-08 (1-4)	0 - 5 WIDELY GRADED SAND WITH GRAVEL (SW); ~70% sand, fine to coarse, ~20% gravel, fine to coarse, ~10% fines; ~5% brick and coal, moist, dark brown, wet likely from heavy rain over night, more organics in top foot, HAND CLEARED.
5	S-1	5.0	36	1.6			5 - 9.5 SILTY SAND WITH GRAVEL (SM); ~70% sand, fine to coarse, ~20% gravel, fine to coarse, ~10% fines; ~5% brick, coal, wood, moist, dark brown, wet likely from heavy rain over night.
10	S-2	5.0	30	0.1			9.5 - 15.5 WIDELY GRADED SAND WITH SILT (SW-SM); ~80% sand, fine to coarse, ~10% gravel, ~10% fines; moist, brown.
15	S-3	5.0	54	0.1		MS-GP-08 (19-20)	15.5 - 16.5 SILTY SAND (SM); ~90% sand, fine, ~10% fines; wet, blackish gray. 16.5 - 18 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~75% sand, fine to coarse, ~15% gravel, fine to coarse, subrounded, ~10% fines; layered, moist, brown. 18 - 25 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~75% sand, fine to coarse, ~15% gravel, fine to coarse, subrounded, ~10% fines; moist, brown, dense
20	S-4	5.0	12	0.2			
25							Bottom of borehole at 25.0 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)
ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET
NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR
CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG BORING LOGS.GPJ GEI CONSULTANTS.GDT 3/17/09

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: National Grid
PROJECT NAME: Manhasset Hortonsphre SSC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8

BORING LOG

PAGE 1 of 1

MS-GP-09

GROUND SURFACE ELEVATION (FT): 93.44
LOCATION:
NORTHING: 224981.26676 **EASTING:** 1065517.88004
TOTAL DEPTH (FT): 25.00
DRILLED BY: Zebra Environmental / Evan Moraits
DATUM VERT. / HORZ.: NAVD 88 / NAD83 NY Long Island Zone
LOGGED BY: Kim Barber
DATE START / END: 2/19/2009 - 2/19/2009
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT):

DEPTH FT.	SAMPLE INFO: TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0		5.0		0.1		MS-GP-09 (1-5)	0 - 2 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~70% sand, fine to coarse, ~25% gravel, fine to coarse, subangular, ~5% fines; ~5% coal, beer can, wood, moist, dark brown, HAND CLEARED. 2 - 5 WIDELY GRADED GRAVEL WITH SILT AND SAND (GW-GM); ~60% gravel, ~35% sand, fine to coarse, ~5% fines; ~5% glass, coal, wet, blackish gray, HAND CLEARED.
5	S-1	5.0	48	1.2			5 - 12 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~70% sand, fine to coarse, ~20% gravel, fine to coarse, subangular, ~10% fines; ~10% wood, brick, pavement, moist, grayish brown, lens of wood and pavement at 5 ft.
10	S-2	5.0	48	0.4			12 - 20 WIDELY GRADED SAND (SW); ~75% sand, fine to coarse, ~15% fines, ~10% gravel, fine to coarse, subrounded; moist, orangeish brown.
15	S-3	5.0	30	0.0		MS-GP-09 (15-17)	
20	S-4	5.0	36	0.1			20 - 22 WIDELY GRADED SAND WITH GRAVEL (SW); ~75% sand, fine to coarse, ~20% gravel, fine to coarse, subrounded, ~5% fines; moist, orangeish brown. 22 - 23 SANDY SILT (ML); ~60% fines, ~40% sand, fine; varved, moist, orangeish tan, dense. 23 - 24 WIDELY GRADED SAND WITH GRAVEL (SW); ~75% sand, fine to coarse, ~20% gravel, fine to coarse, subrounded, ~5% fines; moist, orangeish brown. 24 - 25 SANDY SILT (ML); ~60% fines, ~40% sand, fine; varved, moist, orangeish tan, dense.
25							Bottom of borehole at 25.0 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG BORING LOGS.GPJ GEI CONSULTANTS.GDT 3/17/09

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: National Grid
PROJECT NAME: Manhasset Hortonsphre SSC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8

BORING LOG

PAGE 1 of 1

MS-GP-10

GROUND SURFACE ELEVATION (FT): 59.66
LOCATION:
NORTHING: 225127.55841 EASTING: 1065785.20535
TOTAL DEPTH (FT): 6.50
DRILLED BY: Zebra Environmental / Evan Moraits
DATUM VERT. / HORZ.: NAVD 88 / NAD83 NY Long Island Zone
LOGGED BY: Kim Barber
DATE START / END: 2/20/2009 - 2/20/2009
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT):

DEPTH FT.	SAMPLE INFO: TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0		5.0		0.0		MS-GP-10 (1-2)	0 - 2 WIDELY GRADED SAND WITH GRAVEL (SW); ~75% sand, fine to coarse, ~20% gravel, fine to coarse, subangular, ~5% fines; ~5% brick, coal, dry, blackish brown, HAND CLEARED. 2 - 6 WIDELY GRADED SAND WITH GRAVEL (SW); ~70% sand, fine to coarse, ~20% gravel, fine to coarse, subrounded, ~10% fines; moist, orangeish brown, HAND CLEARED TO 5 ft.
5	S-1	1.5		0.0		MS-GP-10 (5.5-6.5)	6 - 6.5 SILTY SAND (SM); ~55% sand, fine, ~40% fines, ~5% gravel; varved, moist, orangeish tan. Refusal at 6.5 feet. Bottom of borehole at 6.5 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG BORING LOGS.GPJ GEI CONSULTANTS.GDT 3/17/09

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: National Grid
PROJECT NAME: Manhasset Hortonsphre SSC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8

BORING LOG
PAGE 1 of 1
MS-GP-11

GROUND SURFACE ELEVATION (FT): 61.16
LOCATION:
NORTHING: 225106.17273 EASTING: 1065775.70324
TOTAL DEPTH (FT): 15.00
DRILLED BY: Zebra Environmental / Evan Moraits
DATUM VERT. / HORZ.: NAVD 88 / NAD83 NY Long Island Zone
LOGGED BY: Kim Barber
DATE START / END: 2/20/2009 - 2/20/2009
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT):

DEPTH FT.	SAMPLE INFO: TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0		5.0		0.0		MS-GP-11 (1-4)	0 - 4 WIDELY GRADED SAND WITH GRAVEL (SW); ~70% sand, fine to coarse, ~20% gravel, ~10% fines; ~10% pavement, brick, coal, moist, blackish brown, HAND CLEARED.
5	S-1	5.0	60	0.0		MS-GP-11 (5-10)	4 - 7 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~60% sand, fine to coarse, ~20% gravel, fine to coarse, subrounded, ~20% fines; moist, orangeish brown, dense, HAND CLEARED TO 5 ft. 7 - 7.5 ELASTIC SILT WITH SAND (MH); ~80% fines, ~20% sand, fine; tan. 7.5 - 9 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~60% sand, fine to coarse, ~20% gravel, fine to coarse, subrounded, ~20% fines; moist, orangeish brown, dense, wet at 7.5-8 ft. 9 - 10 SILTY SAND (SM); ~55% sand, fine, ~40% fines, ~5% gravel, fine, subrounded; varved, moist, orangeish tan, lense of blackish brown silt at 9 ft.
10	S-2	5.0	0				10 - 15 LINER JAMMED, NO RECOVERY.
15							Bottom of borehole at 15.0 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)
ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET
NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR
CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG BORING LOGS.GPJ GEI CONSULTANTS.GDT 3/17/09

GEI Consultants, Inc. 455 Winding Brook Road Glastonbury, CT 06033 (860) 368-5300	CLIENT: National Grid PROJECT NAME: Manhasset Hortonsphre SSC CITY/STATE: Manhasset, New York GEI PROJECT NUMBER: 072710-8	BORING LOG PAGE 1 of 1	MS-GP-12

GROUND SURFACE ELEVATION (FT): 62.12 LOCATION:
NORTHING: 225117.91018 EASTING: 1065757.91508 TOTAL DEPTH (FT): 10.00
DRILLED BY: Zebra Environmental / Evan Moraits DATUM VERT. / HORZ.: NAVD 88 / NAD83 NY Long Island Zone
LOGGED BY: Kim Barber DATE START / END: 2/20/2009 - 2/20/2009
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT):

DEPTH FT.	SAMPLE INFO: TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0		5.0		0.1		MS-GP-12 (1-2)	0 - 2 WIDELY GRADED SAND (SW); ~85% sand, fine to coarse, ~10% gravel, fine to coarse, ~5% fines; <~5% glass, dry, brown, HAND CLEARED.
							2 - 6.5 WIDELY GRADED SAND WITH SILT (SW-SM); ~85% sand, fine to coarse, ~10% fines, ~5% gravel, fine to coarse; dry, brown, HAND CLEARED, lens of tan silt at 5.5 ft. and 6.5 ft.
5	S-1	5.0		0.1		MS-GP-12 (7-8)	6.5 - 10 SILTY SAND (SM); ~55% sand, ~45% fines; varved, moist, orangeish tan, blackish brown silt lenses at 7 and 9.5 ft.
10							Bottom of borehole at 10.0 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

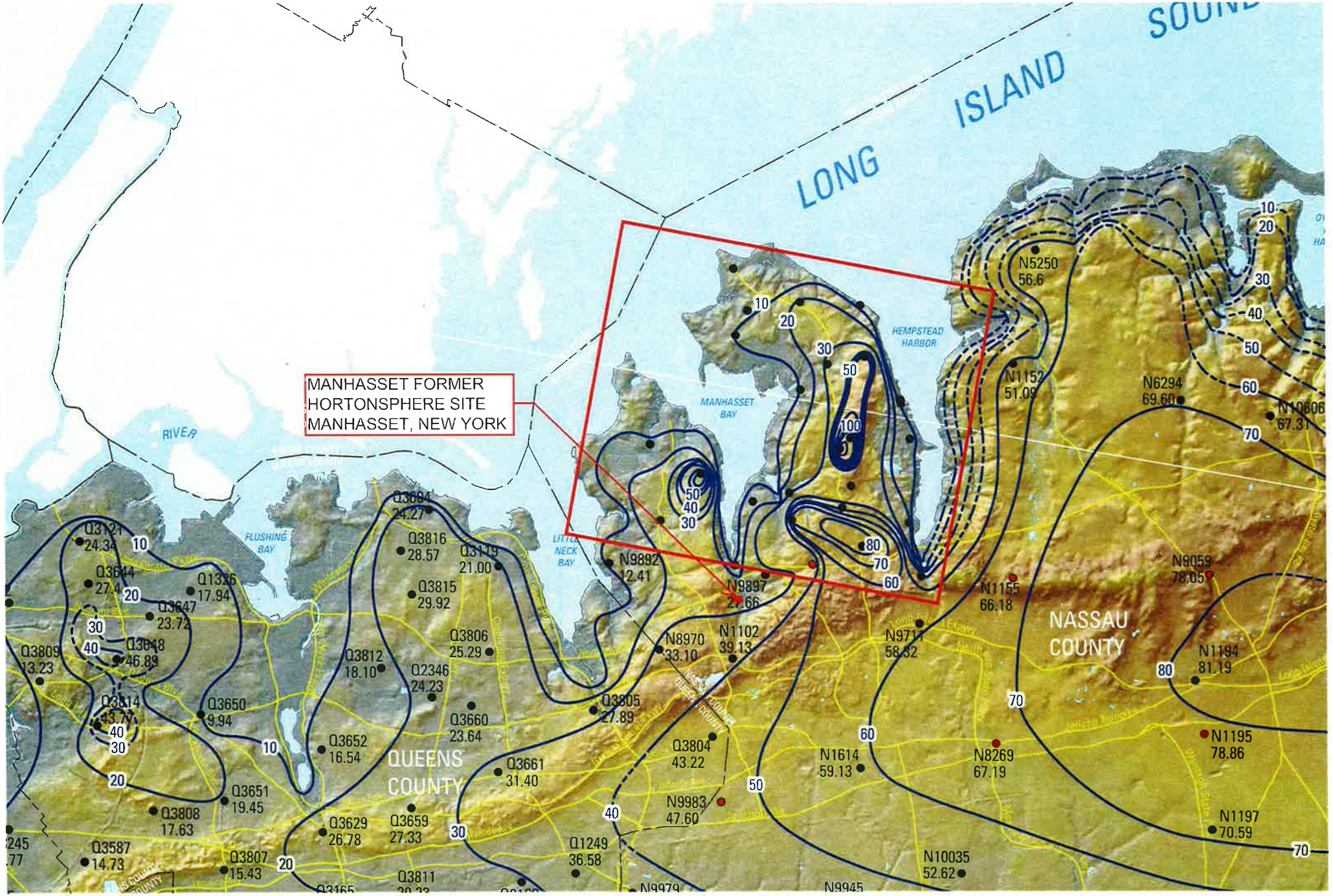
ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG BORING LOGS.GPJ GEI CONSULTANTS.GDT 3/17/09

Water Table Elevations in Vicinity of Manhasset, New York



Appendix E

Data Usability Summary Report and Electronic Data Deliverables

(Electronic Only)

Table of Contents

Abbreviations and Acronyms iv

Executive Summary vi

1. Introduction 1
- 1.1 SC Objectives and Scope 2
- 1.2 Site Description 2
  - 1.2.1 Current Ownership and Use 3
  - 1.2.2 Surrounding Property Use 3
  - 1.2.3 Site History 3
- 1.3 Physical and Environmental Setting 4
  - 1.3.1 Regional Geology 5
  - 1.3.2 Regional Hydrogeology 5
  - 1.3.3 Water Use 6
  - 1.3.4 Climatology 6
- 1.4 Previous Investigations 6

2. Site Characterization Scope of Work 7
- 2.1 SC Field Work 7
- 2.2 Field Methods 8
  - 2.2.1 Utility Mark Out 8
  - 2.2.2 Soil Sampling and Monitoring Well Installation 9
  - 2.2.3 Stormwater Channel Sediment Sampling 12
  - 2.2.4 Groundwater Sampling 12
  - 2.2.5 Soil Vapor and Ambient Air Sampling 13
  - 2.2.6 Survey 14

3. Site Geology and Hydrogeology 16
- 3.1 Geology 16
- 3.2 Site Hydrogeology 16

4. Findings 18
- 4.1 Surface Soil 19
- 4.2 Subsurface Soil 19
- 4.3 Stormwater Sediment 20
- 4.4 Groundwater 21
- 4.5 Soil Vapor 22
- 4.6 Non-Aqueous Phase Liquids (NAPL) 22

5. Qualitative Human Health Exposure Assessment 23
- 5.1 Exposure Pathways 23
  - 5.1.1 Surface Soil 23

5.1.2 Subsurface Soil 24
5.1.3 Stormwater Sediment 24
5.1.4 Groundwater 24
5.1.5 Soil Vapor 25
5.2 QHHEA Conclusions 25

6. Fish and Wildlife Resources Impact Analysis 26

7. Conclusions 29

References 32

Table of Contents (cont.)

Tables

1 Climatological Norms and Means – LaGuardia Airport
2 Sample Rationale
3 Monitoring Well Construction Data
4 Final Groundwater Parameters
5 Surface Soil Analytical Results for Detected Compounds
6 Subsurface Soil Analytical Results for Detected Compounds
7 Stormwater Sediment Analytical Results for Detected Compounds
8 Groundwater Analytical Results for Detected Compounds
9 Soil Vapor and Ambient Air Analytical Results for Detected Compounds
10 Soil Analytical Data Statistical Summary
11 Groundwater Analytical Data Statistical Summary
12 Typical Background Concentrations of Metals in Soil
13 Fish and Wildlife Resources Impact Analysis Decision Key

Figures

1 Site Location Map
2 Existing Conditions and Sample Location Summary
3 1966 Aerial Photograph of Site and Vicinity
4 1976 Aerial Photograph of Site and Vicinity
5 Cross section A-A′
6 Cross section B-B′
7 Groundwater Contours (December 27-28, 2007)
8 Groundwater Contours (January 28, 2008)
9 Groundwater Contours (January 14, 2010)
10 Surface Soil Analytical Summary (mg/kg)
11 Subsurface Soil Analytical Summary (mg/kg)
12 Stormwater Sediment Analytical Summary (mg/kg)
13 Dissolved Phase Groundwater Analytical Summary (ug/L)

Appendices

A Work Plan Approval Letter and Change Order
B Representative Site Photographs
C Historical Documents
D Soil Boring, Monitoring Well Logs and Map of Water Table Elevations in Vicinity of Manhassett, New York
E Data Usability Summary Report and Electronic Data Deliverables (Electronic Only)

Abbreviations and Acronyms

AOC	Administrative Order on Consent
bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CAMP	Community Air-Monitoring Plan
COPC	Contaminants Of Potential Concern
DER-10	Technical Guidance for Site Investigation and Remediation
DO	Disolved Oxygen
DUSR	Data Usability Summary Report
EDR	Environmental Data Resources
ELAP	Environmental Laboratory Approval Program
EPA	United States Environmental Protection Agency
FCO	Field Change Order
FSP	Field Sampling Plan
FWRIA	Fish and Wildlife Resource Impact Analysis
GEI	GEI Conultants, Inc.
GPR	Ground Penetrating Radar
GPS	Global Positioning System
ID	Inner Diameter
KeySpan	KeySpan Corporation
LILCO	Long Island Lighting Company
MGP	Manufactured Gas Plant
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NAD	North American Datum
NAPL	Non-aqueous Phase Liquids
NAVD	North American Vertical Datum
NOAA	National Oceanographic and Atmospheric Administration
NY LS	New York State-Licensed Land Surveyor
NYSASP	New York State Analytical Services Protocol
NYS SCGs	New York State Ambient Water Quality Standards and Guidance Values
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
ORP	Oxidation/Reduction Potential
OSHA	Occupational Safety and Health Administration
PAH	Polycyclic Aromatic Hydrocarbon
PEL	Pemissible Exposure Limit
PCB	Polychlorinated Biphenyl

Abbreviations and Acronyms

PID	Photoionization Detector
PVC	Polyvinyl chloride
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QHHEA	Qualitative Human Health Exposure Assessment
Sanborn	Sanborn Fire Insurance Map
SC	Site Characterization
SCOs	New York State Soil Cleanup Objectives
SCWP	Site Characterization Work Plan
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
USCS	Unified Soil Classification System
U.S.	United States
USDOT	United States Department of Transportation
VOC	Volatile Organic Compound
6NYCRR	Title 6, Chapter 100, Part 700-705 Of The New York State Code Of Rules And Regulations

UNITS OF MEASURE

cm/s	Centimeter Per Second
°F	Degrees Farenheight
ft/d	Feet Per Day
L	Liter
mg/kg	Milligram Per Kilogram
mL	Milliliters
mph	Miles Per Hour
ppm	Parts Per Million
ug/L	Microgram Per Liter

Executive Summary

On behalf of National Grid, GEI Consultants, Inc. (GEI) conducted a Site Characterization (SC) to assess environmental conditions at the former Manhasset Hortonsphere Site in Manhasset, New York. The SC evaluated potential environmental impacts associated with the former Hortonsphere. It was conducted in accordance with the Administrative Order on Consent (AOC) Index No. A1-0595-08-07 and with New York State Department of Environmental Conservation (NYSDEC)-approved SC and supplemental SC (SSC) work plans.

The Hortonsphere was an aboveground gas storage vessel located on a small portion of the property to the south of High Street and along Community Drive in Manhasset, Nassau County, New York (Figures 1 and 2). The property is primarily undeveloped, overgrown, and wooded. A small portion of the property is used as parking for the Mount Olive Baptist Church, the current owner of the property. The original "footprint" of the former gas operations and equipment occupies a portion of the property currently owned by the church.

The Long Island Lighting Company (LILCO), a predecessor of National Grid, operated and used the Hortonsphere to store and locally distribute natural gas and manufactured gas from 1929 until 1960. The Bay Shore former manufactured gas plant (MGP) likely supplied gas to the Hortonsphere based upon a review of historical records. In 1960, the Hortonsphere and regulator house were dismantled and removed. The gas piping was abandoned in-place. No additional historical or operational information has been located for the Manhasset Hortonsphere.

The current property, including the former Manhasset Hortonsphere Site, was sold to the Mount Olive Baptist Church in 1961. Sometime between the late 1960s and mid 1970s, the soils at the property were reworked, areas of the property were filled, and trees and vegetation were cleared, based on 1966 and 1976 aerial photographs (Figures 3 and 4). Trees and other vegetation have subsequently grown back. The property is zoned for residential use.

The objectives of the SC included evaluating the potential for human and ecological exposure to chemical constituents at the Site. To achieve these objectives, soil borings were drilled, groundwater-monitoring wells were installed, surface- and subsurface-soil samples, stormwater sediment samples, soil vapor samples, and groundwater samples were collected and analyzed to identify impacts that might be associated with the former Hortonsphere.

Chemicals potentially related to former Hortonsphere operations include volatile organic compounds (VOCs) [including benzene, toluene, ethylbenzene, and xylenes (BTEX)], semi-volatile organic compounds (SVOCs) [including polycyclic aromatic hydrocarbons (PAHs)],

polychlorinated biphenyls (PCBs), and lead. Concentrations of PAHs, pesticides and metals were detected in reworked soils and fill material outside the footprint of the former Hortonsphere.

Detected compound concentrations in surface soil, subsurface soil, and stormwater channel sediments were compared to Title 6, Chapter 100, Part 700-705 of the New York State Code of Rules and Regulations (6NYCRR), Part 375 Restricted Residential Use Soil Cleanup Objectives (the "Residential SCOs") (NYSDEC, 2006). The concentrations of compounds detected in groundwater were compared to New York State Ambient Water Quality Standards, Guidance, and Criteria (NYS SCGs) for GA Groundwater.

VOCs (including BTEX compounds), PCBs, pesticides and herbicides were either not detected or were detected below the Residential SCOs in surface soil, subsurface soil, and stormwater channel sediments. Chromium and lead were present in surface soil at concentrations above Residential SCOs. All other metals detected in soils and sediment were below the Residential SCOs.

A few individual PAHs – a subset of SVOCs - were detected in three out of nine surface soil samples, five out of twenty-eight subsurface soil samples, and two out of four stormwater sediment samples. Lead was also detected in one surface soil sample just above the Residential SCOs in a grassed area adjacent to High Street. The origin of PAHs and lead present at concentrations above the Residential SCOs does not appear to be former gas operations. They are primarily found in surface and shallow subsurface soils at locations where soils were reworked, fill materials were encountered, and/or vehicles have been parking in recent years, separate from the gas operations "footprint". The sediment PAH impacts appear to have originated off-site, at an up-gradient location, and were transported onto the site and deposited by stormwater.

VOCs (including BTEX compounds), PCBs, pesticides and herbicides were either not detected or were detected below NYS SCGs in groundwater. Metals were detected at concentrations above the SCGs in all groundwater samples. Most of these metals occur naturally and commonly in groundwater. The presence of other metals, such as lead and arsenic, were most likely present due to turbidity. Groundwater flow direction at the site varies, but dissolved phase impacts are low or not detectable and off-site migration is not regarded as a concern.

Groundwater is located more than 45 feet below ground surface beneath the Hortonsphere and ranges from 14 below ground surface adjacent to Community Drive to over 65 feet at eastern property boundary limiting potential contact to these metals. The Manhasset-Lakeville Water Company supplies potable water to the area. The closest downgradient water supply wells are located more than ½ mile to the north-northwest and are not screened either in the deeper

Magothy or Lloyd aquifers. Therefore, there is no potential exposure through consumption of the groundwater beneath the property.

Although there is no apparent on-site source, low levels of VOCs were detected in soil vapor at all soil vapor sample locations. Most of the sampling locations were situated away from the footprint of the former Hortonsphere, in areas of reworked soils and areas where fill materials were encountered. The VOCs are consistent with petroleum hydrocarbons (including gasoline) and chlorinated solvents. Chlorinated compounds are not typically associated with the operation of Hortonspheres. One "deep" soil vapor sample collected in native soil beneath reworked shallow soil contained VOCs at lower concentrations than the shallow sample. Because surface soil, subsurface soil, and groundwater generally lacked VOC impacts, it does not appear there is an on-site source of VOCs.

There is no potential for soil vapor intrusion at the Site because there are no on-site structures where indoor air quality could be impacted. However, construction, utility and other workers could be exposed to low levels of VOCs within soil vapor if soils are disturbed.

A Qualitative Human Health Exposure Assessment determined that limited potential exists for human receptors to encounter several PAHs, lead and chromium compounds above screening values because the Site is infrequently accessed and posted with no trespassing signs that restrict access.

The low-level and infrequent detections of chemical constituents in surface soils did not warrant the completion of a Fish and Wildlife Resource Impact Analysis according to NYSDEC's guidance, and the low-level surface soil detections pose no potential threat to the ecology.

These findings adequately characterize the site and demonstrate that former Hortonsphere operations are not an apparent source of the minor impacts in site media.

1. Introduction

On behalf of National Grid, GEI Consultants, Inc. (GEI) conducted a Site Characterization (SC) to assess environmental conditions at the Manhasset former Hortonsphere Site, located to the south of High Street in Manhasset, Nassau County, New York (Figure 1). The Manhasset former Hortonsphere site (Site) encompassed a small portion of the current property as shown in Figure 2.

The SC was performed pursuant to an Administrative Order on Consent (AOC) (Index No. A1-0595-08-07) with the New York State Department of Environmental Conservation (NYSDEC), requiring environmental assessment for this and other gas facilities including former Hortonsphere locations. The Manhasset former Hortonsphere Site is identified in Exhibit A of the AOC. National Grid is responsible for the SC because a predecessor company, the Long Island Lighting Company (LILCO), operated the Hortonsphere to store manufactured gas and natural gas for use in the surrounding community. Former gas storage may have generated waste products with the potential to affect human health and the environment. These products could include volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) polycyclic aromatic hydrocarbons (PAHs – a subset of SVOCs), polychlorinated biphenyls (PCBs), and lead.

GEI submitted the Site Characterization Work Plan in November 2007 to the NYSDEC, which approved the SCWP in a letter dated November 16, 2007 (Appendix A). Following the review of the SC data, NYSDEC requested supplemental investigation. GEI submitted a Supplemental Site Characterization (SSC) Work Plan on January 28, 2009 to the NYSDEC. NYSDEC approved the SSC Work Plan in letter dated February 3, 2009.

GEI prepared a Site Characterization Data Summary on behalf of National Grid, and integrated all data and information acquired during both site characterization studies. The summary was submitted to NYSDEC on July 13, 2009. NYSDEC provided a conditional acceptance letter on October 7, 2009. The acceptance was contingent on submittal of this final SC report.

The remainder of Section 1 discusses the SC objectives and scope (subsection 1.1), presents a description and current use of the Site and surrounding properties, the history of the Site (subsection 1.2), and discusses the physical and environmental setting of the Site (subsection 1.3). Section 2 discusses the SC scope of work and methods employed during the field investigation. Section 3 discusses the geology and hydrogeology underlying the property. Section 4 presents the findings of the investigation, including field observations and chemical data collected, and interprets these findings. Section 5 presents a Qualitative Human Health

Exposure Assessment (QHHEA). Section 6 presents an ecological evaluation. Section 7 presents a summary of the key findings and conclusions.

1.1 SC Objectives and Scope

There were four objectives of the SC, as follow:

- Determine if environmental impacts were present in soil, groundwater, stormwater sediment, and/or soil vapor.
- Determine which impacts were related to the historic Hortonsphere operation.
- Identify the potential for human exposure to impacts.
- Identify the potential for ecological exposure to impacts.

The SC scope of work consisted of:

- Environmental records database search with radius map performed, and historic aerial photographs and Sanborn Fire Insurance (Sanborn) maps provided by Environmental Data Resources of Milford, Connecticut (EDR).
- Search of the on-line NYSDEC Searchable Spills or Environmental Remediation databases.
- Multiple site visits.
- Identification and mark out of underground utilities.
- Surface soil sampling.
- Advancement of soil borings and collection of subsurface soil samples.
- Collection of stormwater channel sediment samples.
- Installation of monitoring wells and collection of groundwater samples.
- Installation and sampling of temporary soil vapor points.
- Survey of sample locations.
- Community air monitoring.
- Preparation of a QHHEA.
- Ecological evaluation.

Contaminants of potential concern (COPC) identified in the SCWP that may be associated with the former Hortonsphere include VOCs, SVOCs, PCBs, and lead. In addition, sulfate and sulfide were included as COPCs as requested in the NYSDEC comment letter dated October 5, 2007.

1.2 Site Description

The former Hortonsphere site is located on High Street on a small portion of the 3.16-acre parcel located to the west of Community Drive and to the south of High Street in Manhasset, Nassau County, New York. The footprint of the former Hortonsphere Site is shown in Figure 2. The undeveloped property currently occupies Section 2 - Block 347 - Lots 16 and 17. The property is

zoned for residential purposes (R-C) by the Town of North Hempstead. The Site conditions are shown in Figure 2. Photographic documentation collected during Site reconnaissance is included in Appendix B.

1.2.1 Current Ownership and Use

The Site is currently owned by the Mount Olive Baptist Church. It is undeveloped and consists of a vacant wooded lot and grassed parking lot (Appendix B). The property is partially enclosed by a chain link fence on the southern property boundary and a locked gate is located at the parking lot on High Street. The property is posted with "No Trespassing" signs along High Street.

1.2.2 Surrounding Property Use

The Site is located in a residential and commercial section of Manhasset. The property is bordered to the south by multiple residential apartment buildings. A playground for a daycare/community center is located to the west. Residential dwellings, a church and High Street are located to the north. Community Drive is located to the east. The entrance to a commercial property and a Nassau County Police Department building and associated parking lots are located to the east of Community Drive.

1.2.3 Site History

GEI developed a history of the Manhasset Hortonsphere Site, current property and surrounding area through Site reconnaissance and review of available Sanborn maps, aerial photographs, topographic maps, site property plans, Hortonsphere photograph, and a drawing entitled "Retirement of Sphere, Governor House & Equipment Manhasset, NY Drawing L-209-Q dated March 29, 1960." Photographic documentation from the SC is included in Appendix B, and the Sanborn maps, aerial photographs, topographic maps, Hortonsphere photograph, site property plans and drawing are included in Appendix C.

LILCO purchased the property and constructed the Manhasset Hortonsphere in 1929. The Hortonsphere served solely as a gas distribution facility, no gas manufacturing occurred at the Site. Site equipment consisted of the Hortonsphere and a regulator (governor) house that controlled the gas pressure.

GEI reviewed and compiled information regarding the distribution of gas by National Grid's predecessor the Long Island Lighting Company (LILCO). The historical information is presented in *Review of Long Island Gas Manufacture and Distribution (1907 to 1950)*, which was provided to the NYSDEC in April 2009 [revised October 2009] (Appendix C). Historical information suggests that the Manhasset Hortonsphere was most likely supplied by the Bay Shore manufactured gas plant (MGP). No other operational data or information has been located for the site.

The former Hortonsphere operations occupied a small portion of the property adjacent to Community Drive as shown in Figure 2. The Hortonsphere and regulator house were first shown on the 1936 Sanborn map. During a search for Site operating information, National Grid discovered a historic photograph (date unspecified) that shows the condition of the Hortonsphere. In the photograph, the Hortonsphere Site consisted of a steel sphere with steel legs that appear to be attached to concrete footings and a one-story brick regulator (pump) house. The area adjacent to the Hortonsphere and regulator house is a grassed area with trees. A copy of the Hortonsphere photograph is provided in Appendix C. The Site remained relatively unchanged in the 1950 Sanborn map. On the 1954 aerial photograph, the Manhasset Hortonsphere and regulator house are present. The remainder of the property was undeveloped and appears to be grassed and wooded.

The Hortonsphere and regulator house were decommissioned in 1960 according to available LILCO records. LILCO sold the property to the current owner, Mount Olive Baptist Church in October 1961, after which LILCO did not have control over the property. The Hortonsphere and regulator house were absent from the 1966 aerial photograph (Figure 3).

In the 1976 aerial photograph (Figure 4), the trees and vegetation were cleared from the current property, including the Hortonsphere Site, and the soils appear to be reworked across the entire property. By 1980, soils at the former Hortonsphere Site appear reworked on the eastern boundary and areas of vegetation are noted on the remainder of the property. The northwestern portion of the property was used as a parking lot as it is used today. By 1994, the property, including the Hortonsphere Site, was overgrown with vegetation and trees as it remains today.

The Site has remained undeveloped since that time. The property has been subject to unauthorized dumping. Garbage and other debris were observed during a site walk with National Grid, NYSDEC, and GEI on October 30, 2008.

1.3 Physical and Environmental Setting

The Manhasset Hortonsphere property is undeveloped and is primarily wooded with trees and brush. The northwestern portion of the property is used as a parking lot for the Mount Olive Baptist Church. Fill materials including construction debris (asphalt and concrete fragments) were encountered adjacent to the parking lot. The property is located on a steep slope with topographic elevations ranging from 40 feet North American Vertical Datum (NAVD) adjacent to Community Drive to 95 feet NAVD within the parking lot at the western property boundary near the end of High Street. A stormwater drainage channel snakes eastward, adjacent to the southern boundary of the property, and then flows northward through the footprint of the former Hortonshere Site to a catch basin on High Street (Figure 2).

An unnamed tributary to Whitney Lake is located approximately 500 feet to the east of the Site.

1.3.1 Regional Geology

Long Island is within the Atlantic Coastal Plain physiographic province. The geologic units in northern Long Island, in order of shallowest to deepest, include glacial till deposits of the Upper Glacial Aquifer, thick sequences of Cretaceous-aged marine deposits of the Magothy Aquifer, and Cretaceous-aged shallow marine and terrestrial sediments of the Lloyd Aquifer overlying a southward-sloping bedrock surface. Near the Site, the thickness of unconsolidated deposits overlying bedrock is approximately 650 feet (Soren and Simmons, 1985). Surficial soil at the property normally consists of glacial till deposits, but some of these soils may have been reworked and areas filled with material. The SC wells are screened at the water table in the Upper Glacial Aquifer.

The Raritan Clay, an aquitard (a low-conductivity layer that restricts vertical groundwater flow), separates the Magothy Aquifer from the Lloyd Aquifer. The underlying bedrock consists of virtually impermeable Precambrian and Paleozoic-aged crystalline metamorphic and igneous rock. The bedrock surface is regarded as the lowest hydraulic boundary of the groundwater flow system within the study area, as well as for the rest of Long Island (Busciolano, 2002).

1.3.2 Regional Hydrogeology

Three regional groundwater aquifers are present in the Long Island area, in order of increasing depth.

- The Upper Glacial Aquifer consisting of Upper Pleistocene glacial deposits.
- The Magothy Aquifer consisting of the Late Cretaceous Magothy Formation and Matawan Group deltaic deposits.
- The Lloyd Aquifer consisting of the Lloyd Sand Member.

The Upper Glacial Aquifer is generally unconfined (water table); however, it can be locally confined by the presence of silt and clay layers within moraine deposits. Groundwater within the Upper Glacial Aquifer flows north towards Manhasset Bay. The horizontal hydraulic conductivity of glacial outwash deposits of the Upper Glacial Aquifer on Long Island were calculated at 270 feet per day (9.5 $x10^{-2}$ centimeters per second [cm/s]) (Franke and Cohen, 1972 in Cartwright, R.A., 2002). The horizontal hydraulic conductivity for the poorly-sorted moraine deposits is likely in the range of 135 feet per day (4.4 $x10^{-2}$ cm/s) (Buxton and Shernoff, 1995 in Cartwright, 2002).

The Magothy aquifer underlies the Upper Glacial Aquifer and is the thickest hydrogeologic unit on Long Island. It consists of beds and lenses of clay, silt, sand and gravel. The average horizontal hydraulic conductivity ranges from approximately 50 to 67 feet per day (ft/d) (Soren and Simmons, 1985). The Lloyd Aquifer is a confined artesian unit between the bedrock and

overlying Raritan Clay. It also consists of beds and lenses of clay, silt, sand and gravel. The average horizontal hydraulic conductivities range from 40 to 67 ft/d (Soren and Simmons, 1985).

1.3.3 Water Use

The Manhasset-Lakeville Water District currently provides the public water supply to the Site and surrounding area. The Manhasset-Lakeville Water District is serviced by 18 wells that obtain water from the Magothy and Lloyd aquifers (Manhasset-Lakeville Water District, 2008). An EDR commercial database search of environmental records indicated that there are six public water supply wells (public water supply system NYW2902836) located within 1 mile of the Site (Appendix C). Three public water supply wells (Eden 23, Jennings and Campbell 1) are located ¼ to ½ mile to the south-southwest. One well *E. Shore Road* 5 is located ½ to 1 mile to the south, and two wells NYW2902836 (*Parkway 1* and *Parkway 2*) are located ½ to 1 mile to the north-northwest of the Site. These wells are located topographically upgradient of the Site and are screened in the Magothy and Lloyd Aquifers.

1.3.4 Climatology

A summary of the monthly climatologic records collected at LaGuardia Airport in Queens, New York was reviewed. The airport is located approximately 12 miles to the west of the Site and its weather records are considered representative of weather conditions at the Site. Table 1 summarizes the climatologic data for the airport. The average monthly maximum temperature was 62 degrees Fahrenheit (°F) and the average monthly minimum temperature was 48°F. The lowest average monthly maximum temperature was 39°F recorded for January and the highest average monthly maximum was 85°F recorded for July. The average annual precipitation (rainfall) for the area is 44.36 inches with the largest monthly precipitation of 4.41 inches, occurring in July.

During implementation of the SC field program, climatic conditions were monitored as part of the perimeter air-monitoring program (Table 1). In November 2007, the average maximum temperature was 53°F and the average minimum temperature was 41°F. Precipitation was 2.78 inches in November 2007. The average wind speed was 11 miles per hour (mph). The SSC activities were conducted in February 2009. The average maximum temperature was 37°F and the average minimum temperature was 29°F. Precipitation was 0.66 inches. The average wind speed was 13 miles per hour (mph).

1.4 Previous Investigations

No previous environmental investigations related to the Site are known by GEI or National Grid to have been performed. No records of environmental investigations were encountered during our environmental database searches conducted in April and May 2007.

2. Site Characterization Scope of Work

The objective of the SC was to identify the presence or absence of chemical compounds that could potentially be associated with the operation of the former Hortonsphere. The initial SC fieldwork was conducted between in November and December 2007, and SSC fieldwork was conducted in February 2009.

Prior to the preparation of the SCWP, GEI conducted a reconnaissance of the Site and reviewed historic environmental records, information sources such as Sanborn maps, topographic maps, and an EDR Radius Report. The information gathered during these activities determined the type of environmental sampling and the number and location of sampling locations specified in both approved work plans. All sample locations are shown in Figure 2.

The following sections describe the methods used for the sampling in accordance with the NYSDEC-approved work plans and approved field change order. Detailed field procedures were provided in the SC Work Plan. Zebra Environmental, Inc. of Lynbrook, New York, advanced Geoprobe® soil borings, installed soil vapor points and installed shallow monitoring wells (MS-MW-03 and MS-MW-06). Aquifer Drilling and Testing of New Hyde Park, New York, advanced soil borings and installed monitoring wells at depths greater than 45 feet (MS-MW-04A and MS-MW-05) utilizing a hollow stem auger drilling rig.

GEI provided oversight of all field activities, installed soil-gas sampling points, and collected all samples. TestAmerica Laboratories of Shelton, Connecticut, a New York State Environmental Laboratory Approval Program (ELAP) certified laboratory, completed the soil and groundwater sample analyses in accordance with New York State Analytical Service Protocols (NYSASP). Alpha Woods Hole Labs of Westborough, Massachusetts, a New York State Environmental ELAP laboratory, completed the soil vapor sample analysis.

2.1 SC Field Work

The SC Field work included:

- Collection and analysis of nine surface soil samples (MS-SS-01 through MS-SS-09).
- Drilling of twelve soil borings (MS-GP-01 through MS-GP-12).
- Installation of five monitoring wells (MS-MW-03 through MS-MW-06).
- Collection of two groundwater samples with a Geoprobe® groundwater sampler (MS-GW-01 and MS-GW-02).
- Collection of four stormwater sediment samples from a stormwater channel (MS-SED-01 through MS-SED-04).

- Installation of ten soil vapor sampling points (MS-SV-01 through MS-SV-06, MS-SV-07S, MS-07D, MS-SV-08S, and MS-SV-08D).
- Laboratory chemical analysis of twenty-eight subsurface-soil samples was completed on soils collected from twelve boring locations (one to two samples per boring plus two duplicate samples).
- Laboratory chemical analysis of seven groundwater samples collected from four monitoring wells and two grab samples utilizing the Geoprobe® groundwater sampler (one sample per well plus one duplicate sample).
- Laboratory chemical analysis of ten soil vapor samples collected from nine soil vapor points (MS-SV-01 through MS-SV-06, MS-SV-07S, MS-SV-08S, and MS-SV-08D). One duplicate sample was collected. A soil vapor sample could not be collected from MS-SV-07D because of perched groundwater conditions.
- Groundwater elevation measurements in April and December 2009 and January 2010 to assess variations observed in groundwater flow direction between December 2007, January 2008, and February 2009.

Table 2 presents a sample collection rationale and summary of laboratory analyses performed.

During the initial SC, an upwind/downwind air quality-monitoring program was conducted in accordance with the provisions of the Site-specific health and safety plan and the New York State Department of Health's (NYSDOH) Community Air Monitoring Plan (CAMP) requirements (NYSDEC, 2002). The air-monitoring program included the collection of real-time air quality data, time-averaged air quality data, and meteorological data to document potential migration routes of airborne VOCs and particulates. No exceedances of the air monitoring or health and safety action levels action levels were measured at the perimeter of the work zones during the initial SC field program. As such, only work zone air monitoring was conducted during SSC activities, with NYSDEC concurrence. No action levels were exceeded during SSC field activities.

