ALTERNATIVES ANALYSIS REPORT
FORMER ZEREGA AVENUE GAS HOLDER SITE
BRONX, NEW YORK
CONSENT ORDER NUMBER 0-20180516-519
SITE ID NO. 203110

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Certification Statement

I, Jason D. Brien, P.E. certify that I am currently a NYS registered professional engineer and that this *Alternatives Analysis Report* was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER *Technical Guidance for Site Investigation and Remediation* (DER-10).

______________________ Date __________

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Former Zerega Avenue Gas Holder Site

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ACRONYMS AND ABBREVIATIONS

AAR	Alternatives Analysis Report
amsl	above mean sea level
BTEX	benzene, toluene, ethylbenzene, and xlyene
bgs	below ground surface
Ca/MgO	calcium and/or magnesium oxide
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cf	cubic-foot
CFR	Code of Federal Regulations
COCs	constituents of concern
cy	cubic-yard
C&D	Construction and demolition
DAR	Division of Air Resources
DER	Division of Environmental Remediation
ECL	Environmental Conservation Law
FEMA	Federal Emergency Management Agency
GRA	general response action
HASP	Health and Safety Plan
LDRs	Land Disposal Restrictions
LTTD	Low Temperature Thermal Desorption
mg/kg	milligram per kilogram
MGP	manufactured gas plant
NAPL	non-aqueous phase liquid
NCP	National Contingency Plan
NYCRR	New York Code of Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OLM	Oil-Like Material
O&M	operation and maintenance
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PDI	Pre-design investigation
PPE	personal protective equipment
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
SCGs	standards, criteria, and guidelines
SCOs	soil cleanup objectives
SMP	site management plan
SVOC	semi-volatile organic compound
TCLP	Toxicity Characteristic Leaching Procedure
TOGS	Technical and Operational Guidance Series

USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
UTSs	Universal Treatment Standards
VOC	volatile organic compound

EXECUTIVE SUMMARY

Introduction

This *Alternatives Analysis Report* (AAR) presents an evaluation of remedial alternatives to address environmental impacts identified at the Consolidated Edison Company of New York, Inc. (Con Edison) former Zerega Avenue Gas Holder site (the site) located in Bronx, New York (Site No. 203110). This AAR has been prepared in accordance with the Order on Consent and Administrative Settlement Number 0-20180516-519 (Consent Order) between Con Edison and the New York State Department of Environmental Conservation (NYSDEC).

The purpose of this AAR is to identify and evaluate remedial alternatives that are:

- Appropriate for site-specific conditions
- Protective of public health and the environment
- Consistent with relevant sections of NYSDEC guidance, the National Contingency Plan (NCP), and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

The overall objective of this AAR is to recommend a reliable remedy that achieves the site-specific remedial action objectives (RAOs) and best balance the NYSDEC evaluation criteria.

Background

The site is located on two adjacent parcels on the west side of Zerega Avenue in the Unionport section of Bronx, New York. The site is bordered by Watson Avenue to the north, Zerega Avenue to the east, Blackrock Avenue to the south, and a private property to the West. The site is currently occupied/owned by Clarendon Holding Company, Inc. (Clarendon) and is used as a school bus parking lot and maintenance facility (operated by Clarendon). Above-grade structures at the site include a large two-story service garage and fueling station. The site is covered with asphalt pavement and concrete (fueling areas and maintenance garage aprons). A chain link fence currently surrounds the entire property. An electrical substation (owned and operated by Con Edison) is located in the southeast corner of the site. The substation property is surrounded by a chain link fence and covered with gravel, grass, and vegetation.

The Zerega Avenue Gas Holder site is located on the west side of Zerega Avenue, directly opposite from the former Unionport Works site. Historical manufactured gas plant (MGP) operations were conducted at the Unionport Works site between 1905 and 1927 and primarily consisted of the production of manufactured gas using the Lowe carbureted water gas process. Manufactured gas produced at the Unionport Works site, east of Zerega Avenue, was stored in aboveground gas holders located at the former Zerega Avenue Gas Holder site. Con Edison owned and operated the Zerega Avenue Gas Holder site between 1905 and 1966. In 1929, the gas works at the Unionport Work site and the 75,000 and 500,000 cubic-foot (cf) gas holders at the Zerega Avenue site were dismantled. The remaining 5 million cf gas holder at the Zerega Avenue site continued to be used for natural gas storage and distribution until it was dismantled in 1966.

Nature and Extent of Impacts

Relatively minor quantities of NAPL/sheen and elevated concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs) and some inorganics were identified in soil and groundwater at isolated locations at the site. Site-related impacts are generally distributed as follows:

Visual Impacts

- Minor NAPL impacts were observed in two soil borings completed in the eastern portion of the site. NAPL, visually characterized as oil-like material (OLM), was observed in soil from 10 to 11 feet below ground surface (bgs) at boring location SB-10 located within the former footprint of the 500,000 cf gas holder. Minor quantities of NAPL (visually characterized as blebs) were also encountered at MW-4 (i.e., immediately east of the site) at depths of 10 and 15 feet bgs. Sheens and strong odors were also noted in soils at MW-4 throughout the entire 10-15 feet bgs depth interval.
- Visible sheens were noted in SB-04 at depths ranging from 1.2 to 1.4 bgs feet, SB-13 at depths ranging from 10 to 15 bgs feet, MW-5 at depths ranging from 10 to 12 bgs feet, and TP-04 at depths ranging from 4.2 to 7 feet bgs. Additionally, sheens were observed during field screening (shake testing) for soil recovered from SB-05 at depths ranging from 5.8 to 10 feet bgs and from SB-07 at depths ranging from 5.6 to 5.7 feet bgs. Odors were sporadically noted in SB-13 at depths ranging from 10 to 15 feet bgs, MW-5 at depths ranging from 5 to 6.8 and 10 to 12 feet bgs, and TP-04 at depths ranging from 4.7 to 7.0 feet bgs.

Soil Quality

Soil analytical results were compared to the restricted commercial- and industrial-use soil cleanup objectives (SCOs) and SCOs for protection of groundwater presented in 6 NYCRR Part 375-6.8(a) and (b). In addition, a site-specific screening value of 500 mg/kg total PAHs has been established to aid in the delineation of soil containing site-related impacts. Analytical results for soil samples indicated the following:

- Individual BTEX compounds were detected at concentrations exceeding the SCOs for the protection of groundwater in only 3 of 36 soil samples (all collected from soil borings located within the footprint of the 500,000 cf gas holder). None of the soil samples contained individual volatile organic compounds (VOCs) at concentrations greater then commercial or industrial use SCOs.
- Individual PAHs were detected at concentrations exceeding SCOs for protection of groundwater, commercial use, and industrial use in 11 of 36 subsurface soil samples. Most sample locations where PAHs were detected in soil samples at concentrations above their respective SCOs are located within and hydraulically downgradient from the former 500,000 cf gas holder. Elevated PAHs were also identified in a soil sample collected from SB-05 at 7 feet bgs immediately below the suspected foundation of a former 80,000-gallon oil tank.
- Total PAHs were detected at concentrations greater than 500 mg/kg in only 3 of 36 subsurface soil samples. These samples were all collected from locations within the footprint of the 500,000 cf gas holder, including SB-10, SB-13, and TP-04.

Groundwater Quality

Groundwater analytical results were compared to NYSDEC's *Division of Water, Technical and Operational Guidance Series (TOGS 1.1.1) Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations*. BTEX and PAHs were only constituents detected in groundwater samples at concentrations exceeding the groundwater quality standards and/or guidance values (at monitoring well MW-4). Concentrations of BTEX and PAHs detected at this location during the 2010 sampling event were lower than the concentrations identified during the 2009 event.

Remedial Action Objectives

RAOs are developed to assist in developing goals for cleanup of constituents of concern (COCs) in each medium that may require remediation. The RAOs presented in the following table have been developed based on the generic RAOs listed on NYSDEC's website (http://www.dec.ny.gov/regulations/67560.html).

Table ES.1 Remedial Action Objectives

RAOs for Soil
RAOs for Public Health Protection 1. Prevent, to the extent practicable, ingestion/direct contact with COCs/NAPL. 2. Prevent, to the extent practicable, inhalation of or exposure to COCs from impacted soil. RAOs for Environmental Protection Address, to the extent practicable, COCs/NAPL in soil that could result in impacts to groundwater.
RAOs for Groundwater
RAOs for Public Health Protection 1. Prevent, to the extent practicable, ingestion of groundwater containing dissolved phase COCs at concentrations exceeding NYSDEC groundwater quality standards or guidance values. 2. Prevent, to the extent practicable, contact with or inhalation of VOCs from groundwater containing COCs at concentrations exceeding NYSDEC groundwater quality standards or guidance values. RAOs for Environmental Protection 1. Restore groundwater to pre-disposal/pre-release conditions, to the extent practicable. 2. Address the source of groundwater impacts to the extent practicable.

Remedial Technology Screening and Development of Remedial Alternatives

The objective of the technology screening is to present general response actions (GRAs), associated remedial technology types and technology process options, and then narrow the universe of process options to those that have had documented success at achieving similar RAOs at former MGP sites to identify options that are implementable and potentially effective at addressing impacts identified for the site. Based on this screening, remedial technology types and technology process options were eliminated or retained and subsequently combined into potential remedial alternatives for further, more detailed evaluation. This approach is consistent with the screening and selection process provided in DER-10.

Based on the results of the technology screening, the following potential remedial alternatives were developed:

- Alternative 1 – No Action
- Alternative 2 – Long-Term Site Management
- Alternative 3 – Targeted Excavation

Following the development of the remedial alternatives, a detailed description of each alternative was prepared, and each alternative was evaluated with respect to the criteria presented in DER-10.

Recommended Remedial Alternative

Based on the results of the comparative analysis, the recommended remedial alternative for this site is Alternative 2 – Long-Term Management. The primary components of the preferred remedial alternative consist of the following:

- Conducting periodic groundwater monitoring
- Establishing institutional controls in the form of deed restrictions and/or environmental easements to control intrusive (i.e., subsurface) activities and require compliance with the Site Management Plan (SMP); and restrict groundwater use at the site.
- Preparing an SMP to document the following:
  - The institutional controls that have been established and will be maintained for the site
  - Known locations of soil containing COCs at concentrations greater than 6 NYCRR Part 375-6 commercial use SCOs
  - Protocols (including health and safety requirements) for conducting invasive (i.e., subsurface) activities and managing potentially impacted material encountered during these activities within an Excavation Work Plan.
  - Protocols and requirements for conducting annual groundwater monitoring
  - Protocols for addressing significant changes in COC concentrations in groundwater based on the results of the annual monitoring activities

1 INTRODUCTION

This *Alternatives Analysis Report* (AAR) presents an evaluation of remedial alternatives to address environmental impacts identified at the Consolidated Edison Company of New York, Inc. (Con Edison) former Zerega Avenue Gas Holder site (the site) located in Bronx, New York (Site No. 203110). This AAR has been prepared in accordance with the Order on Consent and Administrative Settlement Number 0-20180516-519 (Consent Order) between Con Edison and the New York State Department of Environmental Conservation (NYSDEC).

1.1 Regulatory Framework

This AAR has been prepared to evaluate remedial alternatives to address identified environmental impacts at the site in a manner consistent with the Consent Order and with NYSDEC Division of Environmental Remediation (DER) DER-10 *Technical Guidance for Site Investigation and Remediation* (DER-10) (NYSDEC, 2010a).

This AAR has also been prepared in consideration of applicable provisions of the New York State Environmental Conservation Law (ECL) and associated regulations, including Title 6 of the New York Code of Rules and Regulations (NYCRR) Part 375-6 (6 NYCRR Part 375-6).

1.2 Purpose

The purpose of this AAR is to identify and evaluate remedial alternatives that are:

- Appropriate for site-specific conditions
- Protective of public health and the environment
- Consistent with relevant sections of NYSDEC guidance, the National Contingency Plan (NCP), and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

The overall objective of this AAR is to recommend a reliable remedy that achieves the site-specific remedial action objectives (RAOs) and best balance the NYSDEC evaluation criteria.

1.3 Report Organization

This AAR is organized as described in the following table.

Table 1.1 Report Organization

Section	Purpose
Section 1 – Introduction	Provides background information relevant to the development of remedial alternatives evaluated in this AAR.

Section	Purpose
Section 2 – Identification of Standards, Criteria, and Guidance	Identifies standards, criteria, and guidance (SCGs) that govern the development and selection of remedial alternatives.
Section 3 – Development of Remedial Action Objectives	Presents the site-specific RAOs that have been developed to be protective of public health and the environment.
Section 4 – Technology Screening and Development of Remedial Alternatives	Presents the results of a screening process completed to identify potentially applicable remedial technologies and develops remedial alternatives that have the potential to meet the RAOs.
Section 5 – Detailed Evaluation of Remedial Alternatives	Presents a detailed evaluation of each potential remedial alternative using the criteria presented in the referenced guidance documents.
Section 6 – Comparative Analysis of Alternatives	Presents a comparative analysis of the remedial alternatives using the evaluation criteria.
Section 7 – Preferred Remedial Alternative	Identifies the preferred remedial alternative for addressing the environmental concerns at the site.
Section 8 – References	Provides a list of references utilized to prepare this AAR.

1.4 Background Information

This section summarizes site background information relevant to the development and evaluation of remedial alternatives, including site location and physical setting, site history and operation, and previous investigations conducted for the site.

1.4.1 Site Location and Physical Setting

The former Zerega Avenue Gas Holder site is located on two adjacent parcels on the west side of Zerega Avenue in the Unionport section of Bronx, New York (see Figure 1). The site covers approximately 1.8 acres bordered by Watson Avenue to the north, Zerega Avenue to the east, Blackrock Avenue to the south, and a private property to the West. Properties adjacent to the site are primarily utilized for industrial or commercial purposes and include some residential properties. The former Unionport Works site and Westchester Creek are located east of Zerega Avenue. A nursing home is located on the adjacent property to the west of the site. The existing layout of the site is shown on Figure 2.

The site (Bronx Tax Map Block 3827, Lot 1) is currently occupied/owned by Clarendon Holding Company, Inc. (Clarendon) and is used as a school bus parking lot and maintenance facility (operated by

Clarendon). Above-grade structures at the site include a large two-story service garage and fueling station. The site is covered with asphalt pavement and concrete (fueling areas and maintenance garage aprons). A chain link fence currently surrounds the entire property. An electrical substation (owner and operated by Con Edison) is located in the southeast corner of the site (Bronx Tax Map Block 3827, Lot 30). The substation is surrounded by a chain link fence and covered with gravel, grass, and vegetation.

The site is generally flat with an elevation of approximately 20 feet above mean sea level (amsl) as referenced to the 1988 North American Vertical Datum (NAVD). The majority of the site is graded to slope toward storm sewer catch basins which are located in the center of the property. The storm sewer conveys flow southeast/east toward Westchester Creek.

1.4.2 Site History and Operation

A detailed account of the site operations and ownership was presented in the December 2002 *Manufactured Gas Plant History: Unionport Works and Zerega Avenue Station* prepared by GEI Consultants, Inc. (GEI, 2002). Historical manufactured gas plant (MGP) operations were conducted at the Unionport Works site between 1905 and 1927 and primarily consisted of the production of manufactured gas using the Lowe carbureted water gas process. Manufactured gas produced at the Unionport Works site, east of Zerega Avenue, was stored in aboveground gas holders located at the former Zerega Avenue Gas Holder site. Con Edison owned and operated the Zerega Avenue Gas Holder site between 1905 and 1966. In 1929, the gas works at the Unionport Work site and the 75,000 and 500,000 cubic-foot (cf) gas holders at the Zerega Avenue site were dismantled. The remaining 5 million cf gas holder at the Zerega Avenue site continued to be used until it was dismantled in 1966 (GEI, 2002).

Two realty companies owned the site between 1967 and 2001 and site use between 1967 and 1977 is unknown. Based on historical Sanborn maps, from 1977 through the 1990’s the site was used as a parking area (GEI, 2002). The property was purchased by Clarendon (current owner) in 2001 and is currently used as a school bus parking lot and maintenance facility (operated by Clarendon).

1.4.3 Summary of Previous Investigations and Site Activities

The previous investigation activities conducted at the site are documented in the June 2011 *Remedial Investigation Report* (RI Report) (Arcadis, 2011). The overall objective of the RI was to assess the nature and extent of the site-related environmental impacts to facilitate an evaluation of remedial alternatives. RI addressed the following specific objectives:

- Determining if MGP- and/or non-MGP-related compounds are present in soil and/or groundwater at the site.
- Identifying the potential presence of MGP- and/or non-MGP-related by-product residuals (such as coal tar, non-aqueous phase liquid [NAPL], purifier wastes, petroleum, solvents, etc.) in soil and/or groundwater at the site.
- Evaluating, to the extent practicable, whether groundwater flow may be a pathway for off-site migration of identified chemical constituents (if present).
- Determining compliance with applicable NYSDEC SCGs.

RI field activities consisted of the following:

- Implementing soil investigation activities which consisted of completing 17 soil borings and four test pits to visually characterize subsurface conditions and facilitate the collection of subsurface soil samples for laboratory analysis.
- Implementing groundwater investigation activities, which included installing five groundwater monitoring wells, collecting groundwater samples for laboratory analysis, and completing fluid level monitoring to characterize groundwater flow conditions and evaluate the presence and characteristics of NAPL.

Investigation locations are shown in Figure 3.

1.5 Site Characterization

This section presents an overall site characterization and a summary of the nature and extent of impacted media at the site based on the results of the RI. The site characterization consists of an overview of site geology and hydrogeology followed by a summary of the nature and extent of impacts identified at the site.

1.5.1 Geology

Geologic cross-sections are provided as Figures 4 through 8. As shown on the figures, the overburden strata in descending order from the ground surface, consists of fill and a bedrock unit. The characteristics of these strata is briefly described below:

- Fill – The fill is generally described as unsorted sands, with varying amounts of gravel, silt and clay, and lesser amounts of organics, cinders, wood, brick, slag and/or glass typically present in the upper five feet of soils. The lower fill appears to consist of reworked soils (i.e., till) likely disturbed during development of the area. The fill also contains several remnant man-made concrete structures from various industrial uses of the site. The fill unit ranges in thickness between 3 feet near the former 5 million cf holder to as much as 23 feet in the southeast portion of the site.
- Bedrock – The bedrock surface was encountered at 17 soil borings at depths ranging between approximately 3 and 23 feet below ground surface (bgs). The maximum depth penetrated into bedrock was approximately 19 feet (SB-1). As shown on Figure 5, the bedrock surface forms a west to east oriented ridge that appears to plunge to the east. Varying degrees of weathering was observed in the upper portion of the bedrock.

An undisturbed glacial till was also observed on the bedrock surface in the northeast corner of the site. This till unit was not observed in any other areas of the site and is not consider as a major geologic unit.

1.5.2 Hydrogeology

The water table is generally encountered at depths ranging from 5 to 10 feet bgs. Shallow groundwater flows toward the east, in the direction of Westchester Creek at a relatively steep hydraulic gradient (0.02 feet/feet). The hydraulic gradient begins to flatten in the eastern portion of the site, possibly due to the tidally influenced Westchester Creek. Although the hydraulic gradient at the site is steep, the relatively low hydraulic conductivity (geometric mean of 0.36 feet/day) of the fill and bedrock results in low groundwater flow velocity of approximately 11 feet/year.

1.5.3 Nature and Extent of Impacts

Manufactured gas-production byproducts, typically NAPL (i.e., coal tar) and purifier waste, often account for the majority of the impacts at former MGP sites. Principal components of coal tar that are routinely analyzed for at MGP sites are benzene, toluene, ethylbenzene, and xylene (BTEX) compounds, which are volatile organic compounds (VOCs), and polycyclic aromatic hydrocarbons (PAHs), which are semi-volatile organic compounds (SVOCs). The principal chemical of concern associated with purifier waste is cyanide, and as such, total and free cyanide analyses are typically performed during investigations of MGP sites. However, deposits of purifier waste and elevated levels of total cyanide were not observed. The RI identified BTEX and PAH compounds as constituents of concern (COCs) because these compounds were detected in soil and/or groundwater at concentrations exceeding applicable SCGs. Total cyanide was not identified as a COC because it was not detected in any soil or groundwater samples at concentrations above applicable SCGs.

1.5.4 Distribution of Visual Impacts and NAPL

Physical evidence of impacts in subsurface soil, including odors, visible staining, sheens, and limited amount of NAPL were document at 10 of the 22 RI sampling locations. Field observations are shown on the geologic cross sections presented as Figures 4 through 8. Additionally, a summary of visual impacts is presented on Figure 9.

Minor NAPL impacts were only observed in two of the RI soil borings completed in the eastern portion of the site. NAPL was identified as oil-like material (OLM) in the saturated zone at SB-10 (though to be located within the limits of the former 500,000 cf gas holder) at a depth of 10 to 11 feet bgs, which was above a slightly less permeable layer of clayey sands. While, evidence of the holder foundation was not present at SB-10, the suspected holder foundation was encountered between 9 to 10 feet bgs at SB-09 (completed approximately 60 feet northwest of SB-10). Minor quantities of NAPL (visually characterized as blebs) were also encountered at MW-4 (i.e., immediately east of the site) at a depth of 9 to 10 feet bgs (i.e., NAPL blebs observed on core bit). Sheens and strong odors were also present in the silt layer in MW-4 (from 10-15 feet bgs).

Visible sheens were noted in SB-04 at depths ranging from 1.2 to 1.4 feet bgs, SB-13 at depths ranging from 10 to 15 feet bgs, MW-5 at depths ranging from 10 to 12 feet bgs, and TP-04 at depths ranging from 4.2 to 7 feet bgs. Additionally, sheens were observed during field testing (shake testing) for soil recovered from SB-05 at depths ranging from 5.8 to 10 feet bgs and from SB-07 at depths ranging from 5.6 to 5.7 feet bgs. Odors were sporadically noted in SB-13 at depths ranging from 10 to 15 feet bgs, MW-5 at depths ranging from 5 to 6.8 and 10 to 12 feet bgs, and TP-04 at depths ranging from 4.7 to 7.0 feet bgs.

Visual staining was also observed in the unsaturated zone at a depth of 2.8 feet bgs at soil boring SB-08 and at a depth of 0.2- to 1-foot bgs at test pit TP-02. Each of these locations where staining was observed in the unsaturated zone were adjacent to former drip tanks.

1.5.5 Soil Quality

BTEX compounds, PAHs, and inorganic compounds were detected in several of the soil samples collected as part of the RI. Soil analytical results were compared to the restricted commercial- and industrial-use soil cleanup objectives (SCOs) and SCOs for protection of groundwater presented in 6 NYCRR Part 375-6.8(a) and (b). The commercial- and industrial-use SCOs are based on the current and anticipated site use. The SCOs for the protection of groundwater are also potentially applicable given the proximity of the site to Westchester Creek (located approximately at 450 feet). In addition, a site-specific screening value of 500 mg/kg total PAHs has been established to aid in the delineation of soil containing site-related impacts. Soil samples with visible sheens and/or total PAH concentrations exceeding 500 mg/kg are shown on Figure 9. Soil samples with individual BTEX and PAH compounds detected at concentrations exceeding the SCOs for the protection of groundwater are shown on Figures 10 and 11, respectively. Analytical results for soil samples indicated the following:

- Individual BTEX compounds were detected at concentrations exceeding the SCOs for the protection of groundwater in only 3 of 36 soil samples (at locations MW-4, SB-110, and SB-113). None of the soil samples contained individual VOCs at concentrations greater than commercial or industrial SCOs.
- Individual PAHs were detected at concentrations exceeding SCOs for commercial use, industrial use, and/or protection of groundwater in 11 of 36 subsurface soil samples. Most sample locations where PAHs were detected in soil samples at concentrations above their respective SCOs are located within and hydraulically downgradient from the former 500,000 cf gas holder. Elevated PAHs were also identified in a soil sample collected from SB-05 at 7 feet bgs at a location that was immediately below the suspected foundation of the former 80,000-gallon oil tank.
- Total PAHs were detected at concentrations greater than 500 mg/kg in only 3 of 36 subsurface soil samples. These samples were all collected from locations located within the footprint of the 500,000 cf gas holder, including SB-10, SB-13, and TP-04.
- Arsenic exceeded the SCOs for commercial use, industrial use and/or protection of groundwater in 4 of the 36 samples analyzed. Lead exceeded the SCOs for the protection of groundwater use in 2 of the 36 samples analyzed, and mercury exceeded SCOs for the protection of groundwater use in 1 of the 36 samples analyzed.
- Cyanide did not exceed the SCOs for protection of groundwater in any soil samples collected during the RI Investigation.

In general, individual BTEX and PAHs at concentrations exceeding the SCOs for the protection of groundwater are limited to the eastern portion of the site.

1.5.6 Groundwater Quality

A summary of groundwater impacts is shown on Figure 12. The distribution of groundwater samples with concentrations exceeding NYSDEC's *Division of Water, Technical and Operational Guidance Series (TOGS 1.1.1*) *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations* (NYSDEC, 2004) is as follows:

- Individual BTEX and PAHs were present at concentrations exceeding the groundwater quality standards and/or guidance values at MW-4. Note that concentrations of BTEX and PAHs identified at this location during the 2010 sampling event were less than the concentrations identified during the 2009 event.
- Lead was present at concentrations exceeding the groundwater quality standard at both MW-4 and MW-5 during the 2009 event. In addition, antimony and chromium were also present at concentrations exceeding groundwater quality standards at MW-5 during the 2009 event. However, antimony, chromium, and lead were not detected at any monitoring location during the 2010 sampling event.

  Several other typical mineral constituents (including iron, magnesium, manganese, and sodium) were also present at concentrations exceeding the groundwater quality standards at each monitoring well sampled during the RI.
- Total cyanide was not present at concentrations exceeding the groundwater quality standard or guidance value at any of the monitoring well locations sampled during the RI.

In general, individual BTEX and PAHs at concentrations exceeding the groundwater quality standards and/or guidance values are limited to the northeast portion of the site.

2 IDENTIFICATION OF STANDARDS, CRITERIA, AND GUIDANCE

This AAR was prepared in general conformance with the applicable guidelines, criteria and considerations set forth in the DER-10 and 6 NYCRR Part 375 Environmental Remediation Programs. This section presents the SCGs that have been identified for the site.

2.1 Definitions of Standards, Criteria, and Guidance

"Standards and criteria" are cleanup standards, standards of control and other substantive environmental protection requirements, criteria or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance.

"Guidance" is non-promulgated criteria, advisories and/or guidance that are not legal requirements and do not have the same status as "standards and criteria;" however, remedial programs should be designed with consideration given to guidance documents that, based on professional judgment, are determined to be applicable to the project (6 NYCRR 375-1.8[f][2][ii]).

Standards, criteria and guidance will be applied so that the selected remedy will conform to standards and criteria that are generally applicable, consistently applied and officially promulgated; and that are either directly applicable, or that are not directly applicable but relevant and appropriate, unless good cause (as defined in 6 NYCRR 375-1.8 [f][2][i]) exists why conformity should be dispensed with.

2.2 Types of Standards, Criteria, and Guidance

Potential SCGs considered in this AAR were categorized in the following classifications:

- *Chemical-Specific SCGs* – These SCGs are health- or risk-based numerical values or methodologies that, when applied to site-specific conditions, result in the establishment of numerical values for each COC. These values establish the acceptable amount or concentration of chemical constituents that may be found in, or discharged to, the ambient environment.
- *Action-Specific SCGs* – These SCGs are technology- or activity-based requirements or limitations on actions taken with respect to hazardous waste management and remediation of the site.
- *Location-Specific SCGs* – These SCGs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they occur in specific locations.

2.3 Standards, Criteria, and Guidance

The SCGs identified for the evaluation of remedial alternatives are presented in the following subsections. These SCGs have been identified as potentially applicable; their actual applicability will be determined during the evaluation of a particular remedy, and further described during development of the remedial design (i.e., after the final site remedy has been selected). Each potential remedy will comply with the identified SCGs or indicate why compliance with an SCG cannot or will not be obtained.

2.3.1 Chemical-Specific SCGs

The potential chemical-specific SCGs are summarized in Table 1. As mentioned above, chemical-specific SCGs are the criteria that typically drive the remedial efforts at former MGP sites because they are most directly associated with addressing potential human exposure. The primary chemical-specific SCGs that exist for impacted soil and groundwater at the site are briefly summarized below.

The SCOs presented in 6 NYCRR Part 375-6 are chemical-specific SCGs that are relevant and appropriate to the site. Specifically, the SCOs for the protection of human health, assuming a future commercial use (commercial use SCOs), are applicable for surface soils and subsurface soils, respectively. Additionally, CP-51 *Soil Cleanup Guidance* (NYSDEC, 2010b) allows for a subsurface soil total PAH SCO of 500 milligrams per kilogram (mg/kg) at non-residential sites (i.e., commercial and industrial use sites).

Chemical-specific SCGs that potentially apply to the waste materials generated during remedial activities are the Resource Conservation and Recovery Act (RCRA) and New York State regulations regarding identifying and listing hazardous wastes outlined in 40 Code of Federal Regulations (CFR) 261 and 6 NYCRR Part 371, respectively. Included in these regulations are the regulated levels for the Toxicity Characteristic Leaching Procedure (TCLP) constituents. The TCLP constituent levels are a set of numerical criteria at which solid waste is considered a hazardous waste by the characteristic of toxicity. In addition, the hazardous characteristics of ignitability, reactivity and corrosivity may also apply, depending upon the results of waste characterization activities.

Another set of chemical-specific SCGs that may apply to regulated hazardous waste materials generated at the site (e.g., soil that is excavated and determined to be a hazardous waste) are the United States Environmental Protection Agency (USEPA) Universal Treatment Standards/Land Disposal Restrictions (UTSs/LDRs), as listed in 40 CFR Part 268. These standards and restrictions identify hazardous wastes for which land disposal is restricted and define acceptable treatment technologies or concentration limits for those hazardous wastes on the basis of their waste code characteristics. The UTSs/LDRs also provide a set of numerical criteria at which a hazardous waste is restricted from land disposal.

Groundwater beneath the site is classified as Class GA and, as such, the New York State groundwater quality standards and/or guidance values (6 NYCRR Parts 700-705) and ambient water quality standards presented in the NYSDEC's *Division of Water, TOGS 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations* (NYSDEC, 2008) (NYSDEC Class GA Standards and Guidance Values) are potentially applicable. These standards identify acceptable levels of constituents in groundwater based on potable use.

2.3.2 Action-Specific SCGs

Potential action-specific SCGs are summarized in Table 2. Action-specific SCGs include general health and safety requirements, and general requirements regarding handling and disposal of waste materials (including transportation and disposal, permitting, manifesting, disposal and treatment facilities), discharge of water generated during implementation of remedial alternatives, and air monitoring requirements (including permitting requirements for on-site treatment systems). Action-specific criteria will be identified for the selected site remedy in the remedial design work plan; compliance with these criteria will be required. Several action-specific SCGs that may be applicable to this site are summarized below.

The NYSDEC Division of Air Resources (DAR) policy document *DAR-1: Guidelines for the Control of Toxic Ambient Air Contaminants* (formerly issued as Air Guide 1) (NYSDEC, 1997), incorporates applicable federal and New York State regulations and requirements pertaining to air emissions, which may be applicable for soil or groundwater alternatives that result in certain air emissions. Community air monitoring would be required in accordance with the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan. New York Air Quality Standards provide requirements for air emissions (6 NYCRR Parts 257). Emissions from remedial activities will meet the air quality standards based on the air quality class set forth in the New York State Air Quality Classification System (6 NYCRR Part 256) and the permit requirements in New York Permits and Certificates (6 NYCRR Part 201).