2.2 Field Methods

This subsection describes the sampling procedures and field methods used during the SC. All were in accordance with the SC and SSC work plans, except where noted.

2.2.1 Utility Mark Out

Prior to commencement of intrusive activities, Utility Survey Corp. of New Windsor, New York conducted an underground utility mark-out of proposed boring locations. Ground penetrating radar (GPR) and magnetic induction surveys were applied to identify subsurface features that might be utilities, former structures or footings.

The former Hortonsphere footings and regulator house were not identified during the GPR or magnetic survey during the SC. This is consistent with the removal of the structures previously described in the Site history section above. Utility Survey Corp. did not generate a report as part of the mark out.

2.2.2 Soil Sampling and Monitoring Well Installation

This subsection describes the methodology used to collect soil samples and install monitoring wells during the SC. Table 2 identifies:

- The surface soil, soil boring, and monitoring well locations.
- The rationale for installing each boring.
- The rationale for submittal of each sample for laboratory analysis and the analyses performed for each sample.

Soils were logged and screened in general accordance with the SC and SSC work plans. Boring logs are presented in Appendix D. Each non-dedicated sampling implement was decontaminated in accordance with decontamination procedures described in the Field Sampling Plan (FSP). Quality Assurance/Quality Control (QA/QC) procedures are detailed within the Quality Assurance Project Plan (QAPP) submitted as part of the SC Work Plan. QA/QC samples included blind duplicate soil samples, matrix spike/matrix spike duplicate (MS/MSD) samples, and equipment rinsate blank samples. Trip blanks accompanied each shipment of samples to the laboratory.

Soil samples were placed in certified pre-cleaned containers and stored in ice-filled coolers. The samples were then transported via laboratory courier or shipped via Federal Express to TestAmerica for chemical analysis.

Surface-Soil Sampling

Surface-soil samples were collected at nine locations (MS-SS-01 through MS-SS-09 (Figure 2). The surface-soil samples were collected from the top 0- to 2-inches of mineral soil beneath the vegetative root mat. On November 20, 2007, a Field Change Order (FCO) was agreed upon by the NYSDEC, National Grid and GEI to shift the location of MS-SS-05 closer to the property boundary. The signed FCO is contained in Appendix A.

Soil samples collected from six surface soil sample locations (MS-SS-01 through MS-SS-06) were analyzed for VOCs by United States Environmental Protection Agency (EPA) SW-846 Method 8260; SVOCs by EPA Method 8270C; target analyte list (TAL) metals by EPA Methods 6000/7000 series; sulfide by EPA Method 9034; sulfate by EPA Method 300.0; PCBs EPA Method 8082; pesticides by EPA Method 8081A and for herbicides by EPA Method 8151A as specified in the SCWP.

During the supplemental SC, surface soils were collected to further evaluate of lead and PAHs detected in MS-SS-04 during the initial SC investigation. Three surface soil samples (MS-SS-07 through MS-SS-09) were analyzed for PAHs by EPA Method 8270 and lead by EPA Method 6010.

Table 2 provides a summary of the rationale for surface-soil collection and analysis.

Soil Borings

Twelve borings (MS-GP-01 through MS-GP-12) were advanced using Geoprobe® direct-push methods as part of SC field investigations (Figure 2). This included one additional soil boring (MS-GP-06/MS-MW-06) that was installed as part of a FCO and was agreed upon by the NYSDEC, National Grid and GEI to install the additional well (Appendix A). A conventional hollow stem auger drill rig was used to collect soil information at two locations (MS-GP-04A and MS-GP-05A) because the required boring depth was beyond the limits of the Geoprobe® drilling rig.

The objective of these borings was to evaluate subsurface conditions and to install monitoring wells to evaluate groundwater conditions within the footprint of the Hortonsphere Site and the property. Soil samples were collected using dedicated, disposable sampling sleeves and a decontaminated stainless steel split spoon sampler. All boring locations were cleared by hand augering to 5 feet.

At each boring location, soils were continuously logged, screened with a photoionization detector (PID), headspace samples were collected, and visual and olfactory observations were noted in accordance with the SC work plan.

At each of the six SC borings locations (MS-GP-01 through MS-GP-06), one soil sample was collected for laboratory analyses from the ground surface to approximately 5 feet below grade. If overlying soils did not contain physical evidence of impacts, the second subsurface soil sample in each boring was collected at the apparent water table or from the interval exhibiting the highest PID reading. At MS-GP-01 and MS-GP-02, the second sample interval was collected above the water table due to limitations of the Geoprobe® drilling rig. MS-GP-06/MS-MW-06 was installed topographically downgradient (adjacent to Community Drive) to evaluate groundwater conditions as documented in the NYSDEC approved-FCO (Appendix A).

Soil samples collected from the six borings were analyzed for VOCs by EPA Method 8260; SVOCs by EPA Method 8270C; TAL metals by EPA Methods 6000/7000 series; sulfide by EPA Method 9034; sulfate by EPA Method 300.0; PCBs by EPA Method 8082; pesticides by EPA Method 8081A and for herbicides by EPA Method 8151A as specified in the SC work plan. Refer to Table 2.

Purging

Low-flow sampling and purging was conducted with a peristaltic pump in monitoring wells MS-MW-03 and MS-MW-06. A bladder pump was used in MS-MW-04A and MS-MW-05, with dedicated tubing. Purging rates varied because of groundwater conditions; however, pumping rates generally ranged between 200 milliliters (mL) and 400 mL per minute. Regardless of the purge rate, draw-down of the static water level was minimized at all times.

Groundwater purged from each well was monitored for field parameters (temperature, pH, conductivity, dissolved oxygen [DO], oxidation/reduction potential [ORP], and turbidity) to ensure that representative formation water was sampled. The approximate flow rates and purge volumes were recorded concurrently with field parameter measurements. A groundwater sample was collected from each monitoring well once parameters stabilized in accordance with the FSP, with the exception of MS-MW-06, where the conductivity and ORP were slightly above the 10% range. However, MS-MW-06 was developed prior to sampling and the remaining parameters (temperature, DO and turbidity) were within range; as a result, the sample is considered a representative groundwater sample. Table 4 presents the field parameter readings and physical observations of purge water prior to sampling.

Sampling purge water was containerized and was transported to the National Grid Hicksville Facility for temporary storage until it was disposed of at an approved facility.

Sampling

After each well was purged, groundwater samples were collected and placed into preserved containers provided by TestAmerica Labs. VOC samples were collected using new, clean, disposable bailers in monitoring wells MS-MW-03 and MS-MW-06. The VOC samples were collected directly from the bladder pumps in MS-MW-04 and MS-MW-05.

Groundwater samples were analyzed for EPA Method 8260; SVOCs by EPA Method 8270C; TAL metals by EPA Methods 6000/7000 series; PCBs by EPA Method 8082; pesticides by EPA Method 8081A and for herbicides by EPA Method 8151A as specified in the SC work plan. Monitoring wells were also sampled for sulfide by EPA Method 9034 and sulfate by EPA Method 300.0.

2.2.5 Soil Vapor and Ambient Air Sampling

Five soil vapor samples were collected in November 2007 (MS-SV-01, MS-SV-02, MS-SV-03, MS-SV-04, and MS-SV-05).

Four additional soil vapor points (MS-SV-06, MS-SV-07S, and MS-SV-08 S/D) were installed in February 2009 as part of the SSC activities. These points were added to evaluate VOC concentrations within the reworked soils/ fill and the native soils beneath the fill. Soil vapor

points with the "D" designation were deep soil vapor points installed within the native soils. A fifth proposed sample (MS-SV-07D) could not be collected because perched groundwater was present within the native soils.

One ambient air sample (MS-OA-01) was also collected during soil vapor sampling in February 2009 to evaluate outdoor ambient air concentrations.

Figure 2 shows the soil vapor sample locations. Table 2 presents the sample rationale for each soil vapor point and the analysis completed for each point.

All soil vapor sample points were installed using either a hand auger or Geoprobe® drill rig. At each location, a six-inch stainless steel soil gas point fitted with Teflon tubing was installed and the annulus was then backfilled with clean sand and sealed with bentonite. All of the soil vapor points extended to a depth of approximately 5 to 5.5 feet bgs with the exception of MS-SV-08D. MS-SV-08D was installed at a depth of 12 feet bgs.

The SC soil vapor samples were collected in individually-certified, one-liter SUMMA® canisters with 10-minute flow controllers at a rate of 0.1 Liter (L)/minute. Supplemental SC samples were collected in an individually certified, 6-liter SUMMA® canister equipped with a flow controller at a rate of less than 0.2 L/ min. To ensure that the sampling point was isolated from the ambient air above ground, GEI utilized helium as a tracer gas as described in the NYSDOH Soil Vapor Intrusion Guidance document. SC soil vapor samples were shipped via Federal Express to Alpha Woods Hole Laboratories for analysis. The SSC soil vapor and ambient air samples were analyzed by TestAmerica Laboratories in Knoxville, Tennessee.

The samples were analyzed for VOCs and naphthalene by the modified EPA Method TO-15 (including naphthalene).

2.2.6 Survey

Each soil boring, monitoring well, and soil vapor point was surveyed by a New York State-licensed land surveyor (NY LS) #050146 at the conclusion of the SC field activities. The survey was conducted to A-2 standards of accuracy, with an approximate horizontal and vertical precision of ±0.02 feet. Surveyed well elevations are included in Table 3. Surface soil sample locations were field located relative to surveyed locations.

Point coordinates were referenced to the New York State Plane Coordinate System (Long Island Zone, North American Datum [NAD] 83) as determined by differential Global Positioning System (GPS) observations. Point elevations are expressed as heights above the ellipsoid NAVD 88. This datum is not directly related to sea level; however, the record elevations related to the tidal benchmark at Bridgeport, CT indicate that mean sea level has an NAVD 88 elevation of

-0.22 feet (National Oceanic and Atmospheric Administration [NOAA], 2007), indicating that within the general Site vicinity, the data are essentially synonymous.

3. Site Geology and Hydrogeology

This section documents the Site geology and hydrogeology based on regional information described in Section 1 and site-specific boring and monitoring well data collected during SC activities.

3.1 Geology

Surficial geology at the property was determined through visual inspection of soil samples collected during the field investigation. Soil was described according to the Unified Soil Classification System (USCS). Site stratigraphy consisted predominately of sand that was inter-bedded with layers of silty sand, silt, sandy clay and clay.

Two cross sections (Figures 5 and 6) were developed to illustrate the geology underlying the property. The cross-sections also provide the observed apparent groundwater elevation and summary of selected chemical soil and groundwater testing data. Detailed geologic descriptions are provided in boring logs located in Appendix D. A general description of the stratigraphic units is provided below.

Fill, including brick, coal and glass fragments, was observed in a number of SC and SSC borings located within the parking lot, grassed area, and adjacent to Community Drive. Within the parking lot area, fill was encountered within borings MS-GP-05, MS-GP-07, MS-GP-08, and MS-GP-09 to as deep as 16 feet bgs. Fill was also encountered within borings MS-GP-10 and MS-GP-11 to as deep as 4 feet bgs within the grassed yard area north of the Hortonsphere. Along Community Drive, fill materials were encountered in boring MS-GP-06 to a depth of 1 feet bgs. These areas are identified on Figure 11 and are not associated with the former Hortonsphere footprint. They do not appear to be related to the former gas storage and distribution operations.

Sand encountered was predominantly widely graded fine-to-coarse sand, tan, orange-tan, grayish tan, gray, brown and reddish brown, containing less than 20% fine-to-coarse gravel and 5 to 10% fines. These deposits are consistent with deposits mapped in the region, as described in subsection 1.3.1. Layers of silty sand, silt, clayey sand and clay were observed at MS-GP-04/04A, MS-GP-05/05A, MS-GP-06, MS-GP-07, and MS-GP-08, MS-GP-10, MS-GP-11, and MS-GP-12.

3.2 Site Hydrogeology

Perched groundwater was observed above the silty sand layers in MS-GP-07, MS-GP-04 and MS-GP-11 after heavy rains. The perched groundwater is apparently a function of the dense, lower permeability sandy-silt layers that are present above the groundwater table at the property.

Twenty-eight (28) analytical samples were collected from subsurface soils. VOCs (including BTEX), metals, pesticides, herbicides, and PCBs in all samples were either not detected or were detected below the Residential SCOs.

A few PAH compounds were detected above the Residential SCOs in only five samples (MS-GP-04, MS-GP-05, MS-GP-08, MS-GP-10, and MS-GP-12). All five samples were collected in the 0.0 to 5.0 foot interval where fill was present (Appendix D). The individual concentrations of PAHs (including benz[a]anthacene, benzo[a]pyrene, benzo[b]fluoranthene, chrysene, dibenz(a,h) anthracene and indeno[1,2,3-cd] pyrene) were less than 1.9 ppm. These concentrations slightly exceed the SCOs that are established at or below 1 ppm for the individual PAH compounds (Table 6).

Subsurface samples collected at the Hortonsphere footprint (MS-GP-01 and MS-GP-02) did not contain detectable PAHs.

Sulfate was detected in 12 subsurface soil sample locations at the property ranging from 3.6 ppm at MS-GP-03 (0-5 feet bgs) to 23.9 ppm at MS-GP-04 (0 to 5 feet bgs). There are no SCOs established for sulfate.

4.3 Stormwater Sediment

Four sediment samples (MS-SED-01 through MS-SED-04) were collected from areas of accumulated sediment in the stormwater channel that traverses the property. The channel was generated by stormwater run-off that discharges from upgradient locations onto the property. The conditions of the channel were observed during a site meeting between National Grid, NYSDEC, and GEI on October 30, 2008.

A summary of the detected concentrations is provided on Table 7. The locations are shown on Figure 12.

None of the sediment samples contained concentrations of VOCs, metals, PCBs, pesticides, or herbicides in excess of the Residential SCOs.

Only two PAH compounds were detected at concentrations slightly higher than Residential SCOs in MS-SED-01 and MS-SED-03. MS-SED-01 was collected upgradient of the Hortonsphere and contained one PAH (dibenz[a,h]anthracene) that exceeded the Residential SCO. MS-SED-03 sediment had accumulated behind woody debris in the former Hortonsphere footprint. It contained two PAHs (dibenz[a,h]anthracene and indeno[1,2,3-cd]pyrene) that exceeded the Residential SCOs. MS-SED-04, the downgradient sediment sampling point, did not contain any exceedance of Residential SCOs.

Given that one PAH was present upgradient of the former Hortonsphere, but no PAHs were present downgradient of the former Hortonsphere, it is likely the PAHs were carried onto the Site by stormwater and deposited within the Hortonsphere footprint.

4.4 Groundwater

No evidence of impacts (sheens or odors) was observed during the collection of the groundwater samples from each of the monitoring wells and temporary groundwater sampling points. The compounds detected in groundwater are summarized in Table 8. A summary of analytical results from the sampling event is presented on Figure 13.

VOC, SVOC, and PCB compounds were not detected in groundwater at concentrations above the NYS SCGs.

Concentrations of arsenic, chromium, copper, and lead exceeded the NYS SCGs in samples MS-GW-01 and MS-GW-02 (Figure 13). These were grab samples collected with the Geoprobe® temporary groundwater screen.

It is unlikely that these metals concentrations are attributable to former Hortonsphere operations because the depth to groundwater is more than 45 feet at these locations. In addition, a review of data from other former Hortonsphere sites on Long Island demonstrates that arsenic, chromium, and copper are not Hortonsphere-related metals. Lead is potentially related, but it was not otherwise detected above Residential SCOs at this site. The most likely explanation for the presence of metals in these two samples is entrained sediments due to sample collection through the temporary Geoprobe® sampling point (these metals are absent above the SCGs in the four groundwater samples collected from permanent wells that had been developed and sampled via standard low flow methods).

Iron, manganese and sodium concentrations exceeded their respective NYS SCGs in monitoring wells upgradient and downgradient of the Hortonsphere. These are common and likely represent groundwater conditions within the Upper Glacial Aquifer.

Sulfate was detected in all of the groundwater samples below the NYS SCGs. Sulfide was not detected in groundwater samples except for MS-GW-01, where it was detected at a concentration of 600 micrograms/liter (ug/L); however, this concentration is most likely attributable to sediments entrained in the sample.

Groundwater at the Site has the potential to flow in several directions, as described in subsection 3.2. However, groundwater impacts are generally low, non-existent, or due to sampling techniques. As such, off-site migration of dissolved phase constituents is not regarded as a concern.

4.5 Soil Vapor

Ten soil vapor samples were collected from the soil vapor sampling points. Nine of these points were installed in shallow soil (within reworked soils and areas with fill) to approximately 5 feet bgs. MS-SV-08D was installed to approximately 12 feet bgs, in native soil. One ambient air sample (MS-OA-01) was collected for analysis to evaluate ambient air concentrations.

MS-SV-01 and MS-SV-02 were collected in the footprint of the former Hortonsphere. BTEX was present at low concentrations; naphthalene was not detected in these samples. BTEX and naphthalene are commonly found in association with gas-making/storage operations. Chlorinated compounds, such as 1,3- and 1,4-dichlorobenzene and tetrachloroethene were encountered within soil vapor; however, these compounds are not associated with gas making and storage operations.

Off-site, MS-SV-03, MS-SV-06, and MS-SV-07S were located within the parking lot at the property while MS-SV-04, MS-SV-08S/D were located in the grassed yard adjacent to High Street. Shallow soil vapor samples were collected in areas that contained reworked soils and fill material with the exception of one deep soil vapor sample (MS-SV-08D) which was installed below the fill materials within native soils. Concentrations of VOCs, such as chlorinated compounds, decanes, and nonanes, are consistent with compounds that are found in petroleum and solvents – products that are frequently found in vehicle parking areas. The results of samples MS-SV-08S and MS-SV-08D demonstrate that concentrations of VOCs are greater in shallow impacts than deeper in native material. As such, the shallow impacts have not resulted from any site activities prior to filling and reworking of soils.

Chlorinated compounds are not associated with former gas storage and distribution operations. VOCs (including chlorinated compounds) and naphthalene were not present in surface soil, subsurface soil, sediment, or groundwater (except a minor detection of toluene alone in MS-GW-01) near the Hortonsphere footprint, so the Hortonsphere is not an apparent source for soil vapor impacts at the Site.

4.6 Non-Aqueous Phase Liquids (NAPL)

NAPL was not observed during SC activities.

5. Qualitative Human Health Exposure Assessment

This section evaluates the qualitative potential for exposure posed to human receptors by COPCs detected in surface soil, subsurface soil, stormwater sediment, and groundwater, at the Site at concentrations in excess of the Residential SCOs and NYS SCGs. Tables 5 through 8 provide a summary of the detected concentrations and highlights compounds that exceed criteria values in surface soils, subsurface soils, stormwater sediment, and groundwater. Concentrations of VOCs in soil vapor presented on Table 9 were also evaluated for potential exposure pathways to human receptors.

5.1 Exposure Pathways

An exposure pathway describes the means by which a potential receptor may be exposed to contaminants originating from a site. Assessment of potential exposure pathways includes the following five elements (NYSDEC, 2002):

(1) A contaminant source.
(2) Contaminant release and transport mechanisms.
(3) A point of exposure.
(4) A route of exposure.
(5) A receptor population.

The NYSDEC and NYSDOH consider an exposure pathway complete when all five elements of an exposure pathway are documented. An exposure pathway may be eliminated from further evaluation when any one of the five elements comprising an exposure pathway has not existed in the past, does not exist in the present, and will never exist in the future (NYSDEC, 2002).

5.1.1 Surface Soil

A potentially complete exposure pathway to certain PAH compounds in surface soils exists for the commercial worker, utility worker, adult and child visitors, and trespassers if surface soils are disturbed in the vicinity of MS-SS-04, MS-SS-08, and MS-SS-09 beneath the grassed yard. The potential routes of exposure are ingestion, dermal contact, and inhalation of soil particulates.

Lead was also present in one sample (MS-SS-04) at 433 ppm. This is slightly above the Residential SCO (400 ppm) and eastern U.S. background concentrations (Schacklette and Boerngen, 1984). Surface soil sample MS-SS-03 contained chromium at a concentration of 27.1 mg/kg, which is slightly higher than the Residential SCO of 22 mg/kg. However, this concentration is well below the maximum eastern U.S background concentration of 1000 ppm (Table 12).

A potentially complete pathway for trespassers, visitors, and commercial/utility worker is contingent upon removal of the grass at the affected locations. As such, the potential for actual exposure is minimal. Currently, there is a limited potential for receptors to encounter these compounds because of infrequent access and no trespassing signs that restrict access to the property.

5.1.2 Subsurface Soil

PAHs at concentrations above Residential SCOs were detected in the upper five feet of subsurface soil at borings MS-GP-04, MP-GP-10, and MP-GP-12 near High Street and at MS-GP-05 and MS-GP-08 beneath the parking lot area. PAHs were not present above the Residential SCOs within native soils. As such, a potentially complete exposure pathway to PAHs exists for trespassers, adult and child visitors, and construction and utility workers only if the shallow soils are disturbed. The potential routes of exposure are ingestion, dermal contact, and inhalation of soil particulates for these receptors. These sample locations are within areas of fill material and are not representative of the Hortonsphere operations.

5.1.3 Stormwater Sediment

Isolated concentrations of PAHs above the Residential SCOs were present in stormwater sediments (MS-SED-01 and MS-SED-03). A potentially complete exposure pathway to PAHs exists for trespassers, adult and child visitors, and construction/utility workers. The potential routes of exposure are ingestion, dermal contact, and inhalation of soil particulates if the sediments are disturbed. There is a limited potential for receptors to encounter these compounds because the property is undeveloped, infrequently accessed, and is posted with no trespassing signs.

5.1.4 Groundwater

A potentially complete current and future exposure pathway exists for metals in groundwater for utility and construction workers involved in deep excavations (~14 feet bgs) in the adjacent to Community Drive (Table 8). There are no complete direct exposure pathways to groundwater on the remainder of the Site because groundwater is encountered below 15 feet bgs and as deep as 65 feet bgs at the western property boundary, which is below the depths of typical excavations.

No potable wells are known to be present within a half-mile downgradient of the Site. The Lakeville-Manhasset Water Company provides water to the area surrounding the Site. EDR identified six public supply wells within 1-mile of the Site; however, these supply wells are screened within the deeper Magothy and/or Lloyd Aquifers - not the shallower Upper Glacial Aquifer. Direct ingestion of groundwater at the Site is not considered a potential exposure pathway and groundwater is not likely to be used as a source of drinking water in the foreseeable future.

5.1.5 Soil Vapor

VOCs were detected in all soil vapor samples collected at the site. Construction and utility workers, adult and child visitors, and trespassers could be exposed to the VOCs within soil vapor if they were to disturb the soils. Therefore, potentially complete exposure pathways via inhalation are possible. However, exposure to soil vapor via vapor intrusion cannot occur because there are no Site structures where VOCs could accumulate. Currently, there is a limited potential for receptors to encounter these compounds because the property is undeveloped, is infrequently accessed, and is posted with no trespassing signs.

5.2 QHHEA Conclusions

The QHHEA indicates that there are potentially complete exposure pathways to chemical constituents above the screening criteria for surface soils, subsurface soils, and groundwater. A potentially complete exposure pathway also exists to VOC concentrations in soil vapor. Based upon the current property use, there is a limited potential for receptors to encounter these compounds because the Site is infrequently accessed and posted with no trespassing signs that restrict access.

6. Fish and Wildlife Resources Impact Analysis

The NYSDEC's FWRIA guidance provides a decision key outlining the actual or potential risks for wildlife in the vicinity of a potential hazardous waste site, which might require performance of a FWRIA. According to this key, a FWRIA is not required for the Manhasset Former Hortonsphere Site (Table 13). The remaining portion of this section provides the supporting information for this conclusion.

An EDR Radius Map report provided to GEI indicates there were no reported spills occurring on the Manhasset Former Hortonsphere Site (NYSDEC, 2007), and environmental testing performed as part of the SC identified that there are no elevated concentrations of contaminants of ecological concern present in groundwater, surface soil, or sub-surface soil related to the activities of the Former Hortonsphere. The lack of Hortonsphere-related contamination at the Site, other than localized lead and PAHs detections in surface soil most likely resulting from fill material, indicate that adjacent water bodies, ecological communities, and species of concern are not being impacted by the former processes that occurred at the Site.

The Site is currently a vacant wooded lot in a residential area and is zoned for residential use. The Site is composed of a successional maritime forest cover-type, which is highly disturbed (Edinger et al. 2002). This is consistent with the post Hortonsphere clearing of the site vegetation presented above in the site history summary in subsection 1.2.3. The residential community of Manhasset surrounds the Site directly adjacent to the north, east, and south. Community Drive, a busy roadway, borders the western edge of the Site. Manhasset is a community with a high density of residential and commercial structures nearby including landscaped yards and paved roads.

Correspondence from the New York Natural Heritage Program in conjunction with the New York State Department of Environmental Conservation indicates that there are no endangered species, habitats, or communities of concern at the Manhasset Hortonsphere Site. Only one endangered vascular plant and one habitat/community of concern are reported in the vicinity of the Site. They are described below:

- Pale duckweed (Lemna valdiviana) was reported within 2 miles of the Site, located in a kettlehole pond on the seventh tee of the Deepdale Golf Club. This species requires quiet bodies of surface water with little disturbance (lack of currents, etc.) and have highly specific mineral requirements. Habitat required for this species is not present on the Site, and the identified location is beyond commercial/residential urbanized area and the roadway adjacent to the Site.

- One significant community, an oak-tulip tree forest, occurs within the 2-mile radius of the Site; however, this ecological community is located upgradient of the Site beyond the commercial/residential urbanized area and adjacent roadway.

According to the National Wetlands Inventory database (United States Fish & Wildlife Service, 1994), there are palustrine forested wetlands as well as Whitney Lake, a fresh surface water body, within 2 miles primarily to the northeast of the Site. These waters are classified as "C" under 6NYCRR. Freshwater features classified as "C" are suitable for fish propagation and survival. The water quality is suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes. Whitney Lake is surrounded by residential structures, along with Community Drive to the west. The roadway is also present between the Site and the wetlands. Therefore, there is no direct surface runoff migration pathway for contaminants to move from the Site to the wetlands or lake.

A field reconnaissance survey conducted in October of 2007 revealed no apparent stress on the ecology of the Site, and did not identify the presence of species of concern listed above. The species that were identified within the 2-mile radius of the Site during the field reconnaissance included:

Plant Species:

- pitch pine (Pinus rigida)
- sassafras (Sassifras albidum)
- red maple (Acer rubrum)
- black oak (Quercus velutina)
- white oak (Quercus alba)
- American beech (Fagus gradifolia)
- American elm (Ulmus Americana)
- poison ivy (Toxicodendron radicans)
- wild grape (Vitis spp.)
- silver maple (Acer saccharinum)
- oriental bittersweet (*Celastrus orbiculatus*)
- clipped lawn grasses

Avian Species

- blue jay (Cyanocitta cristata)
- house sparrow (Passer domesticus)
- song sparrow (Melospiza melodia)
- pigeon (Columba fasciata)
- European starling (Sturnus vulgaris)

Mammalian Species

- Racoon (Procyon lotor) [tracks observed]
- Gray squirrel (Sciurus carolinensis)

7. Conclusions

The Site Characterization at the Manhasset Hortonsphere site was undertaken per the terms of the NYSDEC and National Grid executed AOC (Index #A1-0595-08-07) to evaluate soils, soil vapor and groundwater to determine if former Hortonsphere operations may have impacted the environment. The Manhasset Hortonsphere and regulator house were constructed in 1929. In 1960 the Hortonsphere and regulator house were removed and the gas piping was abandoned in-place. No other records regarding its operation were encountered.

In 1961, LILCO sold the property to the Mount Olive Baptist Church after which LILCO did not have control over the property. Sometime between 1966 and 1976, the Hortonsphere property was cleared of vegetation, soils were reworked, and some filling occurred. The Site has since reverted to forestland.

No physical evidence of staining, sheen or odors were observed in soils and groundwater during the SC investigations. Analytical data for these media were evaluated with respect to Residential SCOs because the property is zoned for residential use. A summary of the SC analytical findings is presented below.

Surface Soils

Individual PAH compounds were slightly above the Residential SCOs at sample locations MS-SS-04, MS-SS-08, and MS-SS-09. All three of these samples were located north of the former Hortonsphere footprint within the grassed yard area adjacent to High Street. Surface soil sample MS-SS-03 contained chromium at a concentration of 27.1 mg/kg, which is slightly higher than the Residential SCO of 22 mg/kg, but well below the maximum eastern U.S background concentration of 1000 ppm. MS-SS-04 also contained a concentration of lead slightly above the Residential SCO.

Based on aerial photographs from 1966 and 1976 (Figures 3 and 4), most surface soil at the property was reworked and augmented with fill after LILCO sold the property. The presence of lead and PAHs is attributed to these reworked soils (potential fill material) or dry deposition of lead from vehicle exhaust on High Street. While potential exposure pathways are complete, the actual risk is regarded as minimal because Site access is limited by no trespassing signs.

Subsurface Soils

BTEX compounds were not detected above Residential SCOs in any of the subsurface soils collected. PAHs and PCBs were not detected in the area of the former Hortonsphere or regulator house.

Off site, in the grassed yard area near High Street, concentrations of individual PAHs were slightly above the Residential SCOs; however, reworked soils (fill material) were found in this location outside the footprint of the former Hortonsphere Site at soil borings. A second off-site location within the parking lot area contained individual PAHs that were slightly above the Residential SCOs. This sample was collected in fill material used in the development of the parking lot and is located outside the former Hortonsphere footprint. PAHs were not detected above the Residential SCOs within native materials indicating that the PAHs are isolated to the reworked soils/ fill materials.

A limited exposure pathway exists for adult and child visitors and trespassers, because deliberate digging is required for contact or inhalation/ingestion. For construction and utility workers the potential is limited because the few PAHs and lead were found only in the reworked soils.

Stormwater Sediments

The stormwater channel appears to be formed from surface run-off that enters the property from off-site, to the west, then flows east and north through the footprint of the former Hortonsphere. None of the sediment samples exceeded Residential SCOs for VOCs, metals, PCBs, pesticides, herbicides, sulfate or sulfide.

The stormwater sediments upgradient of and within the footprint of the former Hortonsphere Site did contain PAH concentrations just above the Residential SCOs. As such, there are potentially complete pathways for workers, adult and child visitors, and trespassers.

The sediments were likely transported from upgradient off-site locations and deposited within the footprint of the Hortonsphere. This likelihood is supported by reduced or absent PAH concentrations in surface or subsurface soils collected within the footprint of the Hortonsphere.

A limited exposure pathway exists for receptors to come into contact with these compounds. Qualitative risk is minimal because the area is isolated and the site is posted with no trespassing signs.

Groundwater

VOCs, PAHs, and PCBs were not detected in groundwater at the Site or above the NYS SCGs.

Metals including lead were detected above the NYS SCGs. However, the elevated metal concentrations in groundwater are naturally occurring and may be associated with suspended sediments in the groundwater samples collected with the Geoprobe® groundwater sampler. The metals concentrations are not indicative of dissolved groundwater conditions. A limited exposure pathway exists for construction and utility workers in excavations ~14 feet deep adjacent to Community Drive. The area surrounding the Site is serviced by the Manhasset-Lakeville Water District, so consumption of the groundwater is not likely. Contact with the water is also unlikely since the depth to water ranges from approximately 14 feet bgs at Community Drive to over 65 feet at the western property boundary at the end of High Street.

Groundwater at the Site has the potential to flow in different directions. However, since dissolved phase impacts are low or not detectable and off-site migration is not regarded as a concern.

Soil Vapor and Ambient Air

There is no apparent on-site source of VOCs at the Site. The highest concentrations of VOCs in soil vapor were detected on the property outside the footprint of the former Hortonsphere in areas of reworked soils (potential fill material). Because there are no buildings on the property, soil vapor intrusion cannot occur under current site conditions. Construction, utility, and other workers may be exposed to low levels of VOCs in soil vapor if they were to disturb the soils. However, the low concentrations present a minimal risk.

Fish and Wildlife Resource Impact Analysis Findings

A Fish and Wildlife Resource Impact Analysis decision key was completed as part of this SC. According to this key (Table 13), a FWRIA was not required. The ecological resources in the vicinity of the Site are not being affected by the low-level chemical constituents detected at the Site.

Final Summary

Based on the findings presented in this report, no release of contaminants resulting from the operation of the Hortonsphere has occurred, and there is no evidence that former gas storage operations have affected the Site. On-site reworked soils (containing historic fill material) have minor impacts, but these are commonly encountered in fill and do not pose significant risk. Considering the current and anticipated future use of the Site (residential zoning), no further action is warranted.

References

Busciolano, R., J. Monti, Jr., and A. Chu, 1998. *Water-Table and Potentiometric-Surface Altitudes of the Upper Glacial, Magothy, and Lloyd Aquifers on Long Island, New York, in March-April, 1997, with a Summary of Hydrogeologic Conditions*. United States Geological Survey. Water-Resources Investigations Report 98-4019.

Busciolano, R., 2002. *Water-Table and Potentiometric-Surface Altitudes of the Upper Glacial, Magothy, and Lloyd Aquifers on Long Island, New York, in March-April 2000, with a Summary of Hydrogeologic Conditions*. United States Geological Survey. Water-Resources Investigations Report 01-4165.

Cartwright, R. A., 2002. *History and Hydrologic Effects of Ground-Water Use in Kings, Queens, and Western Nassau Counties, Long Island, New York, 1800s through 1997*. United States Geological Survey Water-Resources Investigations Report 01-4096.

Edinger, G. J., D. J. Evans, S. Gebauer, T. G. Howard, D. M. Hunt, A. M. Olivero. 2002. DRAFT Ecological Communities of New York State: Second Edition, New York Natural Heritage Program, Albany, NY available at: http://www.dec.state.ny.us/website/dfwmr/heritage/EcolComm.htm.

Environmental Data Resources, 2007, EDR Radius Report, Manghasset Hortonsphere Site, 43 High Street, Manhasset, New York, 11030. April 09.

GEI Consultants, Inc., 2007. *Site Characterization Work Plan, Manhasset Hortonsphere Site*. November 2007.

Ken Petro. Chicago Bridge and Iron. Personal Communication. May 2008.

Long Island Lighting Company. March 29, 1960. *Retirement of Sphere, Governor House & Equipment Manhasset, N.Y. Drawing L-209-Q*, Scale 1 inch = 30 feet.

Long Island Lighting Company. Manhasset Hortonsphere Property Plan Parcel Nos. 24.1, 24.2, and 23.

Morgan, Jerome J. 1935. A Textbook of American Gas Practice, Volume 2, Distribution and Utilization of City Gas. Jerome J. Morgan. Maplewood, New Jersey.

Nassau County Department of Assessment. June 24, 2003, Land and Tax Map Section 2, Block 347 Sheet 1 of 1.

National Oceanic and Atmospheric Administration (NOAA), National Ocean Services, Tidal Datums. http://tidesandcurrents.noaa.gov, accessed December 17, 2007.

New York State Department of Environmental Conservation (NYSDEC), 2002, *Draft DER-10 Technical Guidance for Site Investigation and Remediation.*

New York State Department of Environmental Conservation (NYSDEC), 2007, Environmental Site Database Search. http://www.dec.ny.gov/chemical/8437.html Accessed May 2007.

New York State Department of Environmental Conservation (NYSDEC), *New York State Code of Rules and Regulations*, 6NYCRR Title 6, Chapter 100, Part 700-705 and Part 925.6.

New York State Department of Environmental Conservation (NYSDEC). 2006. *Remedial Program Soil Cleanup Objectives*, Environmental Conservation Law, Chapter IV, Subpart 375-6.

New York State Department of Environmental Conservation, 1998. *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations*. Division of Water Technical and Operational Guidance Series (1.1.1), June 1998.

New York State Department of Health (NYSDOH) 2006. *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York.* October 2006. Prepared by the New York State Department of Health, Center for Environmental Health, Bureau of Environmental Exposure Investigation.

New York State Department of Health (NYSDOH) October 2006. *Summary of Indoor and Outdoor Levels of Volatile Organic Compounds from Fuel Oil Heated Homes in New York State, 1997 to 2003. Vapor Intrusion Guidance Appendix C.* Study Conducted by New York State Department of Health.

Poole, A., P. Stettenheim, and F. Gill. Eds. 1992. The Birds of North America, No. 2. Philidelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Shacklette, H.T., and Boerngen, J.G., 1984. *Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States*. U.S. Geological Survey Professional Paper 1270. 105p.

Soren, Julian and Simmons, Dale L., 1985. *Thickness and Hydrogeology of Aquifers and Confining Units Below the Upper Glacial Aquifer on Long Island, New York.* United States Geological Survey. Water-Resources Investigations Report 86-4175.

United States Department of Labor Occupational Safety & Health Administration. http://www.osha.gov/SLTC/pel/standards.html accessed July 15, 2007.

United States Environmental Protection Agency (EPA), November 2002. *Draft Guidance For Evaluating The Vapor Intrusion to Indoor Air Pathway From Groundwater and Soils.* EPA530-F-02-052. www.epa.gov/osw.

Weather Underground, LaGuardia Airport. http://www.underground.com, accessed on February 12, 2008.

Tables

Table 1
Climatological Norms and Means - LaGuardia Airport
Manhasset Former Hortonsphere Site
Manhasset, New York

Month:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Climatic Averages for New York LaGuardia Airport from 1971 to 2000													
Precipitation (inches)	3.56	2.75	3.93	3.68	4.16	3.57	4.41	4.09	3.77	3.26	3.67	3.51	44.36
Average Maximum Temperature (°F)	38.6	41.2	49.6	60	70.6	79.3	84.7	83.1	75.6	64.5	53.6	43.7	62.1
Average Minimum Temperature (°F)	26.5	28.3	35.1	44.4	54.3	63.7	69.5	68.7	61.6	50.9	41.6	32	48.1
Climatic Averages for LaGuardia Airport, New York 2007													
Precipitation (inches)	---	---	---	---	---	---	---	---	---	---	2.78	4.43	---
Average Temperature (°F)	---	---	---	---	---	---	---	---	---	---	47	39	---
Average Maximum Temperature (°F)	---	---	---	---	---	---	---	---	---	---	53	43	---
Average Minimum Temperature (°F)	---	---	---	---	---	---	---	---	---	---	41	34	---
Average Wind Speed (mph)	---	---	---	---	---	---	---	---	---	---	11	12	---
Climatic Averages for LaGuardia Airport, New York 2009													
Precipitation (inches)	---	0.66	---	---	---	---	---	---	---	---	---	---	---
Average Temperature (°F)	---	37	---	---	---	---	---	---	---	---	---	---	---
Average Maximum Temperature (°F)	---	45	---	---	---	---	---	---	---	---	---	---	---
Average Minimum Temperature (°F)	---	29	---	---	---	---	---	---	---	---	---	---	---
Average Wind Speed (mph)	---	13	---	---	---	---	---	---	---	---	---	---	---

Notes:

All data was collected from the U.S. Weather Service weather station located in New York in Queens County, New York. The New York LaGuardia Airport weather station is at an elevation of 11 feet and was established as a weather station on 01 Aug 1935.

Climatic Averages for New York LaGuardia Airport from 1971 to 2000 were obtained from Online Highways, http://www.ohwy.com/ny/w/wx305811.htm, retrieved June 11, 2003.

2007 Monthly average temperature (degrees Fahrenheit) and precipitation data (inches) were obtained from Weather Underground, http://www.wunderground.com, accessed November 17, 2009.