6 NYCRR Parts 370-374 and 376 and NYSDEC's *Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment from Former Manufactured Gas Plants* (DER-4) (NYSDEC, 2002) may be applicable to alternatives that include the disposal of impacted soil. LDRs that regulate the disposal of hazardous wastes may be applicable to alternatives involving the disposal of hazardous waste (if any). MGP-impacted material is only considered a hazardous waste in New York State if it is removed (generated) and it exhibits a characteristic of a hazardous waste. However, MGP-impacted material that only exhibits the hazardous characteristic of toxicity for benzene (D018) is conditionally exempt from the hazardous waste management requirements if it is thermally treated. If MGP-related hazardous wastes are destined for land disposal in New York State, the state hazardous waste regulations apply, including LDRs and alternative LDR treatment standards for hazardous waste soil.

The NYSDEC will no longer allow amendment of soil at MGP sites with lime kiln dust/ quick lime containing greater than 50% calcium and/or magnesium oxide (Ca/MgO) due to vapor issues associated with free oxides. Guidance issued in the form of a letter from the NYSDEC to the New York State utility companies, dated May 20, 2008, indicated that lime kiln dust/quick lime will not be permitted for use during future remedial activities.

The United States Department of Transportation (USDOT) and New York State rules for the transport of hazardous materials are provided in 49 CFR Parts 107 and 171.1 through 172.558 and 6 NYCRR 372.3, respectively. These rules include procedures for packaging, labeling, manifesting and transporting hazardous materials and are potentially applicable to the transport of hazardous materials under any remedial alternative. New York State requirements for waste transporter permits are included in 6 NYCRR Part 364, along with standards for collection, transport and delivery of regulated wastes within New York State. Contractors transporting waste materials off-site during the selected remedial alternative must be properly permitted.

Remedial alternatives conducted within the site must comply with applicable requirements outlined under the Occupational Safety and Health Administration (OSHA). General industry standards are outlined under OSHA (29 CFR 1910) that specify time-weighted average concentrations for worker exposure to various compounds and training requirements for workers involved with hazardous waste operations. The types of safety equipment and procedures to be followed during remediation are specified under 29 CFR 1926, and recordkeeping and reporting-related regulations are outlined under 29 CFR 1904.

In addition to OSHA requirements, the RCRA (40 CFR 264) preparedness and prevention procedures, contingency plan and emergency procedures are potentially relevant and appropriate to those remedial alternatives that include generation, treatment or storage of hazardous wastes.

2.3.3 Location-Specific SCGs

Potential location-specific SCGs for the site are summarized in Table 3. Examples of potential location-specific SCGs include regulations and federal acts concerning activities conducted in floodplains, wetlands, historical areas, and activities affecting navigable waters and endangered/threatened or rare species.

Location-specific SCGs also include local requirements, such as local building permit conditions for permanent or semi-permanent facilities constructed during the remedial activities (if any), and local pollution requirements (air and noise).

Based on the Federal Emergency Management Agency (FEMA) National Flood Insurance Program Maps Number 3604970104F and 3604970103F, both dated September 5, 2007; the site is not located within the limits of a 100-year floodplain. Therefore, federal floodplain management laws and regulations provided in 40 CFR Part 6 are not potential SCGs for remedial alternatives selected for the site.

3 DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES

This section presents the RAOs for impacted media identified at the site. These RAOs represent medium-specific goals that are protective of public health and the environment that have been developed through consideration of the results of the site investigation activities and with reference to potential SCGs, as well as current and foreseeable future anticipated uses of the site.

RAOs are developed to specify the COCs within the site, and to assist in developing goals for cleanup of COCs in each medium that may require remediation. The RAOs presented in the table below are based on the generic RAOs listed on NYSDEC's website (http://www.dec.ny.gov/regulations/67560.html).

Table 3.1 Remedial Action Objectives

RAOs for Soil
RAOs for Public Health Protection 1. Prevent, to the extent practicable, ingestion/direct contact with COCs/NAPL. 2. Prevent, to the extent practicable, inhalation of or exposure to COCs from impacted soil. *RAOs for Environmental Protection* 1. Address, to the extent practicable, COCs/NAPL in soil that could result in impacts to groundwater.
RAOs for Groundwater
RAOs for Public Health Protection 1. Prevent, to the extent practicable, ingestion of groundwater containing dissolved phase COCs at concentrations exceeding NYSDEC groundwater quality standards or guidance values. 2. Prevent, to the extent practicable, contact with or inhalation of VOCs from groundwater containing COCs at concentrations exceeding NYSDEC groundwater quality standards or guidance values. *RAOs for Environmental Protection* 1. Restore groundwater to pre-disposal/pre-release conditions, to the extent practicable. 2. Address the source of groundwater impacts to the extent practicable.

Potential remedial alternatives are evaluated (in Section 5) based on their ability to meet the RAOs and be protective of public health and the environment.

4 TECHNOLOGY SCREENING AND DEVELOPMENT OF REMEDIAL ACTIVITIES

The objective of the technology screening conducted as a part of this AAR is to present general response actions (GRAs) and associated remedial technology types and technology process options that have documented success at achieving similar RAOs at MGP sites, and to identify options that are implementable and potentially effective at addressing site-specific concerns. Based on this screening, remedial technology types and technology process options were eliminated or retained and subsequently combined into potential site-wide remedial alternatives for more detailed evaluation. This approach is also consistent with the screening and selection process provided in DER-10.

This section identifies potential remedial alternatives to address impacted media within the site limits. As an initial step, GRAs potentially capable of addressing impacted media were identified. GRAs are medium-specific and describe actions that will satisfy the RAOs. GRAs may include various non-technology specific actions such as treatment, containment, institutional controls, and excavation, or any combination of such actions. Based on the GRAs, potential remedial technology types and process options were identified and screened to determine the technologies that were the most appropriate for the site. Technologies/process options that were retained through the screening were used to develop the potential remedial alternatives that are evaluated in Section 5.

According to DER-10, the term “technology type” refers to general categories of technologies appropriate to the site-specific conditions and impacts, such as chemical treatment, immobilization, biodegradation, capping. The term “technology process options” refers to specific processes within each remedial technology type. For each GRA identified, a series of remedial technology types and associated technology process options has been assembled. Remedial technology types and technology process options can be identified by drawing on a variety of sources, including regulatory references and standard engineering texts not specifically directed toward impacted sites. In accordance with the DER-10 guidance document, each remedial technology type and associated technology process options are briefly described and screened, on a medium-specific basis, to identify those that are technically implementable and capable of meeting the RAOs. This approach was used to determine if the application of a particular remedial technology type and technology process option is applicable given site-specific conditions for remediation of the impacted media.

4.1 General Response Actions

Based on the RAOs identified in Section 3, the following GRAs have been established for soil and groundwater:

- No Action
- Institutional Controls/Long-Term Site Management
- In-Situ Containment/Control
- In-Situ Treatment
- Removal
- Ex-Situ On-Site Treatment and/or Disposal
- Off-Site Treatment and/or Disposal

4.2 Identification of Remedial Technologies

Remedial technology types that are potentially applicable for addressing the impacted media were identified through a variety of sources, including vendor information, engineering experience, and review of available literature that included the following documents:

- *Technical Guidance for Site Investigation and Remediation* (DER-10) (NYSDEC, 2010a)
- *Presumptive/Proven Remedial Technologies for New York States Remedial Programs* (DER-15) (NYSDEC, 2007)
- "Management of Manufactured Gas Plant Sites" (Gas Research Institute [GRI], 1996)
- *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA, 1988)

Section 4.3 of DER-10 indicates that GRAs should be established such that they give preference to presumptive remedies. Although each former MGP site offers its own unique site characteristics, the evaluation of remedial technology types and process options that are applicable to MGP-related impacts, or have been implemented at other MGP sites, is well documented. Therefore, this collective knowledge and experience, and regulatory acceptance of previous feasibility studies performed on MGP-related sites with similar impacts, were used to reduce the universe of potentially applicable process options for the site to those with documented success in achieving similar RAOs.

4.3 Remedial Technology Screening Criteria

Potentially applicable remedial technology types and technology process options were identified for each of the GRAs and were screened on a medium-specific basis to retain the technology types and process options that could be implemented and would potentially be effective at achieving the site-specific RAOs. Screening was conducted to identify potential technologies and technology processes to address soil and groundwater.

Technology process options were evaluated in relative terms to other technology process options of the same remedial technology type using the following criteria:

- Implementability – This criterion evaluates the ability to construct and reliably operate the technology process option as well as the availability of specific equipment and technical specialists to design, install, and operate and maintain the remedy.
- Effectiveness – This criterion is focused on the process option's ability to meet the site-specific RAOs, either as single technology or when used in combination with other technologies.

4.4 Remedial Technology Screening

This AAR briefly presents GRAs and associated technology types and focuses on the process options/remedial technologies that have documented success at achieving similar RAOs at former MGP sites. A summary of the screening of remedial technologies to address impacted soil and groundwater is presented in Tables 4 and 5, respectively. As required by DER-10, the "No Action" technology has been included and retained through the screening evaluation. The “No Action” GRA will serve as a baseline for comparing the potential overall effectiveness of the other technologies.

4.5 Summary of Retained Technologies

As indicated previously, results of the remedial technology screening process for soil and groundwater are presented in Tables 4 and 5, respectively. Retained remedial technologies are summarized in the following tables.

Table 4.1 Retained Soil Technologies

GRA	Technology Type	Technology Process Option
No Action	No Action	No Action
Institutional Controls	Institutional Controls	Deed Restrictions, Environmental Land Use Controls, Subsurface Activity Controls, Informational Devices
Removal	Excavation	Excavation
Off-Site Treatment and/or Disposal	Extraction, Off-Site Disposal	Low-Temperature Thermal Desorption (LTTD) Solid Waste Landfill

Table 4.2 Retained Groundwater Technologies

GRA	Technology Type	Technology Process Option
No Action	No Action	No Action
Institutional Controls	Institutional controls	Deed Restrictions, Groundwater Use Restrictions, Enforcement and Permit Controls, Informational Devices
In-Situ Treatment	Biological Treatment	Groundwater Monitoring

4.6 Assembly of Site-Wide Remedial Alternatives

Retained remedial technology types and technology process options were combined into remedial alternatives that have the potential to achieve or work toward achieving site-specific RAOs. Alternatives were also developed based on the current, intended and reasonably anticipated future use of the site, as well as removal of source area(s) of site-related impacts. These remedial considerations require varying levels of remediation, while providing protection of public health and the environment by preventing or minimizing exposure to the COCs through the use of institutional controls; removing COCs to the extent possible thereby minimizing the need for long-term management; and treating COCs.

Remedial alternatives that have been assembled and developed for addressing the impacted media are presented below. Detailed technical descriptions of the remedial alternatives are presented in Section 5 as part of the detailed evaluation of each remedial alternative.

4.6.1 Alternative 1 – No Action

The "No Action" alternative was retained for evaluation as required by DER-10. Under this alternative, no remedial activities would be completed to address site-related impacts to soil and/or groundwater. The "No Action" alternative serves as the baseline for comparison of the overall effectiveness of the other remedial alternatives.

4.6.2 Alternative 2 – Long-Term Site Management

Under this alternative, annual groundwater monitoring would be conducted to document the extent of dissolved phase impacts and the potential trends in COC concentrations. Additionally, institutional controls (i.e., deed restrictions or environmental easements) would be established to control the future development and use of the site and groundwater, as well as controlling the permissible invasive (i.e., subsurface) activities. The premise behind this alternative is that the identified impacts and associated future site use do not pose significant risk of exposure under current conditions and property use. In addition, MGP impacts are present at depths not usually encountered during normal site utility maintenance. Remedial activities to address potentially impacted material is delayed until the current site operations (i.e., as a school bus parking lot and maintenance facility) change and the property becomes accessible to Con Edison without significant impact to the property owner's business. As Con Edison does not own most of the former Gas Holder site (i.e., Block 3827, Lot 1), implementation of institutional controls would require coordination between NYSDEC and the property owner. In support of this alternative, a Site Management Plan (SMP) would be prepared to document the long-term groundwater monitoring requirements and handling and management protocols for potential future excavation activities that may be conducted at the site.

4.6.3 Alternative 3 – Targeted Excavation

Alternative 3 would include the removal of soil that contains visual site-related impacts (i.e., NAPL in quantities greater than sheen) and/or total PAHs at concentrations greater than 500 mg/kg. Under this alternative, the area north of the electrical substation (including a small portion of Con Edison's property) would be excavated to a depth up to 12 feet bgs to address OLM and total PAHs at concentrations greater than 500 mg/kg observed within the former footprint of the 500,000 cf gas holder. Excavated material would be transported off-site for treatment and/or disposal (as appropriate) and excavated areas would be backfilled with clean imported fill. Alternative 3 would also include the same groundwater monitoring, institutional controls and SMP components as Alternative 2.

5 DETAILED EVALUATION OF REMEDIAL ALTERNATIVES

This section presents detailed descriptions of the remedial alternatives developed to address the identified site impacts. Each of the retained remedial alternatives is evaluated with respect to the criteria presented in DER-10. The results of the detailed evaluation of remedial alternatives are used to aid in the recommendation of a preferred remedial alternative for addressing impacted site media.

5.1 Description of Evaluation Criteria

Consistent with DER-10, the detailed evaluation of remedial alternatives presented in this section consists of an evaluation of each assembled alternative (presented in Section 4.6) against the following criteria:

- Short-Term Impacts and Effectiveness
- Long-Term Effectiveness and Permanence
- Land Use
- Reduction of Toxicity, Mobility, or Volume of Contamination through Treatment
- Implementability
- Compliance with SCGs
- Overall Protection of Public Health and the Environment
- Cost Effectiveness

Descriptions of the evaluation criteria are presented in the following sections. Additional criteria, including public and state acceptance, will be addressed following submittal of this AAR. The community acceptance assessment will be completed by the NYSDEC after community comments on the Proposed Remedial Action Plan (PRAP) are received. The results of the evaluation are typically considered when the NYSDEC selects a preferred remedial alternative and are typically presented in a Responsiveness Summary completed by the NYSDEC. The Responsiveness Summary is part of the NYSDEC Decision Document for the project and responds to all comments and questions raised during a public meeting associated with the PRAP, as well as comments received during the associated public comment period.

Per DER-10, sustainability and green remediation will also be considered in the remedial evaluation with the goal of improving the sustainability of the selected remedy. The evaluation will consider the alternative's ability to minimize energy use; reduce greenhouse gas and other emissions; maximize reuse of land and recycling of materials; and preserve, enhance, or create natural habitats, etc. Sustainability and green remediation will be discussed under the short-term impacts and cost effectiveness criterion.

5.1.1 Short-Term Impacts and Effectiveness

The short-term impacts and effectiveness criterion is used to evaluate the remedial alternative relative to its potential effect on public health and the environment during construction and/or implementation of the alternative. The evaluation of each alternative with respect to its short-term impacts and effectiveness will consider the following:

- Potential short-term adverse impacts and nuisances to which the public and environment may be exposed during implementation of the alternative.

- Potential impacts to workers during implementation of the remedial actions and the effectiveness and reliability of protective measures.
- Amount of time required to implement the remedy and the time until the remedial objectives are achieved.
- The sustainability and use of green remediation practices utilized during implementation of the remedy.

5.1.2 Long-Term Effectiveness and Permanence

The evaluation of each remedial alternative relative to its long-term effectiveness and permanence is made by considering the risks that may remain following completion of the remedial alternative. The following factors will be assessed in the evaluation of the alternative's long-term effectiveness and permanence:

- Potential impacts to human receptors, ecological receptors, and the environment from untreated waste or treatment residuals remaining at the completion of the remedial alternative.
- The adequacy and reliability of institutional and/or engineering controls (if any) that will be used to manage treatment residuals or remaining untreated impacted media.

5.1.3 Land Use

This criterion evaluates the current and intended future land use of the site relative to the cleanup objectives of the remedial alternative when commercial use cleanup levels would not be achieved. This evaluation considers local zoning laws, proximity to residential property, accessibility to infrastructure, and proximity to natural resources including groundwater drinking supplies.

5.1.4 Reduction of Toxicity, Mobility, and Volume of Contamination through Treatment

This evaluation criterion addresses the degree to which the remedial alternative will permanently and significantly reduce the toxicity, mobility, or volume of the constituents present in the site media.

5.1.5 Implementability

This criterion addresses the technical and administrative feasibility of implementing the remedial alternative, including the availability of the various services and materials required for implementation. The following factors will be considered during the implementability evaluation:

- *Technical Feasibility* – This factor considers the remedial alternative's constructability, as well as the ability to monitor the effectiveness of the remedial alternative.
- *Administrative Feasibility* – This factor refers to the availability of necessary personnel and material along with potential difficulties in obtaining approvals for long-term operation of treatment systems, access agreements for construction, and acquiring necessary approvals and permits for remedial construction.

5.1.6 Compliance with SCGs

This criterion evaluates the remedial alternative's ability to comply with SCGs that were identified in Section 2. Compliance with the following items is considered during evaluation of the remedial alternative:

- Chemical-specific SCGs
- Action-specific SCGs
- Location-specific SCGs

Potentially applicable chemical-, action-, and location-specific SCGs are presented in Tables 1, 2 and 3, respectively.

5.1.7 Overall Protection of Public Health and the Environment

This criterion evaluates whether the remedial alternative provides adequate protection of public health and the environment based on the following:

- How the alternative would eliminate, reduce, or control (through removal, treatment, containment, engineering controls, or institutional controls) existing or potential human exposures or environmental impacts that have been identified.
- The ability of the remedial alternative to meet the site-specific RAOs.

This criterion also considers a combination of the other above-listed criteria including: long-term effectiveness and permanence; short-term impacts and effectiveness; and compliance with SCGs.

5.1.8 Cost Effectiveness

This criterion evaluates the overall qualitative cost of the alternative relative to the effectiveness of the alternative (i.e., cost compared to long-term effectiveness and permanence, short-term impacts and effectiveness, and reduction of toxicity, mobility, and volume through treatment).

5.2 Detailed Evaluation of Alternatives

This section presents the detailed analysis of each of the site-wide alternatives previously identified in Section 4.

- Alternative 1 – No Action
- Alternative 2 – Long-Term Site Management
- Alternative 3 – Targeted Excavation

Each alternative is evaluated against the criteria described above (as indicated, public and state acceptance will be evaluated following submittal of this AAR).

5.2.1 Alternative 1 – No Action

The "No Action" alternative was retained for evaluation as required by DER-10. The "No Action" alternative serves as the baseline for comparison of the overall effectiveness of the other remedial alternatives. The "No Action" alternative would not involve implementation of any remedial activities to address impacts. The site would be allowed to remain in its current condition and no effort would be made to change or monitor the current site conditions.

Short-Term Impacts and Effectiveness – Alternative 1

No remedial actions would be implemented to address impacted environmental media. Therefore, there would be no short-term environmental impacts, nor risks associated with remedial activities would be posed to the community.

Long-Term Effectiveness and Permanence – Alternative 1

Under the "No Action" alternative, the COCs in media or the potential for on-going releases and/or migration of impacts would not be addressed. As a result, this alternative is not considered effective on a long-term basis.

Land Use – Alternative 1

The current zoning for the site is listed, in accordance with the New York City (NYC) Planning Commission Zoning Map 4b (NYC, 2010), as manufacturing (i.e., M2-1 – Medium Manufacturing District). Areas immediately surrounding the site are zoned for manufacturing (i.e., M1-1 – Light Manufacturing District and M3-1 – Heavy Manufacturing District), commercial (i.e., C8-1 – General Service District) and residential (i.e., R5 General Residence District). The current and foreseeable future use of the area surrounding the site is commercial. The majority of the site (i.e., Block 3827, Lot 1) will continue to be used as a school bus parking lot and maintenance facility (operated by Clarendon). In addition, the southeast corner of the site (i.e., Block 3827 Lot 30) will continue to house the electrical substation that is owned and operated by Con Edison.

No remedial actions would be completed under this alternative and the site would remain in its current condition. Although this alternative would not consist of any remedial action, there are isolated locations of impacted site media that exceed commercial use criteria. There would be limited risk to future human and the environment under a future commercial use scenario.

Reduction of Toxicity, Mobility or Volume of Contamination through Treatment – Alternative 1

Under the "No Action" alternative, environmental media would not be treated (other than by natural processes), recycled, or destroyed. Therefore, the toxicity, mobility, and volume of environmental media containing site-related impacts would not be reduced.

Implementability – Alternative 1

The "No Action" alternative does not require implementation of any remedial activities and therefore, is technically and administratively implementable.

Compliance with SCGs – Alternative 1

- *Chemical-Specific SCGs* – Because removal or treatment is not included as part of this alternative, the chemical-specific SCGs would not be met by this alternative.
- *Action-Specific SCGs* – This alternative does not involve implementation of any remedial activities; therefore, the action-specific SCGs are not applicable.
- *Location-Specific SCGs* – Because no remedial activities would be conducted under this alternative, the location-specific SCGs are not applicable.

Overall Protectiveness of the Public Health and the Environment – Alternative 1

The “No Action” alternative does not address the toxicity, mobility, or volume of impacted environmental media and is not effective on a long-term basis for eliminating potential migration or potential exposure to impacts. Therefore, the “No Action” alternative would not be protective of public health and the environment and would not meet the RAOs.

Cost Effectiveness – Alternative 1

The “No Action” alternative does not involve implementation of any active remedial activities or monitoring conditions; therefore, there are no costs associated with this alternative.

5.2.2 Alternative 2 – Long-Term Site Management

The major components of Alternative 2 consist of the following:

- Conducting long-term groundwater monitoring
- Establishing institutional controls
- Developing a site management plan
- Annual site inspections and periodic review reporting

This alternative would further reduce the already limited potential for exposure to soil and groundwater containing site-related impacts through the implementation of institutional controls. This alternative also includes long-term groundwater monitoring to document the extent of dissolved phase impacts and potential trends in COC concentrations. The anticipated limits of institutional controls and potential groundwater monitoring well locations associated with Alternative 2 are shown on Figure 13. Limited site-related impacts that have been identified to date would remain and would not be directly addressed at the current time by this remedial alternative. BTEX and PAHs were detected in groundwater at concentrations exceeding the groundwater quality standards and/or guidance values in samples collected from monitoring well MW-4 only. Although there are no current users of groundwater or exposures to impacted groundwater, this alternative would include conducting annual groundwater monitoring to document changes and trends in groundwater conditions. Annual groundwater monitoring activities would consist of collecting groundwater samples from the existing groundwater monitoring well network. The results of the groundwater monitoring would be presented to NYSDEC annually as part of the Period Review Report. Based on the results of the monitoring activities, Con Edison may request to modify the quantity of wells sampled or the frequency of sampling events.

Alternative 2 would also include establishing institutional controls on the site in the form of deed restrictions and/or environmental easements on the affected properties (as shown on Figure 13) to monitor the future development and control intrusive (i.e., subsurface) activities that could result in potential exposures to limited locations of soil and groundwater containing site-related impacts at concentrations greater than applicable standards and guidance values. Additionally, the institutional controls would require compliance with the SMP (described below) that would be prepared as part of this alternative. Although potable water is provided by a municipal supply, the institutional controls would also prohibit the use of non-treated groundwater from the site. An annual report would be submitted to NYSDEC to document that institutional controls are maintained and remain effective.

As indicated above, this alternative would include preparation of an SMP that would document the following:

- The institutional controls that have been established and will be maintained for the site
- Known isolated locations of soil containing COCs at concentrations greater than 6 NYCRR Part 375-6 commercial use SCOs
- Protocols (including soil management and health and safety requirements) for conducting invasive (i.e., subsurface) activities and managing potentially impacted material encountered during these activities
- Protocols and requirements for conducting annual groundwater monitoring
- Protocols for addressing significant changes in COC concentrations in groundwater based on the results of the annual monitoring activities

<u>Short-Term Impacts and Effectiveness – Alternative 2</u>

As no remedial construction activities would be implemented under this alternative, short-term environmental impacts and risks posed to the community would be insignificant. Potential exposures to field personnel conducting groundwater monitoring would be reduced through the use of proper training and personal protective equipment (PPE), as specified in a site-specific health and safety plan (HASP) that would be developed as part of the remedial design for this alternative. Potential exposures to the community during groundwater sampling or on-site intrusive activities would be reduced by following appropriate procedures and protocols that would be described in the SMP.

Implementation of this alternative would utilize minimal non-renewable resources and is not anticipated to negatively impact the environment (i.e., consume non-renewable resources and energy). The relative carbon footprint of Alternative 2 (compared to the other alternatives) is considered insignificant. The greatest contribution to greenhouse gases would occur as a result of traveling to and from the site to conduct groundwater monitoring and site inspection activities.

The short-term impact on the community associated with Alternative 2 is negligible, as is the short-term impact to property owner operations.

<u>Long-Term Effectiveness and Permanence – Alternative 2</u>

Under Alternative 2, the limited quantities of soil and groundwater containing site-related COCs would not actively be addressed. Alternative 2 would include the establishment of institutional controls and development of an SMP to reduce the potential for exposures during specific planned subsurface activities to the limited impacted media. A majority of the site is covered with asphalt pavement, concrete, gravel, or vegetated soil which provides a physical barrier to the limited subsurface impacts. Based on the current and foreseeable future site use, employees do not conduct activities that would potentially result in exposure to soil and groundwater containing site-related COCs. Additionally, because of the limited isolated location of site-related impacts, the potential for future site construction activities to encounter impacted media is low. If subsurface activities (e.g., installation of new utilities) were to be conducted at the site, work activities (including handling potentially impacted material) would be conducted in accordance with the procedures described in the SMP to reduce the potential for exposures to impacted media.

Although the extent of dissolved phase impacts (i.e., groundwater containing BTEX and PAHs at concentrations exceeding the groundwater quality standards and/or guidance values) is limited to a single location (i.e., MW-4), institutional controls would prohibit potable uses of groundwater at the site. Annual verification of the institutional controls would be completed to document that the controls are maintained and remain effective. Periodic groundwater monitoring would be conducted to document the extent of dissolved phase impacts and potential trends in COC concentrations. Potential exposures to field personnel and the community during long-term groundwater monitoring activities would be reduced by following appropriate procedures and protocols that would be established in the SMP.

Land Use – Alternative 2

The current zoning for the site is listed, in accordance with the New York City (NYC) Planning Commission Zoning Map 4b (NYC, 2010), as manufacturing (i.e., M2-1 – Medium Manufacturing District). Areas immediately surrounding the site are zoned for manufacturing (i.e., M1-1 – Light Manufacturing District and M3-1 – Heavy Manufacturing District), commercial (i.e., C8-1 – General Service District) and residential (i.e., R5 General Residence District). The current and foreseeable future use of the area surrounding the site is commercial. The majority of the site (i.e., Bronx Tax Map Block 3827, Lot 1) will continue to be used as a school bus parking lot and maintenance facility. In addition, Con Edison will continue to use the southeast corner of the site (i.e., Block 3827 Lot 30) as an electrical substation.

Based on the isolated nature of the impacted media containing COCs at concentrations greater than commercial site use, the current and anticipated future site use is appropriate. Institutional controls would be placed on the properties within the site and groundwater monitoring would be conducted for an assumed 30 years. In the event that properties within the site are sold, future owners/operators would be required to comply with the SMP and institutional controls established based on the continued presence of limited quantities of soil and groundwater containing site-related COCs. There would be limited potential for impacts to human health based on the current and anticipated site use and the proposed institutional controls would further mitigate the potential for exposure.

Reduction of Toxicity, Mobility or Volume of Contamination through Treatment – Alternative 2

Alternative 2 does not include direct treatment or containment of the limited quantities of impacted soil and groundwater. The extent of dissolved phase impacts (i.e., groundwater containing BTEX and PAHs at concentrations exceeding the groundwater quality standards and/or guidance values) is limited to a single location (i.e., MW-4), and as indicated in Section 1, dissolved phase concentrations of BTEX and PAHs were lower in groundwater samples collected in 2010 compared to samples collected in 2009. Alternative 2 includes periodic groundwater monitoring to document the extent and potential long-term reduction (i.e., toxicity and volume) of dissolved phase groundwater impacts.

Implementability – Alternative 2

This remedial alternative would easily be both technically and administratively implementable. From a technical implementability aspect, equipment and personnel qualified to conduct groundwater monitoring activities are readily available. Administratively, institutional controls in the form of a deed notice or environmental easement would be established for both the Con Edison-owned substation and for the portion of the site that is not owned by Con Edison, which would require coordination with state agencies (i.e., NYSDEC and NYSDOH) and the property owners. Access agreements would be required, as existing groundwater monitoring wells are located on properties not owned by Con Edison.

Compliance with SCGs – Alternative 2

- *Chemical-Specific SCGs* – Chemical-specific SCGs are presented in Table 1. Potentially applicable chemical-specific SCGs for soil include 6 NYCRR Part 375-6 soil cleanup objectives (i.e., commercial use) and 40 CFR Part 261 and 6 NYCRR Part 371 regulations for the identification of hazardous materials. Potentially applicable chemical-specific SCGs for groundwater include NYSDEC Class GA Standards and Guidance Values.

  Alternative 2 would not address the limited quantities of soil containing COCs at concentrations greater than 6 NYCRR Part 375-6 commercial SCOs. Existing site soils would remain in place. Waste materials generated during periodic groundwater sampling activities would be managed and characterized in accordance with 40 CFR 261 and 6 NYCRR Part 371 to determine off-site treatment/disposal requirements. NYS LDRs would apply to any materials that are characterized as a hazardous waste.

  As indicated in Section 1, the extent of dissolved phase impacts is limited to one location (i.e., MW-4) where BTEX and PAHs were detected in groundwater at concentrations exceeding groundwater quality standards and/or guidance values. Therefore, this alternative could achieve groundwater SCGs over a prolonged period of time (i.e., through natural attenuation of dissolved phase impacts).

- *Action-Specific SCGs* – Action-specific SCGs are presented in Table 2. Potentially applicable action-specific SCGs include health and safety requirements and regulations associated with handling impacted media. Groundwater monitoring activities would be conducted in accordance with OSHA requirements that specify general industry standards, safety equipment and procedures, and record keeping and reporting regulations. Compliance with these action-specific SCGs would be accomplished by following a site-specific HASP.

  Waste materials generated during groundwater monitoring activities could be subject to USDOT requirements for packaging, labeling, manifesting, and transporting hazardous or regulated materials. Compliance with these requirements would be achieved by following an NYSDEC-approved work plan and using licensed waste transporters and permitted disposal facilities.

- *Location-Specific SCGs* – Location-specific SCGs are presented in Table 3. As Alternative 2 does not include remedial construction activities, location-specific SCGs are not applicable.

Overall Protectiveness of the Public Health and the Environment – Alternative 2

Alternative 2 would further reduce the already limited potential for exposures soil and groundwater containing site-related impacts through groundwater monitoring and implementing institutional controls to provide measures for eliminating uncontrolled exposure to constituents of concern. Limited site-related impacts would remain and would not be directly addressed. This alternative would prevent exposures (i.e., direct contact, ingestion, and inhalation) to the limited site-related impacts in soil and groundwater (soil RAOs #1 and #2 and groundwater RAOs #1 and #2) through the implementation of institutional controls and adherence to the procedures to be presented in the SMP.