Table 2
Sample Rationale
Manhasset Former Hortonsphere Site
Manhasset, New York

Sample I.D.	Sample Location	Laboratory Sample Description (Sample Depth Feet)	Sample Rationale	Number of Samples				VOCs (EPA 8260B)	SVOCs (EPA 8270C)	TAL Metals (6000/7000)	Herbicides (EPA 8151A)	PCBs (EPA 8082)/ Pesticides (EPA 8081A)	Sulfide (EPA 9034/ 376.1)	Sulfate (EPA 300)	VOCs (Expanded) (Modified TO-15)
				Soil	Soil Vapor	Sediment	Groundwater								
Subsurface Soil Borings, Groundwater Monitoring Points, Monitoring Wells															
MS-GP-01/ MS-GW-01	Central portion of the property (former location of the Hortonsphere)	MS-GP-01 (0-4')	Evaluate soil conditions in the top four feet of soils in the area of the former Hortonsphere.	X				X	X	X	X	X	X	X	
		MS-GP-01 (44-45')	Evaluate soil conditions at the completion of the soil boring in the area of the former Hortonsphere.	X				X	X	X	X	X	X	X	
		MS-GW-01	Groundwater grab sample to evaluate groundwater conditions in the area of the former Hortonsphere.				X	X	X	X	X	X	X	X	
MS-GP-02/ MS-GW-02	Central portion of the property (former location of Hortonsphere Regulator Building)	MS-GP-02 (0-5')	Evaluate soil conditions in the top five feet of soils in the area of the former Hortonsphere and regulator/ pump house.	X				X	X	X	X	X	X	X	
		MS-GP-02 (38-40')	Evaluate soil conditions at the completion of the soil boring in the area of the former Hortonsphere and regulator/ pump house.	X				X	X	X	X	X	X	X	
		MS-GW-02	Groundwater grab sample to evaluate groundwater conditions in the area of the former Hortonsphere and regulator/pump house.				X	X	X	X	X	X	X	X	
MS-GP-03/ MS-MW-03	Eastern property boundary adjacent to Community Drive (topographically downgradient of former location of Hortonsphere)	MS-GP-03 (0-5')	Evaluate soil conditions within the top five feet of subsurface soils topographically downgradient of the former Hortonsphere.	X				X	X	X	X	X	X	X	
		MS-GP-03 (15-17')	Evaluate soil conditions at the watertable topographically downgradient of the former Hortonsphere.	X				X	X	X	X	X	X	X	
		MS-MW-03	Evaluate groundwater conditions downgradient of the former Hortonsphere				X	X	X	X	X	X	X	X	
MS-GP-04/ MS-MW-04	Grassed area adjacent to former Hortonsphere property (Lot 17)	MS-GP-04 (0-5')	Evaluate soil conditions in the top five feet of reworked subsurface soils adjacent to the residence and apartment buildings.	X				X	X	X	X	X	X	X	
		MS-GP-04 (25-27')	Evaluate soil conditions at the apparent perched watertable adjacent to the residence and nearby apartment buildings	X				X	X	X	X	X	X	X	
		MS-GP-04A (43-45')	Evaluate soil conditions at the apparent water table adjacent to the residence and nearby apartment buildings	X									X		
		MS-GP-04A (45-47')	Evaluate soil conditions within the apparent water table adjacent to the residence and nearby apartment buildings.	X				X	X	X	X	X		X	
		MS-MW-04	Evaluate groundwater conditions cross-gradient from Hortonsphere and adjacent to the residence and nearby apartment buildings.				X	X	X	X	X	X	X	X	

Table 2
Sample Rationale
Manhasset Former Hortonsphere Site
Manhasset, New York

Sample I.D.	Sample Location	Laboratory Sample Description (Sample Depth Feet)	Sample Rationale	Number of Samples				VOCs (EPA 8260B)	SVOCs (EPA 8270C)	TAL Metals (6000/7000)	Herbicides (EPA 8151A)	PCBs (EPA 8082)/ Pesticides (EPA 8081A)	Sulfide (EPA 9034/ 376.1)	Sulfate (EPA 300)	VOCs (Expanded) (Modified TO-15)
				Soil	Soil Vapor	Sediment	Groundwater								
MS-GP-05/ MS-MW-05	Western property boundary in the parking lot for the Mount Olive Baptist Church	MS-GP-05 (0-5')	Evaluate soil conditions within fill encountered in the parking lot for the Mount Olive Baptist Church.	X				X	X	X	X	X	X	X	
		MS-GP-05A (71-73')	Evaluate soil conditions at the apparent watertable upgradient of the former Hortonsphere operation.	X				X	X	X	X	X	X	X	
		MS-MW-05	Evaluate groundwater conditions upgradient of the former Hortonsphere operation.				X	X	X	X	X	X	X	X	
MS-GP-06/ MS-MW-06	Southeastern property line adjacent to Community Drive	MS-GP-06 (1-3')	Evaluate shallow subsurface soil conditions topographically topographically downgradient of the former Hortonsphere operation	X				X	X	X	X	X	X	X	
		MS-GP-06 (12-13')	Evaluate soil conditions at the apparent water table topographically downgradient of the former Hortonsphere.	X				X	X	X	X	X	X	X	
		MS-MW-06	Evaluate groundwater conditions topographically downgradient of the former Hortonsphere.				X	X	X	X	X	X	X	X	
MS-GP-07	Western area of property within the parking lot for the Mount Olive Baptist Church.	MS-GP-07 (1-2')	Evaluate fill/ reworked soil.	X				X	X	X					
		MS-GP-07 (19-20')	Confirm native material below Evaluate fill/ reworked soil.	X				X	X	X					
MS-GP-08	Western area of property within the parking lot for the Mount Olive Baptist Church.	MS-GP-08 (1-4')	Evaluate fill/ reworked soil.	X				X	X	X					
		MS-GP-08 (19-20')	Confirm native material below Evaluate fill/ reworked soil.	X				X	X	X					
MS-GP-09	Western area of property within the parking lot for the Mount Olive Baptist Church.	MS-GP-09 (1-5')	Evaluate fill/ reworked soil.	X				X	X	X					
		MS-GP-09 (15-17')	Confirm native material below Evaluate fill/ reworked soil.	X				X	X	X					
MS-GP-10	Grassed area to north of the former Hortonsphere property (Lot 17).	MS-GP-10 (1-2')	Evaluate fill/ reworked soil.	X				X	X	X					
		MS-GP-10 (5.5-6.5')	Confirm native material below Evaluate fill/ reworked soil.	X				X	X	X					
MS-GP-11	Grassed area to north of the former Hortonsphere property (Lot 17).	MS-GP-11 (1-4')	Evaluate fill/ reworked soil.	X				X	X	X					
		MS-GP-11 (9-10')	Confirm native material below Evaluate fill/ reworked soil.	X				X	X	X					
MS-GP-12	Grassed area to north of the former Hortonsphere property (Lot 17).	MS-GP-12 (1-2')	Evaluate fill/ reworked soil.	X				X	X	X					
		MS-GP-12 (7-8')	Confirm native material below Evaluate fill/ reworked soil.	X				X	X	X					

Table 2
Sample Rationale
Manhasset Former Hortonsphere Site
Manhasset, New York

Sample I.D.	Sample Location	Laboratory Sample Description (Sample Depth Feet)	Sample Rationale	Number of Samples				VOCs (EPA 8260B)	SVOCs (EPA 8270C)	TAL Metals (6000/7000)	Herbicides (EPA 8151A)	PCBs (EPA 8082)/ Pesticides (EPA 8081A)	Sulfide (EPA 9034/ 376.1)	Sulfate (EPA 300)	VOCs (Expanded) (Modified TO-15)
				Soil	Soil Vapor	Sediment	Groundwater								
Surface Soil Sample Locations															
MS-SS-01	Located within a wooded area at the central portion of the property adjacent to the former Hortonsphere.	MS-SS-01 (0-2")	Soil sample to evaluate surface soil conditions adjacent to the former Hortonsphere.	X				X	X	X	X	X	X	X	
MS-SS-02	Located within a wooded area at the central portion of the property at the location of the former Hortonsphere	MS-SS-02 (0-2")	Soil sample to evaluate surface soil conditions in the footprint of the former Hortonsphere.	X				X	X	X	X	X	X	X	
MS-SS-03	Located within a wooded area at the location of the former Hortonsphere out building	MS-SS-03 (0-2")	Soil sample to evaluate surface soil conditions at the location of the former Hortonsphere regulator/ pump house building.	X				X	X	X	X	X	X	X	
MS-SS-04	Northern property boundary adjacent to High Street	MS-SS-04 (0-2")	Surface soil sample to evaluate surface soil conditions in a grassed area (within fill area).	X				X	X	X	X	X	X	X	
MS-SS-05	Western property boundary adjacent to the neighboring day-care/ community center playground	MS-SS-05 (0-2")	Surface soil sample to evaluate surface soil conditions adjacent to the neighboring playground for the day care/ community center.	X				X	X	X	X	X	X	X	
MS-SS-06	Located within a grassed area at the location of the former Hortonsphere out building	MS-SS-06 (0-2")	Soil sample to evaluate surface soil conditions near the location of the former Hortonsphere regulator/ pump house building.	X				X	X	X	X	X	X	X	
MS-SS-07	Located to the southwest of MS-SS-04 in Lot 17.	MS-SS-07 (0-2")	Evaluate concentrations of lead and polycyclic aromatic hydrocarbons (PAHs) in surface soils near MS-SS-04.	X					X [PAH Only]	X [Lead Only]					
MS-SS-08	Located to the east of MS-SS-04 in Lot 17.	MS-SS-08 (0-2")	Evaluate concentrations of lead and PAHs in surface soils near MS-SS-04.	X					X [PAH Only]	X [Lead Only]					
MS-SS-09	Located to the northeast of MS-SS-04 in Lot 17.	MS-SS-09 (0-2")	Evaluate concentrations of lead and PAHs in surface soils near MS-SS-04.	X					X [PAH Only]	X [Lead Only]					
Storm water Sediment Samples															
MS-SED-01	Located where the storm water channel discharges onto the property.	MS-SED-01	Sediment sample to evaluate upgradient sediment quality.			X		X	X	X	X	X	X	X	
MS-SED-02	Located up gradient of the former Hortonsphere site.	MS-SED-02	Sediment sample to evaluate sediment quality upgradient of the Hortonsphere.			X		X	X	X	X	X	X	X	
MS-SED-03	Located within the footprint of the former Hortonsphere	MS-SED-03	Sediment sample to evaluate sediment within Hortonsphere footprint.			X		X	X	X	X	X	X	X	
MS-SED-04	Located downgradient of the former Hortonsphere.	MS-SED-04	Sediment sample to evaluate sediment in storm water channel downgradient of the Hortonsphere.			X		X	X	X	X	X	X	X	

Table 2
Sample Rationale
Manhasset Former Hortonsphere Site
Manhasset, New York

Sample I.D.	Sample Location	Laboratory Sample Description (Sample Depth Feet)	Sample Rationale	Number of Samples				VOCs (EPA 8260B)	SVOCs (EPA 8270C)	TAL Metals (6000/7000)	Herbicides (EPA 8151A)	PCBs (EPA 8082)/ Pesticides (EPA 8081A)	Sulfide (EPA 9034/ 376.1)	Sulfate (EPA 300)	VOCs (Expanded) (Modified TO-15)
				Soil	Soil Vapor	Sediment	Groundwater								
Soil Vapor and Ambient Air Sample Locations															
MS-SV-01	Central portion of the property	MS-SV-01	Soil vapor sample to screen the soil conditions at the location of the former Hortonsphere.		X										X
MS-SV-02	Central portion of the property	MS-SV-02	Soil vapor sample to screen the soil conditions at the location of the former Hortonsphere regulator/pump house.		X										X
MS-SV-03	Western boundary of the site	MS-SV-03	Soil vapor sample to screen the soil conditions adjacent to the abutting day-care/ community center.		X										X
MS-SV-04	Northern boundary of the property	MS-SV-04	Soil vapor sample to screen the soil conditions adjacent to the residence and nearby apartment building.		X										X
MS-SV-05	Southern boundary of the property	MS-SV-05	Soil vapor sample to screen the soil conditions adjacent to the nearby apartment buildings.		X										X
MS-SV-06	Located in parking lot along western property boundary.	MS-SV-06	Assess shallow soil vapor quality in parking lot along western property extent in the parking lot.		X										X
MS-SV-07	Located in parking lot along western property boundary.	MS-SV-07S	Assess shallow soil vapor quality in parking lot.		X										X
MS-SV-08	Located in the grassed area in between the residence and MS-SV-04.	MS-SV-08S	Assess shallow soil vapor quality in grassed area along high street.		X										X
		MS-SV-08D	Assess soil vapor in deeper vadose zone below reworked soils and fill materials.		X										X
MS-OA-1	Positioned on-site at breathing height.	MS-OA-1	Assess ambient air quality during soil vapor collection.		X										X

Notes:
Chemical analysis test methods specified are from U.S. EPA SW-846 test methods
EPA TO-15 analysis included VOCs and naphthalene
EPA - Environmental Protection Agency
VOC - volatile organic compounds
SVOC - semi volatile organic compounds
TAL - target analyte list
PCBs - polychlorinated biphenyls

Prepared by: LW

Table 3
Monitoring Well Construction Data
Manhasset Former Hortonsphere Site
Manhasset, New York

Well ID	Lithology of Screened Interval	Depth to bottom (BGS)	Screened Interval (feet below ground surface)		Top of Screen Elevation (Feet above NAVD)	Bottom of Screen Elevation (Feet above NAVD)	Top of Casing Elevation (Feet above NAVD)	Ground Surface Elevation (Feet Above NAVD)	Elevation at Center of Well Screen (Feet above NAVD)	Ground-Water Elevation 12/27-12/28/2007	Ground-Water Elevation 1/28/2008	Ground-Water Elevation 2/20/2009	Ground-Water Elevation 4/9/2009	Ground-Water Elevation 12/30/2009	Ground-Water Elevation 1/14/2010
			Top of Screen	Bottom of Screen											
MS-MW-03	SAND and SILT-SAND	20.02	13	23	28.89	18.89	41.86	41.89	23.89	27.25	27.6	28.24	28.05	28.37	28.47
MS-MW-04	SILT-SAND	33	23	33	36.60	26.60	59.27	59.6	31.60	NM-Dry	NM	NM	NM	NM	NM
MS-MW-04A	SAND and CLAY	46.02	37	47	23.75	13.75	60.75	61.08	18.75	27.52	27.4	28.35	28.11	28.4	28.58
MS-MW-05	SAND	75.41	69	79	24.22	14.22	93.42	93.22	19.22	27.69	26.81	27.75	27.5	27.79	28.02
MS-MW-06	SAND and SILT-SAND	20.85	11	21	30.58	20.58	41.23	41.58	25.58	27.48	27.65	28.63	28.45	28.79	28.89

Notes:

Wells MS-MW-03 and MS-MW-06 were constructed using 2-inch Schedule 40 PVC Geoprobe prepacked (0.010") slotted screens threaded to 2-inch Schedule 40 PVC riser.
Wells MS-MW-04A and MS-MW-05A were constructed using 2-inch Schedule 40 PVC slotted screen (0.010") threaded onto 2-inch Schedule 40 PVC riser.
Well MS-MW-04 was a 1-inch Schedule 40 PVC slotted screen (0.010") threaded to a 1-inch PVC Schedule 40 riser.
BGS - Below Ground Surface
NM - Not Measured
NAVD - North American Vertical Datum

Table 4
Final Groundwater Parameters
Manhasset Former Hortonsphere Site
Manhasset, New York

Sample Location/ Well ID	Date	Flow Rate (mL/min)	Depth to water (feet below TOC at time of sampling)	Groundwater Elevation (feet NAVD at time of sampling)	Parameters								
					Temperature (C)	pH (su)	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Odor	Color	Sheen
MS-MW-03	12/27/2007	400	14.61	27.25	10.65	6.18	0.378	54	4.32	144	none	clear	none
MS-MW-04A	12/27/2007	200	33.23	27.52	10.6	5.83	0.291	>999	4.02	138	none	turbid, grey	none
MS-MW-05	12/28/2007	200	65.73	27.69	11.22	5.83	0.417	473.00	3.21	78	none	turbid, grey	none
MS-MW-06	12/28/2007	200	13.75	27.48	14.05	6.03	0.574	30.0	1.66	25	none	clear	none

Notes:
NAVD - North American Vertical Datum
TOC - Top of Casing
ml/min = milliliters per minute
NTU = nephelometric turbidity units
C = Celsius
su = standard units
mg/L = milligrams per liter
mV = millivolts
mS/cm = milliSiemens per centimeter

Table 5
Surface Soil Analytical Results for Detected Compounds
Manhasset Former Hortonsphere Site
Manhasset, New York

Sample Name: / Sample Interval: / Sample Date:	RESIDENTIAL SCOs	MS-SS-01 (0-2 in.) 11/20/2007	MS-SS-02 (0-2 in.) 11/20/2007	MS-SS-03 (0-2 in.) 11/20/2007	MS-SS-04 (0-2 in.) 11/20/2007	MS-SS-05 (0-2 in.) 11/20/2007	MS-SS-06 (0-2 in.) 11/20/2007	MS-SS-07 (0-2 in.) 2/19/2009	MS-SS-08 (0-2 in.) 2/19/2009	MS-SS-09 (0-2 in.) 2/19/2009
BTEX (mg/kg)										
Total BTEX	NE	ND	ND	ND	ND	ND	ND	NA	NA	NA
PAHs (mg/kg)										
Acenaphthene	100	0.38 U	0.4 U	0.46 U	0.072 J	0.44 U	0.4 U	0.3 U	0.29 U	3.3
Anthracene	100	0.38 U	0.4 U	0.46 U	0.46	0.44 U	0.4 U	0.067 J	0.24 J	11
Benz[a]anthracene	1	0.38 U	0.085 J	0.27 J	2	0.28 J	0.21 J	0.25 J	1	15
Benzo[a]pyrene	1	0.06 J	0.097 J	0.28 J	1.8	0.31 J	0.21 J	0.25 J	1.1	13 J
Benzo[b]fluoranthene	1	0.1 J	0.15 J	0.39 J	2	0.44	0.28 J	0.31	1.3	18 J
Benzo[g,h,i]perylene	100	0.077 J	0.11 J	0.31 J	1.6	0.25 J	0.22 J	0.18 J	0.63	7.2 J
Benzo[k]fluoranthene	1	0.38 U	0.4 U	0.14 J	0.7	0.16 J	0.11 J	0.14 J	0.47	6.5 J
Chrysene	1	0.095 J	0.14 J	0.34 J	2.1	0.36	0.25 J	0.25 J	1	15
Dibenz[a,h]anthracene	0.33	0.38 U	0.4 U	0.07 J	0.38	0.44 U	0.4 U	0.3 U	0.15 J	4.5 J
Pyrene	100	0.11 J	0.17 J	0.43 J	3.3	0.35	0.32 J	0.52	1.4	21
Total PAHs (mg/kg)	NE	0.652	1.161	3.32	21.394	3.15	2.4	2.867	10.68	223.32
Other SVOCs (mg/kg)										
Bis(2-ethylhexyl)phthalate	NE	0.22 J	0.078 J	0.27 J	0.11 J	0.079 J	0.069 J	NA	NA	NA
Carbazole	NE	0.38 U	0.4 U	0.46 U	0.11 J	0.44 U	0.4 U	NA	NA	NA
PCBs (mg/kg)										
Aroclor 1254	NE	0.0064 J	0.0083 J	0.03	0.0045 J	0.02 J	0.033 J	NA	NA	NA
Aroclor 1260	NE	0.02 U	0.021 U	0.024 U	0.019 U	0.023 U	0.025	NA	NA	NA
PCBs, Total	1	0.0064	0.0083	0.03	0.0045	0.02	0.058	NA	NA	NA
Pesticides (mg/kg)										
Alpha-chlordane	0.91	0.002 U	0.0021 U	0.0024 UJ	0.0017 J	0.003 JN	0.0021 JN	NA	NA	NA
Chlordane, trans-	NE	0.0011 J	0.0019 J	0.0024 UJ	0.0019 U	0.0025 JN	0.0021 U	NA	NA	NA
DDD,4,4-	2.6	0.0038 UJ	0.004 UJ	0.0037 JN	0.0037 UJ	0.0045 UJ	0.0037 JN	NA	NA	NA
DDE,4,4-	1.8	0.0038 U	0.004 U	0.0025 JN	0.0037 U	0.008 JN	0.0034 JN	NA	NA	NA
DDT,4,4-	1.7	0.0038 UJ	0.004 UJ	0.0068 J	0.0048 J	0.013 J	0.0057 J	NA	NA	NA
Delta-BHC	100	0.00083 J	0.001 J	0.0024 UJ	0.0019 U	0.0023 J	0.0021 U	NA	NA	NA
Endosulfan II	4.8	0.0038 U	0.004 U	0.0022 J	0.0037 U	0.001 J	0.0041 U	NA	NA	NA
Endosulfan sulfate	4.8	0.00069 J	0.00062 J	0.0046 UJ	0.0037 U	0.0045 U	0.0041 U	NA	NA	NA
Endrin aldehyde	NE	0.0023 J	0.0026 J	0.0067 J	0.0037 U	0.0037 J	0.0042 J	NA	NA	NA
Heptachlor epoxide	NE	0.00032 J	0.0005 J	0.00079 J	0.0019 U	0.0011 J	0.0021 U	NA	NA	NA
Herbicides (mg/kg)										
Herbicides	NE	ND	ND	ND	ND	ND	ND	NA	NA	NA
Metals (mg/kg)										
Aluminum	NE	1760	2150	6950	7690	4220	6130	NA	NA	NA
Arsenic	16	10 U	12 U	3.8 J	2.8 J	7.6	2.8 J	NA	NA	NA
Barium	350	17 J	15.4 J	53.2 J	73.5 J	40.8 J	42.3 J	NA	NA	NA
Calcium	NE	741 J	617 J	2450 J	1660 J	5610 J	1210 J	NA	NA	NA
Chromium	22*	8.8 J	8.2 J	27.1 J	19 J	10.4 J	21 J	NA	NA	NA
Cobalt	NE	2 J	2.7 J	5.1 J	5.6 J	4.4 J	4.2 J	NA	NA	NA
Copper	270	6.2 UJ	7.5 UJ	19.4 J	35.7 J	18.8 J	15.7 J	NA	NA	NA
Iron	NE	8260	7940	13600	18500	9950	11400	NA	NA	NA
Lead	400	9 J	11.8 J	111 J	433 J	58.7 J	88.2 J	12.4 J	31.9 J	44.4 J
Magnesium	NE	401 J	507 J	1400 J	2120	1810	1220 J	NA	NA	NA
Manganese	2000	129	138	355	337	346	252	NA	NA	NA
Mercury	0.81	0.017 J	0.06	0.15	0.1	0.063	0.11	NA	NA	NA
Nickel	140	4.5 J	4.8 J	12.8 J	11.2	10.9 J	10.9	NA	NA	NA
Potassium	NE	200 J	197 J	488 J	714 J	409 J	429 J	NA	NA	NA
Silver	36	3.7 U	4.5 U	1.6 J	2.9 U	4.1 U	1.4 J	NA	NA	NA
Sodium	NE	25.4 J	301 U	37 J	84 J	50.2 J	61.7 J	NA	NA	NA
Vanadium	NE	10.3 J	10.6 J	20.6 J	33.1 J	15.6 J	17.8 J	NA	NA	NA
Zinc	2200	16.6 J	18.4 J	83.6 J	62 J	87.2 J	62.5 J	NA	NA	NA
Other (mg/kg)										
Sulfide	NE	17.4 UJ	18.9 UJ	18.6 UJ	17.4 UJ	17.4 UJ	19.1 UJ	NA	NA	NA
Sulfate	NE	11.6 U	12.1 U	14.1 U	11.2 U	13.6 U	12.3 U	NA	NA	NA

Table 5
Surface Soil Analytical Results for Detected Compounds
Manhasset Former Hortonsphere Site
Manhasset, New York

Notes:

Only detected compounds are presented on this table.
mg/kg - milligrams/kilogram or parts per million (ppm)
BTEX - benzene, toluene, ethylbenzene, and xylene
PAHs - polycyclic aromatic hydrocarbons
SVOCs - semivolatile organic compounds
PCBs - Polychlorinated Biphenyls
Total PAHs and Total PCBs are calculated using detects only.

6 NYCRR -New York State Register and Official Compilation of Codes, Rules and Regulations of the State of New York
6 NYCRR 375 SCO RESTRICTED USE RESIDENTIAL - regulatory comparison against NYCRR, Chapter IV, Part 375-6 Restricted Use Residential Soil Cleanup Objectives (SCOs)
*-There is no established criteria for total chromium. The residential SCO for hexavalent chromium was used for comparison

NE- not established
NA - not analyzed
ND - Not detected

Bolding indicates a detected concentration
Gray shading and bolding indicates that the detected result value exceeds established NYSDEC 375 RESTRICTED RESIDENTIAL USE SCO
Total PAHs (mg/kg)

Validation Qualifiers:
J - estimated value
JN - analyte is presumptively present at an approximated quantity
U - indicates not detected to the reporting limit for organic analysis and the method detection limit for inorganic analysis
UJ - not detected at or above the reporting limit shown and the reporting limit is estimated

Table 6
Subsurface Soil Analytical Results for Detected Compounds
Manhasset Former Hortonsphere Site
Manhasset, New York

Sample Name: / Sample Interval: / Sample Date:	RESIDENTIAL SCOs	MS-GP-04 (0-5) 11/14/2007	MS-GP-04 (25-27) 11/15/2007	MS-GP-04A (43-45) 12/18/2007	MS-GP-04A (45-47) 12/18/2007	MS-GP-05 (0-5) 11/16/2007	MS-GP-05A (71-73) 12/7/2007	MS-GP-06 (1-3) 11/20/2007	MS-GP-06 (12-13) 11/20/2007
BTEX (mg/kg)									
Toluene	100	0.0061 U	0.0054 U	NA	0.0061 U	0.0056 U	0.006 U	0.0055 U	0.006 U
Total BTEX	NE	ND	ND	NA	ND	ND	ND	ND	ND
Other VOCs (mg/kg)									
Acetone	100	0.024 U	**0.0057 J**	NA	0.024 U	**0.016 J**	**0.0045 J**	0.022 U	0.024 U
Carbon disulfide	NE	0.0061 U	0.0054 U	NA	**0.00071 J**	0.0056 U	0.006 U	0.0055 U	0.006 U
PAHs (mg/kg)									
Acenaphthene	100	**0.083 J**	0.34 U	NA	0.4 U	**0.27 J**	0.39 U	0.36 U	0.39 U
Acenaphthylene	100	0.4 U	0.34 U	NA	0.4 U	**0.074 J**	0.39 U	0.36 U	0.39 U
Anthracene	100	**0.25 J**	0.34 U	NA	0.4 U	**0.8**	0.39 U	0.36 U	0.39 U
Benzo[a]pyrene	1	**1.1**	0.34 U	NA	0.4 U	**1.2**	**0.39 U**	**0.068 J**	0.39 U
Benzo[b]fluoranthene	1	**1.5**	0.34 U	NA	0.4 U	**1.4**	0.39 U	**0.097 J**	0.39 U
Benzo[g,h,i]perylene	100	**1.2**	0.34 U	NA	0.4 U	**1**	0.39 U	0.36 U	0.39 U
Benzo[k]fluoranthene	1	**0.6**	0.34 U	NA	0.4 U	**0.6**	0.39 U	0.36 U	0.39 U
Chrysene	1	**1.5**	0.34 U	NA	0.4 U	**1.4**	0.39 U	**0.079 J**	0.39 U
Dibenz[a,h]anthracene	0.33	**0.24 J**	0.34 U	NA	0.4 U	**0.22 J**	0.39 U	0.36 U	0.39 U
Fluoranthene	100	**3.1**	0.34 U	NA	**0.073 J**	**3.1**	0.39 U	**0.14 J**	0.39 U
Fluorene	100	**0.1 J**	0.34 U	NA	0.4 U	**0.45**	0.39 U	0.36 U	0.39 U
Indeno[1,2,3-cd]pyrene	0.5	**1.3**	0.34 U	NA	0.4 U	**1.1**	0.39 U	0.36 U	0.39 U
Naphthalene	100	0.4 U	0.34 U	NA	0.4 U	**0.058 J**	0.39 U	0.36 U	0.39 U
Phenanthrene	100	**1.7**	0.34 U	NA	0.4 U	**3.1**	0.39 U	0.36 U	0.39 U
Pyrene	100	**2.5**	0.34 U	NA	0.4 U	**2.9**	0.39 U	**0.12 J**	0.39 U
Total PAHs	NE	**16.273**	ND	NA	**0.073**	**19.172**	ND	**0.582**	ND
Other SVOCs (mg/kg)									
Bis(2-ethylhexyl)phthalate	NE	**0.079 J**	**0.12 J**	NA	**0.38**	0.36 U	**0.23 J**	0.36 U	0.39 U
Carbazole	NE	**0.21 J**	0.34 U	NA	0.4 U	**0.21 J**	0.39 U	0.36 U	0.39 U
Dibenzofuran	14	0.4 U	0.34 U	NA	0.4 U	**0.18 J**	0.39 U	0.36 U	0.39 U
PCBs (mg/kg)									
Aroclor 1254	NE	0.02 U	0.018 U	NA	0.021 U	0.018 U	0.02 U	**0.0049 J**	0.021 U
Aroclor 1260	NE	0.02 U	0.018 U	NA	0.021 U	0.018 U	0.02 U	0.019 U	0.021 U
Total PCBs	1	ND	ND	NA	ND	ND	ND	**0.0049**	ND
Pesticides (mg/kg)									
Alpha-chlordane	0.91	0.002 UJ	0.0018 UJ	NA	0.0021 UJ	**0.0048 J**	0.002 U	0.0019 UJ	0.0021 U
DDD,4,4-	2.6	0.0039 UJ	0.0035 UJ	NA	0.004 U	**0.0097 JN**	0.0039 UJ	0.0036 UJ	0.004 UJ
DDE,4,4-	1.8	0.0039 UJ	0.0035 UJ	NA	0.004 U *	**0.0049 JN**	0.0039 U	0.0036 U	0.004 U
DDT,4,4-	1.7	0.0039 UJ	0.0035 UJ	NA	0.004 U	**0.0076 J**	0.0039 U	**0.0012 J**	0.004 UJ
Delta-BHC	100	0.002 UJ	0.0018 UJ	NA	0.0021 U	0.0037 UJ	0.002 U	0.0019 U	0.0021 U
Dieldrin	0.039	0.0039 UJ	0.0035 UJ	NA	0.004 U	**0.0032 J**	0.0039 U	0.0036 U	0.004 U
Endrin aldehyde	NE	0.0039 UJ	0.0035 UJ	NA	0.004 UJ	0.0071 UJ	0.0039 UJ	**0.0014 J**	0.004 U
Metals (mg/kg)									
Aluminum	NE	**7460**	**317**	NA	**421**	**5130**	**906**	**2650**	**706**
Arsenic	16	**3.5 J**	8 U	NA	10.1 U	**3.8**	10.4 U	9.8 U	10.7 U
Barium	350	**31.6 J**	**4.3 J**	NA	**4.4 J**	**83.5**	**7.3 J**	**14.8 J**	**6.2 J**
Beryllium	14	2.5 U	2 U	NA	2.5 U	2 U	2.6 U	2.4 U	2.7 U
Calcium	NE	**1370 J**	**27.3 J**	NA	253 U	**1820 J**	**87.8 J**	**408 J**	**80.9 J**
Chromium	22*	**18.6**	**3.7**	NA	**4.9**	**15.6**	**2.5 J**	**11.6 J**	**2.3 J**
Cobalt	NE	**12.7**	2 U	NA	2.5 U	**3.8 J**	2.6 U	**2.5 J**	**0.88 J**
Copper	270	**16.9**	**2.1 J**	NA	**1.6 J**	**30.3**	**0.63 J**	7.3 UJ	6.7 UJ
Iron	NE	**20500**	**1700**	NA	**1740**	**13500**	**566**	**7680**	**3240**
Lead	400	**18.3 J**	**2.5 J**	NA	**2 J**	**136 J**	**2.9 J**	**37.5 J**	**3.3 J**
Magnesium	NE	**1550**	**13.9 J**	NA	95.5 UJ	**797 J**	**48.9 J**	**582 J**	**39.6 J**
Manganese	2000	**684 J**	**9.7 J**	NA	**16.8 J**	**135 J**	**3.6 J**	**164**	**7**
Mercury	0.81	**0.11**	0.052 U	NA	0.057 U	**0.26**	0.059 U	**0.02**	0.057 U
Nickel	140	**9.9 J**	5 U	NA	6.3 U	**9.8**	6.5 U	**6.2 J**	**1.6 J**
Potassium	NE	**531 J**	**103 J**	NA	**77.6 J**	**333 J**	**176 J**	**255 J**	**175 J**
Selenium	36	12.6 U	10 U	NA	12.7 U	9.9 U	13 U	12.2 U	13.3 U
Silver	36	3.8 U	3 U	NA	3.8 U	3 U	3.9 U	**0.38 J**	4 U
Sodium	NE	**41.8 J**	200 U	NA	253 U	**27.6 J**	260 U	244 U	267 U
Vanadium	NE	**26.4**	**5.3 J**	NA	**5.1 J**	**16**	**5.4 J**	**11.5 J**	**6.2 J**
Zinc	2200	**31 J**	20 U	NA	**7.5 J**	**251 J**	26 U	**34.1 J**	26.7 UJ
Other (mg/kg)									
Acid Soluble Sulfide	NE	R	R	R	NA	R	18.3 U	16.2 UJ	18.4 UJ
Sulfate	NE	**23.9**	**9.5**	NA	**10.1**	**16.5**	**14.4**	11.0 U	12.0 U

Table 6
Subsurface Soil Analytical Results for Detected Compounds
Manhasset Former Hortonsphere Site
Manhasset, New York

Sample Name: / Sample Interval: / Sample Date:	RESIDENTIAL SCOs	MS-GP-07 (1-5) 2/19/2009	MS-GP-07 (19-20) 2/19/2009	MS-GP-08 (1-4) 2/19/2009	MS-GP-08 (19-20) 2/19/2009	MS-GP-09 (1-5) 2/19/2009	Duplicate of MS-GP-09 (1-5) 2/19/2009	MS-GP-09 (15-17) 2/19/2009	MS-GP-10 (1-2) 2/20/2009	MS-GP-10 (5.5-6.5) 2/20/2009
BTEX (mg/kg)										
Toluene	100	0.0059 U	0.0054 U	0.0057 UJ	0.0055 U	0.0057 U	**0.00039 J**	0.0054 U	0.0056 U	0.0058 U
Total BTEX	NE	ND	ND	ND	ND	ND	**0.00039**	ND	ND	ND
Other VOCs (mg/kg)										
Acetone	100	0.023 UJ	0.022 U	0.023 U	0.022 U	0.023 UJ	0.024 UJ	0.022 U	0.022 UJ	0.023 U
Carbon disulfide	NE	0.0059 U	0.0054 U	0.0057 U	0.0055 U	0.0057 U	0.0059 U	0.0054 U	0.0056 U	0.0058 U
PAHs (mg/kg)										
Acenaphthene	100	0.31 U	0.28 U	0.3 U	0.3 U	0.3 U	0.3 U	0.28 U	**0.076 J**	0.31 U
Acenaphthylene	100	0.31 U	0.28 U	0.3 U	0.3 U	0.3 U	0.3 U	0.28 U	**0.084 J**	0.31 U
Anthracene	100	0.31 U	0.28 U	0.3 U	0.3 U	0.3 U	0.3 U	0.28 U	**0.3**	0.31 U
Benzo[a]pyrene	1	**0.075 J**	0.28 U	**0.11 J**	0.3 U	**0.12 J**	**0.12 J**	0.28 U	**1.3**	0.31 U
Benzo[b]fluoranthene	1	0.31 U	0.28 U	**0.14 J**	0.3 U	**0.14 J**	**0.12 J**	0.28 U	**1.9**	0.31 U
Benzo[g,h,i]perylene	100	**0.08 J**	0.28 U	**0.43 J**	0.3 U	**0.13 J**	**0.16 J**	0.28 U	**0.77**	0.31 U
Benzo[k]fluoranthene	1	0.31 U	0.28 U	**0.048 J**	0.3 U	0.3 U	**0.051 J**	0.28 U	**0.67**	0.31 U
Chrysene	1	**0.072 J**	0.28 U	**0.13 J**	0.3 U	**0.13 J**	**0.11 J**	0.28 U	**1.5**	0.31 U
Dibenz[a,h]anthracene	0.33	0.31 U	0.28 U	**0.36 J**	0.3 U	0.3 U	0.3 U	0.28 U	**0.17 J**	0.31 U
Fluoranthene	100	**0.1 J**	0.28 U	**0.2 J**	0.3 U	**0.18 J**	**0.15 J**	0.28 U	**3.4**	0.31 U
Fluorene	100	0.31 U	0.28 U	0.3 U	0.3 U	0.3 U	0.3 U	0.28 U	**0.099 J**	0.31 U
Indeno[1,2,3-cd]pyrene	0.5	0.31 U	0.28 U	**0.4 J**	0.3 U	**0.13 J**	**0.14 J**	0.28 U	**0.86**	0.31 U
Naphthalene	100	0.31 U	0.28 U	0.3 U	0.3 U	0.3 U	0.3 U	0.28 U	0.29 U	0.31 U
Phenanthrene	100	0.31 U	0.28 U	**0.1 J**	0.3 U	**0.13 J**	**0.069 J**	**0.091 J**	**1.8**	0.31 U
Pyrene	100	**0.13 J**	0.28 U	**0.15 J**	0.3 U	**0.2 J**	**0.17 J**	**0.083 J**	**1.8**	0.31 U
Total PAHs	NE	**0.528**	ND	**2.188**	ND	**1.27**	**1.19**	**0.174**	**15.929**	ND
Other SVOCs (mg/kg)										
Bis(2-ethylhexyl)phthalate	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	14	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs (mg/kg)										
Aroclor 1254	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PCBs	1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticides (mg/kg)										
Alpha-chlordane	0.91	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDD,4,4-	2.6	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDE,4,4-	1.8	NA	NA	NA	NA	NA	NA	NA	NA	NA
DDT,4,4-	1.7	NA	NA	NA	NA	NA	NA	NA	NA	NA
Delta-BHC	100	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	0.039	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)										
Aluminum	NE	**8840**	**3120**	**3660**	**1730**	**5750**	**5130**	**2880**	**4800**	**5770**
Arsenic	16	**5.2 J**	5.1 UJ	**2.2 J**	**0.72 J**	**2.3 J**	**3.4 J**	**0.89 J**	6.1 UJ	5.2 UJ
Barium	350	**65 J**	**18.9 J**	**49.9 J**	**11.6 J**	**62.8 J**	**63.6 J**	**19.1 J**	**28.3 J**	**15 J**
Beryllium	14	**0.6 J**	**0.23 J**	1.9 U	2 U	**0.4 J**	**0.46 J**	2.1 U	**0.3 J**	**0.39 J**
Calcium	NE	**1900**	203 U	**4210**	195 U	**2850 J**	**20300 J**	**281**	**5710**	**357**
Chromium	22*	**19.4 J**	**8.9 J**	**7.3 J**	**4.8 J**	**14.1 J**	**15.7 J**	**8 J**	**10.6 J**	**10.9 J**
Cobalt	NE	**7.9**	**1.7 J**	**3.9**	**1.2 J**	**5 J**	**9 J**	**2.8**	**5.2**	**3.4**
Copper	270	**26.3 J**	**4.1 J**	**32.2 J**	**2.8 J**	**20 J**	**14.2 J**	**4.5 J**	**11.3 J**	**8.1 J**
Iron	NE	**19900**	**7430**	**8860**	**4790**	**12300**	**13400**	**8260**	**10700**	**11700**
Lead	400	**72.5 J**	**2.7 J**	**62.1 J**	**1.6 J**	**65.2 J**	**78.8 J**	**5.6 J**	**31.4 J**	**4.5 J**
Magnesium	NE	**2450**	**481**	**2500**	**265**	**1820 J**	**9340 J**	**592**	**2950**	**506**
Manganese	2000	**412 J**	**114 J**	**115 J**	**124 J**	**239 J**	**480 J**	**218 J**	**174 J**	**217 J**
Mercury	0.81	**0.17 J**	0.053 U	**0.19 J**	0.055 U	**0.071 J**	**0.078 J**	**0.028 J**	**0.029 J**	**0.018 J**
Nickel	140	**15.6**	**5.1**	**6.4**	**3.4**	**10.5**	**9.9**	**7**	**7.1**	**8.7**
Potassium	NE	**940**	**215**	**305**	**137**	**667**	**511**	**237**	**345**	**307**
Selenium	36	13.3 U	10.1 U	9.6 U	9.8 U	11.3 U	12.7 U	10.6 U	**1.5 J**	10.4 U
Silver	36	4 U	3 U	2.9 U	2.9 U	3.4 U	3.8 U	3.2 U	3.7 U	3.1 U
Sodium	NE	266 U	203 U	191 U	195 U	226 U	254 U	213 U	244 U	209 U
Vanadium	NE	**23.3**	**8.4**	**12.4**	**5.6**	**18.1**	**16.7**	**7.1**	**14.7**	**14.4**
Zinc	2200	**94.7 J**	**9.2 J**	**64.2 J**	**7.3 J**	**70.7 J**	**75 J**	**15.7 J**	**33.4 J**	**12.1 J**
Other (mg/kg)										
Acid Soluble Sulfide	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NE	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 7
Stormwater Sediment Analytical Results for Detected Compounds
Manhasset Former Hortonsphere Site
Manhasset, New York

Sample Name: / Sample Interval (ft): / Sample Date:	Residential SCOs	MS-SED-01 (0.67-0.83) 2/20/2009	MS-SED-02 (1.65-1.80) 2/20/2009	Duplicate of MS-SED-02 (1.65-1.80) 2/20/2009	MS-SED-03 (1.45-1.60) 2/20/2009	MS-SED-04 (0.17-0.33) 2/20/2009
BTEX (mg/kg)						
Toluene	100	0.0062 U	0.0054 U	0.0055 U	0.0067 U	0.0057 UJ
Total BTEX	NE	ND	ND	ND	ND	ND
Other VOCs (mg/kg)						
Acetone	100	0.025 U	0.021 U	0.022 U	0.027 U	0.023 U
PAHs (mg/kg)						
Anthracene	100	0.34 U	0.28 U	0.29 U	**0.096 J**	0.3 U
Benz[a]anthracene	1	**0.13 J**	0.28 U	0.29 U	**0.33 J**	0.3 U
Benzo[a]pyrene	1	**0.13 J**	0.28 U	0.29 U	**0.33 J**	0.3 U
Benzo[b]fluoranthene	1	**0.17 J**	0.28 U	0.29 U	**0.41**	0.3 U
Benzo[g,h,i]perylene	100	**0.49**	0.28 U	0.29 U	**0.7**	**0.4**
Benzo[k]fluoranthene	1	0.34 U	0.28 U	0.29 U	**0.15 J**	0.3 U
Chrysene	1	**0.13 J**	0.28 U	0.29 U	**0.39**	0.3 U
Dibenz[a,h]anthracene	0.33	**0.4**	0.28 U	0.29 U	**0.47**	0.3 U
Fluoranthene	100	**0.23 J**	0.28 U	0.29 U	**0.61**	0.3 U
Indeno[1,2,3-cd]pyrene	0.5	**0.46**	0.28 U	0.29 U	**0.66**	**0.37**
Phenanthrene	100	**0.14 J**	0.28 U	0.29 U	**0.4**	0.3 U
Pyrene	100	**0.27 J**	0.28 U	0.29 U	**0.71**	0.3 U
Total PAHs	NE	**2.55**	ND	ND	**5.256**	**0.77**
PCBs (mg/kg)						
Total PCBs	1	ND	ND	ND	ND	ND
Pesticides (mg/kg)						
Alpha-chlordane	0.91	**0.0038 J**	0.0018 U	0.0019 U	**0.0052 JN**	**0.002 JN**
Chlordane, trans-	NE	**0.0026 J**	0.0018 U	0.0019 U	**0.0044 J**	**0.0024 J**
DDD,4,4-	2.6	**0.0031 JN**	0.0035 UJ	0.0036 UJ	**0.0065 JN**	**0.0023 JN**
DDE,4,4-	1.8	**0.0014 JN**	0.0035 U	0.0036 U	**0.0027 JN**	0.0037 U
DDT,4,4-	1.7	**0.0028 J**	0.0035 UJ	0.0036 UJ	**0.0051 J**	R
Delta-BHC	100	**0.0014 J**	0.0018 U	0.0019 U	**0.0012 J**	0.0019 U
Dieldrin	0.039	0.0041 UJ	0.0035 UJ	0.0036 UJ	**0.0013 J**	0.0037 UJ
Heptachlor	0.42	0.0021 U	0.0018 U	0.0019 U	**0.00073 J**	0.0019 U
Heptachlor epoxide	NE	**0.00077 J**	0.0018 U	0.0019 U	**0.0013 J**	0.0019 U
Herbicides (mg/kg)						
Herbicides	NE	ND	ND	ND	ND	ND
Metals (mg/kg)						
Aluminum	NE	**3510**	**3410**	**2620**	**4710**	**1620**
Arsenic	16	5.5 UJ	5 UJ	6.8 UJ	**2.1 J**	6.2 UJ
Barium	350	**17.8**	**14.2**	**10.4**	**32.5**	**7.6**
Beryllium	14	**0.25 J**	**0.25 J**	2.7 U	**0.36 J**	2.5 U
Calcium	NE	**820 J**	**231 J**	**209 J**	**1750 J**	**268 J**
Chromium	22*	**7.6 J**	**6.7 J**	**7 J**	**10.8 J**	**6.4 J**
Cobalt	NE	**4.1**	**3.1**	**2.8**	**4.7**	**1.7 J**
Copper	270	**8.5**	**5.9**	**4.8**	**14.6**	**3.7**
Iron	NE	**10200**	**7760**	**8460**	**10800**	**4850**
Lead	400	**17.9 J**	**7 J**	**7.5 J**	**29.6 J**	**5.8 J**
Magnesium	NE	**832**	**760**	**585**	**1240**	**321**
Manganese	2000	**179 J**	**161 J**	**134 J**	**320 J**	**90.7 J**
Mercury	0.81	**0.026 J**	0.053 UJ	0.05 UJ	**0.082 J**	**0.078 J**
Nickel	140	**7.2**	**6.4**	**5.4**	**10.7**	**3**
Potassium	NE	**255**	**347**	**239**	**424**	**127**
Selenium	36	11 U	10.1 U	13.6 U	**1.3 J**	12.4 U
Vanadium	NE	**11.3**	**8.8**	**8.5**	**16**	**6.7**
Zinc	2200	**34.4 J**	**15.2 J**	**13 J**	**71.2 J**	**15.6 J**
Other (mg/kg)						
Acid Soluble Sulfide	NE	17.8 U	**21.1**	17.7 U	20.7 U	**21.9**
Sulfate	NE	12.4 U	10.7 U	11.0 U	13.4 U	11.4 U

Table 7
Stormwater Sediment Analytical Results for Detected Compounds
Manhasset Former Hortonsphere Site
Manhasset, New York

Notes:

Only detected compounds are shown on this table
mg/kg - milligrams/kilogram or parts per million (ppm)
BTEX - benzene, toluene, ethylbenzene, and xylenes
VOCs - volatile organic compounds
PAHs - polycyclic aromatic hydrocarbons

6 NYCRR -New York State Register and Official Compilation of Codes, Rules and Regulations of the State of New York
6 NYCRR 375 SCO RESTRICTED USE RESIDENTIAL - regulatory comparison against NYCRR, Chapter IV, Part 375-6 Restricted Use Residential Soil Cleanup Objectives (SCOs)
*-There is no established criteria for total chromium. The residential SCO for hexavalent chromium was used for comparison

NE - not established
NA - not analyzed

Bolding indicates a detected concentration
Gray shading and bolding indicates that the detected result value exceeds established NYSDEC 375 RESIDENTIAL USE SCO.

Validation Qualifiers:

J - estimated value
JN - analyte is presumptively present at an approximated quantity
U - indicates not detected to the reporting limit for organic analysis and the method detection limit for inorganic analysis
UJ - not detected at or above the reporting limit shown and the reporting limit is estimated
R - rejected

Table 8
Groundwater Analytical Results for Detected Compounds
Manhasset Former Hortonsphere Site
Manhasset, New York

Sample Location: / Sample Date:	NYS SCGs	MS-GW-01 11/19/2007	MS-GW-02 11/19/2007	MS-MW-03 12/27/2007	MS-MW-04 12/27/2007	MS-MW-05 12/28/2007	MS-MW-06 12/28/2007	Duplicate of: MS-MW-06 12/28/2007
BTEX (ug/l)								
Benzene	1	5 U	5 U	5 U	5 U	**0.4 J**	5 U	5 U
Toluene	5	**0.31 J**	5 U	5 U	5 U	5 U	5 U	5 U
Total BTEX	NE	**0.31**	ND	ND	ND	**0.4**	ND	ND
Other VOCs (ug/l)								
Acetone	50	**1.6 J**	10 U	10 U	10 U	2.5 U	10 U	10 U
Carbon disulfide	NE	5 U	5 U	5 U	**0.76**	5 U	5 U	5 U
Chloroform	7	5 U	5 U	**0.3 J**	5 U	5 U	5 U	5 U
Dibromochloromethane	50	5 U	5 U	**0.5 J**	5 U	5 U	5 U	5 U
Methyl-2-pentanone,4-	NE	10 U	10 U	**0.46 J**	10 U	10 U	10 U	10 U
Tetrachloroethene	5	5 U	**0.36 J**	**0.87**	**0.92**	**0.97**	**0.72**	**0.54**
Total VOCs	NE	**1.91**	**0.36**	**2.13**	**1.68**	**1.37**	**0.72**	**0.54**
Total PAHs (ug/l)								
Total PAHs	NE	ND	ND	ND	ND	ND	ND	ND
PCBs (ug/l)								
Total PCBs	0.1	ND	ND	ND	ND	ND	ND	ND
Pesticides (ug/l)								
Chlordane, trans-	NE	0.052 U	0.056 U	0.05 U	**0.0085 J**	0.05 U	0.05 U	0.05 U
Delta-BHC	0.04	0.052 U	0.056 U	0.05 UJ	0.05 UJ	**0.0095 J**	0.05 U	0.05 U
Total Pesticides	NE	ND	ND	ND	**0.0085**	**0.0095**	ND	ND
Total Metals (ug/l)								
Aluminum	NE	**18000**	**19300**	**100 J**	**1600**	**830**	**190 J**	**180 J**
Arsenic	25	**35**	**29**	25 U	**7 J**	25 U	25 U	25 U
Barium	1000	**180 J**	**210**	**28 J**	**38 J**	**41 J**	**62 J**	**62 J**
Beryllium	3	**1.9 J**	**2.1 J**	5 U	5 U	5 U	5 U	5 U
Calcium	NE	**19500 J**	**17500 J**	**41900**	**38100**	**36200**	**62900**	**61300**
Chromium	50	**710 J**	**640 J**	10 U	**12**	**9.5 J**	**2.4 J**	**2.2 J**
Cobalt	NE	**14 J**	**18 J**	10 U	**3 J**	**15 J**	**4.9 J**	**5 J**
Copper	200	**250**	**220**	10 U	**23 J**	**3.9 J**	10 U	10 U
Iron	300	**161000**	**147000**	**210**	**7200**	**3100**	**7900**	**7300**
Lead	25	**95**	**170**	10 U	**5.6 J**	10 U	10 U	10 U
Magnesium	35000	**7400**	**6800**	**13400**	**7500**	**13600**	**18200**	**18000**
Manganese	300	**2000**	**4800**	**580**	**470**	**370**	**330**	**310**
Nickel	100	**320**	**380**	**22 J**	**23 J**	**17 J**	**120**	**120**
Potassium	NE	**3600 J**	**3200 J**	**1400 J**	**3300 J**	**2800 J**	**6100**	**6100**
Sodium	20000	**8000**	**5600**	**9900**	**6300**	**20700**	**56000**	**55500**
Vanadium	NE	**260**	**430**	5 U	**21 J**	**11 J**	**1.1 J**	5 U
Zinc	2000	**500**	**290**	50 U	**250**	**43 J**	50 U	50 U
Sulfide/ Sulfate (ug/l)								
Sulfate	250000	**20400**	**11100**	**8900**	**25300**	**63500**	**59500**	**57800**
Sulfide	NE	**600 J**	1000 U	1000 U	1000 U	1000 U	1000 U	1000 U

Notes:

NYS SCG- New York State Ambient Water Quality Standards, Criteria and Guidance (SCGs) Values for GA groundwater

NE- not established

ND - not detected; total concentration is listed as ND because no compounds were detected in the group

J - estimated value

U - indicates not detected to the reporting limit for organic analysis and the method detection limit for inorganic analysis

Bold indicates detected result

Shading and bolding indicates that the detected result value exceeds established NYS SCGs

ug/L - micrograms per liter or parts per billion (ppb)

BTEX - benzene, toluene, ethylbenzene, and xylene

VOCs - volatile organic compounds

PAHs - polycyclic aromatic hydrocarbons

PCBs - polychlorinated biphenyls

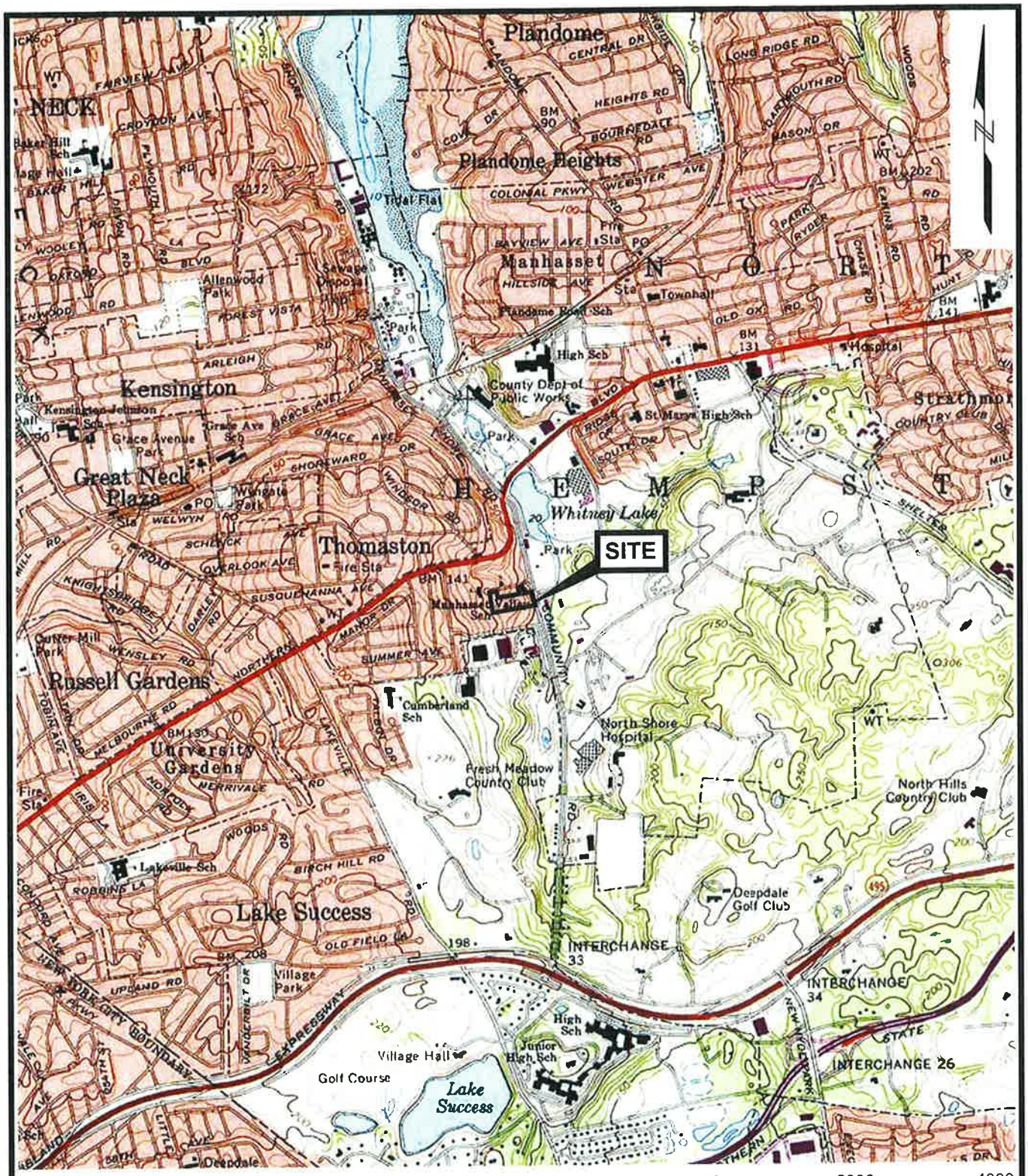
Table 12
Typical Background Concentrations of Metals in Soil
Manhasset Former Hortonsphere Site
Manhasset, New York

Metals	Background Levels - Eastern USA (mg/kg)
Aluminum	0.07 - > 10
Antimony	NE
Arsenic	< 0.1 - 73
Barium	10 - 1,500
Beryllium	< 1 - 7
Cadmium	NE
Calcium	0.01 - 28
Chromium	1 - 1,000
Cobalt	< 0.3 - 70
Copper	< 1 - 700
Iron	0.01 - >10
Lead	> 10 - 300
Magnesium	0.005 - 5
Manganese	< 2 - 7,000
Mercury	0.01 - 3.4
Nickel	< 5 - 700
Potassium	0.005 - 3.7
Selenium	< 0.01 - 3.9
Silver	NE
Sodium	<0.05 - 5
Thallium	NE
Vanadium	<7 - 300
Zinc	< 5 - 2,900

Notes:
NE - Not established
From: H.T. Shacklette and J.G. Boerngen, USGS Professional Paper 1270, 1984

Table 13
Fish and Wildlife Resources Impact Analysis Decision Key
Manhasset Former Hortonsphere Site
Manhasset, New York

	Yes	No
1. Is the site or area of concern a discharge or spill event?		√
2. Is the site or area of concern a point source of contamination to groundwater which will be prevented from discharging to surface water? Soil contamination is not widespread, or if widespread, is confined under buildings and paved areas?		√
3. Is the site and all adjacent property a developed area with buildings, paved surfaces and little or no vegetation?		√
4. Does the site contain habitat of an endangered, threatened, or special concern species?		√
5. Has the contamination gone off-site?		√
6. Is there any discharge or erosion of contamination or the potential for discharge or erosion of contamination?		√
7. Are the site contaminants PCBs, pesticides, or other persistent, bioaccumulable substances?		√
8. Does contamination exist at concentrations that could exceed SCGs or be toxic to aquatic life if discharged to surface water?		√
9. Does the site or any adjacent or downgradient property contain any of the following resources?		
a. Any endangered, threatened, or special concern species or rare plants or their habitats		√
b. Any NYSDEC designated significant habitats or rare NYS ecological communities		√
c. Tidal or freshwater wetlands	√	
d. Streams, creeks, or river		√
e. Pond, lake, or lagoon		√
f. Drainage ditch or channel		√
g. Other surface water features		√
h. Other marine or freshwater habitats		√
i. Forest	√	
j. Grassland or grassy field		√
k. Parkland or woodland	√	
l. Shrubby area	√	
m. Urban wildlife habitat	√	
n. Other terrestrial habitat	√	
10. Is the lack of resources due to contamination?		√
11. Is the contamination a localized source which has not migrated from the source to impact any on-site or off-site resources?	√	
12. Does the site have widespread soil contamination that is not confined under and around buildings or paved areas?		√
13. Does the contamination at the site or area of concern have the potential to migrate to, erode into or otherwise impact any on-site or off-site habitat of endangered, threatened or special concern species or other fish and wildlife resources?		√
14. Fish and wildlife resource impact analysis needed?		√



SOURCE: Map created with TOPO! ® ©2001 National Geographic (www.nationalgeographic.com/topo)

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

nationalgrid

GEI Consultants

Project 093000-8-1801

SITE LOCATION MAP

August 2011 Figure 1

I:\GEI\National Grid\Manhasset\Final-SCR\MANHASSET Location Map.cdr

LEGEND:

PROPERTY BOUNDARY (APPROXIMATE)

FORMER HORTONSPHERE SITE BOUNDARY (APPROXIMATE)

SOURCE:

1966 AERIAL PHOTOGRAPH PROVIDED BY ENVIRONMENTAL DATA RESOURCES, INC., MILFORD, CT., INQUIRY # 1898554.5, INQUIRY DATE : APRIL 10, 2007.

NOTE:

MANHASSET HORTONSPHERE AND PROPERTY WERE SOLD IN 1961.

0 200 400

SCALE, FEET

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

nationalgrid

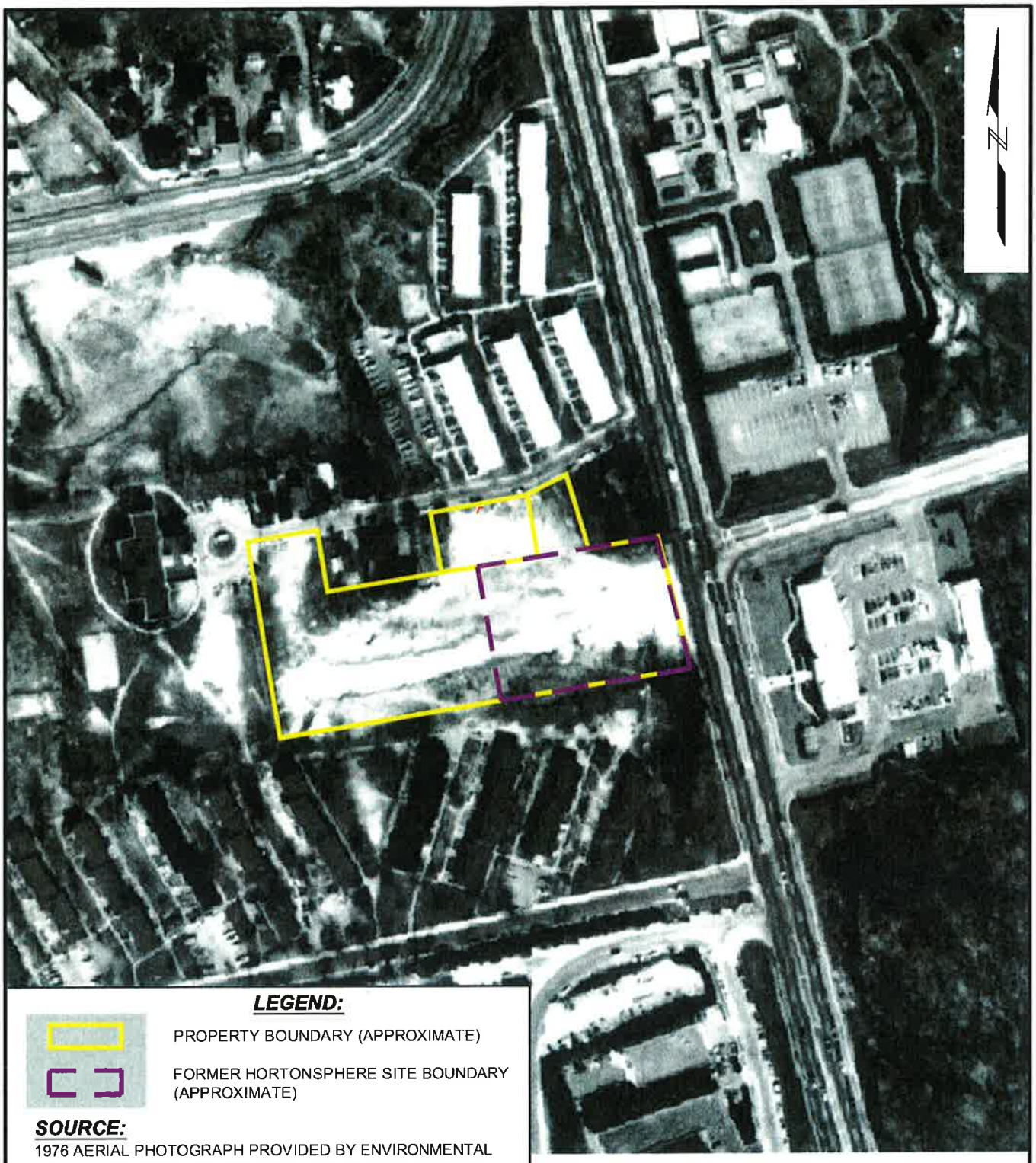
GEI Consultants

Project 093000-8-1801

1966 AERIAL PHOTOGRAPH OF SITE AND VICINITY

August 2011 Figure 3

I:\Project\National Grid\Manhasset\Final-SCR\ Manhasset-Final SCR Figures 08-11.dwg \Aug 11, 2011



LEGEND:

PROPERTY BOUNDARY (APPROXIMATE)

FORMER HORTONSPHERE SITE BOUNDARY (APPROXIMATE)

SOURCE:

1976 AERIAL PHOTOGRAPH PROVIDED BY ENVIRONMENTAL DATA RESOURCES, INC., MILFORD, CT., INQUIRY # 1898554.5, INQUIRY DATE : APRIL 10, 2007.

NOTE:

MANHASSET HORTONSPHERE AND PROPERTY WERE SOLD IN 1961.

0 200 400

SCALE, FEET

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

nationalgrid

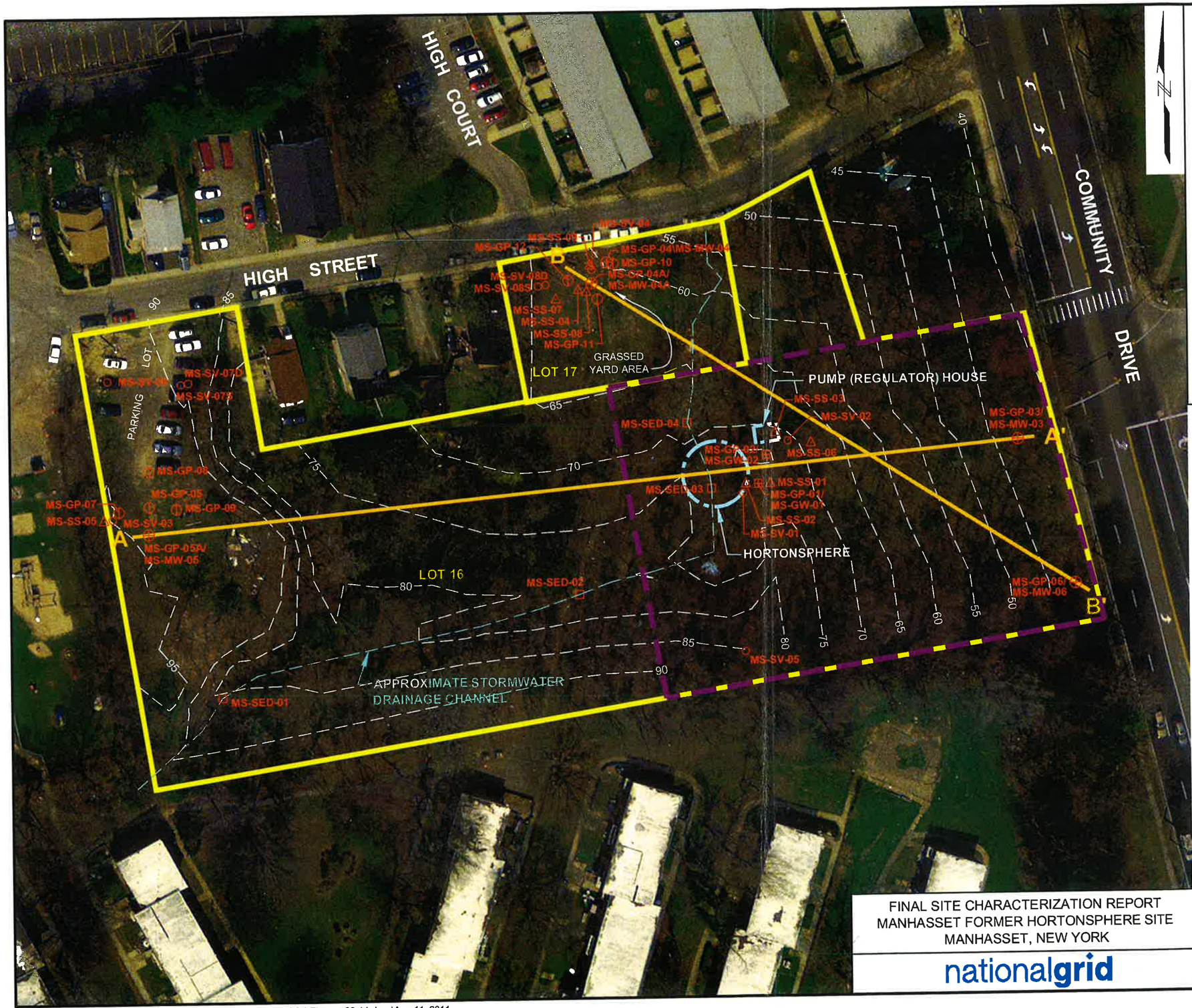
GEI Consultants

Project 093000-8-1801

1976 AERIAL PHOTOGRAPH OF SITE AND VICINITY

August 2011 Figure 4

I:\Project\National Grid\Manhasset\Final-SCR\ Manhasset-Final SCR Figures 08-11.dwg \Aug 11, 2011



LEGEND:

- PROPERTY BOUNDARY (APPROXIMATE)
- FORMER HORTONSPHERE SITE BOUNDARY (APPROXIMATE)
- HISTORIC STRUCTURE LOCATION
- GROUND SURFACE ELEVATION CONTOUR (FEET, NAVD)
- CROSS SECTION LOCATION
- MS-GP-01/ MS-GW-01 — SOIL BORING LOCATION/ GEOPROBE® TEMPORARY GROUNDWATER SAMPLING LOCATION
- MS-GP-03/ MS-MW-03 — SOIL BORING LOCATION/ MONITORING WELL LOCATION
- MS-GP-05 — SOIL BORING LOCATION
- MS-SV-02 — SOIL VAPOR SAMPLE LOCATION
- MS-SS-01 — SURFACE SOIL SAMPLE LOCATION
- MS-SED-01 — SEDIMENT SAMPLE LOCATION

NOTE:
Contour intervals provided on this figure are based upon field survey.

SOURCES:

1. Orthophoto obtained from New York State Interactive Mapping Gateway (http://www1.nysgis.state.ny.us/MainMap.cfm) photo date: 2004, accessed 10/04/07.
2. *Land and Tax Map, Sec. 2, Blk. 347,* Nassau County Department of Assessment, Sheet 1 of 1, Revised date: April 18,, 2003, Scale: 1" = 100', map obtained from: http://www.nassaucountyny.gov.
3. 1950 Sanborn Fire Insurance Map.
4. Manhasset Hortonsphere Property Maps Parcel Nos. 24.1, 24.2, and 23 Long Island Lighting Company, Mineola, N.Y.
5. Survey of existing conditions and sample locations conducted by GEI Consultants, Inc. on 12/10 and 12/18/07. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.
6. Survey of additional sample locations conducted by GEI Consultants, Inc. on 3/11/09. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.

0 60 120

SCALE, FEET

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

nationalgrid

GEI Consultants

Project 093000-8-1801

EXISTING CONDITIONS AND SAMPLE LOCATION SUMMARY

August 2011 Figure 2

I:\Project\National Grid\Manhasset\Final-SCR\ Manhasset-Final SCR Figures 08-11.dwg \Aug 11, 2011

SW
A

NE
A'

MS-GP-05A/
MS-MW-05

MS-GP-05

FORMER
HORTONSPHERE

FORMER
PUMP HOUSE

MS-GP-01/
MS-GW-01

MS-GP-02/
MS-GW-02

COMMUNITY
DRIVE

MS-GP-03/
MS-MW-03

ELEVATION (FT NAVD88)

90
80
70
60
50
40
30
20
10

S ND
S ND
S ND
S ND
S ND
S ND
S ND
S ND
S ND
S 0.4
S 0.31
S ND

LEGEND

MS-GP-04/
MS-GW-04

SOIL BORING/ MONITORING WELL IDENTIFICATION

OBSERVED APPARENT GROUNDWATER TABLE BASED UPON BORING INFORMATION

S — ANALYTICAL SOIL SAMPLE INTERVAL

ND — BTEX (mg/kg) IN SOIL SAMPLE

WELL SCREEN INTERVAL

0.6 — BTEX (µg/L) IN GROUNDWATER

S — GEOPROBE® GROUNDWATER GRAB SAMPLE

CONTACT

CONTACT IS APPROXIMATE

GEOLOGY

- FILL
- SAND
- SILTY SAND
- SILT
- CLAY

NOTES:

BTEX	BENZENE, TOLUENE, ETHLYBENZENE, AND XYLENE
mg/kg	MILLIGRAMS/KILOGRAM OR PARTS PER MILLION (ppm)
µg/L	MICROGRAMS PER LITER OR PARTS PER BILLION (ppb)
ND	NOT DETECTED
NAVD	NORTH AMERICAN VERTICAL DATUM

NOTE: SITE TOPOGRAPHY IS BASED ON SURVEYED LOCATIONS.

10 0 5 10 — VERTICAL SCALE IN FEET

60 30 0 30 — HORIZONTAL SCALE IN FEET

NOTE: VERTICAL EXAGGERATION = 6X

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

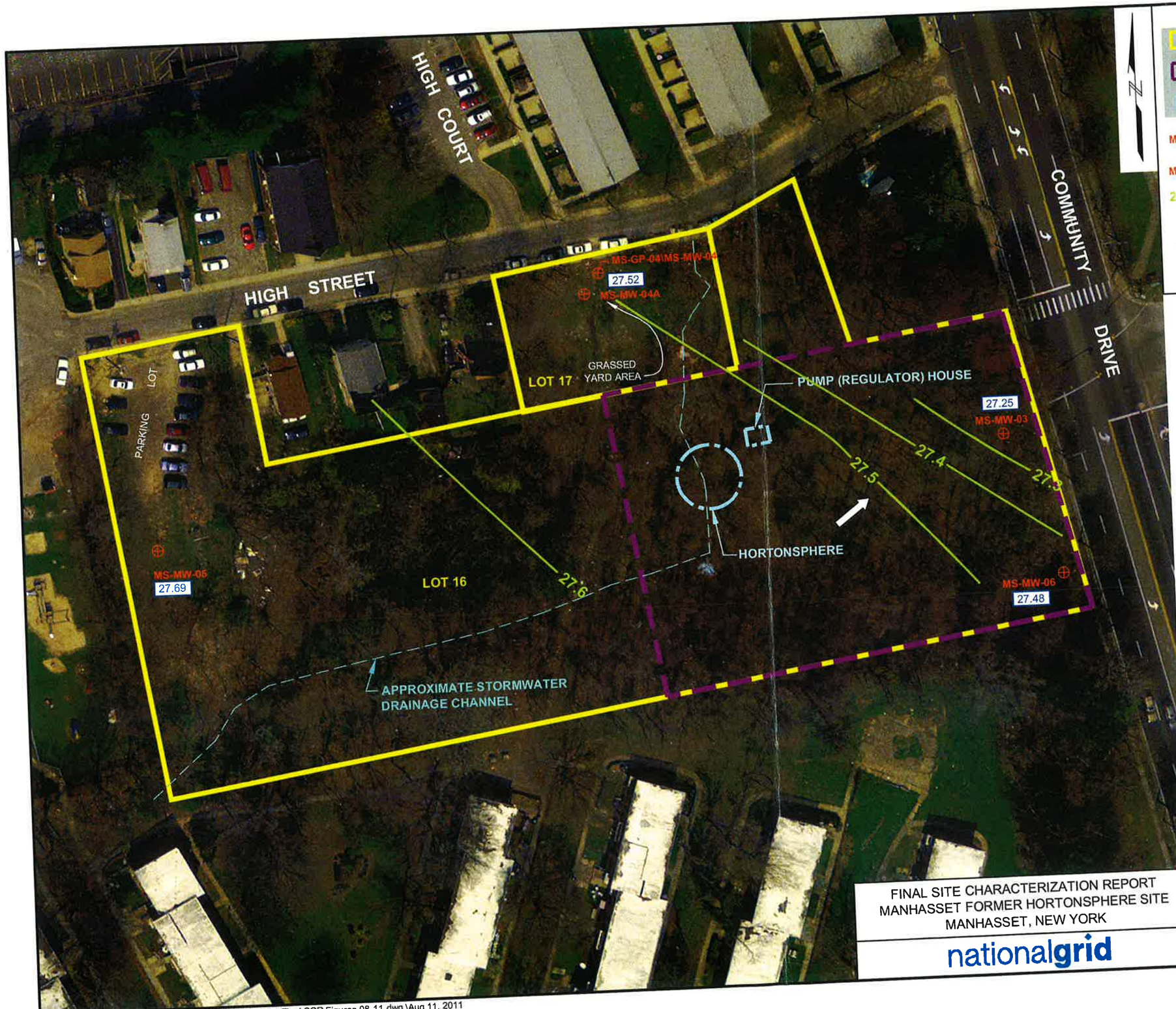
nationalgrid

GEI Consultants

CROSS SECTION A-A'

Project 093000-8-1801 | August 2011 | Figure 5

I:\Project\National Grid\Manhasset\Final-SCR\ Manhasset-Final SCR Figures 08-11.dwg \Aug 11, 2011



LEGEND:

- PROPERTY BOUNDARY (APPROXIMATE)
- FORMER HORTONSPHERE SITE BOUNDARY (APPROXIMATE)
- HISTORIC STRUCTURE LOCATION
- MS-GW-01 — TEMPORARY GROUNDWATER SAMPLING LOCATION
- MS-MW-03 — MONITORING WELL LOCATION
- 27.3 — GROUNDWATER CONTOUR (FEET NAVD)
- 27.25 — GROUNDWATER ELEVATION (FEET NAVD)
- INFERRED GROUNDWATER FLOW DIRECTION
- NAVD — NORTH AMERICAN VERTICAL DATUM

SOURCES:

1. Orthophoto obtained from New York State Interactive Mapping Gateway (http://www1.nysgis.state.ny.us/MainMap.cfm) photo date: 2004, accessed 10/04/07.
2. *Land and Tax Map, Sec. 2, Blk. 347,* Nassau County Department of Assessment, Sheet 1 of 1, Revised date: April 18,, 2003, Scale: 1" = 100', map obtained from: http://www.nassaucountyny.gov.
3. 1950 Sanborn Fire Insurance Map.
4. Manhasset Hortonsphere Property Maps Parcel Nos. 24.1, 24.2, and 23 Long Island Lighting Company, Mineola, N.Y.
5. Survey of existing conditions and sample locations conducted by GEI Consultants, Inc. on 12/10 and 12/18/07. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.
6. Survey of additional sample locations conducted by GEI Consultants, Inc. on 3/11/09. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.

0 60 120

SCALE, FEET

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

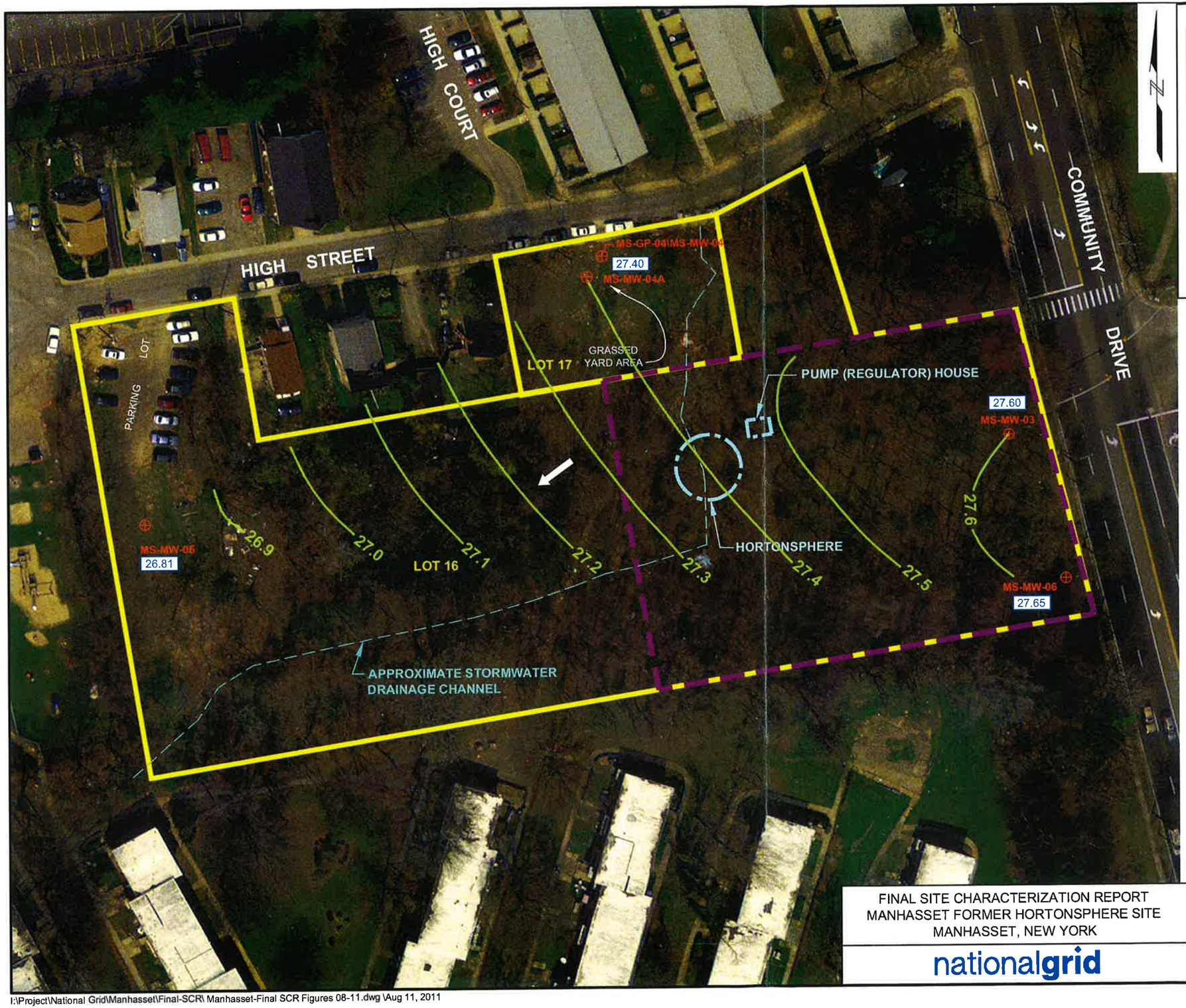
nationalgrid

GEI Consultants

GROUNDWATER CONTOURS (DECEMBER 27 - 28, 2007)

Project 093000-8-1801 | August 2011 | Figure 7

I:\Project\National Grid\Manhasset\Final-SCR\ Manhasset-Final SCR Figures 08-11.dwg \Aug 11, 2011



LEGEND:

- PROPERTY BOUNDARY (APPROXIMATE)
- FORMER HORTONSPHERE SITE BOUNDARY (APPROXIMATE)
- HISTORIC STRUCTURE LOCATION
- MS-GW-01 — TEMPORARY GROUNDWATER SAMPLING LOCATION
- MS-MW-03 — MONITORING WELL LOCATION
- 27.3 — GROUNDWATER CONTOUR (FEET NAVD)
- 27.25 — GROUNDWATER ELEVATION (FEET NAVD)
- INFERRED GROUNDWATER FLOW DIRECTION
- NAVD — NORTH AMERICAN VERTICAL DATUM

SOURCES:

1. Orthophoto obtained from New York State Interactive Mapping Gateway (http://www1.nysgis.state.ny.us/MainMap.cfm) photo date: 2004, accessed 10/04/07.
2. *Land and Tax Map, Sec. 2, Blk. 347,* Nassau County Department of Assessment, Sheet 1 of 1, Revised date: April 18,, 2003, Scale: 1" = 100', map obtained from: http://www.nassaucountyny.gov.
3. 1950 Sanborn Fire Insurance Map.
4. Manhasset Hortonsphere Property Maps Parcel Nos. 24.1, 24.2, and 23 Long Island Lighting Company, Mineola, N.Y.
5. Survey of existing conditions and sample locations conducted by GEI Consultants, Inc. on 12/10 and 12/18/07. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.
6. Survey of additional sample locations conducted by GEI Consultants, Inc. on 3/11/09. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.

0 60 120

SCALE, FEET

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

nationalgrid

GEI Consultants

GROUNDWATER CONTOURS (JANUARY 28, 2008)

Project 093000-8-1801 | August 2011 | Figure 8

I:\Project\National Grid\Manhasset\Final-SCR\ Manhasset-Final SCR Figures 08-11.dwg \Aug 11, 2011

LEGEND:

- PROPERTY BOUNDARY (APPROXIMATE)
- FORMER HORTONSPHERE SITE BOUNDARY (APPROXIMATE)
- HISTORIC STRUCTURE LOCATION
- MS-GW-01 ⊞ TEMPORARY GROUNDWATER SAMPLING LOCATION
- MS-MW-03 ⊕ MONITORING WELL LOCATION
- 27.3 GROUNDWATER CONTOUR (FEET NAVD)
- 27.25 GROUNDWATER ELEVATION (FEET NAVD)
- INFERRED GROUNDWATER FLOW DIRECTION
- NAVD NORTH AMERICAN VERTICAL DATUM

SOURCES:

1. Orthophoto obtained from New York State Interactive Mapping Gateway (http://www1.nysgis.state.ny.us/MainMap.cfm) photo date: 2004, accessed 10/04/07.
2. *Land and Tax Map, Sec. 2, Blk. 347,* Nassau County Department of Assessment, Sheet 1 of 1, Revised date: April 18,, 2003, Scale: 1" = 100', map obtained from: http://www.nassaucountyny.gov.
3. 1950 Sanborn Fire Insurance Map.
4. Manhasset Hortonsphere Property Maps Parcel Nos. 24.1, 24.2, and 23 Long Island Lighting Company, Mineola, N.Y.
5. Survey of existing conditions and sample locations conducted by GEI Consultants, Inc. on 12/10 and 12/18/07. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.
6. Survey of additional sample locations conducted by GEI Consultants, Inc. on 3/11/09. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.