Alternative 2 does not address soil containing site-related impacts and therefore, does not address potential sources of groundwater impacts (soil RAO #3 and groundwater RAO #4). However, the extent of dissolved phase impacts (i.e., groundwater containing BTEX and PAHs at concentrations exceeding NYSDEC groundwater quality standards and/or guidance values) is limited to a single location (i.e., MW-4). Groundwater could potentially be restored to pre-disposal/pre-release conditions (groundwater RAO #3) over a prolonged period of time through natural attenuation of dissolved phase impacts.

Cost Effectiveness – Alternative 2

There is minimal cost required to prepare the SMP and implement institutional controls for this alternative. Costs for ongoing monitoring and reporting are also relatively low when compared to costs for implementing soil excavation efforts to address the limited subsurface impacts identified at the site.

5.2.3 Alternative 3 – Targeted Excavation

The major components of Alternative 3 consist of the following:

- Excavation of soil containing visual impacts (in quantities greater than sheens) and/or total PAHs at concentrations greater than 500 mg/kg
- Conducting long-term groundwater monitoring
- Establishing institutional controls
- Developing an SMP

Alternative 3 would include the excavation of approximately 2,800 cubic-yards (cy) of material at depths up to 12 feet bgs, including an estimated 1,200 cy of impacted material containing NAPL and/or total PAHs at concentrations greater than 500 mg/kg and approximately 1,600 cy of soil overlying the impacted materials. Alternative 3 would include the same groundwater monitoring, institutional controls, and SMP components previously described under Alternative 2. The anticipated limits of soil removal activities and institutional controls associated with Alternative 3 are shown on Figure 14. The limits of the anticipated soil removal associated with Alternative 3 would be further refined as part of a pre-design investigation (PDI) for this alternative. As indicated in Section1, the gas holder foundation was not encountered at SB-10; however, potential indications (i.e., crushed concrete) of the foundation were noted at SB-9. Additional investigation activities would be conducted as part of the PDI to confirm the presence/absence of the gas holder foundation.

Excavation activities would be conducted using conventional construction equipment such as backhoes, excavators, front-end loaders, dump trucks, etc. Based on the proposed extent/depth of excavation activities, excavation support systems (assumed to consist of pre-fabricated support systems [e.g., slide rail]) would be required. The final excavation support plan would be developed as part of a remedial design for this alternative. For the purpose of developing this alternative, it has been assumed that excavated material from 0- to 1-foot below grade would be transported off-site for disposal as construction and demolition (C&D) debris. Remaining excavated material would be transported off-site for treatment via LTTD and/or disposal as a non-hazardous waste at a solid waste landfill. Further off-site treatment/disposal options, including the potential reuse of excavated material, would be assessed during the remedial design of this alternative.

As Alternative 3 includes excavation activities below the water table in a select area, groundwater would be removed from the excavation area. For the purpose of developing this alternative, it has been assumed that water generated during remedial construction activities would be temporarily stored on-site in frac tanks and subsequently transported off-site for disposal.

Prior to backfilling the excavation areas, a demarcation layer (e.g., geotextile fabric) would be placed within excavation bottoms. For the purpose of developing this alternative, it has been assumed that excavation areas would be backfilled with clean imported fill (e.g., general fill). Disturbed surfaces would be restored, in kind, with asphalt pavement, concrete, gravel or vegetated topsoil.

Short-Term Impacts and Effectiveness – Alternative 3

Implementation of this alternative could result in short-term exposure of the surrounding community and workers to site-related COCs as a result of excavation, material handling, and off-site transportation activities. Potential exposure mechanisms would include ingestion and dermal contact with NAPL, impacted soil, and/or groundwater, and inhalation of volatile organic vapors or dust containing COCs during remedial construction.

Potential exposure of remedial workers would be minimized through the use of appropriately trained field personnel and PPE, as specified in a site-specific HASP that would be developed as part of the remedial design. Additional worker safety concerns include working with and around large construction equipment, noise generated from operating construction equipment, and increased vehicle traffic associated with transportation of excavated material from the site and delivery of fill materials. These concerns would be minimized by using engineering controls and appropriate health and safety practices. Community access to the site would be restricted to minimize the potential for exposures.

Off-site transportation of excavated material and importation of clean fill materials would result in approximately 340 truck round trips (assuming 25 tons per truck). Transportation activities would be managed appropriately to reduce en-route risks to the community. Alternative 3 does not employ green remediation practices and the relative carbon footprint (as compared to the other alternatives) is considered high due to the use of excavation equipment for soil removal and backfill, truck traffic to and from the site, and thermal treatment of impacted soil.

There would also be significant impact to current property owner operations during the construction period. On-site operations would be disrupted, and additional off-site property use arrangements would need to be coordinated to maintain school bus operations.

Excavation activities would also pose a significant risk due to potentially disturbing adjacent building foundations and encountering subsurface utilities.

Soil excavation activities could be completed in approximately 4 months and would result in 340 additional truck trips within the highly-congested site area. Groundwater monitoring would be conducted over an assumed 30-year period.

Long-Term Effectiveness and Permanence – Alternative 3

Under Alternative 3, the limited quantities of soil containing NAPL and/or total PAHs at concentrations greater than 500 mg/kg would be excavated and transported off-site for treatment/disposal. Alternative 3 would address the limited visual impacts observed at the site. Exposures to remaining impacts (i.e., sheens) would be addressed through the protocols and requirements that would be presented in the SMP. However, because of the scarce and sporadic distribution of site-related impacts, the potential that future site construction activities would encounter remaining impacted media is low. Additionally, based on the current and foreseeable future use of the site, site workers do not routinely conduct activities that would potentially result in exposure to media containing site-related COCs.

Alternative 3 would address the isolated area where NAPL has been observed (i.e., SB-10). This material represents the most concentrated source of impacted soil below the water table. Therefore, a reduction in dissolved phase COC concentrations (currently limited to MW-4 where BTEX and PAHs were detected in groundwater at concentrations exceeding the NYSDEC groundwater quality standards and/or guidance values) could be expected over time following remedial construction activities.

Annual verification of the institutional controls would be completed to document that the controls are maintained and remain effective. Additionally, Alternative 3 would include continued monitoring of groundwater to document the concentrations and extent of dissolved phase impacts.

Land Use – Alternative 3

The current zoning for the site is listed, in accordance with the New York City (NYC) Planning Commission Zoning Map 4b (NYC, 2010), as manufacturing (i.e., M2-1 – Medium Manufacturing District). Areas immediately surrounding the site are zoned for manufacturing (i.e., M1-1 – Light Manufacturing District and M3-1 – Heavy Manufacturing District), commercial (i.e., C8-1 – General Service District) and residential (i.e., R5 General Residence District). The current and foreseeable future use of the area surrounding the site is commercial. The majority of the site (i.e., Block 3827, Lot 1) will continue to be used as a school bus parking lot and maintenance facility (operated by Clarendon). In addition, Con Edison will continue to use the southeast corner of the site (i.e., Block 3827 Lot 30) as an electrical substation.

Implementation of Alternative 3 is not anticipated to alter current or anticipated future use of the site. Under this alternative, soil that contains visual impacts (i.e., NAPL in quantities greater than sheens) and/or total PAHs at concentrations greater than 500 mg/kg would be removed to a depth of 12 feet bgs. Institutional controls would be placed on the properties within the site and groundwater monitoring would be conducted for an assumed 30 years. In the event that properties within the site are sold, future owners/operators would be required to comply with the SMP and institutional controls established based on the continued presence of soil and groundwater containing site-related COCs at concentrations greater than applicable standards.

Reduction of Toxicity, Mobility or Volume of Contamination through Treatment – Alternative 3

Alternative 3 would include the excavation of approximately 2,800 cy of material to address 1,200 cy of soil containing visual impacts (i.e., in quantities greater than sheens) and/or total PAHs at concentrations greater than 500 mg/kg. Excavated material would be permanently transported off-site for treatment via LTTD and/or disposal as a non-hazardous waste at a solid waste landfill.

Alternative 3 would address the only location where NAPL has been observed below the groundwater table, thereby reducing the flux of COCs from impacted material to groundwater, which would reduce the toxicity and volume of residual dissolved phase groundwater impacts. Dissolved phase concentrations of BTEX and PAHs in groundwater, that exceed the groundwater quality standards and/or guidance values, downgradient of the excavation areas (i.e., in the MW-4 area) would be expected to attenuate, over time, via natural processes (e.g., biodegradation, sorption, dispersion, dilution, and volatilization). Alternative 3 would include long-term groundwater monitoring to document the extent and reduction (i.e., toxicity and volume) of dissolved phase groundwater impacts.

<u>Implementability – Alternative 3</u>

Alternative 3 would be both technically and administratively implementable. Excavation of soil to a depth up to 12 feet bgs is technically feasible. Remedial contractors capable of performing the excavation activities are readily available. Potential implementation challenges associated with conducting activities at the site include: conducting excavation activities in close proximity to the substation at the Con Edison property, and excavating in areas where subsurface utilities may be present (i.e., gas and water lines). Con Edison would assess potential options to protect/or temporarily relocate utility lines (if any) located within the proposed excavation area during the remedial design. Logistically, as Con Edison does not own property at the site (with the exception of the southeast portion of the site), limited space is available for equipment and material staging. Remedial construction activities would have to be coordinated with the property owners, as routine daily site operations would have to be (in part or completely) relocated to facilitate completion of the excavation activities.

Administratively, Alternative 3 is implementable. An access agreement would be required to conduct excavation activities on property not owned by Con Edison. Agreements for use of off-site locations to facilitate school bus operations would also be required. Institutional controls would also be established for a property not owned by Con Edison, which would require coordination with state agencies (i.e., NYSDEC) and the property owner. Access agreements would also be required to conduct periodic groundwater monitoring at monitoring wells not located on Con Edison property.

<u>Compliance with SCGs – Alternative 3</u>

- *Chemical-Specific SCGs* – Chemical-specific SCGs are presented in Table 1. Potentially applicable chemical-specific SCGs for soil include 6 NYCRR Part 375-6 soil cleanup objectives (i.e., commercial use) and 40 CFR Part 261 and 6 NYCRR Part 371 regulations for the identification of hazardous materials. Additionally, CP-51 *Soil Cleanup Guidance* (NYSDEC, 2010b) provides a total PAH SCO of 500 mg/kg for subsurface soil at non-residential sites. Potentially applicable chemical-specific SCGs for groundwater include NYSDEC Class GA Standards and Guidance Values.

  Alternative 3 would include the removal of soil that contains visual impacts (i.e., NAPL in quantities greater than sheens) and/or total PAHs at concentrations greater than 500 mg/kg up to a depth up to 12 feet bgs. All excavated material and process residuals would be managed and characterized in accordance with 40 CFR 261 and 6 NYCRR Part 371 regulations to determine off-site treatment/disposal requirements. New York State LDRs would apply to any materials that are characterized as a hazardous waste.

  As indicated in Section 1, the extent of dissolved phase impacts is limited to one location (i.e., MW-4) where BTEX and PAHs were detected in groundwater at concentrations exceeding groundwater quality standards and/or guidance values. As Alternative 3 would address the majority of NAPL identified below the water table, this alternative would achieve groundwater SCGs over a prolonged period of time (i.e., through natural attenuation of dissolved phase impacts).

- *Action-Specific SCGs* – Action-specific SCGs are presented in Table 2. Potentially applicable action-specific SCGs include health and safety requirements and regulations associated with handling impacted media. Work activities would be conducted in accordance with OSHA requirements that specify general industry standards, safety equipment and procedures, and record keeping and reporting regulations. Compliance with these action-specific SCGs would be accomplished by following a site-specific HASP.

Excavated soil and process residuals would be subject to USDOT requirements for packaging, labeling, manifesting, and transporting hazardous or regulated materials. Compliance with these requirements would be achieved by following a NYSDEC-approved remedial design and using licensed waste transporters and permitted disposal facilities. Per DER-4 (NYSDEC, 2002), excavated material from a former MGP site that is characteristically hazardous for benzene only (D018) is conditionally exempt from hazardous waste management requirements when destined for thermal treatment (e.g., LTTD). All excavated material would be disposed of in accordance with applicable New York State LDRs.

- *Location-Specific SCGs* – Location-specific SCGs are presented in Table 3. Potentially applicable location-specific SCGs generally include local building codes and construction permits. Remedial activities would be conducted in accordance with New York City building/construction codes and ordinances. Local permits would be obtained prior to initiating the remedial activities.

<u>Overall Protectiveness of the Public Health and the Environment – Alternative 3</u>

Alternative 3 would address soil that contains visual impacts (i.e., NAPL in quantities greater than sheens) and/or total PAHs at concentrations greater than 500 mg/kg. Exposures to remaining impacts would be addressed through the protocols and requirements that would be presented in the SMP. Additionally, annual groundwater monitoring would be conducted to document the extent of dissolved phase groundwater impacts.

Alternative 3 would prevent exposures (i.e., direct contact, ingestion, and inhalation) to site-related impacts in soil (soil RAOs #1 and #2) through the removal of the limited quantities of impacted soil at depths up to 12 feet bgs. If future intrusive activities were conducted within the site, the reduction of potential exposures to remaining soil and groundwater impacts would occur by adhering to the institutional controls and the procedures set forth in the SMP that would be established/prepared as part this alternative (soil RAOs #1 and #2 and groundwater RAOs #1 and #2).

The extent of dissolved phase impacts is currently limited to MW-4, where BTEX and PAHs were detected in groundwater at concentrations exceeding NYSDEC groundwater quality standards and/or guidance values. Alternative 3 would address the majority of potential sources of groundwater impacts (soil RAO #3 and groundwater RAO #4) through the removal of the only location of soil containing NAPL below the groundwater table. Reduction in the extent and concentrations of dissolved phase COCs is anticipated following remedial construction activities; therefore, Alternative 3 could restore groundwater quality to pre-disposal/pre-release conditions overtime (groundwater RAO #3).

<u>Cost Effectiveness – Alternative 3</u>

Implementation of Alternative 3 would have a much higher cost than Alternative 2 due to the inclusion of soil excavation and off-site transport/disposal of soil. Similar to Alternative 2, there is minimal cost required to prepare the SMP and implement institutional controls for this alternative. Costs for ongoing monitoring and reporting are also relatively low when compared to costs for implementing soil excavation efforts to address the limited subsurface impacts identified at the site.

6 COMPARATIVE ANALYSIS OF ALTERNATIVES

This section presents the comparative analysis of each remedial alternative using the evaluation criteria identified in Section 5. The comparative analysis identifies the advantages and disadvantages of each alternative relative to each other and with respect to the eight evaluation criteria.

6.1 Comparative Analysis

The alternatives evaluated in Section 5 consist of the following:

- Alternative 1 – No Action
- Alternative 2 – Long-Term Site Management
- Alternative 3 – Targeted Excavation

The comparative analysis of these site-wide alternatives is presented in the following subsections.

6.1.1 Short-Term Impacts and Effectiveness

Alternative 1 would not include any active remediation and subsequently would not present potential short-term impacts to remedial workers, the public, or the environment. As Alternative 2 does not include any intrusive activities, Alternative 2 would pose minimal potential short-term risks and potential disturbances to remedial workers and the surrounding community. Implementation of Alternative 2 could result in short-term exposure to the surrounding community and field personnel during periodic groundwater and NAPL monitoring (conducted over an assumed 30 years). The potential for exposures would be reduced through the use of proper training and PPE) as specified in a site-specific HASP.

Alternative 3 include intrusive activities (i.e., soil excavation) to address the limited volume of soil containing site-related impacts. This alternative would pose potential short-term risks to remedial workers and the public from potential exposure to impacted soil and NAPL during soil excavation, off-site transportation of excavated material, and backfilling. Additionally, excavation activities conducted under this alternative would pose short-term risks from the operation of construction equipment, and generation of noise and dust.

Under Alternative 3, significant nuisances to the surrounding community would include noise from operation of construction equipment and an increase in local truck traffic associated with importing backfill and off-site transportation of excavated materials. Estimated durations to implement each of the alternatives and number of truck trips required for each alternative are presented below.

- Alternative 1 – no time required and no truck trips
- Alternative 2 – no time required and no truck trips
- Alternative 3 – 4 months and 340 truck trips

Potential exposures during remedial construction of Alternative 3 would be mitigated, to the extent practicable, by using appropriate PPE, air and work space monitoring, implementation of dust control and noise mitigation measures (as appropriate and if necessary based on monitoring results), and proper planning and training of remedial workers.

Alternative 1 would have no carbon footprint and Alternative 2 is considered to have an insignificant foot print. With the addition of excavation and off-site treatment/disposal of soil, Alternatives 3 is considered to have moderate carbon footprint when compared to the other alternatives (based on the number of truck trips). The greatest contribution to greenhouse gases would occur as a result of equipment operation during excavation and backfilling, transportation of backfill and waste, and by thermal treatment (LTTD) of NAPL-impacted soil.

Compared to the other remedial alternatives, Alternative 3 would be the most disruptive to the surrounding community and current site business operations, have the greatest potential for exposures to remedial workers and the public, would require the longest time to implement, and have the greatest carbon footprint. Therefore, Alternative 3has the lowest level of short-term effectiveness (i.e., the greatest potential for exposure during implementation).

6.1.2 Long-Term Effectiveness and Permanence

A majority of the site is covered with asphalt pavement and concrete, gravel or vegetated soil, which provides a physical barrier to the limited subsurface impacts. Impacted material is generally encountered at depths greater than 5 feet bgs (i.e., likely to be encountered by workers during future site construction/ redevelopment activities) and groundwater is encountered at depths ranging from 5 to 10 feet bgs. Routine site operations do not include intrusive activities. Therefore, there is limited potential for future worker exposure to impacted soil. Additionally, groundwater is not used for potable (or any other) purposes and drinking water is provided via a municipal supply. Based on the current and foreseeable future use of the site (as a school bus parking lot and maintenance facility, and as an electrical substation), site workers do not routinely conduct activities that would potentially result in exposure to the limited media containing site-related COCs.

Alternative 1 would not include the implementation of any remedial activities and therefore, would not address potential long-term exposures to impacts from material that contains site-related impacts. Alternatives 2 and 3 each include periodic groundwater monitoring to document the extent and concentrations of dissolved phase impacts (i.e., to confirm that concentrations of dissolved phase COCs are stable or potentially decreasing through natural attenuation). Additionally, Alternatives 2 and 3 each include the establishment of institutional controls and development of an SMP to limit the potential for future exposures to the limited site-related impacts in subsurface soil and groundwater (that would remain following remedial construction activities). Based on the limited nature of site impacts, dissolved phase concentrations of COCs could reduce overtime though natural attenuation.

Alternative 3 would include the removal of the limited quantities of soil containing visual impacts (i.e., NAPL at quantities greater than sheens) and/or total PAHs at concentrations greater than 500 mg/kg. Alternative 3 would address soil containing visual impacts below the water table. Because the visually impacted material below the water table serves as a source of dissolved phase impacts, dissolved phase COC concentrations could be reduced following the completion of remedial construction activities and groundwater quality could be restored over time.

Alternatives 2 and 3 are considered to have comparable long-term effectiveness. Although these alternatives differ in their remedial components, the limited potential for exposure and the minimal remedial components common to each of these alternatives provide long-term effectiveness. Under Alternatives 2 and 3, exposure to media containing residual concentrations of COCs (i.e., greater than 6

NYCRR Part 375-6 commercial use SCOs) would be addressed through the protocols and requirements that would be presented in the SMP. As indicated above, site workers do not routinely conduct activities that would potentially result in exposure to the limited media containing site-related COCs.

The long-term effectiveness of Alternative 2 is considered to be equal to Alternative 3 based on the limited potential for exposure to impacted media and the institutional controls that would be implemented under each alternative (which would be considered an effective means to reduce the potential for future exposures). Potential exposures to field personnel and the community during long-term groundwater monitoring activities would be minimized by following appropriate procedures and protocols that would be established in the SMP.

6.1.3 Land Use

As indicated in Section 5, the current zoning for the site, in accordance with the New York City (NYC) Planning Commission Zoning Map 4b (NYC, 2010), is listed as manufacturing (i.e., M2-1 – Medium Manufacturing District). Areas immediately surrounding the site are zoned for manufacturing (i.e., M1-1 – Light Manufacturing District and M3-1 – Heavy Manufacturing District), commercial (i.e., C8-1 – General Service District) and residential (i.e., R5 General Residence District). The current and foreseeable future use of the area surrounding the site is commercial. The majority of the site (i.e., Block 3827, Lot 1) will continue to be used as a school bus parking lot and maintenance facility. In addition, Con Edison will continue to use the southeast corner of the site (i.e., Block 3827 Lot 30) as an electrical substation.

The implementation of Alternatives 1 through 3 is not anticipated to alter future use of the site. As part of Alternatives 2 and 3, institutional controls would be placed on the properties within the site and long-term groundwater monitoring would be conducted. In the event that properties within the site are sold, future owners/operators would be required to comply with the SMP and institutional controls established under Alternatives 2 and 3 based on the continued presence of soil and groundwater containing site-related COCs.

6.1.4 Reduction of Toxicity, Mobility and Volume of Contamination through Treatment

Alternative 1 would not actively treat, remove, recycle, or destroy impacted media and therefore, is considered the least effective for this criterion. Alternatives 2 and 3 include annual groundwater monitoring to document the extent of dissolved phase impacts and potential trends in dissolved phase COC concentrations (i.e., toxicity and volume).

Alternative 3 would include the excavation of approximately 2,800 cy of material to depths up to 12 feet bgs to address soil containing visual impacts (i.e., in quantities greater than sheens) and/or total PAHs at concentrations greater than 500 mg/kg. Under Alternative 3, excavated material would be transported off-site for treatment via LTTD and/or disposal as a non-hazardous waste at a solid waste landfill.

Alternative 3 could potentially restore groundwater quality to pre-disposal/pre-release conditions overtime due to the removal of visually impacted soil. However, based on the limited quantities of impacted material present, and because elevated concentrations of dissolved phase COCs have only been detected at MW-4, Alternative 2 could also eventually result in groundwater conditions being restored to pre-disposal/pre-release conditions overtime through natural attenuation.

6.1.5 Implementability

No remedial activities would be conducted as part of Alternative 1 and therefore, Alternative 1 is considered the most implementable. Alternatives 2 and 3 would include long-term groundwater monitoring, preparation of an SMP, and implementation of institutional controls. From a technical implementability standpoint, these activities do not require highly specialized equipment or personnel and could be easily implemented. Administratively, establishing institutional controls would require coordination with state agencies (i.e., NYSDEC and NYSDOH). Access agreements and permits are required for conducting remedial activities on properties not owned by Con Edison.

Alternative 3 includes the excavation of impacted soil. Removal and transportation of excavated soil for off-site treatment/disposal are technically feasible remedial construction activities. Potential implementation challenges associated with excavation activities at the site include conducting excavation activities immediately adjacent to existing structures (e.g., the large two-story service garage and fueling station), in close proximity to the substation at the Con Edison property, and in areas where subsurface utilities may be present (i.e., gas and water lines). The presence of adjacent structures and energized utilities presents a significant risk and substantial design efforts would be required to safely implement soil excavation at the site. Con Edison would assess potential options to protect/or temporarily relocate utility lines located within the proposed excavation areas during the remedial design. Logistically, as Con Edison does not own the site (with the exception of the electrical substation parcel), limited space is available for equipment and material staging. Remedial construction activities would have to be coordinated with the property owners, as routine daily site operations would have to be (in part or completely) relocated to facilitate completion of the excavation activities. This would require additional access agreements with off-site properties.

6.1.6 Compliance with SCGs

- *Chemical-Specific SCGs* – Chemical-specific SCGs are presented in Table 1. Potentially applicable chemical-specific SCGs for soil include 6 NYCRR Part 375-6 soil cleanup objectives (i.e., commercial use) and 40 CFR Part 261 and 6 NYCRR Part 371 regulations for the identification of hazardous waste. Additionally, CP-51 *Soil Cleanup Guidance* (NYSDEC, 2010b) provides a total PAH SCO of 500 mg/kg for subsurface soil at non-residential sites. Potentially applicable chemical-specific SCGs for groundwater include NYSDEC Class GA Standards and Guidance Values.

  Alternatives 1 and 2 do not include intrusive remedial construction activities and therefore, would not achieve chemical-specific SCGs for soil. Alternative 3 would address the limited soil that contains visual impacts (i.e., NAPL in quantities greater than sheens) and/or total PAHs at concentrations greater than 500 mg/kg. Under Alternative 3, excavated material and/or process residuals would be managed and characterized in accordance with 40 CFR 261 and 6 NYCRR Part 371 regulations to determine off-site treatment/disposal requirements. New York State LDRs would apply to any materials that are characterized as a hazardous waste.

  As indicated in Section 1, BTEX and PAHs in groundwater were only detected at concentrations greater than groundwater quality standards and/or guidance values at one location (i.e., MW-4). Alternatives 1 and 2 do not address soil containing site-related related impacts below the water table. Therefore, if these alternatives could achieve groundwater SCGs, the SCGs would only be achieved over a prolonged period of time through natural attenuation of dissolved phase impacts. Alternative 3 would address soil containing visual impacts (i.e., NAPL in quantities greater than sheens) and total PAH concentrations exceeding 500 mg/kg. These materials are considered the primary source of dissolved phase impacts. Following implementation of Alternative 3, it is more probable (relative to Alternative 2) that groundwater SCGs would be achieved over a shorter period of time.

- *Action-Specific SCGs* – Action-specific SCGs are presented in Table 2. Potentially applicable action-specific SCGs include health and safety requirements and regulations associated with handling impacted media. Work activities would be conducted in accordance with OSHA requirements that specify general industry standards, safety equipment and procedures, and record keeping and reporting regulations. Compliance with these action-specific SCGs would be accomplished by following a site-specific HASP.

  Under Alternative 3, excavated soil and/or process residuals would be subject to USDOT requirements for packaging, labeling, manifesting, and transporting hazardous or regulated materials. Compliance with these requirements would be achieved by following a NYSDEC-approved remedial design and using licensed waste transporters and permitted disposal facilities. Per DER-4 (NYSDEC, 2002), excavated material from a former MGP site that is characteristically hazardous for benzene only (D018) is conditionally exempt from hazardous waste management requirements when destined for thermal treatment (e.g., LTTD). All excavated material would be disposed of in accordance with applicable New York State LDRs.

- *Location-Specific SCGs* – Location-specific SCGs are presented in Table 3. Potentially applicable location-specific SCGs generally include local building codes and construction permits. Remedial activities would be conducted in accordance with New York City building/construction codes and ordinances. Local permits would be obtained prior to initiating the remedial activities.

6.1.7 Overall Protection of Public Health and the Environment

Alternative 1 does not include any active remedial measures or administrative controls and therefore, Alternative 1 is not considered protective of human health and the environment. Alternatives 2 and 3 would prevent exposures (i.e., direct contact, ingestion, and inhalation) to the limited quantities of site-related impacts in soil and groundwater (soil RAOs #1 and #2 and groundwater RAOs #1 and #2). Alternative 2 would rely on institutional controls and the protocols set forth in an SMP to reduce the potential for future exposure to the limited impacted media. Alternative 3 would include a combination of excavation, institutional controls, and an SMP to prevent public exposure to the limited site-related impacts in soil (soil RAOs #1 and #2). Alternative 3 would include excavation of 2,800 cy of soil containing visual impacts and/or total PAHs at concentrations greater than 500 mg/kg (i.e., at depths up to 12 feet bgs).

Alternatives 1 and 2 do not actively address the limited quantities of soil containing site-related impacts. Therefore, these alternatives would not address potential sources of groundwater impacts (soil RAO #3 and groundwater RAO #4). However, as discussed in Section 1, BTEX and PAHs were only detected in groundwater at concentrations exceeding groundwater quality standards and/or guidance values at one location (i.e., MW-4). For Alternatives 1 and 2, it is possible that groundwater could be restored to pre-disposal/pre-release conditions (groundwater RAO #3) overtime through natural attenuation of dissolved phase impacts. Alternative 3 minimizes potential migration of site-related COCs and NAPL (soil RAO #3) and addresses the primary source of groundwater impacts (groundwater RAO #4) by excavating the limited amounts of visually impacted material and soil containing total PAHs at concentrations exceeding 500 mg/kg. Therefore, Alternative 3 is anticipated to restore groundwater quality to pre-disposal/pre-release conditions over a shorter period of time compared to other alternatives (groundwater RAO #3).

6.1.8 Cost Effectiveness

The following table summarizes the estimated costs associated with implementing each of the remedial alternatives.

Table 6.1 Estimated Costs

Alternative	Implementation Cost	Monitoring and Reporting Cost
Alternative 1 – No Action	None	None
Alternative 2 – Long-Term Site Management	Low	Low
Alternative 3 – Targeted Excavation	High	Low

The total estimated cost to implement Alternative 3 is notably greater than the cost to implement Alternative 2. The higher cost for Alternative 3 corresponds to the excavation, backfilling, off-site transportation, and off-site treatment/disposal of excavated soil. Alternative 3 would have a greatest disruption to the surrounding community and potential for exposures and community and site business operations disruption during implementation compared to other alternatives. Additionally, the potential for exposure to the limited volume of impacted soil is minimal. Alternative 3 is considered to be the least cost effective compared to the short-term effectiveness; long-term effectiveness; and reduction of toxicity, mobility, and volume.

The cost to implement Alternative 2 is significantly less than the cost to implement Alternative 3. Based on the depth and limited amount of impacted material, and the low potential for future site construction activities to encounter impacted media, implementation of Alternative 2 would minimize the potential for future exposures to site-related impacts. Alternative 2 would also include annual groundwater monitoring to document the concentrations of dissolved impacts (which exceeded the groundwater quality standards and/or guidance values at only one location, MW-4). Alternative 2 is considered to be the most cost effective alternative with respect to the evaluation criteria.

7 RECOMMENDED REMEDIAL ALTERNATIVE

This section presents a description of the recommended remedial alternative. The results of the comparative analysis conducted in Section 6 were used as a basis for recommending a site-wide remedial alternative. The components of the preferred remedy are presented in the following subsection.

7.1 Summary of Recommended Site-Wide Remedial Alternative

Based on the comparative analysis of the remedial alternatives presented in Section 6, Alternative 2 – Long-Term Site Management is the recommended remedial alternative. The primary components of the preferred remedial alternative consist of the following:

- Conducting periodic groundwater monitoring
- Establishing institutional controls on the site in the form of deed restrictions and/or environmental easements to limit the future development and control intrusive (i.e., subsurface) activities that could result in potential exposures to the limited quantities of soil and groundwater containing site-related impacts at concentrations greater than applicable standards and guidance values; require compliance with the SMP; and prohibit the use of non-treated groundwater from the site.
- Preparing an SMP to document the following:
  - The institutional controls that have been established and will be maintained for the site.
  - Known isolated locations of soil containing COCs at concentrations greater than 6 NYCRR Part 375-6 commercial use SCOs.
  - Protocols (including health and safety requirements) for conducting invasive (i.e., subsurface) activities and managing potentially impacted material encountered during these activities.
  - Protocols and requirements for conducting annual groundwater monitoring.
  - Protocols for addressing significant changes in COC concentrations in groundwater based on the results of the annual monitoring activities.
  - Requirements for further investigation and/or remediation if site accessibility improves due to changes in owner operations or use of the site.

7.2 Recommended Remedy Selection Rationale

The recommended alternative (Alternative 2) consists of groundwater monitoring, institutional controls, and an SMP. Alternative 2 is considered effective over the long-term and is protective of public health and the environment when taking the following into account:

- Routine site operations do not include intrusive site activities. therefore, there is limited potential for future worker exposure to impacted soil and groundwater. If intrusive activities were conducted, protocols and procedures set forth in the SMP (including health and safety and community air monitoring requirements) would be adhered to reduce the potential for exposure to site workers and the surrounding community.