0 60 120

SCALE, FEET

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

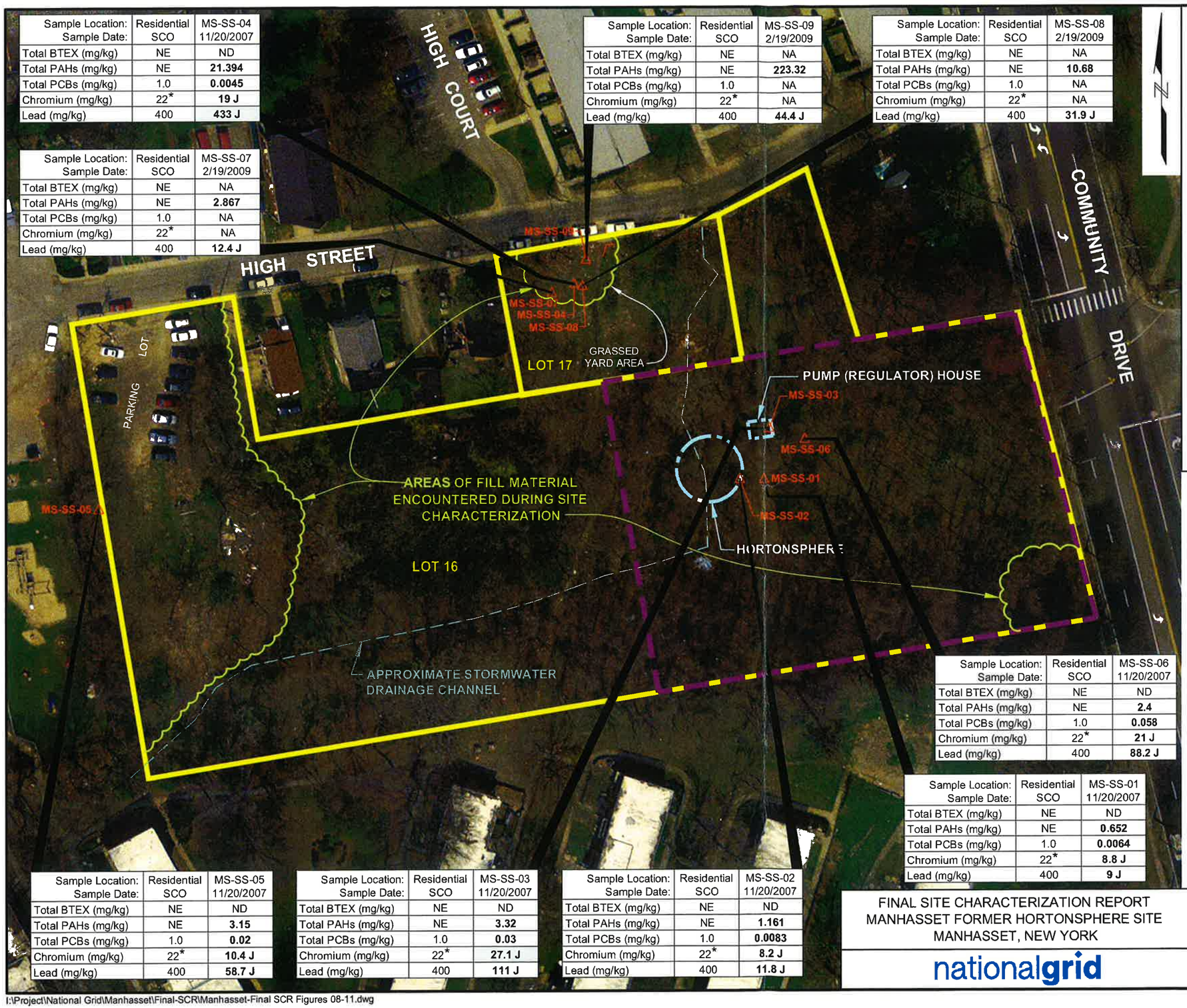
nationalgrid

GEI Consultants

GROUNDWATER CONTOURS (JANUARY 14, 2010)

Project 093000-8-1801 | August 2011 | Figure 9

I:\Project\National Grid\Manhasset\Final-SCR\ Manhasset-Final SCR Figures 08-11.dwg \Aug 11, 2011



Sample Location: / Sample Date:	Residential SCO	MS-SS-04 11/20/2007
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	**21.394**
Total PCBs (mg/kg)	1.0	**0.0045**
Chromium (mg/kg)	22*	**19 J**
Lead (mg/kg)	400	**433 J**

Sample Location: / Sample Date:	Residential SCO	MS-SS-09 2/19/2009
Total BTEX (mg/kg)	NE	NA
Total PAHs (mg/kg)	NE	**223.32**
Total PCBs (mg/kg)	1.0	NA
Chromium (mg/kg)	22*	NA
Lead (mg/kg)	400	**44.4 J**

Sample Location: / Sample Date:	Residential SCO	MS-SS-08 2/19/2009
Total BTEX (mg/kg)	NE	NA
Total PAHs (mg/kg)	NE	**10.68**
Total PCBs (mg/kg)	1.0	NA
Chromium (mg/kg)	22*	NA
Lead (mg/kg)	400	**31.9 J**

Sample Location: / Sample Date:	Residential SCO	MS-SS-07 2/19/2009
Total BTEX (mg/kg)	NE	NA
Total PAHs (mg/kg)	NE	**2.867**
Total PCBs (mg/kg)	1.0	NA
Chromium (mg/kg)	22*	NA
Lead (mg/kg)	400	**12.4 J**

Sample Location: / Sample Date:	Residential SCO	MS-SS-06 11/20/2007
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	**2.4**
Total PCBs (mg/kg)	1.0	**0.058**
Chromium (mg/kg)	22*	**21 J**
Lead (mg/kg)	400	**88.2 J**

Sample Location: / Sample Date:	Residential SCO	MS-SS-01 11/20/2007
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	**0.652**
Total PCBs (mg/kg)	1.0	**0.0064**
Chromium (mg/kg)	22*	**8.8 J**
Lead (mg/kg)	400	**9 J**

Sample Location: / Sample Date:	Residential SCO	MS-SS-05 11/20/2007
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	**3.15**
Total PCBs (mg/kg)	1.0	**0.02**
Chromium (mg/kg)	22*	**10.4 J**
Lead (mg/kg)	400	**58.7 J**

Sample Location: / Sample Date:	Residential SCO	MS-SS-03 11/20/2007
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	**3.32**
Total PCBs (mg/kg)	1.0	**0.03**
Chromium (mg/kg)	22*	**27.1 J**
Lead (mg/kg)	400	**111 J**

Sample Location: / Sample Date:	Residential SCO	MS-SS-02 11/20/2007
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	**1.161**
Total PCBs (mg/kg)	1.0	**0.0083**
Chromium (mg/kg)	22*	**8.2 J**
Lead (mg/kg)	400	**11.8 J**

LEGEND:

- PROPERTY BOUNDARY (APPROXIMATE)
- FORMER HORTONSPHERE SITE BOUNDARY (APPROXIMATE)
- HISTORIC STRUCTURE LOCATION
- MS-SS-01 △ SURFACE SOIL SAMPLE LOCATION

NA	not analyzed
NE	not established
ND	not detected; total concentration is listed as ND because no compounds were detected in the group
J	estimated value
*	there is no established criteria for total Chromium, the Residential SCO for hexavalent chromium is used
BOLD	indicates detected result
BOLD	indicates the result exceeds Residential SCO
mg/kg	milligrams/kilogram or parts per million (ppm)
ft bgs	feet below ground surface
BTEX	benzene, toluene, ethlybenzene, and xylene
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls

NOTE:
Residential SCO – Established in the New York Code of Rules and Regulations, Title 6, Chapter 100, Part 700-705, Subpart 375-6: Remedial Program Soil Cleanup Objectives for Restricted Use Residential

SOURCES:

1. Orthophoto obtained from New York State Interactive Mapping Gateway (http://www1.nysgis.state.ny.us/MainMap.cfm) photo date: 2004, accessed 10/04/07.
2. *Land and Tax Map, Sec. 2, Blk. 347,* Nassau County Department of Assessment, Sheet 1 of 1, Revised date: April 18,, 2003, Scale: 1" = 100', map obtained from: http://www.nassaucountyny.gov.
3. 1950 Sanborn Fire Insurance Map.
4. Manhasset Hortonsphere Property Maps Parcel Nos. 24.1, 24.2, and 23 Long Island Lighting Company, Mineola, N.Y.
5. Survey of existing conditions and sample locations conducted by GEI Consultants, Inc. on 12/10 and 12/18/07. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.
6. Survey of additional sample locations conducted by GEI Consultants, Inc. on 3/11/09. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.

0 60 120

SCALE, FEET

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

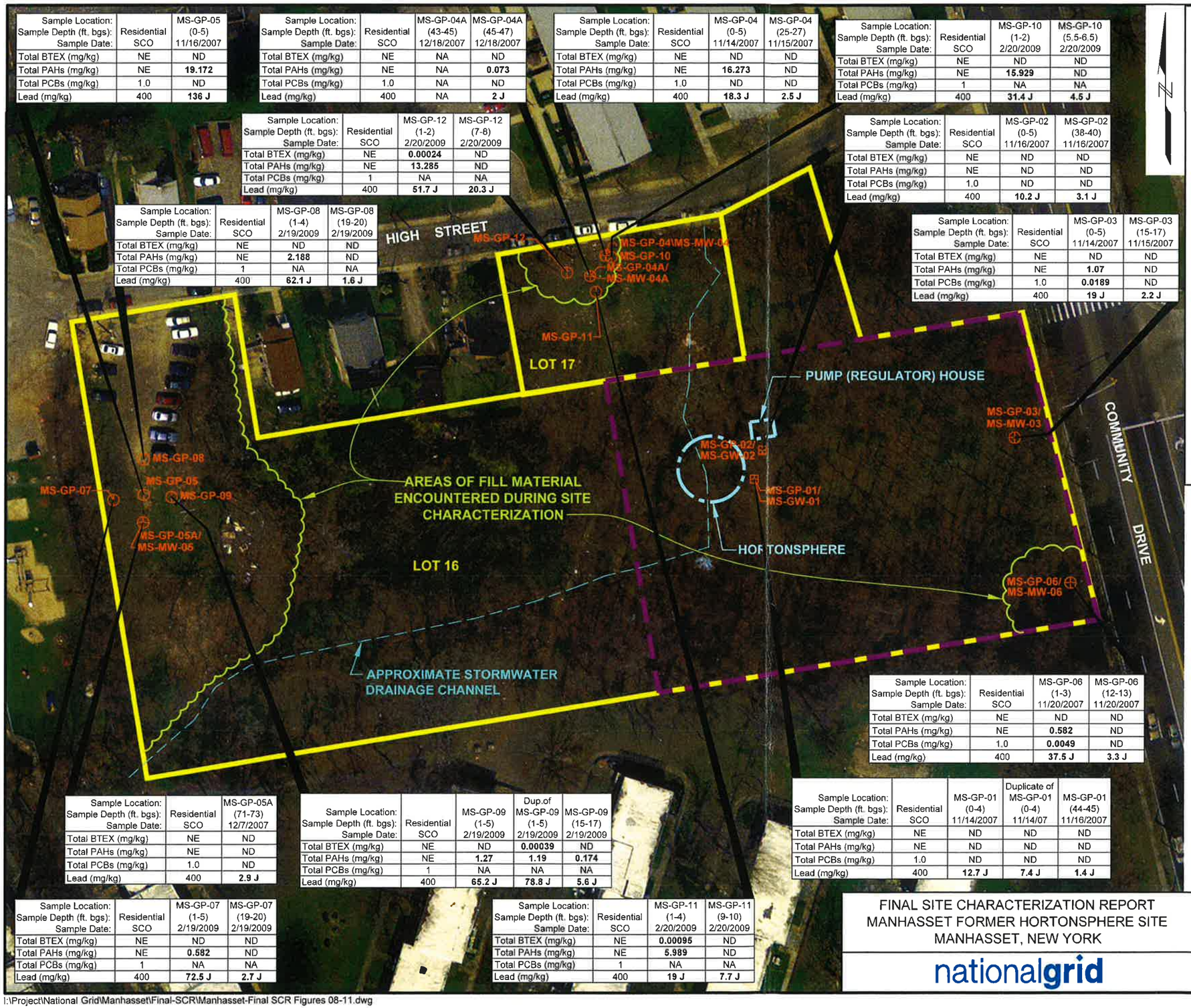
nationalgrid

GEI Consultants

SURFACE SOIL ANALYTICAL SUMMARY (mg/kg)

Project 093000-8-1801 | August 2011 | Figure 10

I:\Project\National Grid\Manhasset\Final-SCR\Manhasset-Final SCR Figures 08-11.dwg



Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-05 (0-5) 11/16/2007
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	**19.172**
Total PCBs (mg/kg)	1.0	ND
Lead (mg/kg)	400	**136 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-04A (43-45) 12/18/2007	MS-GP-04A (45-47) 12/18/2007
Total BTEX (mg/kg)	NE	NA	ND
Total PAHs (mg/kg)	NE	NA	**0.073**
Total PCBs (mg/kg)	1.0	NA	ND
Lead (mg/kg)	400	NA	**2 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-04 (0-5) 11/14/2007	MS-GP-04 (25-27) 11/15/2007
Total BTEX (mg/kg)	NE	ND	ND
Total PAHs (mg/kg)	NE	**16.273**	ND
Total PCBs (mg/kg)	1.0	ND	ND
Lead (mg/kg)	400	**18.3 J**	**2.5 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-10 (1-2) 2/20/2009	MS-GP-10 (5.5-6.5) 2/20/2009
Total BTEX (mg/kg)	NE	ND	ND
Total PAHs (mg/kg)	NE	**15.929**	ND
Total PCBs (mg/kg)	1	NA	NA
Lead (mg/kg)	400	**31.4 J**	**4.5 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-12 (1-2) 2/20/2009	MS-GP-12 (7-8) 2/20/2009
Total BTEX (mg/kg)	NE	**0.00024**	ND
Total PAHs (mg/kg)	NE	**13.285**	ND
Total PCBs (mg/kg)	1	NA	NA
Lead (mg/kg)	400	**51.7 J**	**20.3 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-02 (0-5) 11/16/2007	MS-GP-02 (38-40) 11/16/2007
Total BTEX (mg/kg)	NE	ND	ND
Total PAHs (mg/kg)	NE	ND	ND
Total PCBs (mg/kg)	1.0	ND	ND
Lead (mg/kg)	400	**10.2 J**	**3.1 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-08 (1-4) 2/19/2009	MS-GP-08 (19-20) 2/19/2009
Total BTEX (mg/kg)	NE	ND	ND
Total PAHs (mg/kg)	NE	**2.188**	ND
Total PCBs (mg/kg)	1	NA	NA
Lead (mg/kg)	400	**62.1 J**	**1.6 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-03 (0-5) 11/14/2007	MS-GP-03 (15-17) 11/15/2007
Total BTEX (mg/kg)	NE	ND	ND
Total PAHs (mg/kg)	NE	**1.07**	ND
Total PCBs (mg/kg)	1.0	**0.0189**	ND
Lead (mg/kg)	400	**19 J**	**2.2 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-06 (1-3) 11/20/2007	MS-GP-06 (12-13) 11/20/2007
Total BTEX (mg/kg)	NE	ND	ND
Total PAHs (mg/kg)	NE	**0.582**	ND
Total PCBs (mg/kg)	1.0	**0.0049**	ND
Lead (mg/kg)	400	**37.5 J**	**3.3 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-01 (0-4) 11/14/2007	Duplicate of MS-GP-01 (0-4) 11/14/07	MS-GP-01 (44-45) 11/16/2007
Total BTEX (mg/kg)	NE	ND	ND	ND
Total PAHs (mg/kg)	NE	ND	ND	ND
Total PCBs (mg/kg)	1.0	ND	ND	ND
Lead (mg/kg)	400	**12.7 J**	**7.4 J**	**1.4 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-05A (71-73) 12/7/2007
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	ND
Total PCBs (mg/kg)	1.0	ND
Lead (mg/kg)	400	**2.9 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-09 (1-5) 2/19/2009	Dup.of MS-GP-09 (1-5) 2/19/2009	MS-GP-09 (15-17) 2/19/2009
Total BTEX (mg/kg)	NE	ND	**0.00039**	ND
Total PAHs (mg/kg)	NE	**1.27**	**1.19**	**0.174**
Total PCBs (mg/kg)	1	NA	NA	NA
Lead (mg/kg)	400	**65.2 J**	**78.8 J**	**5.6 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-07 (1-5) 2/19/2009	MS-GP-07 (19-20) 2/19/2009
Total BTEX (mg/kg)	NE	ND	ND
Total PAHs (mg/kg)	NE	**0.582**	ND
Total PCBs (mg/kg)	1	NA	NA
Lead (mg/kg)	400	**72.5 J**	**2.7 J**

Sample Location: / Sample Depth (ft. bgs): / Sample Date:	Residential SCO	MS-GP-11 (1-4) 2/20/2009	MS-GP-11 (9-10) 2/20/2009
Total BTEX (mg/kg)	NE	**0.00095**	ND
Total PAHs (mg/kg)	NE	**5.989**	ND
Total PCBs (mg/kg)	1	NA	NA
Lead (mg/kg)	400	**19 J**	**7.7 J**

LEGEND:

- PROPERTY BOUNDARY (APPROXIMATE)
- FORMER HORTONSPHERE SITE BOUNDARY (APPROXIMATE)
- HISTORIC STRUCTURE LOCATION
- MS-GP-01/ MS-GW-01 — SOIL BORING LOCATION/GEOPROBE® TEMPORARY GROUNDWATER SAMPLING LOCATION
- MS-GP-03/ MS-MW-03 — SOIL BORING LOCATION/ MONITORING WELL LOCATION
- MS-GP-05 — SOIL BORING LOCATION

NE	not established
ND	not detected; total concentration is listed as ND because no compounds were detected in the group
J	estimated value
BOLD	indicates detected result
BOLD	indicates the result exceeds Residential SCO
mg/kg	milligrams/kilogram or parts per million (ppm)
ft bgs	feet below ground surface
BTEX	benzene, toluene, ethlybenzene, and xylene
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls

NOTE:
Residential SCO – Established in the New York Code of Rules and Regulations, Title 6, Chapter 100, Part 700-705, Subpart 375-6: Remedial Program Soil Cleanup Objectives for Restricted Use Residential

SOURCES:
1. Orthophoto obtained from New York State Interactive Mapping Gateway (http://www1.nysgis.state.ny.us/MainMap.cfm) photo date: 2004, accessed 10/04/07.
2. *Land and Tax Map, Sec. 2, Blk. 347,* Nassau County Department of Assessment, Sheet 1 of 1, Revised date: April 18,, 2003, Scale: 1" = 100', map obtained from: http://www.nassaucountyny.gov.
3. 1950 Sanborn Fire Insurance Map.
4. Manhasset Hortonsphere Property Maps Parcel Nos. 24.1, 24.2, and 23 Long Island Lighting Company, Mineola, N.Y.
5. Survey of existing conditions and sample locations conducted by GEI Consultants, Inc. on 12/10 and 12/18/07. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.
6. Survey of additional sample locations conducted by GEI Consultants, Inc. on 3/11/09. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.

0 80 160
SCALE, FEET

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

nationalgrid

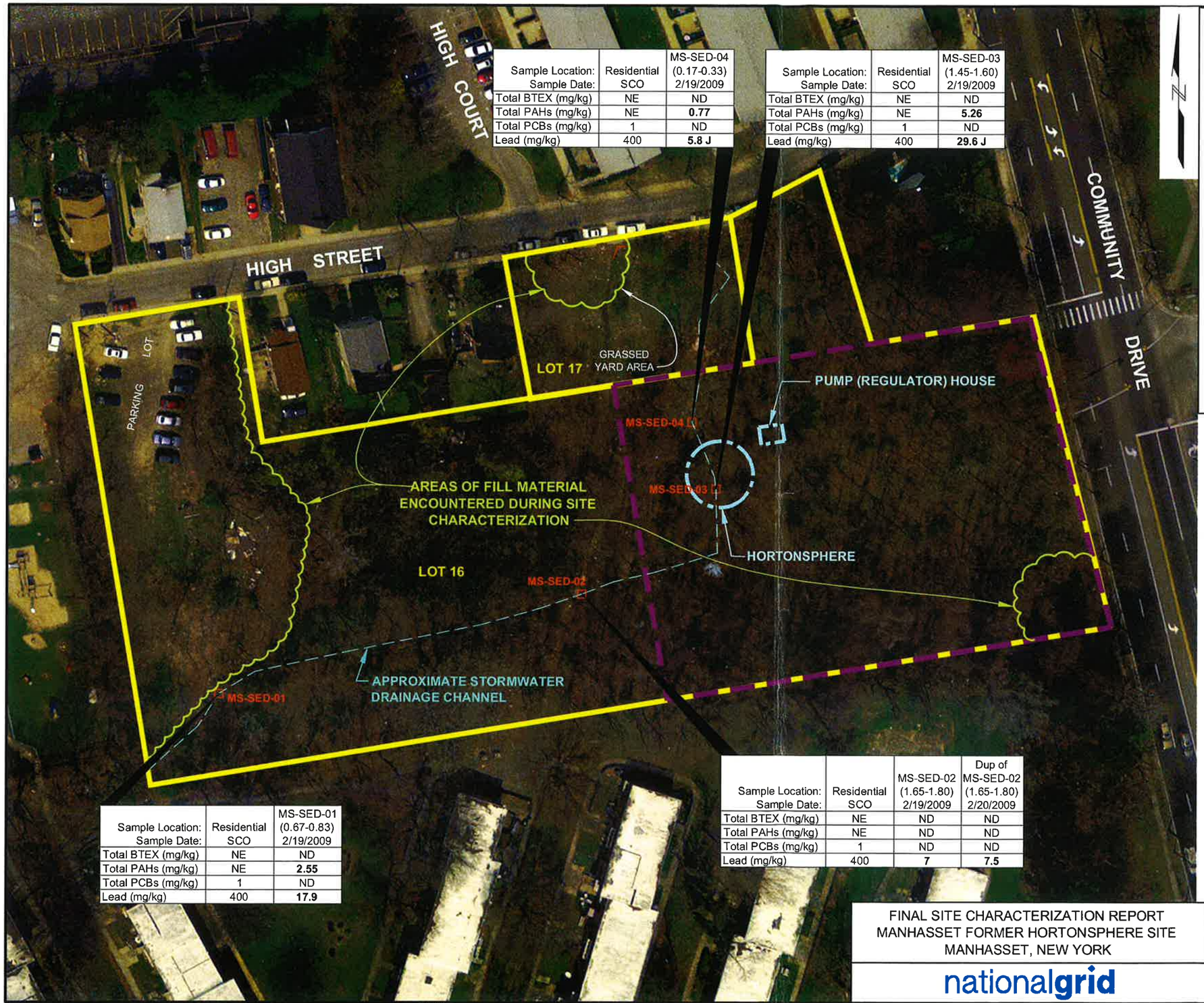
GEI Consultants

Project 093000-8-1801

SUBSURFACE SOIL ANALYTICAL SUMMARY (mg/kg)

August 2011 Figure 11

I:\Project\National Grid\Manhasset\Final-SCR\Manhasset-Final SCR Figures 08-11.dwg



Sample Location: / Sample Date:	Residential SCO	MS-SED-04 (0.17-0.33) 2/19/2009
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	**0.77**
Total PCBs (mg/kg)	1	ND
Lead (mg/kg)	400	**5.8 J**

Sample Location: / Sample Date:	Residential SCO	MS-SED-03 (1.45-1.60) 2/19/2009
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	**5.26**
Total PCBs (mg/kg)	1	ND
Lead (mg/kg)	400	**29.6 J**

Sample Location: / Sample Date:	Residential SCO	MS-SED-01 (0.67-0.83) 2/19/2009
Total BTEX (mg/kg)	NE	ND
Total PAHs (mg/kg)	NE	**2.55**
Total PCBs (mg/kg)	1	ND
Lead (mg/kg)	400	**17.9**

Sample Location: / Sample Date:	Residential SCO	MS-SED-02 (1.65-1.80) 2/19/2009	Dup of MS-SED-02 (1.65-1.80) 2/20/2009
Total BTEX (mg/kg)	NE	ND	ND
Total PAHs (mg/kg)	NE	ND	ND
Total PCBs (mg/kg)	1	ND	ND
Lead (mg/kg)	400	**7**	**7.5**

LEGEND:

	PROPERTY BOUNDARY (APPROXIMATE)
	FORMER HORTONSPHERE SITE BOUNDARY (APPROXIMATE)
	HISTORIC STRUCTURE LOCATION
MS-SED-01	SEDIMENT SAMPLE LOCATION
NE	not established
ND	not detected; total concentration is listed as ND because no compounds were detected in the group
J	estimated value
BOLD	indicates detected result
BOLD	indicates the result exceeds Residential SCO
mg/kg	milligrams/kilogram or parts per million (ppm)
ft bgs	feet below ground surface
BTEX	benzene, toluene, ethlybenzene, and xylene
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls

NOTE:
Residential SCO – Established in the New York Code of Rules and Regulations, Title 6, Chapter 100, Part 700-705, Subpart 375-6: Remedial Program Soil Cleanup Objectives for Restricted Use Residential

SOURCES:
1. Orthophoto obtained from New York State Interactive Mapping Gateway (http://www1.nysgis.state.ny.us/MainMap.cfm) photo date: 2004, accessed 10/04/07.
2. *Land and Tax Map, Sec. 2, Blk. 347,* Nassau County Department of Assessment, Sheet 1 of 1, Revised date: April 18,, 2003, Scale: 1" = 100', map obtained from: http://www.nassaucountyny.gov.
3. 1950 Sanborn Fire Insurance Map.
4. Manhasset Hortonsphere Property Maps Parcel Nos. 24.1, 24.2, and 23 Long Island Lighting Company, Mineola, N.Y.
5. Survey of existing conditions and sample locations conducted by GEI Consultants, Inc. on 12/10 and 12/18/07. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.
6. Survey of additional sample locations conducted by GEI Consultants, Inc. on 3/11/09. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.

0 60 120
SCALE, FEET

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

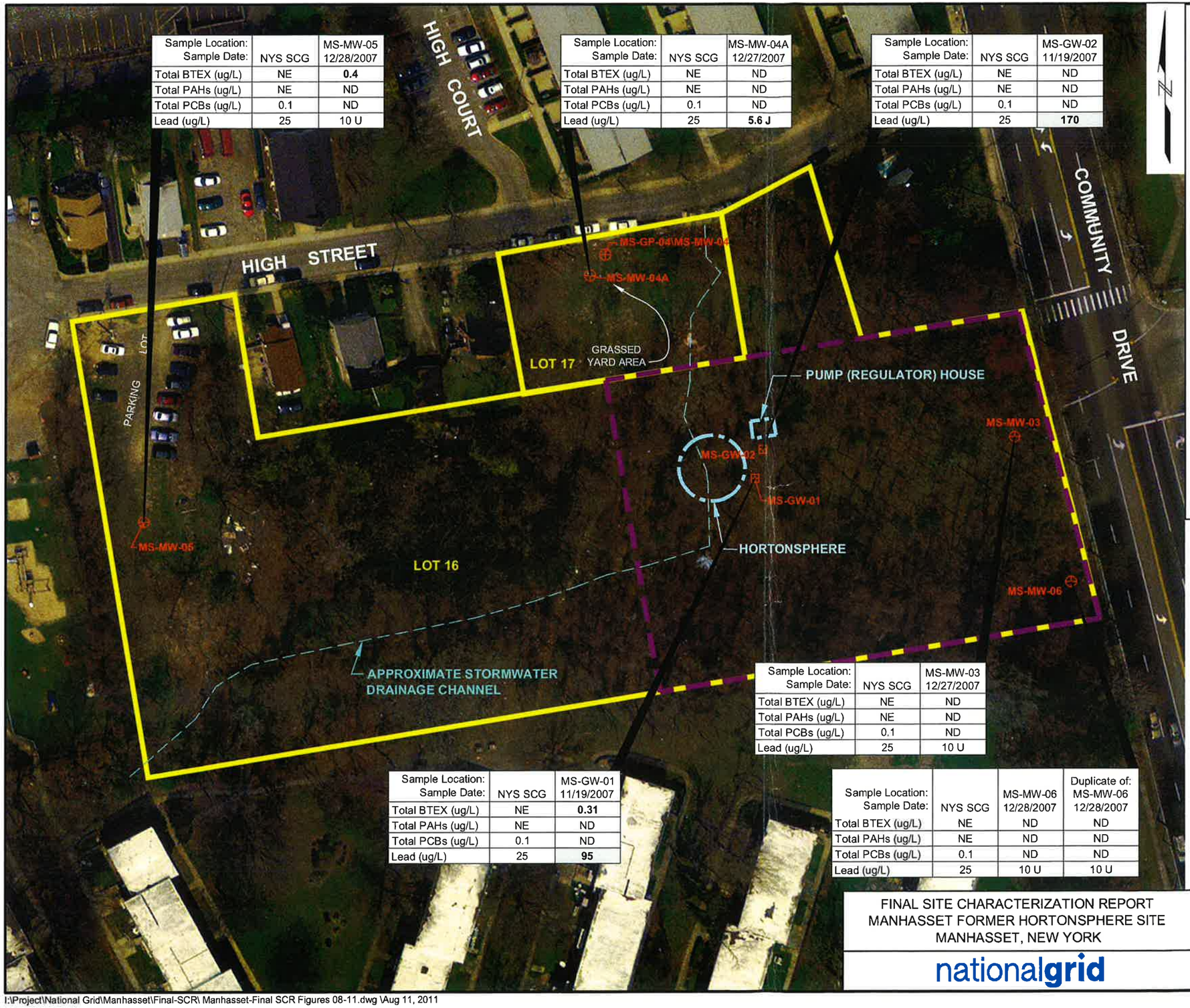
nationalgrid

GEI Consultants

STORMWATER SEDIMENT ANALYTICAL SUMMARY (mg/kg)

Project 093000-8-1801 | August 2011 | Figure 12

I:\Project\National Grid\Manhasset\Final-SCR\ Manhasset-Final SCR Figures 08-11.dwg \Aug 11, 2011



Sample Location: Sample Date:	NYS SCG	MS-MW-05 12/28/2007
Total BTEX (ug/L)	NE	**0.4**
Total PAHs (ug/L)	NE	ND
Total PCBs (ug/L)	0.1	ND
Lead (ug/L)	25	10 U

Sample Location: Sample Date:	NYS SCG	MS-MW-04A 12/27/2007
Total BTEX (ug/L)	NE	ND
Total PAHs (ug/L)	NE	ND
Total PCBs (ug/L)	0.1	ND
Lead (ug/L)	25	**5.6 J**

Sample Location: Sample Date:	NYS SCG	MS-GW-02 11/19/2007
Total BTEX (ug/L)	NE	ND
Total PAHs (ug/L)	NE	ND
Total PCBs (ug/L)	0.1	ND
Lead (ug/L)	25	**170**

Sample Location: Sample Date:	NYS SCG	MS-MW-03 12/27/2007
Total BTEX (ug/L)	NE	ND
Total PAHs (ug/L)	NE	ND
Total PCBs (ug/L)	0.1	ND
Lead (ug/L)	25	10 U

Sample Location: Sample Date:	NYS SCG	MS-GW-01 11/19/2007
Total BTEX (ug/L)	NE	**0.31**
Total PAHs (ug/L)	NE	ND
Total PCBs (ug/L)	0.1	ND
Lead (ug/L)	25	**95**

Sample Location: Sample Date:	NYS SCG	MS-MW-06 12/28/2007	Duplicate of: MS-MW-06 12/28/2007
Total BTEX (ug/L)	NE	ND	ND
Total PAHs (ug/L)	NE	ND	ND
Total PCBs (ug/L)	0.1	ND	ND
Lead (ug/L)	25	10 U	10 U

LEGEND:

- PROPERTY BOUNDARY (APPROXIMATE)
- FORMER HORTONSPHERE SITE BOUNDARY (APPROXIMATE)
- HISTORIC STRUCTURE LOCATION
- MS-GW-01 — TEMPORARY GROUNDWATER SAMPLING LOCATION
- MS-MW-03 — MONITORING WELL LOCATION
- 27.3 — GROUNDWATER CONTOUR (FEET NAVD)
- 27.25 — GROUNDWATER ELEVATION (FEET NAVD)
- INFERRED GROUNDWATER FLOW DIRECTION
- NAVD — NORTH AMERICAN VERTICAL DATUM
- NE — no exceedances of specified NYSDEC standard
- ND — not detected; total concentration is listed as ND because no compounds were detected in the group
- J — estimated value
- U — indicates not detected to the reporting limit for organic analysis and the method detection limit for inorganic analysis
- **BOLD** — indicates detected result
- **BOLD** — indicates that the detected result value exceeds established NYS SCGs
- ug/L — micrograms per liter or parts per billion (ppb)
- BTEX — benzene, toluene, ethlybenzene, and xylene
- PAHs — polycyclic aromatic hydrocarbons
- PCBs — polychlorinated biphenyls

NOTE:

NYS SCG - New York State Department of Environmental Conservation Standards, Criteria, and Guidelines Ambient Water Quality Standards for GA Groundwater

SOURCES:

1. Orthophoto obtained from New York State Interactive Mapping Gateway (http://www1.nysgis.state.ny.us/MainMap.cfm) photo date: 2004, accessed 10/04/07.
2. *Land and Tax Map, Sec. 2, Blk. 347,* Nassau County Department of Assessment, Sheet 1 of 1, Revised date: April 18,, 2003, Scale: 1" = 100', map obtained from: http://www.nassaucountyny.gov.
3. 1950 Sanborn Fire Insurance Map.
4. Manhasset Hortonsphere Property Maps Parcel Nos. 24.1, 24.2, and 23 Long Island Lighting Company, Mineola, N.Y.
5. Survey of existing conditions and sample locations conducted by GEI Consultants, Inc. on 12/10 and 12/18/07. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.
6. Survey of additional sample locations conducted by GEI Consultants, Inc. on 3/11/09. Survey by New York state licensed land surveyor number 050146. Horizontal datum: New York State Plane coordinate system (Long Island Zone, North American Datum (NAD)83). Vertical datum: North American Vertical Datum (NAVD) 88.

0 60 120

SCALE, FEET

FINAL SITE CHARACTERIZATION REPORT
MANHASSET FORMER HORTONSPHERE SITE
MANHASSET, NEW YORK

nationalgrid

GEI Consultants

DISSOLVED PHASE GROUNDWATER ANALYTICAL SUMMARY (ug/L)

Project 093000-8-1801 | August 2011 | Figure 13

I:\Project\National Grid\Manhasset\Final-SCR\ Manhasset-Final SCR Figures 08-11.dwg \Aug 11, 2011

Appendix A

Work Plan Approval Letter and Change Order

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region One
Stony Brook University
50 Circle Road, Stony Brook, New York 11790 - 3409
Phone: (631) 444-0240 • **FAX:** (631) 444-0248
Website: www.dec.state.ny.us

Alexander B. Grannis
Commissioner

October 5, 2007

Thomas Campbell
Manager - MGP Programs, L.I.
KeySpan Corporation
175 East Old Country Road
Hicksville, NY 11801

Re: Draft Site Characterization Work Plan
Manhasset Hortonsphere Site
43 High Street
Manhasset, New York

Dear Mr. Campbell:

The New York State Department of Environmental Conservation (the Department), the New York State Department of Health (NYSDOH) and the Suffolk County Department of Health Services (SCDHS) have reviewed KeySpan Corporation's (KeySpan) Draft Site Characterization Work Plan for the Port Jefferson Hortonsphere site. The plan was developed by KeySpan's Consultant, GEI. Based on the review, the Department offers the following comments:

General Comments:

1. GroundWater Flow Direction: The proposed site characterization work plan includes the installation of five (5) temporary groundwater monitoring points, MS-GW-01 through MS-GW-04. Following installation, the points are to be surveyed for location and elevation. It is suggested that a synoptic round of water level measurements be collected from the monitoring points and the direction of the groundwater flow determined. Section 4.2 of the plan states the anticipated direction of groundwater flow is to the east.

2. TAL Metals: The metals analysis that is proposed for the soil samples collected as part of this investigation is the Target Analyte List (TAL) Metals by EPA 6000/7000 series. To be consistent, it is suggested that TAL metals be included as part of the parameter list for the ground water samples that are to be collected as part of the investigation, not eight (8) RCRA metals that is currently proposed.

3. Sulfur Analysis: The manufactured gas that was stored in the Manhasset Hortonsphere was most likely processed natural gas that was tasteless and odorless. Before this gas was distributed to end-users, it was often odorized by adding small amounts of odorants, such as dimethyl sulfide and other sulfur compounds, to assist in leak detection. Thus, it is suggested that sulfur be included in the analysis of samples collected as part of this investigation.

4. Hortonsphere filling/distribution Process information: To ensure we have properly investigated the former Manhasset Hortonsphere site, it is recommended that a detailed discussion of the technology and operational information that was used in the storage and distribution of the gas be provided. Information should include, but not limited to; storage volume, storage tank maintenance requirement and supply network. In addition, details regarding the piping distribution system, such as the location of condensate traps, should be provided.

5. Soil Vapor Sampling: The proposed work plan includes the collection of a total of four temporary soil vapor sampling points. It is suggested that a fifth soil vapor sampling point, located along the southern portion of the site, be included. In addition, Please revise the text to include that the vapor samples are to be collected in accordance to New York State Department of Health's "*Guidance for Evaluating Soil Vapor Intrusion in the State of New York*".

Specific Comments:

1. MS-SS-06: Section 5.3.3 indicates that a minimum of six surface soil samples and Table 2 discusses the rationale and sample description of MS-SS-06. Only five proposed samples location are depicted on Figure 2. Please revise Figure 2 to include the proposed location of MS-SS-06.

2. MS-GP-02: MS-GP-02 is incorrectly labeled on Figure 2 as MS-GP-03. Please revise Figure.

3. Soil Boring Investigation: Please clarify in Section 5.3.1 that if impacts are observed 10 feet below the water table, the boring will be advanced to approximately five feet beyond observed visual impacts to a maximum depth of 40 feet below the water table.

4. Soil Vapor Sampling: The proposed depth of the soil vapor samples that are to be collected as part of this plan is approximately two feet below grade. In accordance to New York State Department of Health's Guidance for Evaluating Soil Vapor Intrusion in the State of New York, soil vapor samples collected at depths shallower than 5 feet below grade may be prone to negative bias due to infiltration of outdoor air. The Department is suggesting that the soil vapor probes be advance to a depth of five (5) feet below grade to ensure a representative vapor sample is obtained . In Addition, the work plan should clarify the volume of summa canisters and the reporting limits for the laboratory results.

5. Figure 3: The Nearby Land Use Map, Figure 3, should identify the surrounding buildings that are depicted on the map, including the nearby day care facility.

Please call me at (631)-444-0242 if you have any questions.

Sincerely,

John C. Sheehan
Engineering Geologist I

ec: W. Parish, NYSDEC
C. Vasudevan, NYSDEC
G. Bobersky, NYSDEC
R. Weitzman, NCDH
R. Ockerby, NYSDOH
G. Iadarola, GEI

ec: W. Parish, NYSDEC
C. Vasudevan, NYSDEC
G. Bobersky, NYSDEC
R. Weitzman, NCDH
R. Ockerby, NYSDOH
T. Leissing, KeySpan
G. Iadarola, GEI
L. Willey, GEI

Sincerely,

John C. Sheehan
Project Manager

ec: W. Parish, NYSDEC
C. Vasudevan, NYSDEC
G. Bobersky, NYSDEC
R. Weitzman, NCDH
R. Ockerby, NYSDOH
T. Leissing, National Grid
J. Zak, GEI
L. Willey, GEI

1. Temporary Groundwater Monitoring Well MS-MW-05: The SC Summary Package indicates in Section 3.4, *Groundwater*, that groundwater samples were collected from the four site monitoring wells. Please include monitoring well MS-MW-05 in the list of four monitoring wells; monitoring well MS-MW-03 is listed twice.

2. Conclusions: The SC summary package indicates in Section 4.0, *Conclusions*, that "the lack of VOCs in soil and groundwater samples indicates that there is no on-site source for the VOCs in soil vapor and there are no occupied buildings on the site, and therefore no exposure pathway from soil vapor". The lack of contaminants in soil and groundwater samples does not definitely exclude the possibility of an on-site source for the VOCs in soil vapor. The Department is requesting that the conclusion be revised to potentially state "there is no apparent on-site source for the VOCs detected in the soil vapor." While there may not be a VOC source located on-site and since there are no buildings on the property, the potential for exposure via soil vapor intrusion on-site does not exist. However, construction, utility and other workers can be exposed to soil vapor if they were to disturb the sub surface soils. The final bullet item should be revised to reflect this potential exposure pathway.

3. Table 5, Soil Vapor and Ambient Air Analytical Results Summary: The SC summary package presents in Table 5, *Soil Vapor and Ambient Air Analytical Results Summary*, the results of the soil vapor samples collected as part of the SC. The Department is requesting that the table be revised in order to assist in evaluating the data collected. To help evaluate the data, please amend the table by moving the column presenting the Outdoor Air (MS-OA-01) results from 2/24/2009 adjacent to the correlating soil vapor samples collected on that same day (2/24/2009).

The objective of the SC was to implement all of the necessary tasks to evaluate soils, groundwater and soil vapor at the site to determine if the operation of the former Hortonsphere had impacted the environment. With the submittal and subsequent approval of the draft Final SC report, the Department will be satisfied that the objective of the SC was achieved and thus the characterization of the Manhasset Hortonsphere site will have concluded and we can proceed to the next element of the project.