- Site-related impacts are limited to isolated locations at depths that would be deeper than most potential future site construction/ redevelopment activities (i.e., below 5 feet bgs). NAPL (in quantities greater than sheens or blebs) was only observed at SB-10 and elevated concentration of dissolved phase impacts have only been detected in groundwater samples collected from MW-4. Additionally, as discussed in Section 1, the site is already covered with asphalt pavement and concrete, gravel or vegetated soil which provides a physical barrier to subsurface impacts. Therefore, the reduction in potential future exposure to site-related impacts that would result from implementing either Alternative 3 would be minimal. Alternative 2 would be readily implementable from both a technical and an administrative aspect. From a technical implementability aspect, equipment and personnel qualified to conduct groundwater monitoring activities are readily available. Administratively, institutional controls would be established for the properties, which would require coordination with state agencies (i.e., NYSDEC and NYSDOH). Access agreements and permits are required for conducting groundwater monitoring activities within properties not own by Con Edison.

Alternative 2 would mitigate exposures (i.e., direct contact, ingestion, and inhalation) to the limited site-related impacts in subsurface soil and groundwater (soil RAOs #1 and #2 and groundwater RAOs #1 and #2) through the implementation of institutional controls and procedures to be presented in the SMP. Alternative 2 would not address soil containing the limited site-related impacts and therefore, does not address potential sources of groundwater impacts (soil RAO #3 and groundwater RAO #4). However, as discussed in Section 1, dissolved phase impacts in groundwater were only detected at one location at concentrations exceeding the groundwater quality standards and/or guidance values (i.e., MW-4). Based on the limited quantities and severity of the impacts (i.e., sheens and blebs), groundwater could potentially be restored to pre-disposal/pre-release conditions (groundwater RAO #3) over a prolonged period of time through natural attenuation of dissolved phase impacts.

8 REFERENCES

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TABLES

Table 1
Summary of Chemical-Specific SCGs

Alternatives Analysis Report
Consolidated Edison Company of New York, Inc. - Former Zerega Avenue Gas Holder Site - Bronx, New York

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/Remedial Action
Federal				
National Primary Drinking Water Standards	40 CFR Part 141	S	Establishes maximum contaminant levels (MCLs) which are health-based standards for public water supply systems.	These standards are potentially applicable if an action involves future use of ground water as a public supply source.
RCRA-Regulated Levels for Toxic Characteristics Leaching Procedure (TCLP) Constituents	40 CFR Part 261	S	These regulations specify the TCLP constituent levels for identification of hazardous wastes that exhibit the characteristic of toxicity.	Excavated materials may be sampled and analyzed for TCLP constituents prior to disposal to determine if the materials are hazardous based on the characteristic of toxicity.
Universal Treatment Standards/Land Disposal Restrictions (UTS/LDRs)	40 CFR Part 268	S	Identifies hazardous wastes for which land disposal is restricted and provides a set of numerical constituent concentration criteria at which hazardous waste is restricted from land disposal (without treatment).	Applicable if waste is determined to be hazardous and for remedial alternatives involving off-site land disposal.
New York State				
NYSDEC Guidance on Remedial Program Soil Cleanup Objectives	6 NYCRR Part 375	G	Provides an outline for the development and execution of the soil remedial programs. Includes soil cleanup objective tables.	These guidance values are to be considered, as appropriate, in evaluating soil quality.
Identification and Listing of Hazardous Wastes	6 NYCRR Part 371	S	Outlines criteria for determining if a solid waste is a hazardous waste and is subject to regulation under 6 NYCRR Parts 371-376.	Applicable for determining if materials generated during implementation of remedial activities are hazardous wastes. These regulations do not set cleanup standards, but are considered when developing remedial alternatives.
Soil Cleanup Guidance	CP-51	G	Provides the framework and policies for the selection of soil cleanup levels.	Guidance would be used to develop site-specific soil cleanup objectives (SCOs).
NYSDEC Ambient Water Quality Standards and Guidance Values	Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1	G	Provides a compilation of ambient water quality standards and guidance values for toxic and non-conventional pollutants for use in the NYSDEC programs.	These standards are to be considered in evaluating groundwater and surface water quality.
New York State Surface Water and Groundwater Quality Standards	6 NYCRR Parts 700-705	S	Establishes quality standards for surface water and groundwater.	Potentially applicable for assessing water quality at the site during remedial activities.

Table 2
Summary of Action-Specific SCGs

Alternatives Analysis Report
Consolidated Edison Company of New York, Inc. - Former Zerega Avenue Gas Holder Site - Bronx, New York

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/Remedial Action
Federal				
Occupational Safety and Health Act (OSHA) - General Industry Standards	29 CFR Part 1910	S	These regulations specify the 8-hour time-weighted average concentration for worker exposure to various compounds. Training requirements for workers at hazardous waste operations are specified in 29 CFR 1910.120.	Proper respiratory equipment will be worn if it is not possible to maintain the work atmosphere below required concentrations. Appropriate training requirements will be met for remedial workers.
OSHA - Safety and Health Standards	29 CFR Part 1926	S	These regulations specify the type of safety equipment and procedures to be followed during site remediation.	Appropriate safety equipment will be on-site and appropriate procedures will be followed during remedial activities.
OSHA - Record-keeping, Reporting and Related Regulations	29 CFR Part 1904	S	These regulations outline record-keeping and reporting requirements for an employer under OSHA.	These regulations apply to the company(s) contracted to install, operate and maintain remedial actions at hazardous waste sites.
RCRA - Preparedness and Prevention	40 CFR Part 264.30 - 264.31	S	These regulations outline requirements for safety equipment and spill control when treating, handling and/or storing hazardous wastes.	Safety and communication equipment will be installed at the site as necessary. Local authorities will be familiarized with the site.
RCRA - Contingency Plan and Emergency Procedures	40 CFR Part 264.50 - 264.56	S	Provides requirements for outlining emergency procedures to be used following explosions, fires, etc. when storing hazardous wastes.	Emergency and contingency plans will be developed and implemented during remedial design. Copies of the plan will be kept on-site.
90 Day Accumulation Rule for Hazardous Waste	40 CFR Part 262.34	S	Allows generators of hazardous waste to store and treat hazardous waste at the generation site for up to 90 days in tanks, containers and containment buildings without having to obtain a RCRA hazardous waste permit.	Potentially applicable to remedial alternatives that involve the storing or treating of hazardous materials on-site.
Land Disposal Facility Notice in Deed	40 CFR Parts 264 and 265 Sections 116-119(b)(1)	S	Establishes provisions for a deed notation for closed hazardous waste disposal units, to prevent land disturbance by future owners.	The regulations are potentially applicable because closed areas may be similar to closed RCRA units.
RCRA - General Standards	40 CFR Part 264.111	S	General performance standards requiring minimization of need for further maintenance and control; minimization or elimination of post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products. Also requires decontamination or disposal of contaminated equipment, structures and soils.	Decontamination actions and facilities will be constructed for remedial activities and disassembled after completion.
Standards Applicable to Transporters of Applicable Hazardous Waste - RCRA Section 3003	40 CFR Parts 170-179, 262, and 263	S	Establishes the responsibility of off-site transporters of hazardous waste in the handling, transportation and management of the waste. Requires manifesting, recordkeeping and immediate action in the event of a discharge.	These requirements will be applicable to any company(s) contracted to transport hazardous material from the site.
United States Department of Transportation (USDOT) Rules for Transportation of Hazardous Materials	49 CFR Parts 107 and 171.1 - 172.558	S	Outlines procedures for the packaging, labeling, manifesting and transporting of hazardous materials.	These requirements will be applicable to any company(s) contracted to transport hazardous material from the site.
Clean Air Act-National Ambient Air Quality Standards	40 CFR Part 60	S	Establishes ambient air quality standards for protection of public health.	Remedial operations will be performed in a manner that minimizes the production of benzene and particulate matter.
USEPA-Administered Permit Program: The Hazardous Waste Permit Program	RCRA Section 3005; 40 CFR Part 270.124	S	Covers the basic permitting, application, monitoring and reporting requirements for off-site hazardous waste management facilities.	Any off-site facility accepting hazardous waste from the site must be properly permitted. Implementation of the site remedy will include consideration of these requirements.
Land Disposal Restrictions	40 CFR Part 368	S	Restricts land disposal of hazardous wastes that exceed specific criteria. Establishes Universal Treatment Standards (UTSs) to which hazardous waste must be treated prior to land disposal.	Excavated materials that display the characteristic of hazardous waste or that are decharacterized after generation must be treated to 90% constituent concentration reduction capped at 10 times the UTS.
RCRA Subtitle C	40 U.S.C. Section 6901 et seq.; 40 CFR Part 268	S	Restricts land disposal of hazardous wastes that exceed specific criteria. Establishes UTSs to which hazardous wastes must be treated prior to land disposal.	Potentially applicable to remedial activities that include disposal waste material from the site.

Table 2
Summary of Action-Specific SCGs

Alternatives Analysis Report
Consolidated Edison Company of New York, Inc. - Former Zerega Avenue Gas Holder Site - Bronx, New York

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/Remedial Action
New York State				
NYSDEC's Monitoring Well Decommissioning Guidelines	NPL Site Monitoring Well Decommissioning dated May 1995	G	This guidance presents procedure for abandonment of monitoring wells at remediation sites.	This guidance is applicable for soil or groundwater alternatives that require the decommissioning of monitoring wells onsite.
Guidelines for the Control of Toxic Ambient Air Contaminants	DAR-1 (Air Guide 1)	G	Provides guidance for the control of toxic ambient air contaminants in New York State and outlines the procedures for evaluating sources of air pollution.	This guidance may be applicable for soil or groundwater alternatives that results in certain air emissions.
New York Permits and Certificates	6 NYCRR Part 201	G	Provides instructions and regulations for obtaining a permit to operate air emission source.	Permits are not required for remedial actions taken at hazardous waste sites; however, documentation for relevant and appropriate permit conditions would be provided to NYSDEC prior to and during implementation of this alternative.
New York State Air Quality Classification System	6 NYCRR Part 256	G	Outlines the air quality classifications for different land uses and population densities.	Air quality classification system will be referenced during the treatment process design.
New York Air Quality Standards	6 NYCRR Part 257	G	Provides air quality standards for different chemicals (including those found at the site), particles, and processes.	Emissions from the treatment process will meet the air quality standards.
Discharges to Public Waters	New York State Environmental Conservation Law, Section 71-3503	S	Provides that a person who deposits gas tar, or the refuse of a gas house or gas factory, or offal, refuse, or any other noxious, offensive, or poisonous substances into any public waters, or into any sewer or stream running or entering into such public waters, is guilty of a misdemeanor.	During the remedial activities, MGP-impacted materials will not be deposited into public waters or sewers.
New York Hazardous Waste Management System - General	6 NYCRR Part 370	S	Provides definitions of terms and general instructions for the Part 370 series of hazardous waste management.	Hazardous waste is to be managed according to this regulation.
Identification and Listing of Hazardous Wastes	6 NYCRR Part 371	S	Outlines criteria for determining if a solid waste is a hazardous waste and is subject to regulation under 6 NYCRR Parts 371-376.	Applicable for determining if solid waste generated during implementation of remedial activities are hazardous wastes. These regulations do not set cleanup standards, but are considered when developing remedial alternatives.
Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities	6 NYCRR Part 372	S	Provides guidelines relating to the use of the manifest system and its recordkeeping requirements. It applies to generators, transporters and facilities in New York State.	This regulation will be applicable to any company(s) contracted to do treatment work at the site or to transport or manage hazardous material generated at the site.
New York Regulations for Transportation of Hazardous Waste	6 NYCRR Part 372.3 a-d	S	Outlines procedures for the packaging, labeling, manifesting and transporting of hazardous waste.	These requirements will be applicable to any company(s) contracted to transport hazardous material from the site.
Waste Transporter Permits	6 NYCRR Part 364	S	Governs the collection, transport and delivery of regulated waste within New York State.	Properly permitted haulers will be used if any waste materials are transported off-site.
New York Regulations for Hazardous Waste Management Facilities	6 NYCRR Part 373.1.1 - 373.1.8	S	Provides requirements and procedures for obtaining a permit to operate a hazardous waste treatment, storage and disposal facility. Also lists contents and conditions of permits.	Any off-site facility accepting waste from the site must be properly permitted.
Land Disposal of a Hazardous Waste	6 NYCRR Part 376	S	Restricts land disposal of hazardous wastes that exceed specific criteria.	New York defers to USEPA for UTS/LDR regulations.
NYSDEC Guidance on the Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment from Former Manufactured Gas Plants	DER-4	G	Outlines the criteria for conditionally excluding coal tar waste and impacted soils from former MGPs which exhibit the hazardous characteristic of toxicity for benzene (D018) from the hazardous waste requirements of 6 NYCRR Parts 370 - 374 and 376 when destined for thermal treatment.	This guidance will be used as appropriate in the management of MGP-impacted soil and coal tar waste generated during the remedial activities.
National Pollutant Discharge Elimination System (NPDES) Program Requirements, Administered Under New York State Pollution Discharge Elimination System (SPDES)	40 CFR Parts 122 Subpart B, 125, 301, 303, and 307 (Administered under 6 NYCRR 750-758)	S	Establishes permitting requirements for point source discharges; regulates discharge of water into navigable waters including the quantity and quality of discharge.	Removal activities may involve treatment/disposal of water. If so, water generated at the site will be managed in accordance with NYSDEC SPDES permit requirements.

Table 3
Summary of Location-Specific SCGs

Alternatives Analysis Report
Consolidated Edison Company of New York, Inc. - Former Zerega Avenue Gas Holder Site - Bronx, New York

Regulation	Citation	Potential Standard (S) or Guidance (G)	Summary of Requirements	Applicability to the Remedial Design/Remedial Action
Federal				
Historical and Archaeological Data Preservation Act	16 USC 469a-1	S	Provides for the preservation of historical and archaeological data that might otherwise be lost as the result of alteration of the terrain.	The National Register of Historic Places register would be consulted to determine the presence of historical sites in the immediate vicinity of the MGP site.
National Historic and Historical Preservation Act	16 USC 470; 36 CFR Part 65; 36 CFR Part 800	S	Requirements for the preservation of historic properties.	The National Register of Historic Places register would be consulted to determine the presence of historical sites in the immediate vicinity of the MGP site.
Hazardous Waste Facility Located on a Floodplain	40 CFR Part 264.18(b)	S	Requirements for a treatment, storage and disposal (TSD) facility built within a 100-year floodplain.	Does not appear to be applicable as the site is not located within a 100-year floodplain. However, hazardous waste TSD activities (if any) will be designed to comply with applicable requirements cited in this regulation.
Endangered Species Act	16 USC 1531 et seq.; 50 CFR Part 200; 50 CFR Part 402	S	Requires federal agencies to confirm that the continued existence of any endangered or threatened species and their habitat will not be jeopardized by a site action.	Federal agencies would be consulted to determine if any wildlife species are identified on the USFWS list of Threatened, Endangered, Sensitive Species, or if any biota species are identify by the NHP as sensitive species in the vicinity of the site.
New York State				
New York State Freshwater Wetlands Act	ECL Article 24 and 71; 6 NYCRR Parts 662-665	S	Activities in wetlands areas must be conducted to preserve and protect wetlands.	Does not appear to be applicable as the site is not located in a wetlands area.
New York State Parks, Recreation, and Historic Preservation Law	New York Executive Law Article 14	S	Requirements for the preservation of historic properties.	The National Register of Historic Places register would be consulted to determine the presence of historical sites in the immediate vicinity of the MGP site.
Endangered & Threatened Species of Fish and Wildlife	6 NYCRR Part 182	S	Identifies endangered and threatened species of fish and wildlife in New York.	State agencies would be consulted to determine if any species in the vicinity of the site are identified on the list of Endangered, Threatened and Special Concern Fish & Wildlife Species of New York State.
Local				
Local Building Permits	N/A	S	Local authorities may require a building permit for any permanent or semi-permanent structure, such as an on-site water treatment system building or a retaining wall.	Substantive provisions are potentially applicable to remedial activities that require construction of permanent or semi-permanent structures.
Local Street Work Permits	N/A	S	Local authorities will require a permits for conducting work within and closing local roadways.	Street work permits will be required to conduct remedial activities within public roadways.