Pursuant to Paragraph II.E of the above referenced Order, and 6 NYCRR 375-1.6(d)(3), please notify the Department within fifteen (15) days whether National Grid elects to modify the draft SC report consistent with all the comments noted above or whether National Grid elects to invoke dispute resolution. If National Grid elects to modify the draft SC Report, please provide a revised submittal addressing all of the above comments no later than thirty (30) days after such election.

Should you have questions or would like to discuss the above comments, please contact me at (631)-444-0247 or via email at jcsheeha@gw.dec.state.ny.us. Thank you for your cooperation regarding this matter.

Sincerely,

John C. Sheehan
Project Manager

ec: W. Parish, NYSDEC
C. Vasudevan, NYSDEC
G. Bobersky, NYSDEC
R. Ockerby, NYSDOH
B. Weitzman, NCHD
T. Leissing, National Grid
J. Zak, GEI
L. Willey, GEI

Appendix B

Representative Site Photographs

GEI Consultants, Inc.

PHOTOGRAPHIC RECORD

Project: Manhasset Hortonsphere
Site Characterization
Location:: High Street, Manhasset, NY

Photographer: K. Barber
Date: 10/25/07
Photo No.: 1
Direction: NE

Comments:
Photograph of the drainage channel.

Photographer: G. Iadarola
Date: 5/23/07
Photo No.: 2
Direction: S

Comments:
Photograph of the entrance to site on High Street, former Hortonsphere location in the distance.

GEI Consultants, Inc.

PHOTOGRAPHIC RECORD

Project: Manhasset Hortonsphere
Site Characterization
Location:: High Street, Manhasset, NY

Photographer: G. Iadarola
Date: 5/23/07
Photo No.: 3
Direction: S

Comments:
Photograph of the entrance to site on the western end of High Street.

Photographer: G. Iadarola
Date: 5/23/07
Photo No.: 4
Direction: E

Comments:
Photograph of the western wooded area of the site.

GEI Consultants, Inc.

PHOTOGRAPHIC RECORD

Project: Manhasset Hortonsphere
Site Characterization
Location:: High Street, Manhasset, NY

Photographer: G. Iadarola
Date: 5/23/07
Photo No.: 5
Direction: W

Comments:
Photograph of the adjacent playground.

Photographer: G. Iadarola
Date: 5/23/07
Photo No.: 6
Direction: N

Comments:
Photograph of the western portion of the site and High Street.

Appendix C

Historical Documents

EDR® Environmental
Data Resources Inc

The EDR Aerial Photo Decade Package

Manhasset Hortonshpere Site
43 High Street
Manhasset, NY 11030

Inquiry Number: 1898554.5

April 10, 2007

The Standard in Environmental Risk Information

440 Wheelers Farms Road
Milford, Connecticut 06461

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

EDR Aerial Photo Decade Package

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDRs professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

When delivered electronically by EDR, the aerial photo images included with this report are for ONE TIME USE ONLY. Further reproduction of these aerial photo images is prohibited without permission from EDR. For more information contact your EDR Account Executive.

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

Date EDR Searched Historical Sources:

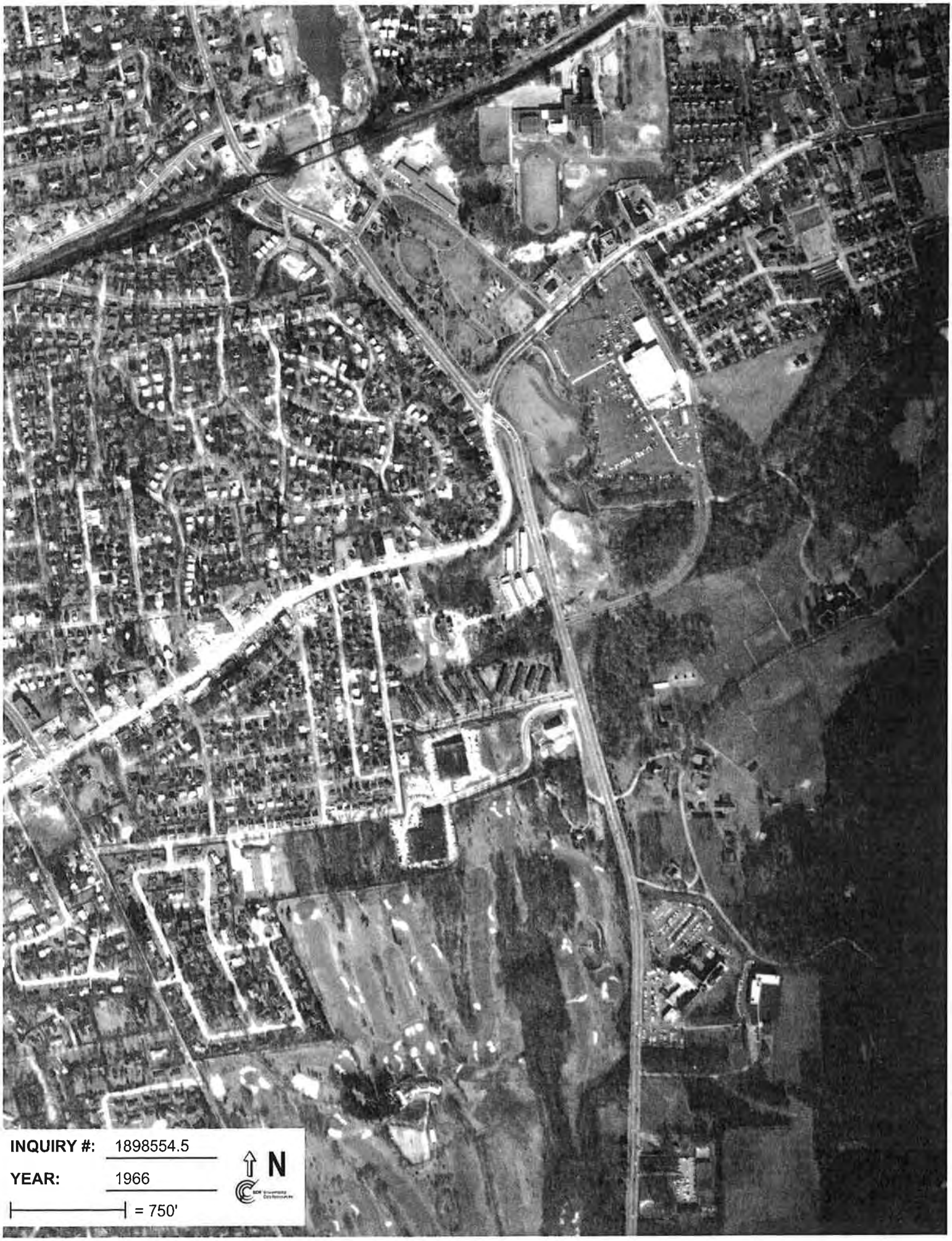
Aerial Photography April 10, 2007

Target Property:

43 High Street
Manhasset, NY 11030

Year	*Scale*	*Details*	*Source*
1954	Aerial Photograph. Scale: 1"=750'	Panel #: 2440073-G6/Flight Date: February 19, 1954	EDR
1966	Aerial Photograph. Scale: 1"=750'	Panel #: 2440073-G6/Flight Date: February 23, 1966	EDR
1976	Aerial Photograph. Scale: 1"=750'	Panel #: 2440073-G6/Flight Date: March 29, 1976	EDR
1980	Aerial Photograph. Scale: 1"=750'	Panel #: 2440073-G6/Flight Date: April 06, 1980	EDR
1994	Aerial Photograph. Scale: 1"=833'	Panel #: 2440073-G6/Flight Date: April 04, 1994	EDR


INQUIRY #: 1898554.5
YEAR: 1954
= 750'
N


INQUIRY #: 1898554.5
YEAR: 1966
= 750'
N


INQUIRY #: 1898554.5
YEAR: 1976
= 750'
N


INQUIRY #: 1898554.5
YEAR: 1980
= 750'
N


INQUIRY #: 1898554.5
YEAR: 1994
= 833'
N

EDR® Environmental
Data Resources Inc

EDR Historical Topographic Map Report

Manhasset Hortonshpere Site
43 High Street
Manhasset, NY 11030

Inquiry Number: 1898554.4

April 10, 2007

The Standard in Environmental Risk Management Information

440 Wheelers Farms Rd
Milford, Connecticut 06461

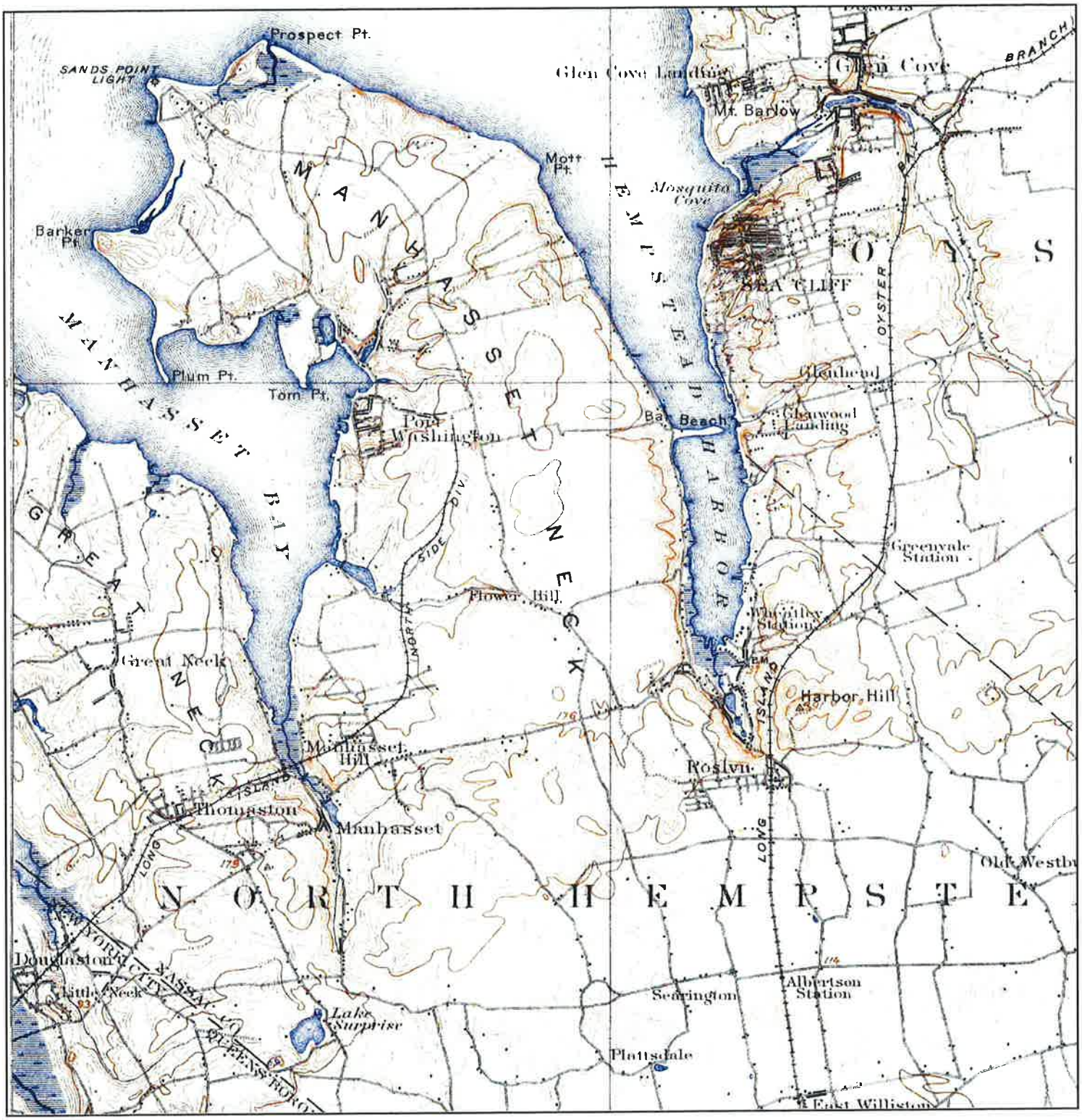
Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

Historical Topographic Map

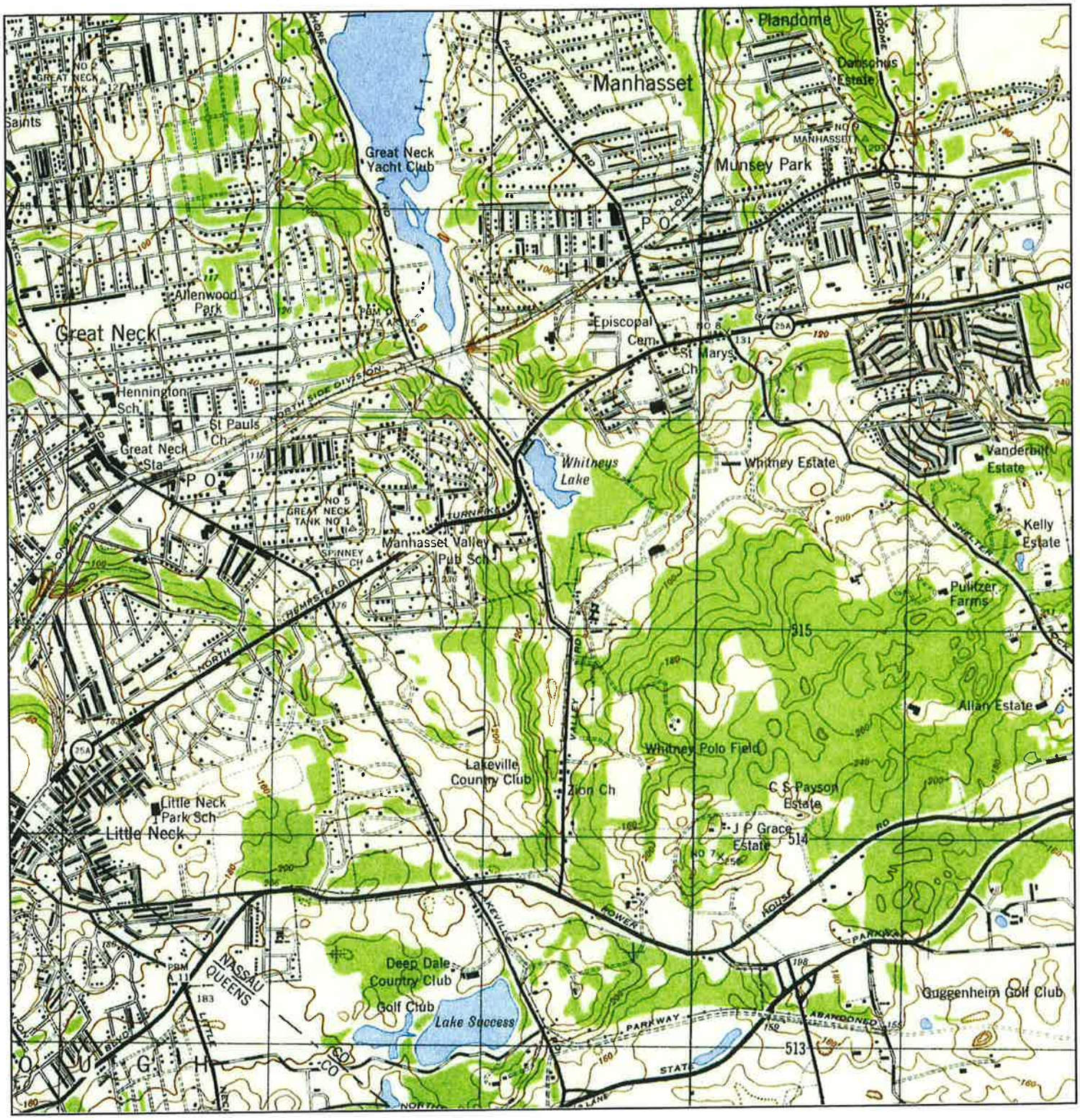
N	TARGET QUAD NAME: OYSTER BAY MAP YEAR: 1900 SERIES: 15 SCALE: 1:62500	SITE NAME: Manhasset Hortonshpere Site ADDRESS: 43 High Street Manhasset, NY 11030 LAT/LONG: 40.7841 / 73.706	CLIENT: GEI Consultants Inc. CONTACT: Lynn Willey INQUIRY#: 1898554.4 RESEARCH DATE: 04/10/2007

Historical Topographic Map



N	TARGET QUAD NAME: CAMP MILLS MAP YEAR: 1918 SERIES: 15 SCALE: 1:62500	SITE NAME: Manhasset Hortonshpere Site ADDRESS: 43 High Street Manhasset, NY 11030 LAT/LONG: 40.7841 / 73.706	CLIENT: GEI Consultants Inc. CONTACT: Lynn Willey INQUIRY#: 1898554.4 RESEARCH DATE: 04/10/2007

Historical Topographic Map

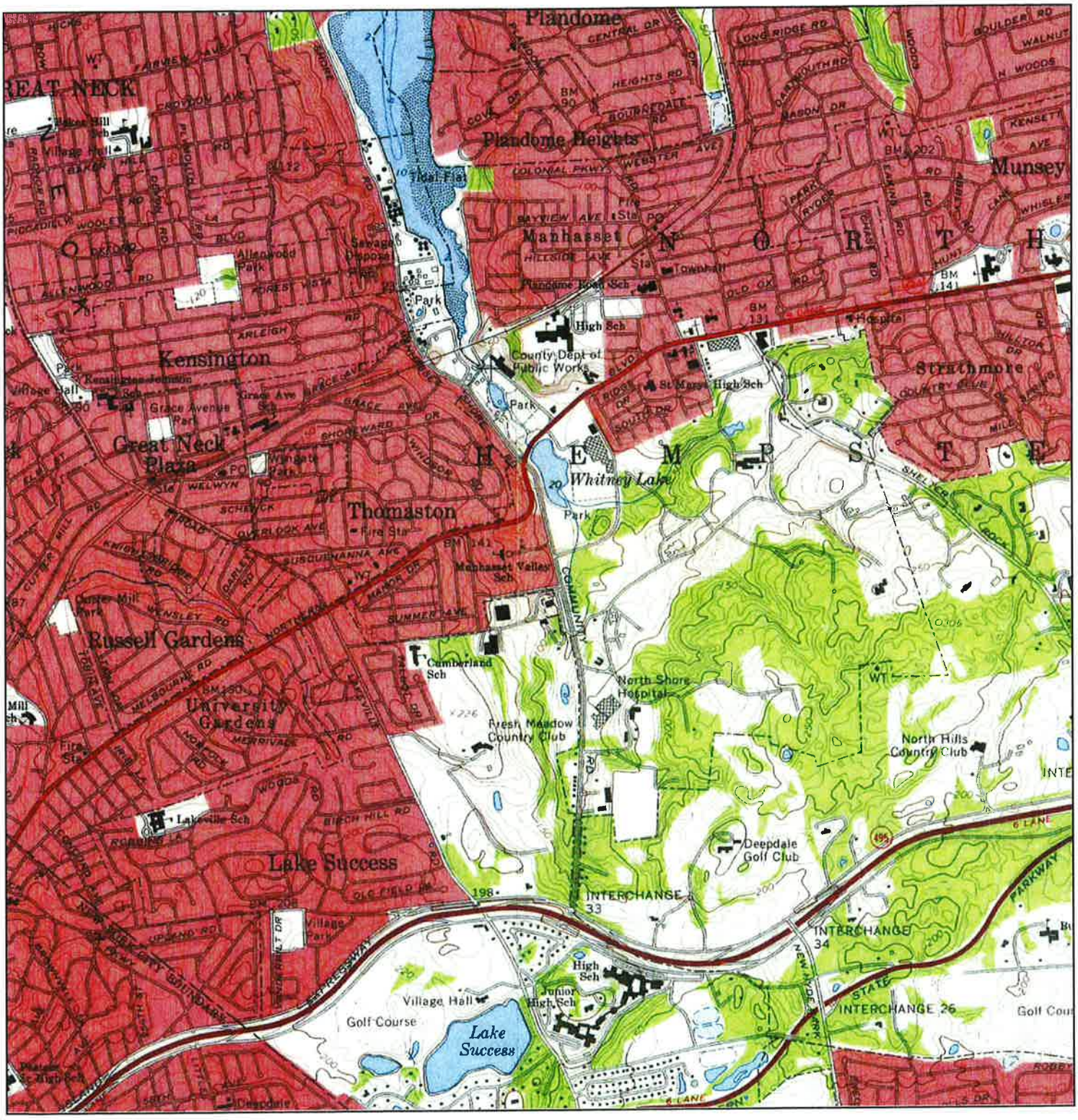


N	TARGET QUAD NAME: SEA CLIFF MAP YEAR: 1947 SERIES: 7.5 SCALE: 1:25000	SITE NAME: Manhasset Hortonshpere Site ADDRESS: 43 High Street Manhasset, NY 11030 LAT/LONG: 40.7841 / 73.706	CLIENT: GEI Consultants Inc. CONTACT: Lynn Willey INQUIRY#: 1898554.4 RESEARCH DATE: 04/10/2007

Historical Topographic Map

N	TARGET QUAD NAME: SEA CLIFF MAP YEAR: 1954 SERIES: 7.5 SCALE: 1:24000	SITE NAME: Manhasset Hortonshpere Site ADDRESS: 43 High Street Manhasset, NY 11030 LAT/LONG: 40.7841 / 73.706	CLIENT: GEI Consultants Inc. CONTACT: Lynn Willey INQUIRY#: 1898554.4 RESEARCH DATE: 04/10/2007

Historical Topographic Map



N	TARGET QUAD NAME: SEA CLIFF MAP YEAR: 1968 SERIES: 7.5 SCALE: 1:24000	SITE NAME: Manhasset Hortonshpere Site ADDRESS: 43 High Street Manhasset, NY 11030 LAT/LONG: 40.7841 / 73.706	CLIENT: GEI Consultants Inc. CONTACT: Lynn Willey INQUIRY#: 1898554.4 RESEARCH DATE: 04/10/2007

Historical Topographic Map

N	TARGET QUAD NAME: SEA CLIFF MAP YEAR: 1979 PHOTOREVISED FROM:1968 SERIES: 7.5 SCALE: 1:24000	SITE NAME: Manhasset Hortonshpere Site ADDRESS: 43 High Street Manhasset, NY 11030 LAT/LONG: 40.7841 / 73.706	CLIENT: GEI Consultants Inc. CONTACT: Lynn Willey INQUIRY#: 1898554.4 RESEARCH DATE: 04/10/2007

gas into the holder when the pressure on the transmission line exceeds 14 pounds and feeds back into the line when the pressure in this drops below 10 pounds. A control switch in series stops the compressor when the holder pressure reaches 60 pounds. By means of long distance gages the operation of this automatic station can be observed by the engineer in the main plant compressor room 2 miles away.

Spherical High Pressure Gas Holders. Spherical steel tanks for the storage of gas under high pressure were introduced by the Chicago Bridge and Iron Works. They were named **Hortonspheres** after George T. Horton, president of that firm. In a paper [51] describing them, Horton has shown that it is necessary in a cylindrical tank with hemispherical ends to make the walls of the cylindrical section twice as thick as those of the hemispherical ends in order to withstand the same pressure, and that hence the weight, W, of steel for a given storage capacity, S, is smallest when the cylindrical section is of zero length, that is, when the hemispherical ends meet forming a sphere. While it is an admitted fact that the cost of construction outside of the materials is somewhat greater for the spherical form than the cylindrical form, experience shows that in spherical tanks this increase in construction costs is considerably less than the saving in steel.

An interesting relationship is that if we assume a joint efficiency of 78.5 per cent and a working stress of 13,750 pounds per square inch for the steel, which allows a factor of safety of 4, the weight, W, in pounds of the steel in the sphere, without including the weight of the joints and supports, **is equal to the storage capacity,** S, in cubic feet.

$$W = S$$

Further, the storage capacity of a given sphere varies directly with the absolute pressure, and the thickness of the walls necessary to withstand the pressure also varies directly with the absolute pressure. Hence in a given size of sphere the weight of steel increases directly with storage capacity. Again, if the pressure is kept constant, the storage capacity or volume varies with the *cube* of the radius. Now the stress, and hence the thickness of the steel to withstand a given pressure, varies *directly* with the radius, and the area to be covered with steel varies with the *square* of the radius. Hence the weight of steel to withstand a given pressure in spheres of different sizes increases with the cube of the radius or of the diameter, just the same as does the volume or storage capacity at constant pressure. Therefore, if we disregard the weight of steel in the joints and supports, the amount of **steel necessary for a given storage capacity** in spherical

high pressure tanks **is independent of the number and diameter of the spheres.** To illustrate, if we wish to store 500,000 cubic feet of gas, we might do it at 30 pounds pressure in one sphere 78 feet in diameter, in two spheres 62 feet in diameter, or in three spheres 54 feet in diameter, the volume in each of these cases being 250,000 cubic feet. The thickness of the steel necessary to withstand the 30 pound pressure would be respectively 0.64, 0.51, and 0.44 inch. We might also store 500,000 cubic feet of gas under 45 pounds pressure in one sphere 69 feet in diameter, in five spheres 40 feet in diameter, or in six spheres 37 feet in diameter. Each of these combinations gives a volume of 167,000 cubic feet. The thickness of the steel necessary in these cases to withstand the 45 pound pressure is respectively 0.85, 0.49 and 0.46 inch.

In **considering the construction,** 78 and 69 foot spheres with steel 0.64 and 0.85 inch thick would require butt strap joints, while the other spheres with steel from 0.44 to 0.51 inch could have lap joints. It will be found then that the weight of steel for the 500,000 cubic foot storage capacity would be about 45 per cent greater than the theoretical 500,000 pounds for the spheres which require butt strap joints and about 35 per cent greater for those with lap joints. Horton finds the maximum economy is obtained with steel of $\frac{7}{16}$ to $\frac{9}{16}$ inch in thickness. With this material the cost for a given storage in various sizes and numbers of spheres does not vary more than 10 per cent. This permits a great **flexibility in the erection of these holders,** allowing them to be built in sizes and numbers that best suit the conditions of the available sites and at different times to suit the need of storage capacity. These holders are also fabricated with butt welded joints which reduces the amount of steel required to approximately the theoretical figure above mentioned.[52] For a more detailed discussion of design problems in connection with these holders reference should be made to Horton's paper [51] and to the article by Milbourne.[53] Figure 27 illustrates a Hortonsphere erected for the Long Island Lighting Co. at Farmingdale, New York. It is 57 feet 6 inches in diameter and is designed to store 400,000 cubic feet of gas at 60 pounds gage pressure.

These holders also have the **advantage of requiring only moderate foundations.** On account of their shape and the fact that gas pressure within tends to keep them spherical, slight settling of the foundations is not serious. Since there are no moving parts and no liquid seals, they require practically no attention, and their maintenance is small. These advantages, together with the fact that a sphere painted with

FIG. 27. Hortonsphere High Pressure Gas Holder, 57.5 feet in Diameter. (Courtesy of Chicago Bridge & Iron Works, Chicago, Ill.)

aluminum or a suitable colored paint may be **easily made to harmonize with the landscape,** make the Hortonsphere especially adapted to use for outlying holders in residential districts. Figure 28 shows how well one of these holders, which is 40 feet in diameter and stores 135,000 cubic feet of gas at 60 pounds pressure, blends with the surroundings.

Purging of High Pressure Holders. In the purging of high pressure holders there are no moving parts and no sealing liquids to complicate matters. The purging is therefore only a matter of replacing the gas content of a closed container. Figure 29 shows the principal **connections to be made for purging** horizontal cylindrical and spherical high pressure holders. The connections for a vertical cylindrical holder are similar to those for a spherical holder. In addition test cocks should be provided around the spherical or vertical cylindrical holder about one-third of its vertical height from the top, and at points on the top of the horizontal holder at maximum distances from the standard vent or vents. In the removal of a holder from service

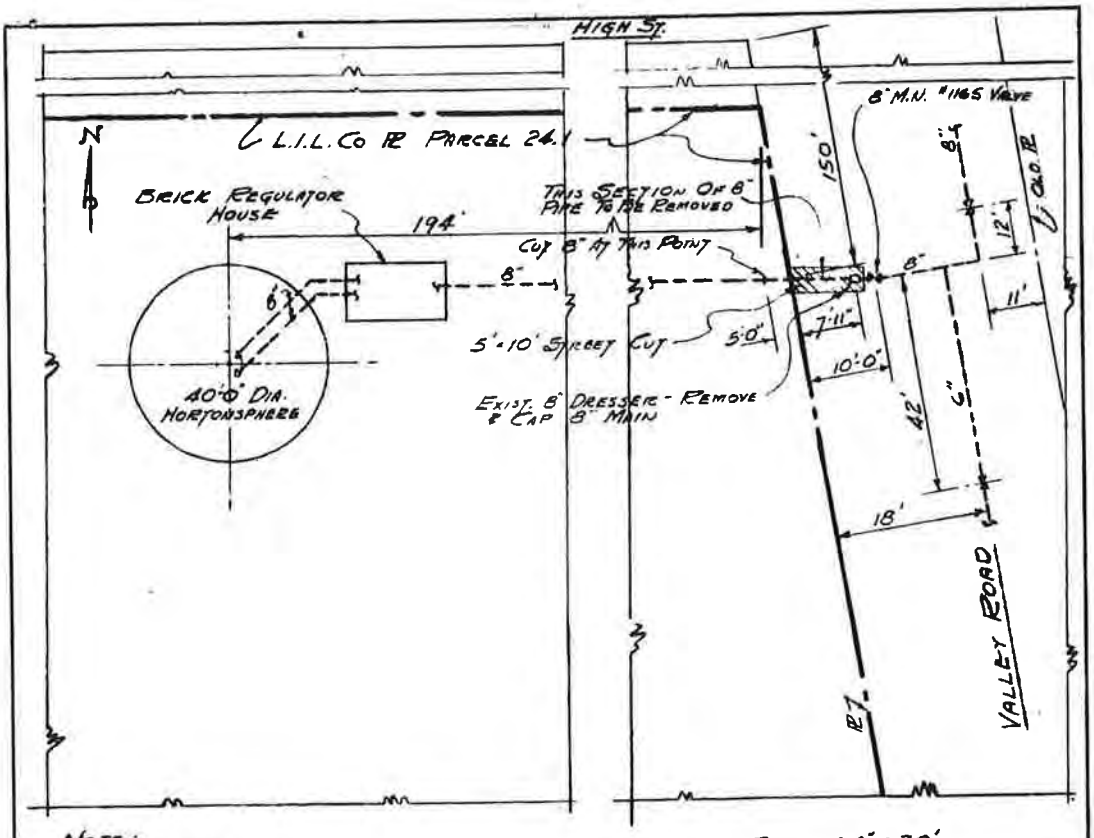
FIG. 28. Hortonsphere High Pressure Gas Holder, 40 feet in Diameter, Blends Well with Background. (Courtesy of Chicago Bridge & Iron Works, Chicago, Ill.)

any oil present must be drawn off and the gas pressure reduced to about 6 inches water gage before purging operations are begun. With these exceptions the principles of purging of these holders may be easily inferred from our discussion of purging low pressure holders. Exact **details of operation** are given in the procedure recommended by the American Gas Association [19] and this should be consulted previous to any attempt to purge such holders.

Underground Storage of Gas. Natural gas occurs, as we have already indicated,[1] stored under pressure in the pores of the so-called gas sands. These are really sedimentary rocks which have a porosity averaging from 8 to 22 per cent, although sands with a porosity up to 35 per cent are known. In its occurrence the natural gas is stored in the pores of the rock either alone under high pressures, or dissolved

28. Braine, J. H. Repair of leaks in sectional gas holders. *A. G. A. Monthly*, 9, 1927, 71–6.
29. Editorial. Recrowning an inflated holder. *Gas Journal*, December 1930, 854.
30. Metzdorff. Repairing the cup of a filled gas holder by welding. *Gas- und Wasserfach*, 74, 1931, 9; translated by L. M. Van der Pyl, *Gas Age-Record*, 67, 1931, 266–8.
31. Alrich, H. W. Lessons learned from gas holder and other explosions. *A. G. A. Monthly*, 1929, 467–8 and 498.
32. Bullard, J. E. Visualizing service by a graphic device. *Gas Age-Record*, 57, 1926, 291.
33. Willis, J. H. The M. A. N. waterless gas holder. *Gas Journal*, May 1930, 312–4.
34. Murray, J. L. A new development in the waterless gas holder. *Gas Age-Record*, 69, 1932, 745–8; also later figures on capacity of holders in Bartlett-Hayward Company's advertisement, *Idem.*, October 7, 1933.
35. Miller, A. S. Building the first waterless holder in America. *A. G. A. Monthly*, 1925, 135–7.
36. Anon. Construction of world's largest gas holder. *A. G. A Monthly*, 1929, 215–8.
37. Murray, J. L. A new development in the waterless gas holder. Abstracts, *Gas Journal*, 199, 1932, 35–6, and *Gas World*, 96, 1932, 692–4.
38. O'Keefe, J. G. Some experiences in the operation of waterless holders. *Proc. A. G. A.*, 1926, 1244–9; also *A. G. A. Monthly*, 1926, 699–702.
39. Lechler, P. Sealing the piston of waterless gas holders. *Gas World*, May 1926, 441.
40. Prentice, F. Experiences with a waterless gas holder. *Gas World*, June 1930, 663–7; and *Gas Journal*, June 1930, 771–5.
41. Bruce, H. Discussion of paper by O'Keefe (reference 38). *Idem*, 1248.
42. Klönne, M. The Klönne waterless gas holder. *Gas Age-Record*, 67, 1931, 957–60.
43. Anon. Klönne gasholder for York Gas Company first in the British Isles. *Gas World*, August 1929, 197.
44. Anon. Syracuse has world's largest dry seal holder. *Gas Age-Record*, 69, 1932, 480–1 and 485.
45. Anon. New developments in waterless holder design in Germany. *Gas Age-Record*, 64, 1929, 45.
Knauss, W. Neuerungen im Scheibengasbehälterbau. *Gas- und Wasserfach*, 72, 1929, 976–8.
Wagner, R. Vorschlage für Neuerungen an Scheibengasbehältern. *Gas- und Wasserfach*, 72, 1929, 1001–5.
Thau, A. Wasserlose Gasbehälter. *Idem*, February 1930, 200–2.
46. Thompson and Bridge. New type holder in operation. *American Gas Journal*, May 1922, 444.
47. Whitney, W. H. A new type of high pressure gas storage system. *Gas Age-Record*, 57, 1926, 185–6.
48. Bridges, A. F. Economics of pressure gas storage. *A. G. A. Monthly*, 1926, 761–6.
49. News Item. Four pressure storage holders under construction. *Gas Age-Record*, 70, 1932, 201.

50. Spencer, A. M. An automatically controlled high pressure holder installation. *Gas Age-Record*, 63, 1929, 711–2.
51. Horton, G. T. High pressure gas holders. *Gas Age-Record*, 58, 1926, 727–9 and 732.
52. Anon. Gas Company uses butane as standby. *Petroleum Engineer*, November 1933, 21–2.
53. Milbourne, S. M. Spherical gas holders. *Gas Journal*, April 1929, 196–200 and 253–5.
54. Meals, S. W. Storing and measuring large quantities of gas. *American Gas Journal*, March 1929, 171–5. Underground storage of gas. *American Gas Journal*, March 1929, 82 and 84; and *Gas Age-Record*, 64, 1929, 645–6. Storing gas in earth's natural reservoirs. *Idem*, 65, 1930, 595–6.
55. Anon. Surplus in gas output stored in old wells. *Gas Age-Record*, 66, 1930, 811.



NOTE:
DISCONNECT ALL PIPING AT SPHERE & IN REGULATOR HOUSE & REMOVE TO 6" BELOW GRADE
DEMOLISH SPHERE & REGULATOR HOUSE & ALL CONCRETE FOOTINGS & FOUNDATIONS TO 6" BELOW GRADE
AFTER COMPLETION OF ABOVE REMOVE ALL DEBRIS & ROUGH GRADE AREA OF SPHERE & HOUSE
ALL UNDERGROUND PIPING TO BE ABANDONED IN PLACE EXCEPT AS NOTED

SCALE: 1" = 30'

Transmitted by Johnson

Transmittal No. 2

Work Order No. 46606

Date 8-19-60

REFERENCE DWGS:
F-6387 - GOVERNORS & CONNECTIONS
F-6055 - 40' HORTONSPHERE, LOCATION PLAN
F-6428 - GOVERNOR HOUSE, ELEV. & SECT.

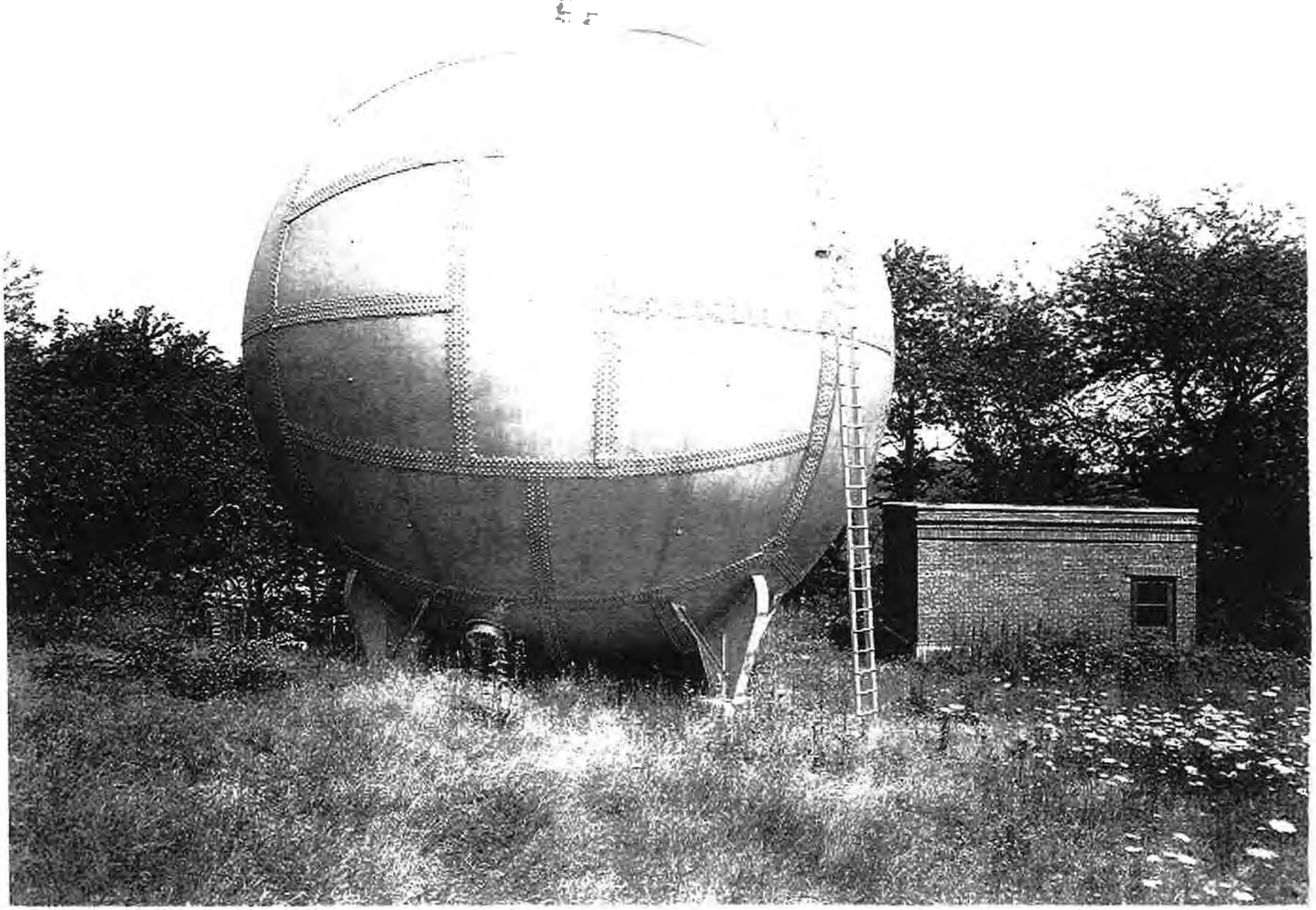
No	Date	Revision	M.G.Y. Drwn	H.W.T. Appd.
1	8-17-60	Rev. Cut Off In Street		

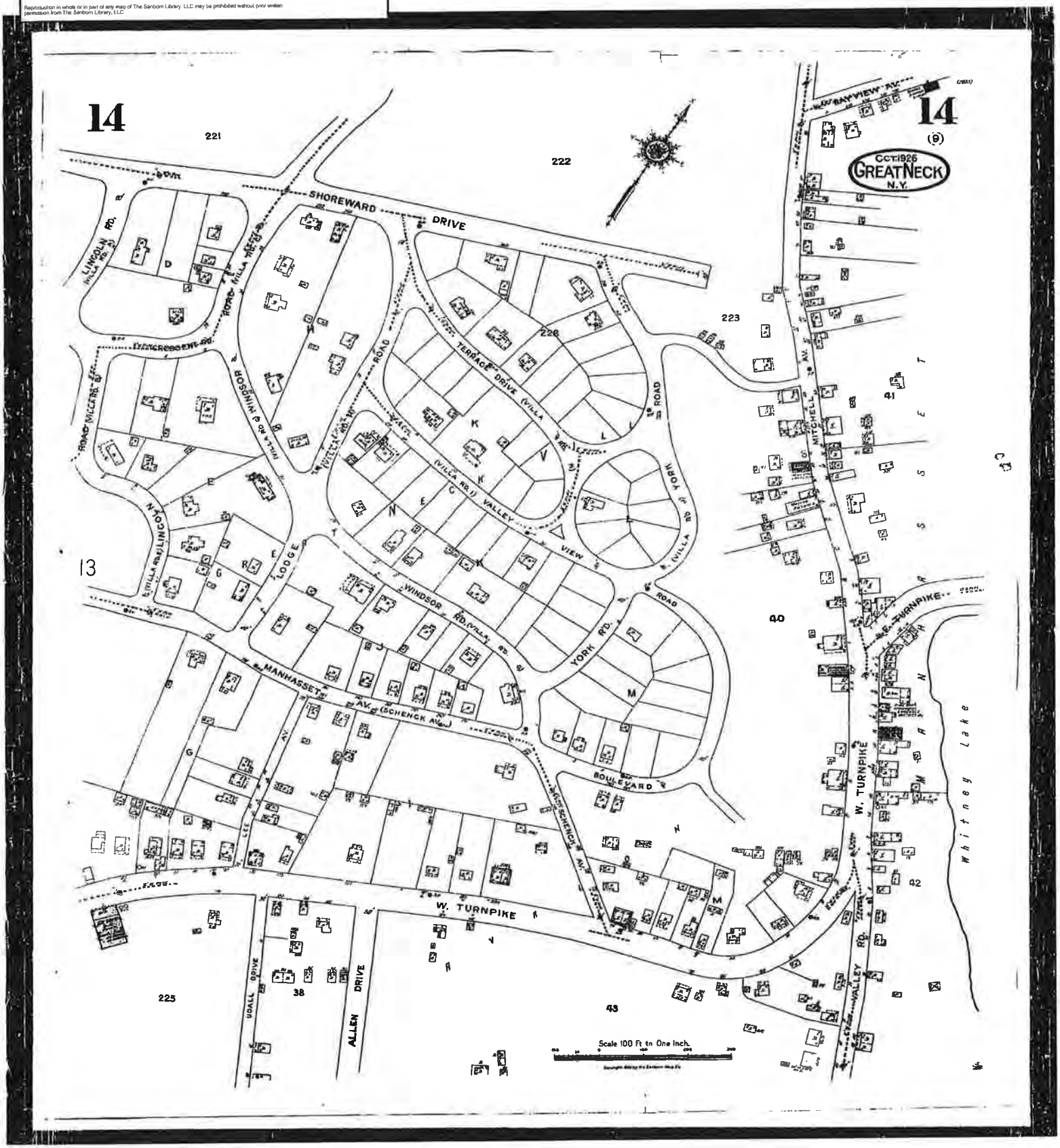
RETIREMENT OF SPHERE, GOVERNOR HOUSE & EQUIPMENT MANHASSET, N.Y.

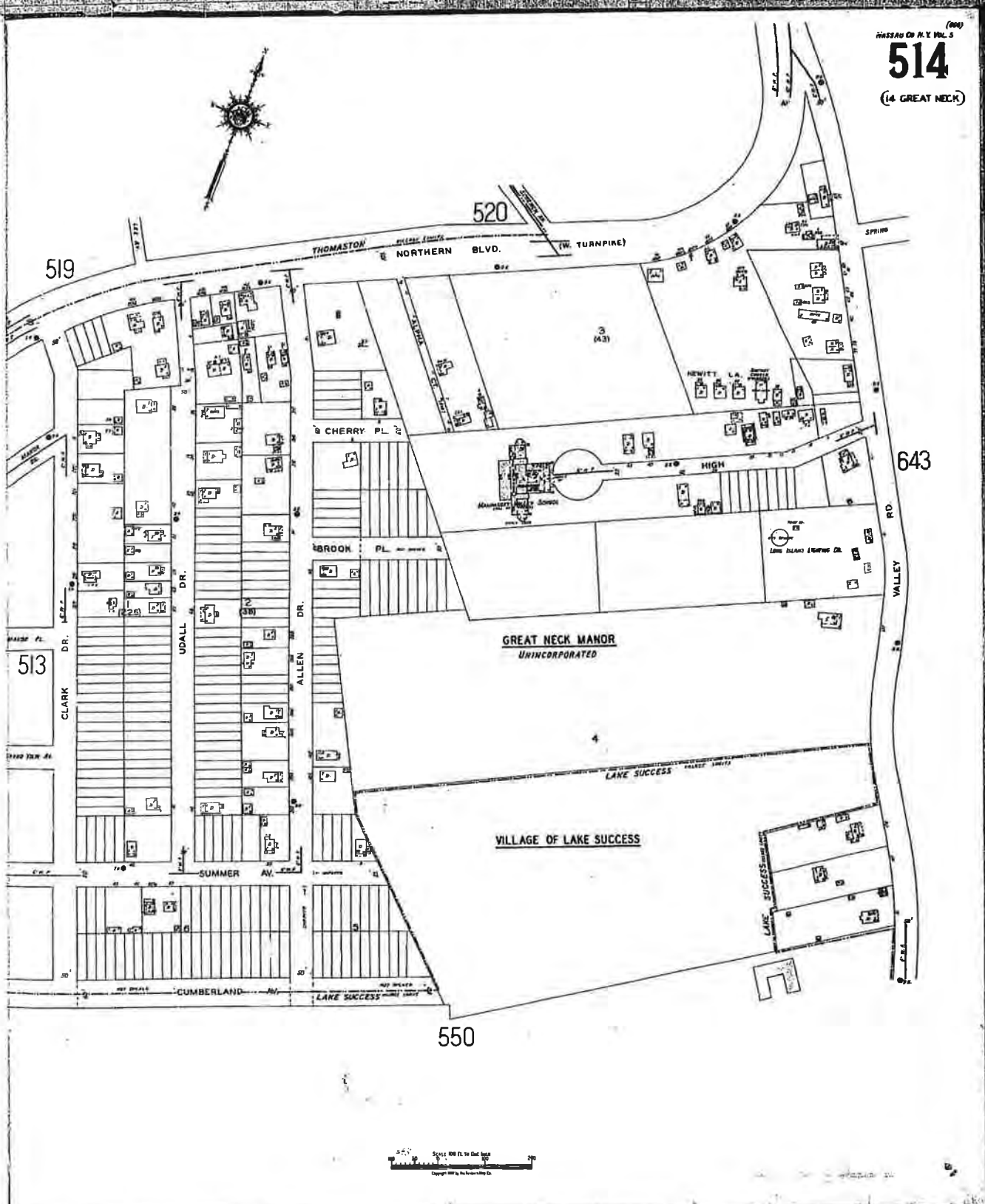
W. O. No. 46606
Drawn by W. YOGEL
App'd by H.W.T.

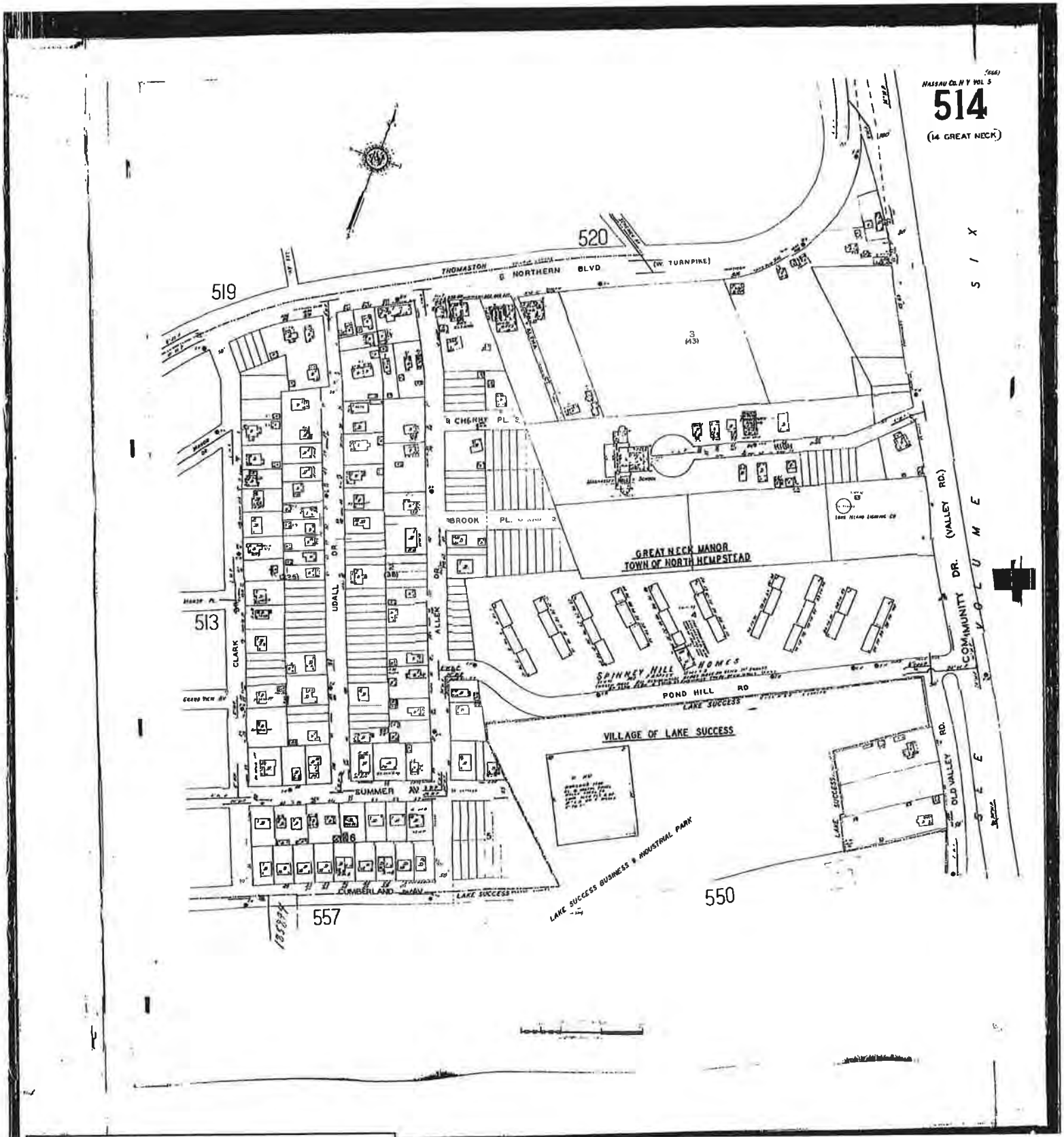
LONG ISLAND LIGHTING COMPANY
175 OLD COUNTRY ROAD
HICKSVILLE, NEW YORK
Engineering Department

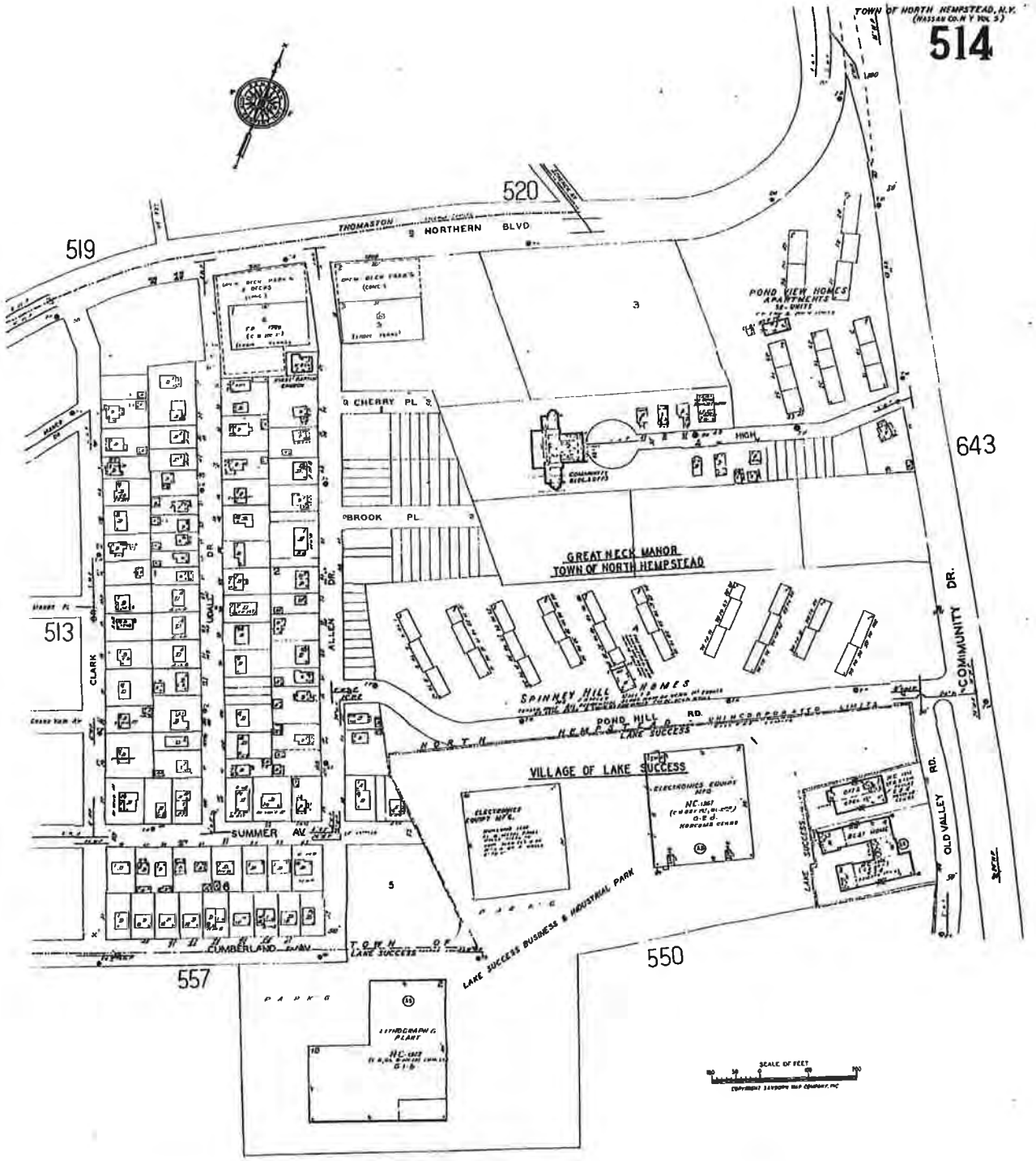
Date 3-29-60
Dwg. L-209-Q











Review of Long Island Gas Manufacture and Distribution (1907 – 1950)

Submitted to:

National Grid
175 East Old County Road
Hicksville, NY 11801

Submitted by:

GEI Consultants, Inc.
455 Winding Brook Drive
Suite 201
Glastonbury, CT 06033
860-368-5300

April 2009
Revised October 2009

Dennis Unites
Sr. Vice President

Introduction

GEI Consultants, Inc. (GEI) has conducted a review of the history of the Long Island Lighting Company (LILCO) to provide a better understanding of the manufactured gas operations and distribution. The primary objective of the review has been to determine the location of gas manufacturing plants and, secondarily, to understand the part played by the Hortonspheres in the distribution system. GEI has reviewed previously published corporate histories, the history of the MGP operations produced by Atlantic Environmental Services, Inc., (1996), annual reports on the file in the New York State Archives, and Public Service Commission (PSC) annual reports provided by National Grid. Given the passage of time, change of companies from year to year, and older recordkeeping methodologies, research is difficult and information about each location is a function of those documents that could be located.

Since 1907, utilities in New York have been required to file annual reports with the PSC. These reports have changed in format over the years, but generally require a summary of ownership, finance, and operation of the utility for the reporting year. They include a listing of major capital equipment such as gas manufacturing plants, storage tanks and gas transmission lines. While these are company prepared reports, they were subject to audit by the public service commission.

The history of LILCO is one of financial and operational consolidation that mirrored the utility industry in the rest of the United States. The period from 1910 through 1932 saw the consolidation of many small gas and electric companies into large holding companies of national or even international scope. At the same time, gas and electric generation was moving away from a model of small operations close to the energy users to larger more centralized facilities with distribution to the centers of usage.

The Long Island Lighting Company

LILCO was incorporated on December 31, 1910 as a consolidation of Amityville Electric Light Co., Islip Electric Light Co., Northport Electric Light Co., and Sayville Electric Co.[1] All of these companies sold electricity exclusively; however, Islip used a producer gas engine for generation.[2] Subsequently, the company acquired by purchase or merger, the following companies listed in Table 1, below.

Table 1
Companies Acquired by
The Long Island Lighting Company

Company	Year Acquired
Babylon Electric Light Co.	1915
Suffolk Gas & Electric Light Co.	1917
South Shore Gas Co.*	1917

[1] Moody's, 1995. p. 670.
[2] Carpenter, [n.d.]. p73

Table 1 (Continued) Companies Acquired by The Long Island Lighting Company	
Company	**Year Acquired**
Huntington Light & Power Co.	1919
Huntington Gas Co.*	1919
North Shore Electric Light & Power Co.	1919
Consumers Gas Co. of Long Island	1922
Riverhead Electric Light Co.	1922
Southold Lighting Co.*	1922
Suffolk Light, Heat & Power Co.	1922
Nassau Light & Power Co.	1922
Long Island Gas Corp.*	1924
Patchogue Gas Co.*	1924
Sag Harbor Electric Light & Power Co.	1924
Sea Cliff and Glen Cove Gas Co.*	1924
East Hampton Electric Light Co.	1926
Public Service Corp. of Long Island	1927
Clinton Gas Co.*	1930
Liland Corp.	1933
Queens Borough Gas & Electric Co.*	1950
Nassau & Suffolk Lighting Co.*	1950
Long Beach Gas Co., Inc.	1950
Shelter Island Light & Power Co.	1959
Patchogue Electric Light Co.	1964

* indicates companies with gas manufacturing operations.

Queens Borough Gas & Electric and Nassau & Suffolk Lighting were consolidated into LILCO in 1950; however, LILCO had controlling interest in these operating companies since 1923.

Gas Manufacture and Distribution

In the beginning of the manufactured gas era, gas was manufactured in small plants close to where it was used. Table 2 lists the original gas works that later made up the LILCO system. Over LILCO's history, these local gas manufacturing companies were consolidated into three operating companies:

Nassau & Suffolk Lighting Company, Queens Borough Gas and Electric Company, and Long Island Lighting Company. Figure 1 shows the growth of the system. The following sections provide a brief history of each of the operating companies.

Table 2
Gas Plants in the LILCO Holding Company System

Gas plant	Years of Operation	Operating Company
Sag Harbor	1859-1928[3]	LILCO predecessor
Garden City	1874?--1906(?)	Nassau & Suffolk predecessor
Babylon	1884-1904(?)	LILCO predecessor
Hempstead Clinton	1860-1904	Nassau & Suffolk predecessor
Hempstead Intersection Street	1904-1950s	Nassau & Suffolk
Rockaway	1880-1950s	Queens Borough Gas and Electric
Far Rockaway	1895-1904(?)	Queens Borough Gas and Electric predecessor
Huntington (Halesite)	1893-1925[4]	LILCO
Glen Cove	1904-1927[5]	LILCO
Bay Shore	1889-1970s	LILCO
Southold	1906-1921	LILCO predecessor
Clinton (East Hampton)	1904-1930	LILCO predecessor
Patchogue	1904-1914[6]	LILCO predecessor

[3] Last gas reported made February 1928. An auditor's note in the 1934 report indicates no manufacture after October 1932 for Huntington, Patchogue, Sag Harbor and Glen Cove.
[4] Last reported gas manufacture 1925.
[5] After 1926 PSC records show all gas purchased from Public Service of Long Island.
[6] PSC reports show no significant gas manufacture after 1914.

Nassau & Suffolk Lighting Company

One of the earliest manufacturers of gas in Nassau & Suffolk Counties occurred at the Clinton Street plant which was later to become part of the Nassau & Suffolk Lighting Company system. In all, three gas works operated in the company's territory. On January 23, 1860, gas was first produced in Hempstead at a plant constructed on the east side of Clinton Street, just north of Front Street.[7] The plant operated until circa 1904 when it was apparently replaced by the plant at Intersection Street. [8] The Garden City gas works, the third plant, was acquired in 1906. Gas was produced only at the Hempstead Intersection Street facility after 1906 until the system was converted to natural gas in the 1950s.

In addition to gas storage at the manufactured gas plant, gas was stored at the Stewart Avenue holder station, constructed in 1929 and the Bellmore Hortonsphere, put into service in 1928.

Because of its location, Nassau & Suffolk served as a "middleman" in the LILCO system in the later years of gas manufacturing. It purchased large volumes of gas from Queens Borough Gas and Electric and sold large volumes to LILCO. Table 3 provides Nassau & Suffolk Intra-Company gas sales for selected years. Note that both Public Service Company of Long Island and Long Beach Gas Company were solely distribution companies, which only purchased gas throughout their corporate histories.

Table 3
Nassau & Suffolk Annual Intra Company Gas Sales

Year	Sold to	Volume (mmcf)*	Purchased from	Volume (mmcf)*	Gas Made at Plant (mmcf)*
1915	Public Service Corp of LI	32		None	226
	Long Beach Gas Co.	339mcf			
1920	Public Service Corp of LI	131	Southshore Gas Co.	66mcf	512
	Long Beach Gas Co.	15			
	Masapequa Gas Electric Light & Power	413mcf			
1925	Public Service Corp of LI	233	LILCO	120mcf	846
	Long Beach Gas Co.	73			
	Masapequa Gas Electric Light & Power	2			
1930	LILCO	754	LILCO	30mcf	864
			Queens Borough Gas and Electric	964	
1935	LILCO	807	Queens Borough Gas and Electric	1082	794
1940	LILCO	1380	Queens Borough Gas and Electric	1769	1003

* mmcf = million cubic feet, mcf = thousand cubic feet

[7] Carpenter,[n.d.]. P. 4.
[8] Atlantic Environmental Services, Inc., 1996. P. 4-11.

Queens Borough Gas and Electric Company

Queens Borough Gas and Electric was made up of a number of small companies which went through several changes of ownership prior to the formation of Queens Borough Gas and Electric in 1902. There were two plants - Rockaway and Far Rockaway.

The first works was built in Rockaway in 1880 but did not appear to begin production until 1894.[9] A second works operated in Far Rockaway from 1895[10] until some time prior to 1908. PSC records for 1908 show the existence of the Far Rockaway works but do not indicate any production. Production at these works is not noted in subsequent reports.

Off plant gas storage facilities in the Queens Borough system were the Lynbrook Holder, a water sealed holder constructed in 1904 and decommissioned in 1932[11] and the Inwood holder, a large water sealed holder constructed in 1924.[12]

The Rockaway plant was used as a source of gas for much of the LILCO system. From the late 1920s onward, roughly half of the gas produced was sold to affiliated companies, primarily Long Beach Gas and Nassau & Suffolk. Based on Nassau and Suffolk records, it is likely that some of this gas was further sold into the LILCO distribution system. Table 4 provides a listing of selected intra company sales. 1924 was selected as the starting date because of gaps in the available PSC records.

Table 4
Queens Borough Gas and Electric Intra Company Sales

Year	Sold to	Volume (mmcf)*	Purchased from	Volume (mmcf)*	Gas Made at Plant (mmcf)*
1924		None		None	1082
1930	Nassau &Suffolk Lighting	964			2593
	Long Beach Gas Co.	188			
1935	Nassau & Suffolk Lighting	1082			2469
	Long Beach Gas Co.	156			
1940	Nassau & Suffolk Lighting	1769			3470
	Long Beach Gas Co.	177			
1945	Nassau & Suffolk Lighting	2000			3967
	Long Beach Gas Co.	236			
1945	Nassau	2000			3967

* mmcf = million cubic feet, mcf = thousand cubic feet

[9] Carpenter, [n.d.]. Pp. 37-43.
[10] Carpenter, [n.d.] P 43.
[11] PSC 1932 auditors note.
[12] PSC 1924.

Long Island Lighting Company

The Long Island Lighting Company (LILCO) name was used for both the overall holding company and the operating company which provided gas and electric services to the eastern part of the service area. It was of greater geographic extent than the other two holding companies and has a more complex history of consolidation.

South Shore Gas Company was the first gas holding incorporated into the LILCO holding company and operating company in 1917. This company owned plants in (West) Babylon and Bay Shore. The Babylon plant apparently had ceased general production prior to 1907 (when PSC reporting began), as the plant is shown as part of the capital equipment but no production records are provided.

A third plant, Halesite, was added to the system in 1919 when LILCO acquired the Huntington Gas Company. This plant operated until 1925. An auditor's note in the 1934 PSC report indicated that this plant and three others had ceased making gas in October of 1932. This note appears to indicate that subsequent to 1932 they were no longer used as a standby reserve.

Southold Lighting Company was acquired along with the Southold acetylene plant in 1922.

The Patchogue, Glen Cove, and Sag Harbor Plants were added to the system in 1924 with the acquisition of Patchogue Gas Company, Sea Cliff and Glen Cove Gas Company and the Long Island Gas Company respectively. In the case of Patchogue, regular gas manufacture had essentially ceased around 1914 and gas was purchased from a LILCO subsidiary. Glen Cove and Sag Harbor ceased regular manufacture within a few years of purchase. All three of these plants were the subject of the 1934 auditor's note that indicated no gas manufactured after October 1932.

The acquisition in 1930 of the Clinton Gas Company and its gasoline vaporization works in East Hampton was the final purchase of a gas plant. Operations at all of the ancillary plants had ceased by 1932. By then, all gas was either provided from the Bay Shore plant or purchased from the other operating companies.

The distribution system for the LILCO system was complex as befits the large geographic extent of the companies. Water sealed holders, at active or inactive plants, made up one part of the distribution system. The 1930 PSC report shows holders at: Bay Shore, Huntington, Sag Harbor, Patchogue and, Glen Cove.

High pressure tanks constructed between 1918 and 1928 also provided storage for the distribution system. The 1935 PSC report shows a total of 47 such tanks located in: Amityville (5), Sayville (3), Huntington (10), Patchogue (7), Northport (3), Southampton (3), Sag Harbor (3), Hicksville (5), and Glen Cove (8). These holders were horizontal cylinders. One point of potential confusion is that several of these storage sites, which have no history of gas manufacture, are shown on some Sanborn maps as "Electric and Gas Plants" (see for example, Amityville).

Hortonspheres also provided high pressure storage. Nine of these were constructed and incorporated in the system between 1927 and 1931. The 1935 PSC report shows the following: Farmingdale (1927), Huntington (1928), Patchogue (1927), Port Jefferson (1930), East Hampton (1930), Sag Harbor (1931), Glen Cove (1927), Manhasset (1929), and Oyster Bay (1930).

During the earlier years, LILCO was a small net exporter of gas (Table 5), selling to Patchogue Gas and Nassau & Suffolk Lighting. After 1930, its exports were limited, and some years more gas was imported than was produced at Bay Shore. In 1935 there was an inter company purchase as a relatively small amount of gas was purchased from Nassau and Queens Gas Company, A Consolidated Edison subsidiary.

Table 5
LILCO Intra Company Sales

Date	Sold to	Volume (mmcf)*	Purchased from	Volume (mmcf)*	Gas Made at plants (mmcf)*
1915		None		None	None
1920	Patchogue Gas Co.	30		None	169 Bay Shore 17 Huntington
	Nassau & Suffolk Lighting Co.	77mcf			
1925	Patchogue Gas Co.	50			364 Bay Shore 31 Huntington
	Nassau & Suffolk Lighting Co.	103 mcf			
1930	Patchogue Gas Co.	32			882 Bay Shore
	Nassau & Suffolk Lighting Co.	31 mcf	Nassau & Suffolk Lighting Co.	513	
1935			Nassau & Suffolk Lighting Co.	807	888 Bay Shore
			New York and Queens Gas co.	116mcf	
1940			Nassau & Suffolk Lighting Co.	1380	1254 Bay Shore
1945			Nassau & Suffolk Lighting Co.	1511	2011 Bay Shore

* mmcf = one million cubic feet, mcf = one thousand cubic feet

Conclusions

The history of LILCO was one of consolidation of gas companies and smaller plants. Based on a review of the PSC records, thirteen gas plants were identified as operating in the early 1900s. By 1930, these had been reduced to three main plants: Rockaway, Hempstead Intersection Street, and Bay Shore. The Hortonspheres were part of the distribution system and, except for Glen Cove, Sag Harbor, Patchogue and Huntington, they were built away from existing gas plants.

Figure 2 provides a layout of the entire system at the maximum extent of gas manufacturing in 1950. The Riverhead gas cracking facility apparently began production in 1948. The figure does not depict the

Glenwood gas cracking facility which was constructed by 1949, perhaps because it did not actually go on-line until sometime in 1951.

As to the source of gas for any particular Hortonsphere, one can assume that most of the time the gas would have been supplied by that operating company's base load plant.

That is, Hempstead would have supplied Bellmore, and Bay Shore would have supplied the rest. However, considering the intra company sales and purchase and the internal links of the distribution system, any Hortonsphere could have been supplied by any plant.

The approach used has a number of limitations. The archives do not have records for all of the companies that ultimately were merged or acquired by the LILCO holding company. Saltaire did not appear in any of the PSC reports. The information about each location is also limited. While the Hortonspheres are identified in the capital equipment lists, there is not any other information provided about the Hortonsphere locations. These limitations notwithstanding, the available information provides a better insight into the history and operation of the system.

References

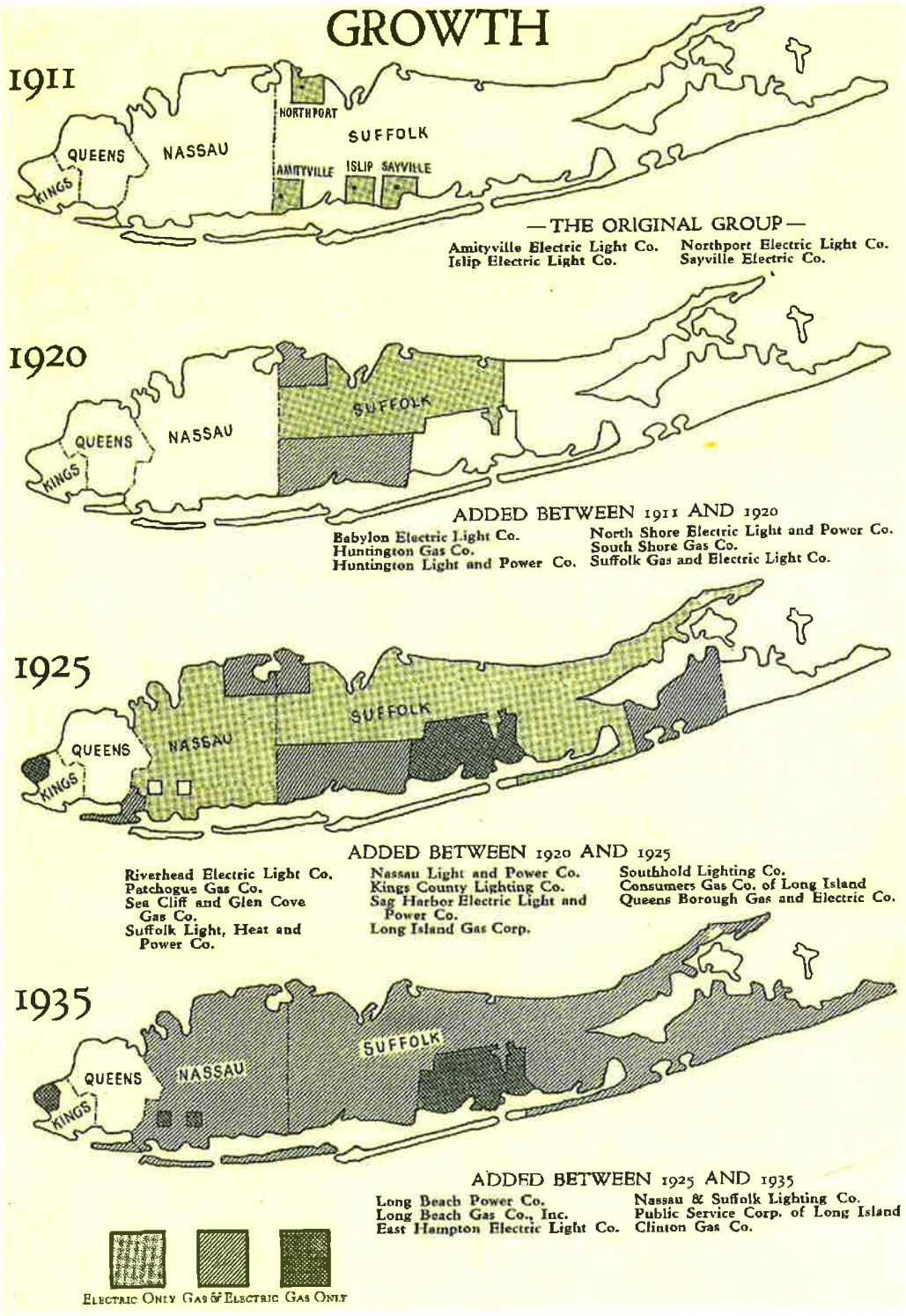
Moody's, Public Utility Manual. Volume 1, Moody's Investors Service, Inc. New York, New York, , 1995, p. 670.

Carpenter, James W, 1960., *Lighting Long Island*, Hicksville, New York, Long Island Lighting Company..

Atlantic, June 26,1996. Historic Review of MGP Plants on Long Island, Final Report, Atlantic Environmental Services, Colchester CT.

Twenty Five Years of the Long Island Lighting System 1911-1936, By The Long Island Lighting System , 1936, p. 17

H:\WPROC\Project\KEYSPAN\11 Site Characterizations\PSC Research\Lilco history Oct 09.docx

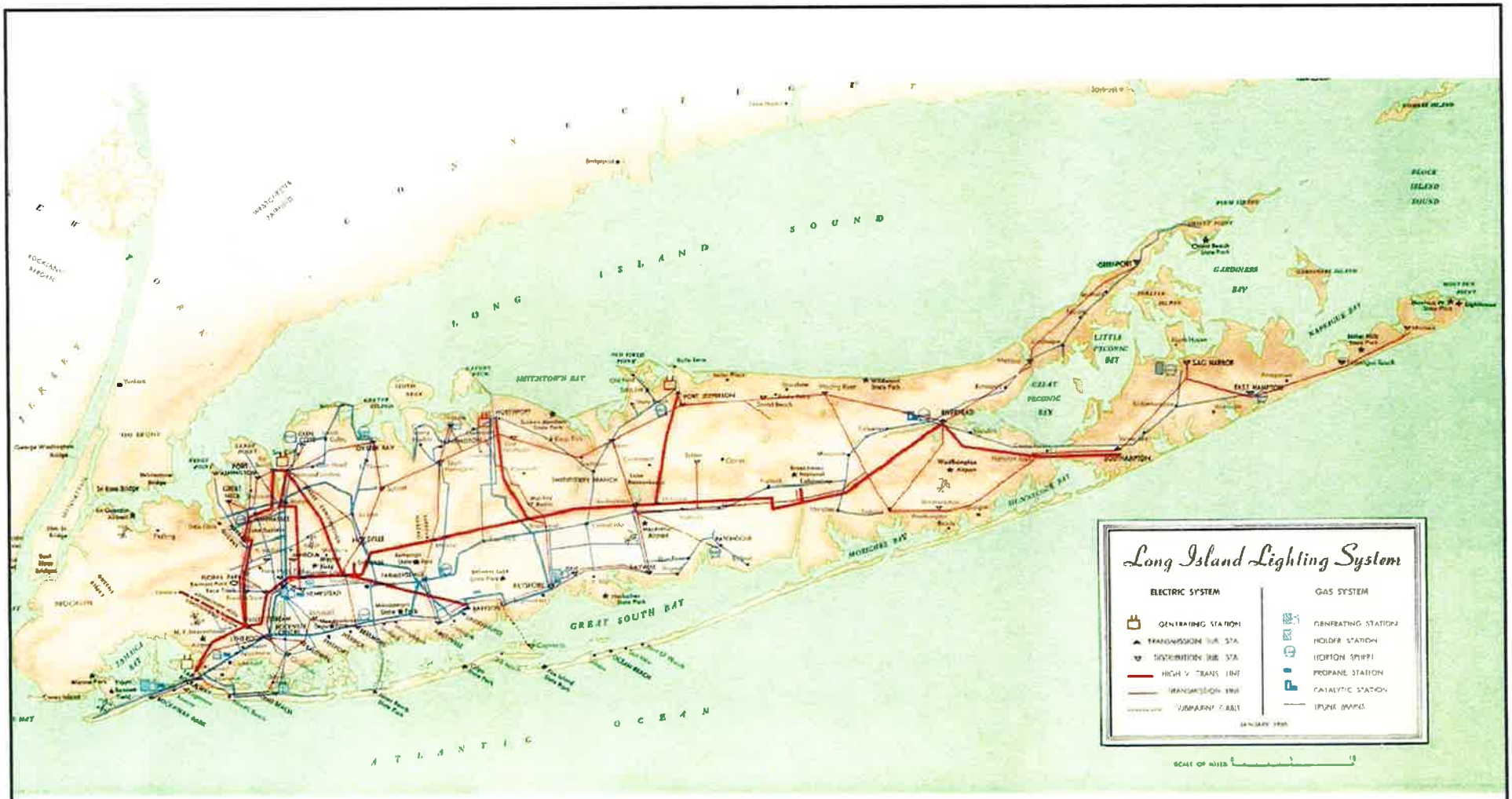


SOURCE:

TWENTY FIVE YEARS OF THE LONG ISLAND LIGHTING SYSTEM 1911 - 1936, BY THE LONG ISLAND LIGHTING SYSTEM ©1936, PAGE 17.

LILCO PSC REVIEW LONG ISLAND, NEW YORK	GEI Consultants	**GROWTH OF THE LILCO SYSTEM**
nationalgrid	Project 090230	March 2009 Figure 1

I:\GEI\National Grid\11 Sites PSC Research\LILCO PSC Figures.dwg



LILCO PSC REVIEW LONG ISLAND, NEW YORK	GEI Consultants	**1950 SYSTEM CONFIGURATION**
nationalgrid	Project 090230	March 2009 Figure 2

I:\GE\NATIONAL GRID\11 SITES PSC RESEARCH\LILCO PSC-FIGURES.DWG

EDR® Environmental
Data Resources Inc

The EDR Radius Map
with GeoCheck®

Manhasset Hortonshpere Site
43 High Street
Manhasset, NY 11030

Inquiry Number: 1898554.2s

April 09, 2007

The Standard in Environmental Risk Information

440 Wheelers Farms Road
Milford, Connecticut 06461

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

FORM-STD-PVC

Peak flow data count:	Not Reported	Water quality data begin date:	Not Reported
Water quality data end date:	Not Reported	Water quality data count:	Not Reported
Ground water data begin date:	Not Reported	Ground water data end date:	Not Reported
Ground water data count:	Not Reported		

Ground-water levels, Number of Measurements: 0

F41
South
1/2 - 1 Mile
Higher

NY WELLS **NYWS006131**

Well Id:	NY2902836	System name:	MANHASSET LAKEVILLE W.D.
System Id:	N-09308	Well name:	E. SHORE RD. 5
Type:	WL	Active?:	A
County:	NASSAU COUNTY	Latitude:	404632 000
Longitude:	734214 000	Slec_type_:	AC
Agency:	SCHRADER, PAUL		
Address:	P.O. BOX 359		
City/State/Zip:	MANHASSET NY 11030		
Phone:	516-627-9454		

G42
NNW
1/2 - 1 Mile
Lower

FED USGS **USGS2115088**

Agency cd:	USGS	Site no:	404732073423701
Site name:	N 854. 1		
Latitude:	404732		
Longitude:	0734237	Dec lat:	40.79232335
Dec lon:	-73.70985303	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	36
State:	36	County:	059
Country:	US	Land net:	Not Reported
Location map:	NC 716 2 66	Map scale:	Not Reported
Altitude:	8.0		
Altitude method:	Level or other surveying method		
Altitude accuracy:	0.1		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Northern Long Island. New York. Area = 915 sq.mi.		
Topographic:	Not Reported		
Site type:	Ground-water other than Spring	Date construction:	Not Reported
Date inventoried:	Not Reported	Mean greenwich time offset:	EST
Local standard time flag:	N		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	GLACIAL AQUIFER,UPPER		
Well depth:	150.	Hole depth:	150.
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	Not Reported	Daily flow data begin date:	Not Reported
Daily flow data end date:	Not Reported	Daily flow data count:	Not Reported
Peak flow data begin date:	Not Reported	Peak flow data end date:	Not Reported
Peak flow data count:	Not Reported	Water quality data begin date:	Not Reported
Water quality data end date:	Not Reported	Water quality data count:	Not Reported
Ground water data begin date:	Not Reported	Ground water data end date:	Not Reported
Ground water data count:	Not Reported		

Ground-water levels, Number of Measurements: 0

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Agency cd:	USGS	Site no:	404733073423803
Site name:	N 869. 1		
Latitude:	404733		
Longitude:	0734238	Dec lat:	40.79260113
Dec lon:	-73.71013082	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	36
State:	36	County:	059
Country:	US	Land net:	Not Reported
Location map:	NC 716 2 66	Map scale:	Not Reported
Altitude:	8.0		
Altitude method:	Level or other surveying method		
Altitude accuracy:	0.1		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Northern Long Island. New York. Area = 915 sq.mi.		
Topographic:	Not Reported		
Site type:	Ground-water other than Spring	Date construction:	Not Reported
Date inventoried:	Not Reported	Mean greenwich time offset:	EST
Local standard time flag:	N		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	GLACIAL AQUIFER,UPPER		
Well depth:	150.	Hole depth:	150.
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	Not Reported	Daily flow data begin date:	Not Reported
Daily flow data end date:	Not Reported	Daily flow data count:	Not Reported
Peak flow data begin date:	Not Reported	Peak flow data end date:	Not Reported
Peak flow data count:	Not Reported	Water quality data begin date:	Not Reported
Water quality data end date:	Not Reported	Water quality data count:	Not Reported
Ground water data begin date:	Not Reported	Ground water data end date:	Not Reported
Ground water data count:	Not Reported		

Ground-water levels, Number of Measurements: 0

G54
NNW
1/2 - 1 Mile
Lower

NY WELLS **NYWS006079**

Well Id:	NY2902836	System name:	MANHASSET LAKEVILLE W.D.
System Id:	N-04243	Well name:	PARKWAY 2
Type:	WL	Active?:	A
County:	NASSAU COUNTY	Latitude:	404733 000
Longitude:	734238 000	Slec_type_:	AC
Agency:	SCHRADER, PAUL		
Address:	P.O. BOX 359		
City/State/Zip:	MANHASSET NY 11030		
Phone:	516-627-9454		

G55
NNW
1/2 - 1 Mile
Lower

FED USGS **USGS2115101**

Agency cd:	USGS	Site no:	404733073424001
Site name:	N 7966. 1		
Latitude:	404733		
Longitude:	0734240	Dec lat:	40.79260113
Dec lon:	-73.71068639	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	36
State:	36	County:	059
Country:	US	Land net:	Not Reported
Location map:	NC 706 2	Map scale:	Not Reported
Altitude:	15.0		
Altitude method:	Level or other surveying method		
Altitude accuracy:	0.1		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Northern Long Island. New York. Area = 915 sq.mi.		
Topographic:	Not Reported		
Site type:	Ground-water other than Spring	Date construction:	Not Reported
Date inventoried:	Not Reported	Mean greenwich time offset:	EST
Local standard time flag:	N		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	GLACIAL AQUIFER,UPPER		
Well depth:	141.	Hole depth:	Not Reported
Source of depth data:	Not Reported		
Project number:	Not Reported		
Real time data flag:	Not Reported	Daily flow data begin date:	Not Reported
Daily flow data end date:	Not Reported	Daily flow data count:	Not Reported
Peak flow data begin date:	Not Reported	Peak flow data end date:	Not Reported
Peak flow data count:	Not Reported	Water quality data begin date:	Not Reported
Water quality data end date:	Not Reported	Water quality data count:	Not Reported
Ground water data begin date:	Not Reported	Ground water data end date:	Not Reported
Ground water data count:	Not Reported		

Ground-water levels, Number of Measurements: 0

G56
NNW
1/2 - 1 Mile
Lower

NY WELLS **NYWS006078**

Well Id:	NY2902836	System name:	MANHASSET LAKEVILLE W.D.
System Id:	N-03905	Well name:	PARKWAY 1
Type:	WL	Active?:	A
County:	NASSAU COUNTY	Latitude:	404733 000
Longitude:	734240 000	Slec_type_:	AC
Agency:	SCHRADER, PAUL		
Address:	P.O. BOX 359		
City/State/Zip:	MANHASSET NY 11030		
Phone:	516-627-9454		

G57
NNW
1/2 - 1 Mile
Lower

FED USGS **USGS2115111**

Appendix D

Soil Boring, Monitoring Well Logs and Map of Water Table Elevations in Vicinity of Manhassett, New York

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 1 of 2

MS-GP-01

GROUND SURFACE ELEVATION (FT): 75
LOCATION:
NORTHING: 224992.07 **EASTING:** 1065872.59
TOTAL DEPTH (FT): 45.00
DRILLED BY: Zebra Environmental / Luke Caballero
DATUM VERT. / HORZ.: NAVD 1988 / NAD83 NY Long Island Zone
LOGGED BY: Melissa Felter
DATE START / END: 11/15/2007 - 11/16/2007
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT):

DEPTH FT.	SAMPLE INFO: TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0						MS-GP-01 (0-4)	0 - 4 WIDELY GRADED SAND WITH GRAVEL (SW); ~75% sand, ~20% gravel, ~5% fines; max. size 6 in., moist, tan, cobbles, loose roots 0-0.5', HAND CLEARED.
5	S-1	5.0	27	0.1			5 - 30 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand; ~10% fines, dry, light tan with light orangeish tan, loose
10	S-2	5.0	42	0.1			
15	S-3	5.0	42	0.1			
20	S-4	5.0	34	0.1			

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 2 of 2

MS-GP-01

DEPTH FT.	SAMPLE INFO TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
25	S-5	5.0	36	0.1			
30	S-6	5.0	34	0.1			30 - 35 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand; ~10% fines, dry to moist, light tan with light orangeish tan.
35	S-7	5.0	33	0.1			35 - 45 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand; ~10% fines, moist, light tan with light orangeish tan
40							
45				0.2		MS-GP-01 (44-45)	Bottom of borehole at 45.0 feet. Drove Geoprobe groundwater sampler to 60 feet and collected MS-GW-01

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG
PAGE 1 of 2
MS-GP-02

GROUND SURFACE ELEVATION (FT): 76.06
NORTHING: 225009.58 EASTING: 1065877.71
DRILLED BY: Zebra Environmental / Luke Caballero
LOGGED BY: Melissa Felter
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT):

LOCATION:
TOTAL DEPTH (FT): 40.00
DATUM VERT. / HORZ.: NAVD 1988 / NAD83 NY Long Island Zone
DATE START / END: 11/16/2007 - 11/16/2007

DEPTH FT.	SAMPLE INFO TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0						MS-GP-02 (0-5)	0 - 5 WIDELY GRADED SAND (SW); ~85% sand; ~5% fines, ~10% fine to coarse gravel, max. size 1 in., dry, brown, loose, HAND CLEARED.
5	S-1	5.0	60	0.1			5 - 10 WIDELY GRADED SAND (SW); ~85% sand; ~5% fines, ~10% fine to coarse gravel, max. size 1.5 in., dry, brown, dense.
10	S-2	5.0	44	0.1			10 - 12 WIDELY GRADED SAND (SW); ~90% sand; ~5% fines, ~5% fine gravel, max. size 0.5 in., dry, brown, dense.
							12 - 25 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand; ~10% fines, dry, light tan with light orangeish tan.
15	S-3	5.0	42	0.1			
20	S-4	5.0	36	0.1			

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 2 of 2

MS-GP-02

DEPTH FT.	SAMPLE INFO TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
25	S-5	5.0	35	0.1			25 - 30 WIDELY GRADED SAND WITH SILT (SW-SM); ~90% sand; ~10% fines, dry, light tan with light orangeish tan.
30	S-6	5.0	35	0.1			30 - 40 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand; ~10% fines, dry, light tan with light orangeish tan.
35	S-7	5.0	30	0.1		MS-GP-02 (38-40)	
40							Bottom of borehole at 40.0 feet. Drove Geoprobe groundwater sampler to 63 feet and collected MS-GW-02

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 1 of 2

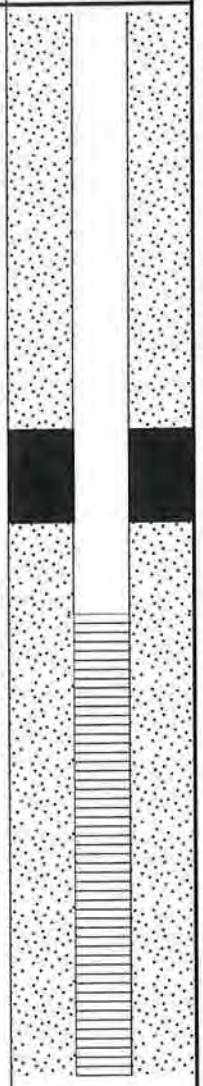
MS-GP-03/ MS-MW-03

GROUND SURFACE ELEVATION (FT): 41.89
NORTHING: 225017.18 EASTING: 1066031.74
DRILLED BY: Zebra Environmental / Luke Caballero
LOGGED BY: Melissa Felter
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT): ▽ 15.00

LOCATION:
TOTAL DEPTH (FT): 25.00
DATUM VERT. / HORZ.: NAVD 1988 / NAD83 NY Long Island Zone
DATE START / END: 11/15/2007 - 11/15/2007

DEPTH FT.	SAMPLE INFO: TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0						MS-GP-03 (0-5)	0 - 0.5 WIDELY GRADED SAND WITH SILT (SW-SM); ~90% sand, ~10% fines; brown, organics/roots, leaves, loose, HAND CLEARED. 0.5 - 5 SAND (SW); ~85% sand, ~10% gravel, ~5% fines; max. size 2 in., moist, light tan, loose, HAND CLEARED.
5	S-1	5.0	47	0.1			5 - 15 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand; ~10% fines, dry to moist, light tan and light orangeish tan, loose, 1" silt lens at 4'.
10	S-2	5.0	45	0.1			
▽ 15	S-3	5.0	42	0.1		MS-GP-03 (15-17)	15 - 20 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand; ~10% fines, wet, light grayish tan and light orangeish tan, loose.
20	S-4	5.0	44				20 - 25 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand; ~10% fines, wet, light grayish tan with light orangeish tan, loose.

WELL CONSTRUCTION DETAILS



NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG
PAGE 2 of 2
MS-GP-03/ MS-MW-03

DEPTH FT.	SAMPLE INFO: TYPE and NO.	SAMPLE INFO: PEN FT.	SAMPLE INFO: REC IN.	SAMPLE INFO: PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION	WELL CONSTRUCTION DETAILS
				0.1				
25							Bottom of borehole at 25.0 feet.	

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 1 of 2

MS-GP-04/ MS-MW-04

GROUND SURFACE ELEVATION (FT): 59.6
NORTHING: 225128.61 EASTING: 1065781.53
DRILLED BY: Zebra Environmental / Luke Caballero
LOGGED BY: Melissa Felter
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT):

LOCATION:
TOTAL DEPTH (FT): 35.00
DATUM VERT. / HORZ.: NAVD 1988 / NAD83 NY Long Island Zone
DATE START / END: 11/15/2007 - 11/15/2007

DEPTH FT.	SAMPLE INFO TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION	WELL CONSTRUCTION DETAILS
0						MS-GP-04 (0-5)	0 - 2 WIDELY GRADED SAND WITH SILT (SW-SM); ~80% sand, ~10% gravel, ~10% fines; max. size 2 in., moist, brown, loose, HAND CLEARED. 2 - 5 SILTY SAND (SM); ~70% sand, ~20% fines, ~10% gravel; max. size 3 in., moist, tan, loose, HAND CLEARED.	
5	S-1	5.0	50	0.1			5 - 10 SANDY SILT (ML); ~60% fines, non plastic; ~30% fine to medium sand, ~10% fine to coarse gravel, max. size 1 in., dry, brown and orangeish brown, dense.	
10	S-2	5.0	39	0.1			10 - 16 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand; ~10% fines, dry, light grayish tan and light orangeish tan.	
15	S-3	5.0	32	0.1			16 - 20 SILT (ML); ~95% fines, non plastic; lensed, ~5% fine sand, moist, light gray with light orangeish tan, dense, thin sand lenses.	
20	S-4	5.0	32	0.1			20 - 25 SILTY SAND (SM); ~80% sand; ~20% fines, moist, light grayish tan with light orangeish tan, dense.	

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

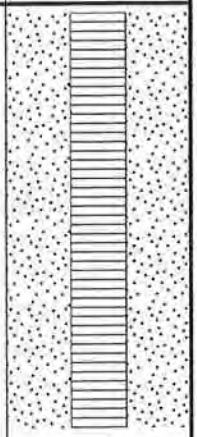
CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 2 of 2

MS-GP-04/ MS-MW-04

DEPTH FT.	SAMPLE INFO: TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION	WELL CONSTRUCTION DETAILS
25	S-5	5.0	32	0.4		MS-GP-04 (25-27)	25 - 33 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand; ~10% fines, moist to wet, light grayish tan with light orangeish tan, dense, perched water table.	
30	S-6	5.0	38	0.1			33 - 35 WIDELY GRADED SAND WITH SILT (SW-SM); ~90% sand; ~10% fines, wet, light grayish tan with light orangeish tan, perched water table.	
35							Bottom of borehole at 35.0 feet.	



NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 1 of 2

MS-GP-04A/ MS-MW-04

GROUND SURFACE ELEVATION (FT): 59.27
NORTHING: 225128.61 EASTING: 1065781.53
DRILLED BY: Aquifer Drilling and Testing
LOGGED BY: Lynn Willey
DRILLING DETAILS: Hollow Stem Auger
WATER LEVEL DEPTHS (FT): ▽ 41.00

LOCATION:
TOTAL DEPTH (FT): 47.00
DATUM VERT. / HORZ.: NAVD 1988 / NAD83 NY Long Island Zone
DATE START / END: 12/18/2007 - 12/18/2007

DEPTH FT.	SAMPLE INFORMATION: TYPE and NO.	PEN FT.	REC IN.	Blows (/6 in.)	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION	WELL CONSTRUCTION DETAILS
0								0 - 35 Boring information from 0-35 feet can be obtained from adjacent boring, MS-GP-04.	
5									
10									
15									
20									

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 2 of 2

MS-GP-04A/ MS-MW-04

DEPTH FT.	SAMPLE INFORMATION TYPE and NO.	PEN FT.	REC IN.	Blows (/6 in.)	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION	WELL CONSTRUCTION DETAILS
25									
30									
35	S-7	2.0	19	2-4-12-14	0.3			35 - 35.21 WIDELY GRADED SAND WITH SILT (SW-SM); ~90% sand, ~10% fines; moist, reddish brown to brown, motted, gray silt stringer.	
	S-8	2.0	15	2-2-4-8	0.7			35.21 - 37 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; homogeneous, wet, tan.	
	S-9	2.0	6	1-1-3-5	0.3			37 - 37.14 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; homogeneous, brown, moist to wet.	
40	S-10	2.0	24	2-6-10-10	2.1			37.14 - 38.07 SANDY LEAN CLAY (CL); ~70% fines, medium plasticity, ~30% sand; moist, gray.	
	S-11	2.0	20	1-13-16-20	2.2		MS-GP-04A (43-45)	38.07 - 39 CLAY (CL); ~100% fines; moist, gray.	
								39 - 41 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; homogeneous, wet, tan.	
45	S-12	2.0	20	5-8-12-16	6.1		MS-GP-04A (45-47)	41 - 41.5 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand, ~10% fines; dark brown to brown, some iron oxide like staining.	
								41.5 - 42.17 CLAYEY SAND (SC); medium plasticity; moist to wet.	
								42.17 - 46.1 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; homogeneous, wet, tan, some iron oxide like banding at 42.17 to 43 feet, banding at 45 feet.	
								46.1 - 46.6 NARROWLY GRADED SAND (SP); ~100% sand; red brown, banded with red and brown bands 0.25" thick.	
								46.6 - 47 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; homogeneous, wet, tan.	
								Bottom of borehole at 47.0 feet.	

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 1 of 2

MS-GP-05

GROUND SURFACE ELEVATION (FT): 93.22
NORTHING: 224982.51 EASTING: 1065501.09
DRILLED BY: Zebra Environmental / Luke Caballero
LOGGED BY: Melissa Felter
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT):

LOCATION:
TOTAL DEPTH (FT): 47.00
DATUM VERT. / HORZ.: NAVD 1988 / NAD83 NY Long Island Zone
DATE START / END: 11/16/2007 - 11/16/2007

DEPTH FT.	SAMPLE INFO: TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0						MS-GP-05 (0-5)	0 - 7 WIDELY GRADED SAND WITH GRAVEL (SW); ~75% sand; ~20% fine to coarse gravel, ~5% fines, ~5% brick, coal and glass, max. size 4 in., dry, brown.
5	S-1	5.0	40	0.2			7 - 10.5 NARROWLY GRADED SAND WITH SILT (SP-SM); ~85% sand; ~10% fines, ~5% fine gravel, <5% coal and glass, max. size 0.5 in., dry, brown and tan, dense.
10	S-2	5.0	49	0.1			10.5 - 17.5 WIDELY GRADED SAND (SW); ~90% sand; ~5% fines, ~5% fine to coarse gravel, max. size 2 in., dry, brown, loose.
15	S-3	5.0	42	0.2			17.5 - 20 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~75% sand; ~10% fines, ~15% fine gravel, max. size 0.5 in., moist to wet, brown, dense, wet at 19'.
20	S-4	5.0	34	0.1			20 - 21 WIDELY GRADED SAND WITH GRAVEL (SW); ~80% sand; ~5% fines, ~15% fine gravel, max. size 2 in., wet, brown. 21 - 25 SILT WITH SAND (ML); ~80% fines; ~20% fine to coarse sand, moist, brown and light tan, very dense.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG
PAGE 2 of 2
MS-GP-05

DEPTH FT.	SAMPLE INFO TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
25	S-5	5.0	31	0.1			25 - 32.5 SILTY SAND (SM); ~80% sand; ~20% fines, moist, light gray and light orangeish tan, dense
30	S-6	5.0	41	0.1			32.5 - 35 SANDY SILT (ML); ~60% fines; varved, ~40% fine sand, moist, dark gray with brown, very dense.
35	S-7	5.0	38	0.1			35 - 38.5 SILTY SAND (SM); ~60% sand; varved, ~40% fines, moist, dark gray with brown, dense 38.5 - 39.5 LEAN CLAY (CL); moist, grayish brown, dense. 39.5 - 40 SILTY SAND (SM); ~70% sand; ~30% fines, moist, grayish brown.
40	S-8	5.0	38	0.1			40 - 47 SILTY SAND (SM); ~80% sand; ~20% fines, moist, light gray and light orangeish tan, dense.
45	S-9	2.0	23	0.1			

Bottom of borehole at 47.0 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

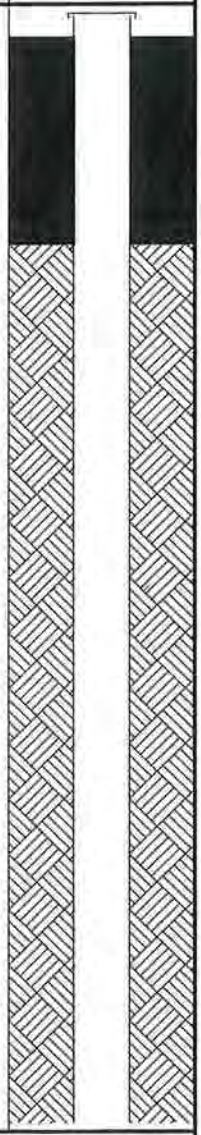
CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 1 of 4

MS-GP-05A/ MS-MW-05

GROUND SURFACE ELEVATION (FT): 93.42
LOCATION:
NORTHING: 224965.75 EASTING: 1065500.72
TOTAL DEPTH (FT): 81.00
DRILLED BY: Aquifer Drilling and Testing
DATUM VERT. / HORZ.: NAVD 1988 / NAD83 NY Long Island Zone
LOGGED BY: Lynn Willey
DATE START / END: 12/7/2007 - 12/8/2007
DRILLING DETAILS: Hollow Stem Auger
WATER LEVEL DEPTHS (FT): ▽ 71.00

DEPTH FT.	SAMPLE INFORMATION: TYPE and NO.	PEN FT.	REC IN.	Blows (/6 in.)	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION	WELL CONSTRUCTION DETAILS
0								0 - 47 Boring information from 0-47 feet can be obtained from adjacent boring, MS-GP-05.	
5									
10									
15									
20									

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG
PAGE 2 of 4
MS-GP-05A/ MS-MW-05

DEPTH FT.	SAMPLE INFORMATION: TYPE and NO.	PEN FT.	REC IN.	Blows (/6 in.)	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION	WELL CONSTRUCTION DETAILS
25									
30									
35									
40									
45									
	S-10	2.0	24	18-15-16-15	0.6			47 - 47.1 SILT WITH SAND (ML); ~85% fines, low plasticity, ~15% sand; homogeneous, moist, grayish brown. 47.1 - 49 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; dry, light tan, with mottling orange at top 2".	
50	S-11	2.0	12	29-33-43-49	1.2			49 - 51 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; dry, reddish brown, mottling	
	S-12	2.0	24	15-14-15-11	0.3			51 - 53 NARROWLY GRADED SAND (SP);	

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG
PAGE 3 of 4
MS-GP-05A/ MS-MW-05

DEPTH FT.	SAMPLE INFORMATION TYPE and NO.	PEN FT.	REC IN.	Blows (/6 in.)	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION	WELL CONSTRUCTION DETAILS
								~95% sand, ~5% fines; dry, orange to reddish brown, banded with 0.125" - 0.25" bands, 0.5" thick grey ML silt layer @ 18".	
	S-13	2.0	13	27-33-29-41	0.9			53 - 56.5 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; dry, reddish brown, banded with 0.125" bands.	
55	S-14	1.5	18	34-38-44-50/2"	0.2				
								56.5 - 59 Refusal - Auger to next samle interval @ 59'.	
	S-15	2.0	19	12-18-21-13	0.2			59 - 61 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; moist, orange brown, varying color bands - tan to white.	
60	S-16	2.0	24	12-11-16-21	0.1			61 - 61.6 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; moist, white to gray.	
	S-17	2.0	24	16-21-25-28	0.2			61.6 - 63 SILT (ML); ~90% fines, non plastic, ~10% sand; dry, narrowly graded sand in sporadic layers.	
								63 - 64 NARROWLY GRADED SAND WITH SILT (SP-SM); ~90% sand, ~10% fines, low plasticity; moist.	
65	S-18	1.3	15	23-29-50/3"	0.2			64 - 65 SILT (ML); ~90% fines, ~10% sand; dry, gray.	
								65 - 66.25 SILT (ML); ~90% fines, ~10% sand; dry, gray, sporadic narrowly graded sand partings, slightly moist at bottom.	
								66.25 - 69 Refusal - Auger to next samle interval @ 69'.	
	S-19	2.0	24	16-17-28-31	0.2			69 - 71 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; moist, gray and light gray, banded, wet at tip.	
70 ▽	S-20	2.0	20	12-13-21-26	0.5		MS-GP-05A (71-73)	71 - 73 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; wet, light gray.	
	S-21	2.0	19	8-8-10-9	0.1			73 - 75 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; wet, light gray, banding of orange brown to tan fine sand.	
75	S-22	2.0	21	20-21-23-34	0.2			75 - 79 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; wet, light gray, banding of red brown to orange.	
	S-23	2.0	19	15-16-17-20	0.3				
	S-24	2.0	15	18-20-35-36	0.5			79 - 81 NARROWLY GRADED SAND (SP); ~95% sand, ~5% fines; homogeneous, wet,	
80									

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN = INCHES
FT = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 4 of 4

MS-GP-05A/ MS-MW-05

DEPTH FT.	SAMPLE INFORMATION					STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION	WELL CONSTRUCTION DETAILS
	TYPE and NO.	PEN FT.	REC IN.	Blows (/6 in.)	PID (ppm)				
80								tan gray.	
								Bottom of borehole at 81.0 feet.	

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS.SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG
PAGE 1 of 2
MS-GP-06/ MS-MW-06

GROUND SURFACE ELEVATION (FT): 41.58
LOCATION:
NORTHING: 224929.08 EASTING: 1066065.85
TOTAL DEPTH (FT): 25.00
DRILLED BY: Zebra Environmental / Luke Caballero
DATUM VERT. / HORZ.: NAVD 1988 / NAD83 NY Long Island Zone
LOGGED BY: Chris Berotti
DATE START / END: 11/20/1997 - 11/20/2007
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT): ▽ 12.75

DEPTH FT.	SAMPLE INFO TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0	S-1	5.0		0		MS-GP-06 (1-3)	0 - 1 WIDELY GRADED SAND WITH SILT; ~80% sand, ~15% fines, ~5% gravel; max. size 0.75 in., brown, roots and leaf material, small amount of asphalt-like material, loose, HAND CLEARED. 1 - 5 WIDELY GRADED SAND WITH SILT; ~80% sand, ~10% fines; ~10% fine to coarse gravel, max. size 1 in., wet, tan brown, wet due to rain, HAND CLEARED.
5	S-2	5.0	56	0			5 - 10 WIDELY GRADED SAND WITH SILT; ~90% sand, ~10% fines; homogeneous, orange brown, loose, moist due to rain.
10	S-3	5.0	38	0		MS-GP-06 (12-13)	10 - 15 SILTY SAND; ~85% sand, ~15% fines; homogeneous, wet, tan.
15	S-4	5.0	27	0			15 - 20 WIDELY GRADED SAND; ~90% sand, ~5% fines; homogeneous, ~5% fine to coarse gravel, wet, orange tan.
20	S-5	5.0	42	0			20 - 25 WIDELY GRADED SAND; ~90% sand, ~5% fines; homogeneous, ~5% fine to coarse sand, max. size 0.75 in., wet, tan.

WELL CONSTRUCTION DETAILS

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)
ppm = PARTS PER MILLION
IN. = INCHES
FT = FEET
NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR
CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: KeySpan
PROJECT NAME: Manhasset Hortonshphere SC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8-1702

BORING LOG

PAGE 2 of 2

MS-GP-06/ MS-MW-06

DEPTH FT.	SAMPLE INFO: TYPE and NO.	SAMPLE INFO: PEN FT.	SAMPLE INFO: REC IN.	SAMPLE INFO: PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION	WELL CONSTRUCTION DETAILS
25							Bottom of borehole at 25.0 feet.	

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG MHS SC BORING LOGS.GPJ GEI CONSULTANTS.GDT 2/20/08

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: National Grid
PROJECT NAME: Manhasset Hortonsphre SSC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8

BORING LOG

PAGE 1 of 1

MS-GP-07

GROUND SURFACE ELEVATION (FT): 94.78
LOCATION:
NORTHING: 224979.488 **EASTING:** 1065482.65821
TOTAL DEPTH (FT): 25.00
DRILLED BY: Zebra Environmental / Evan Moraits
DATUM VERT. / HORZ.: NAVD 88 / NAD83 NY Long Island Zone
LOGGED BY: Kim Barber
DATE START / END: 2/19/2009 - 2/19/2009
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT):

DEPTH FT.	SAMPLE INFO TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0		5.0		0.1		MS-GP-07 (1-5)	0 - 3 WIDELY GRADED SAND WITH GRAVEL (SW); ~70% sand, fine to coarse, ~25% gravel, fine to coarse, subangular, ~5% fines; moist, dark blackish brown, concrete, porcelain, HAND CLEARED
							3 - 6 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~75% sand, fine to coarse, ~15% gravel, fine to coarse, subangular, ~10% fines; moist, brown, brick, coal, HAND CLEARED TO 5 ft.
5	S-1	5.0	48	0.1			6 - 7 SILTY SAND (SM); ~80% sand, fine, ~15% fines, ~5% gravel, fine; dry, tan.
							7 - 18.5 WIDELY GRADED SAND WITH SILT (SW-SM); ~85% sand, fine to coarse, ~10% fines, ~5% gravel, fine to coarse, subrounded; dry, orangeish brown, lense of brick at 9 ft., lens of coal at16 ft.
10	S-2	5.0	54	0.1			
15	S-3	5.0	54	0.1		MS-GP-07 (19-20)	18.5 - 20 WIDELY GRADED SAND WITH GRAVEL (SW); ~75% sand, fine to coarse, ~20% gravel, fine to coarse, subrounded, ~5% fines; moist, orangeish brown.
20	S-4	5.0	60	0.1			20 - 21.5 WIDELY GRADED SAND WITH SILT (SW-SM); ~85% sand, fine to coarse, ~10% fines, ~5% gravel, fine to coarse, subrounded; dry, orangeish brown.
							21.5 - 24 WIDELY GRADED SAND WITH GRAVEL (SW); ~75% sand, fine to coarse, ~20% gravel, fine to coarse, subrounded, ~5% fines; moist, orangeish brown, wet from 21.5-22 ft.
25							24 - 25 SANDY SILT (ML); ~55% fines, ~40% sand, fine, ~5% gravel, coarse; varved, moist, orangeish tan.
							Bottom of borehole at 25.0 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG BORING LOGS.GPJ GEI CONSULTANTS.GDT 3/17/09

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: National Grid
PROJECT NAME: Manhasset Hortonsphre SSC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8

BORING LOG
PAGE 1 of 1
MS-GP-08

GROUND SURFACE ELEVATION (FT): 93.16
LOCATION:
NORTHING: 225004.20422 **EASTING:** 1065501.17014
TOTAL DEPTH (FT): 25.00
DRILLED BY: Zebra Environmental / Evan Moraits
DATUM VERT. / HORZ.: NAVD 88 / NAD83 NY Long Island Zone
LOGGED BY: Kim Barber
DATE START / END: 2/19/2009 - 2/19/2009
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT):

DEPTH FT.	SAMPLE INFO TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0		5.0		0.2		MS-GP-08 (1-4)	0 - 5 WIDELY GRADED SAND WITH GRAVEL (SW); ~70% sand, fine to coarse, ~20% gravel, fine to coarse, ~10% fines; ~5% brick and coal, moist, dark brown, wet likely from heavy rain over night, more organics in top foot, HAND CLEARED.
5	S-1	5.0	36	1.6			5 - 9.5 SILTY SAND WITH GRAVEL (SM); ~70% sand, fine to coarse, ~20% gravel, fine to coarse, ~10% fines; ~5% brick, coal, wood, moist, dark brown, wet likely from heavy rain over night.
10	S-2	5.0	30	0.1			9.5 - 15.5 WIDELY GRADED SAND WITH SILT (SW-SM); ~80% sand, fine to coarse, ~10% gravel, ~10% fines; moist, brown.
15	S-3	5.0	54	0.1		MS-GP-08 (19-20)	15.5 - 16.5 SILTY SAND (SM); ~90% sand, fine, ~10% fines; wet, blackish gray. 16.5 - 18 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~75% sand, fine to coarse, ~15% gravel, fine to coarse, subrounded, ~10% fines; layered, moist, brown. 18 - 25 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~75% sand, fine to coarse, ~15% gravel, fine to coarse, subrounded, ~10% fines; moist, brown, dense
20	S-4	5.0	12	0.2			
25							Bottom of borehole at 25.0 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)
ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET
NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR
CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG BORING LOGS.GPJ GEI CONSULTANTS.GDT 3/17/09

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: National Grid
PROJECT NAME: Manhasset Hortonsphre SSC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8

BORING LOG

PAGE 1 of 1

MS-GP-09

GROUND SURFACE ELEVATION (FT): 93.44
LOCATION:
NORTHING: 224981.26676 **EASTING:** 1065517.88004
TOTAL DEPTH (FT): 25.00
DRILLED BY: Zebra Environmental / Evan Moraits
DATUM VERT. / HORZ.: NAVD 88 / NAD83 NY Long Island Zone
LOGGED BY: Kim Barber
DATE START / END: 2/19/2009 - 2/19/2009
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT):

DEPTH FT.	SAMPLE INFO: TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0		5.0		0.1		MS-GP-09 (1-5)	0 - 2 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~70% sand, fine to coarse, ~25% gravel, fine to coarse, subangular, ~5% fines; ~5% coal, beer can, wood, moist, dark brown, HAND CLEARED. 2 - 5 WIDELY GRADED GRAVEL WITH SILT AND SAND (GW-GM); ~60% gravel, ~35% sand, fine to coarse, ~5% fines; ~5% glass, coal, wet, blackish gray, HAND CLEARED.
5	S-1	5.0	48	1.2			5 - 12 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~70% sand, fine to coarse, ~20% gravel, fine to coarse, subangular, ~10% fines; ~10% wood, brick, pavement, moist, grayish brown, lens of wood and pavement at 5 ft.
10	S-2	5.0	48	0.4			12 - 20 WIDELY GRADED SAND (SW); ~75% sand, fine to coarse, ~15% fines, ~10% gravel, fine to coarse, subrounded; moist, orangeish brown.
15	S-3	5.0	30	0.0		MS-GP-09 (15-17)	
20	S-4	5.0	36	0.1			20 - 22 WIDELY GRADED SAND WITH GRAVEL (SW); ~75% sand, fine to coarse, ~20% gravel, fine to coarse, subrounded, ~5% fines; moist, orangeish brown. 22 - 23 SANDY SILT (ML); ~60% fines, ~40% sand, fine; varved, moist, orangeish tan, dense. 23 - 24 WIDELY GRADED SAND WITH GRAVEL (SW); ~75% sand, fine to coarse, ~20% gravel, fine to coarse, subrounded, ~5% fines; moist, orangeish brown. 24 - 25 SANDY SILT (ML); ~60% fines, ~40% sand, fine; varved, moist, orangeish tan, dense.
25							Bottom of borehole at 25.0 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG BORING LOGS.GPJ GEI CONSULTANTS.GDT 3/17/09

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: National Grid
PROJECT NAME: Manhasset Hortonsphre SSC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8

BORING LOG

PAGE 1 of 1

MS-GP-10

GROUND SURFACE ELEVATION (FT): 59.66
LOCATION:
NORTHING: 225127.55841 EASTING: 1065785.20535
TOTAL DEPTH (FT): 6.50
DRILLED BY: Zebra Environmental / Evan Moraits
DATUM VERT. / HORZ.: NAVD 88 / NAD83 NY Long Island Zone
LOGGED BY: Kim Barber
DATE START / END: 2/20/2009 - 2/20/2009
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT):

DEPTH FT.	SAMPLE INFO: TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0		5.0		0.0		MS-GP-10 (1-2)	0 - 2 WIDELY GRADED SAND WITH GRAVEL (SW); ~75% sand, fine to coarse, ~20% gravel, fine to coarse, subangular, ~5% fines; ~5% brick, coal, dry, blackish brown, HAND CLEARED. 2 - 6 WIDELY GRADED SAND WITH GRAVEL (SW); ~70% sand, fine to coarse, ~20% gravel, fine to coarse, subrounded, ~10% fines; moist, orangeish brown, HAND CLEARED TO 5 ft.
5	S-1	1.5		0.0		MS-GP-10 (5.5-6.5)	6 - 6.5 SILTY SAND (SM); ~55% sand, fine, ~40% fines, ~5% gravel; varved, moist, orangeish tan. Refusal at 6.5 feet. Bottom of borehole at 6.5 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG BORING LOGS.GPJ GEI CONSULTANTS.GDT 3/17/09

GEI Consultants

GEI Consultants, Inc.
455 Winding Brook Road
Glastonbury, CT 06033
(860) 368-5300

CLIENT: National Grid
PROJECT NAME: Manhasset Hortonsphre SSC
CITY/STATE: Manhasset, New York
GEI PROJECT NUMBER: 072710-8

BORING LOG
PAGE 1 of 1
MS-GP-11

GROUND SURFACE ELEVATION (FT): 61.16
LOCATION:
NORTHING: 225106.17273 EASTING: 1065775.70324
TOTAL DEPTH (FT): 15.00
DRILLED BY: Zebra Environmental / Evan Moraits
DATUM VERT. / HORZ.: NAVD 88 / NAD83 NY Long Island Zone
LOGGED BY: Kim Barber
DATE START / END: 2/20/2009 - 2/20/2009
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT):

DEPTH FT.	SAMPLE INFO: TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0		5.0		0.0		MS-GP-11 (1-4)	0 - 4 WIDELY GRADED SAND WITH GRAVEL (SW); ~70% sand, fine to coarse, ~20% gravel, ~10% fines; ~10% pavement, brick, coal, moist, blackish brown, HAND CLEARED.
5	S-1	5.0	60	0.0		MS-GP-11 (5-10)	4 - 7 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~60% sand, fine to coarse, ~20% gravel, fine to coarse, subrounded, ~20% fines; moist, orangeish brown, dense, HAND CLEARED TO 5 ft. 7 - 7.5 ELASTIC SILT WITH SAND (MH); ~80% fines, ~20% sand, fine; tan. 7.5 - 9 WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~60% sand, fine to coarse, ~20% gravel, fine to coarse, subrounded, ~20% fines; moist, orangeish brown, dense, wet at 7.5-8 ft. 9 - 10 SILTY SAND (SM); ~55% sand, fine, ~40% fines, ~5% gravel, fine, subrounded; varved, moist, orangeish tan, lense of blackish brown silt at 9 ft.
10	S-2	5.0	0				10 - 15 LINER JAMMED, NO RECOVERY.
15							Bottom of borehole at 15.0 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)
ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET
NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR
CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG BORING LOGS.GPJ GEI CONSULTANTS.GDT 3/17/09

GEI Consultants, Inc. 455 Winding Brook Road Glastonbury, CT 06033 (860) 368-5300	CLIENT: National Grid PROJECT NAME: Manhasset Hortonsphre SSC CITY/STATE: Manhasset, New York GEI PROJECT NUMBER: 072710-8	BORING LOG PAGE 1 of 1	MS-GP-12

GROUND SURFACE ELEVATION (FT): 62.12 LOCATION:
NORTHING: 225117.91018 EASTING: 1065757.91508 TOTAL DEPTH (FT): 10.00
DRILLED BY: Zebra Environmental / Evan Moraits DATUM VERT. / HORZ.: NAVD 88 / NAD83 NY Long Island Zone
LOGGED BY: Kim Barber DATE START / END: 2/20/2009 - 2/20/2009
DRILLING DETAILS: Geoprobe
WATER LEVEL DEPTHS (FT):

DEPTH FT.	SAMPLE INFO: TYPE and NO.	PEN FT.	REC IN.	PID (ppm)	STRATA	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
0		5.0		0.1		MS-GP-12 (1-2)	0 - 2 WIDELY GRADED SAND (SW); ~85% sand, fine to coarse, ~10% gravel, fine to coarse, ~5% fines; <~5% glass, dry, brown, HAND CLEARED.
							2 - 6.5 WIDELY GRADED SAND WITH SILT (SW-SM); ~85% sand, fine to coarse, ~10% fines, ~5% gravel, fine to coarse; dry, brown, HAND CLEARED, lens of tan silt at 5.5 ft. and 6.5 ft.
5	S-1	5.0		0.1		MS-GP-12 (7-8)	6.5 - 10 SILTY SAND (SM); ~55% sand, ~45% fines; varved, moist, orangeish tan, blackish brown silt lenses at 7 and 9.5 ft.
10							Bottom of borehole at 10.0 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL
REC = RECOVERY LENGTH OF SAMPLE
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

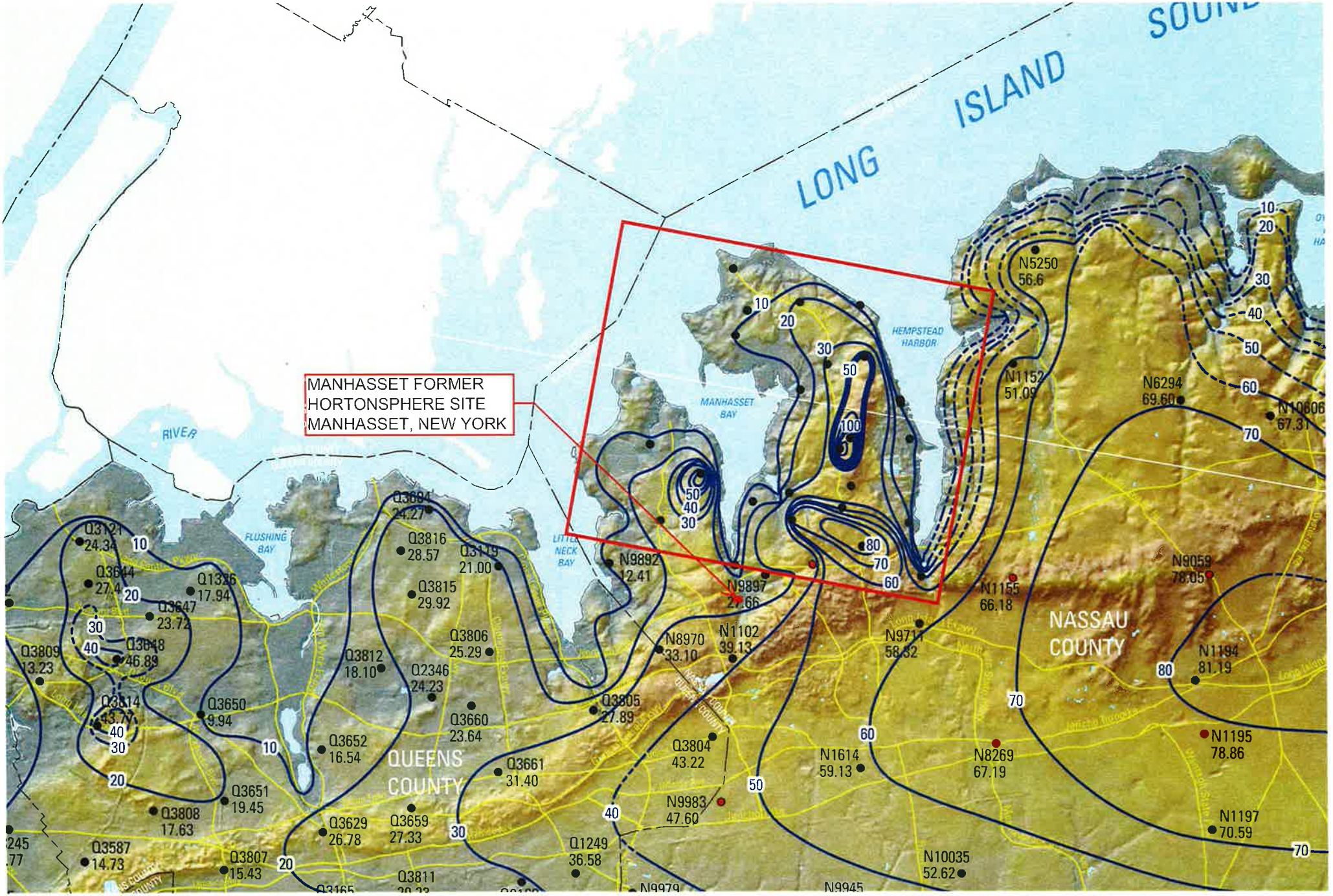
ppm = PARTS PER MILLION
IN. = INCHES
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR
PLO = PETROLEUM LIKE ODOR
TLO = TAR LIKE ODOR
CLO = CHEMICAL LIKE ODOR
ALO = ASPHALT LIKE ODOR

CrLO= CREOSOTE LIKE ODOR
OLO = ORGANIC LIKE ODOR
SLO = SULFUR LIKE ODOR
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG BORING LOGS.GPJ GEI CONSULTANTS.GDT 3/17/09

Water Table Elevations in Vicinity of Manhasset, New York



Appendix E

Data Usability Summary Report and Electronic Data Deliverables

(Electronic Only)