Table 4
Remedial Technology Screening Evaluation for Soil

Alternatives Analysis Report
Consolidated Edison Company of New York, Inc. - Former Zerega Avenue Gas Holder Site - Bronx, New York

General Response Action	Remedial Technology Type	Technology Process Option	Description	Implementability	Effectiveness	Retained?
No Action	No Action	No Action	Alternative would not include any remedial action. A 'No Action' alternative serves as a baseline for comparison of the overall effectiveness of other remedial alternatives. Consideration of a 'No Action' alternative is required by the NYSDEC DER-10.	Implementable.	Would not achieve the RAOs for soil in an acceptable time frame.	Yes
Institutional Controls	Institutional Controls	Deed Restrictions, Environmental Land Use Restrictions, Enforcement and Permit Controls, Informational Devices	Institutional controls would include legal and/or administrative controls that mitigate the potential for exposure to impacted soils and/or jeopardize the integrity of a remedy. Examples of potential institutional controls include establishing land use restrictions, health and safety requirements for subsurface activities.	Implementable. Would require coordination between NYSDEC and current property owner to establish institutional controls on properties not owned by Con Edison.	When properly implemented and followed, this technology could reduce potential human exposures, and may be effective when combined with other technology processes. Would help to reduce human exposure to impacted soil. May not achieve RAOs for environmental protection.	Yes
In-Situ Containment/ Control	Capping	Soil Cap	Placing and compacting soil/gravel material over impacted soil to provide a physical barrier to human and biota exposure to impacted soil at the site.	Implementable. Equipment and materials necessary to construct the cap are readily available.	Although construction of a cap is readily implementable, the presence of a surface cap would not achieve a majority of the site-specific RAOs. Additionally, a vast majority of the site is currently covered with asphalt and concrete, thereby providing a barrier to subsurface impacts.	No
		Asphalt/Concrete Cap	Application of a layer of asphalt or concrete over impacted soils.			No
		Multi-Media Cap	Application of a combination of clay/soils and synthetic membrane(s) over impacted soil.			No
In-Situ Treatment	Immobilization	Solidification	Addition of material to the impacted soil that limits the solubility and mobility of NAPL and COCs in soil and groundwater. Involves treating soil to produce a solidified material with low leachability that physically and chemically locks NAPL and COCs in the solidified matrix.	Potentially implementable. Solidification materials are readily available. The presence of existing buildings and subsurface structures would limit implementability.	Overall effectiveness of this process would need to be evaluated during a bench-scale treatability study. Assuming an effective solidification mix could be developed, this technology would effectively address each of the RAOs for soil. However, pre-ISS excavation would be required to remove the subsurface structures. May not be cost-effective or practical givem shallow depth impacts.	No
	Extraction/In-Situ Stripping	Dynamic Underground Stripping and Hydrous Pyrolysis/Oxidation (DUS/HPO)	Steam is injected into the subsurface to mobilize contaminants and NAPLs. The mobilized contaminants are captured and constituents are recondensed, collected, and treated. In addition, HPO can degrade contaminants in subsurface heated zones. In most cases, this technology requires long-term operation and maintenance of on-site injection, collection and/or treatment systems.	Technically implementable. This option would require a pilot scale study to determine effectiveness. Process may result in uncontrolled NAPL migration. Not a preferred technology process due to risks and potential technical implementability issues.	Could potentially promote NAPL mobilization. Focused on saturated zone, not effective for soil/NAPL above the water table. Alone, this technology would not effectively address the RAO of preventing direct exposure to impacted soil.	No
	Chemical Treatment	Chemical Oxidation	Oxidizing agents are added to oxidize and reduce the mass of organic constituents in-situ chemical oxidation involves the introduction of chemicals such as ozone, hydrogen peroxide, magnesium peroxide, sodium persulfate or potassium permanganate. A pilot study would be required to evaluate/determine oxidant application requirements. May not effectively oxidize NAPL.	Implementable. Equipment and materials necessary to inject/apply oxidizing agents are readily available. May require special provisions for storage of process chemicals.	Would require multiple treatments of chemicals to reduce COCs. Would not be effective at treating NAPL and NAPL-containing soil.	No
		Surfactant/Cosolvent Flushing	A surfactant or cosolvent solution is delivered and extracted by a network of injection and extraction wells to flush the NAPL source area. Reduction of the NAPL mass occurs by increasing the dissolution of the NAPL or selected constituents or by increasing the NAPL mobility with reduction of the interfacial tension between the NAPL and groundwater and/or reduction of the NAPL viscosity. A bench-scale and treatability study would be required to determine surfactant/cosolvent solution.	Implementable. Equipment and materials necessary to inject/apply oxidizing agents are readily available. May require special provisions for storage of process chemicals.	Overall effectiveness of this process would need to be evaluated during a bench- and field-scale pilot test to determine the site-specific design. Would not be effective at treating all NAPL and NAPL-containing soil.	No

See Note on Page 3.

Table 4
Remedial Technology Screening Evaluation for Soil

Alternatives Analysis Report
Consolidated Edison Company of New York, Inc. - Former Zerega Avenue Gas Holder Site - Bronx, New York

General Response Action	Remedial Technology Type	Technology Process Option	Description	Implementability	Effectiveness	Retained?
In-Situ Treatment (Cont.)	Biological Treatment	Biodegradation	Natural biological and physical processes that, under favorable conditions, act without human intervention to reduce the mass, volume, concentration, toxicity, and/or mobility of COCs. This process relies on long-term monitoring to demonstrate the reduction of impacts.	Implementable.	Less effective for PAHs; not effective for NAPLs; would not achieve RAOs in an acceptable time frame.	No
		Enhanced Biodegradation	Addition of amendments (e.g., oxygen, nutrients) and controls to the subsurface to enhance indigenous microbial populations to improve the rate of natural degradation.	Implementable.	May not achieve RAOs for soil. Not effective for NAPLs.	No
		Biosparging	Air/oxygen injection wells are installed within the impacted regions to enhance biodegradation of constituents by increasing oxygen availability. Low-flow injection technology may be incorporated. This technology requires long-term monitoring.	Implementable.	May not achieve RAOs for soil. Not effective for NAPLs.	No
	Thermal Treatment	In-Situ Thermal Desorption	Heat is injected into the subsurface via vacuum wells and heat transfer is completed via thermal conduction. COCs are destroyed via oxidation, pyrolysis, boiling, and volatilization. Vapor/water is recovered and treated.	Potentially implementable. Numerous concerns related to conducting thermal treatment in close proximity to public buildings, roadways, and subsurface utilities.	May not achieve RAOs for soil. May not be cost-effective or practical givem shallow depth impacts.	No
		Electrical Resistance Heating	Electrical current is applied to the subsurface via network of probes installed through standard drilling techniques. Electrical resistance is used to transfer heat via thermal conduction. COCs are destroyed via oxidation, boiling, and volatilization Vapor/water is recovered and treated.			No
Removal	Excavation	Excavation	Physical removal of impacted soil. Typical excavation equipment would include excavators, backhoes, loaders, and/or dozers. Extraction wells and pumps or other methods may be used to obtain hydraulic control to facilitate use of typical excavation equipment to physically remove soil.	Implementable. Equipment capable of excavating the soil is readily available.	Would achieve RAOs. Proven process for effectively removing impacted soil.	Yes
	NAPL Removal	Active Removal	Process by which automated pumps are utilized to remove DNAPL from recovery wells.	Technically implementable.	NAPL does not appear to migrating, therefore, would not achieve RAOs.	No
		Passive Removal	NAPL is passively collected in vertical wells and periodically removed (i.e., via bottom-loading bailers, manually operated pumps, etc.).	Technically implementable.		No
		Hot Water/Steam Injection	Process involves the injection of hot water and/or steam to heat groundwater and decrease the viscosity of DNAPL to facilitate mobilization and removal. Used in conjunction with one (or more) of the above recovery technologies.	Technically feasible.	This process may facilitate uncontrolled migration of NAPL. Would not meet the RAOs as a stand-alone technology.	No
Ex-Situ On-Site Treatment and/or Disposal	Immobilization	Solidification	Addition of material to excavated soil that limits the solubility or mobility of the constituents present. Involves treating soil to produce a solidified material with low leachability, that physically and chemically locks the constituents within the solidified matrix.	Technically implementable. Limitations of space and public proximity concerns limits the implementability of this technology. Pilot study would be needed to verify implementability.	May achieve RAOs. Proven process for effectively reducing mobility and toxicity of NAPL and organic and inorganic constituents.	No
	Extraction	Low-Temperature Thermal Desorption	Process by which soils containing organics with boiling point temperatures less than 800^{o} Fahrenheit are excavated, conditioned, and heated; the organic compounds are desorbed from the soils into an induced airflow. The resulting gas is treated either by condensation and filtration or by thermal destruction. Treated soils are returned to the subsurface. Treatment is conducted in a thermal treatment unit that is mobilized or constructed on-site.	Not considered implementable due to close proximity of public areas.	Proven process for effectively removing organic constituents from excavated soil. The efficiency of the system and rate of removal of organic constituents would require evaluation during bench-scale and/or pilot-scale testing.	No

See Note on Page 3.

Table 4
Remedial Technology Screening Evaluation for Soil

Alternatives Analysis Report
Consolidated Edison Company of New York, Inc. - Former Zerega Avenue Gas Holder Site - Bronx, New York

General Response Action	Remedial Technology Type	Technology Process Option	Description	Implementability	Effectiveness	Retained?
Ex-Situ On-Site Treatment and/or Disposal (Cont.)	Thermal Destruction	Incineration	Use of a mobile incineration unit installed on-site for high temperature thermal destruction of the organic compounds present in the media. Soils are excavated and conditioned prior to incineration. Treated soils are returned to the subsurface.	Not considered implementable due to close proximity of public areas.	Proven process for effectively addressing organic constituents. The efficiency of the system and rate of removal of organic constituents would need to be verified during bench-scale and/or pilot-scale testing.	No
	Chemical Treatment	Chemical Oxidation	Addition of oxidizing agents to degrade organic constituents to less-toxic by-products.	Implementable. Equipment and materials necessary to apply oxidizing agents are available. Large amounts of oxidizing agents may be required. May require special provisions for storage of process chemicals.	Not known to be effective for NAPL.	No
	On-Site Disposal	RCRA Landfill	Construction of a landfill that would meet RCRA requirements.	Not considered implementable due to close proximity of public areas.	This technology process would be effective at meeting the RAOs for soil. Excavated material would be contained in an appropriately constructed soil management cell. Long-term effectiveness requires ongoing maintenance and monitoring.	No
		Solid Waste Landfill	Construction of a landfill that would meet NYSDEC solid waste requirements.			No
Off-Site Treatment and/or Disposal	Recycle/ Reuse	Asphalt Concrete Batch Plant	Soil is used as a raw material in asphalt concrete paving mixtures. The impacted soil is transported to an off-site asphalt concrete facility and can replace part of the aggregate and asphalt concrete fraction. The hot-mix process melts asphalt concrete prior to mixing with aggregate. During the cold-mix process, aggregate is mixed at ambient temperature with an asphalt concrete/water emulsion. Organics and inorganics are bound in the asphalt concrete. Some organics may volatilize in the hot-mix.	Permitted facilities and demand are limited.	Effective for treating organics and inorganics through volatilization and/or encapsulation. Thermal pretreatment may be required to prevent leaching. Limited number of projects to support comparison of effectiveness.	No
		Brick/Concrete Manufacture	Soil is used as a raw material in manufacture of bricks or concrete. Heating in ovens during manufacture volatilizes organics and some inorganics. Other inorganics are bound in the product.	The site does not have the adequate space necessary to conduct the amount of screening of the material required to be performed prior to being utilized in brick/concrete manufacture.	Effective for treating organics and inorganics through volatilization and/or vitrification. A bench-scale/pilot study may be necessary to determine effectiveness.	No
		Co-Burn in Utility Boiler	Soil is blended with feed coal to fire a utility boiler used to generate steam. Organics are destroyed.	Permitted facilities available for burning MGP soils are limited.	Effective for treating organic constituents. Soil would be blended with coal prior to burning. Overall effectiveness of this process would need to be evaluated during a trial burn.	No
	Extraction	Low-Temperature Thermal Desorption	Process by which soils containing organics with boiling point temperatures less than 800^{o} Fahrenheit are heated and the organic compounds are desorbed from the soils into an induced airflow. The resulting gas is treated either by condensation and filtration or by thermal destruction. Would be used on materials that are determined to be characteristically hazardous based on TCLP analysis.	Implementable. Treatment facilities are available.	Effective means for treatment of materials that are characteristically hazardous due to the presence of organic compounds (i.e., benzene).	Yes
	Thermal Destruction	Incineration	Soils are incinerated off-site for high temperature thermal destruction of the organic compounds present in the media. Soils are excavated and conditioned prior to incineration.	Implementable. Not a cost effective means for treating impacted soil. Limited number of treatment facilities. LTTD is a more appropriate technology process for thermally treating MGP-impacted media.	Proven process for effectively addressing organic constituents. The efficiency and effectiveness of the system and rate of removal of organic constituents would need to be verified during bench-scale and/or pilot-scale testing.	No
	Off-Site Disposal	Solid Waste Landfill	Disposal of non-hazardous soil and C&D debris in an existing permitted non-hazardous landfill.	Implementable.	Proven process that, in conjunction with excavation, can effectively achieve the RAOs.	Yes
		RCRA Landfill	Disposal of impacted soil in an existing RCRA permitted landfill facility.	Hazardous materials would not meet New York State LDRs.	Proven process that, in conjunction with excavation, can effectively achieve the RAOs.	No

Note:

1. Shading indicates that technology process has not been retained for development of a remedial alternative.

Table 5
Remedial Technology Screening Evaluation for Groundwater

Alternatives Analysis Report
Consolidated Edison Company of New York, Inc. - Former Zerega Avenue Gas Holder Site - Bronx, New York

General Response Action	Remedial Technology Type	Technology Process Option	Description	Implementability	Effectiveness	Retained?
No Action	No Action	No Action	Alternative would not include any remedial action. A 'No Action' alternative serves as a baseline for comparison of the overall effectiveness of other remedial alternatives. Consideration of a 'No Action' alternative is required by the NYSDEC DER-10.	Implementable.	Would not achieve the RAOs for groundwater in an acceptable time frame.	Yes
Institutional Controls	Institutional Controls	Deed Restrictions, Groundwater Use Restriction, Enforcement and Permit Controls, Informational Devices	Institutional controls would include legal and/or administrative controls that mitigate the potential for exposure to impacted materials and/or jeopardize the integrity of a remedy. Examples of potential institutional controls include establishing land use restrictions, health and safety requirements for subsurface activities, and restrictions on groundwater use and/or extraction.	Implementable. Would require coordination between NYSDEC and current property owner to establish institutional controls on properties not owned by Con Edison.	May be effective for reducing the potential for human exposure. This option would not meet the RAO for restoring groundwater, to the extent practicable, the quality of groundwater. This option may be effective when combined with other process options.	Yes
In-Situ Containment/ Control	Containment	Sheet Pile	Steel sheet piles are driven into the subsurface to contain impacted soils, groundwater, and NAPLs. The sheet pile wall is typically keyed into a confining unit and could be permeable or impermeable to groundwater flow.	Presence of existing buildings and subsurface utilities would prevent installation of a continuous barrier, limiting the implementability of this alternative. Hydraulic effects on-site groundwater would have to be evaluated. Equipment and materials required to install slurry walls are readily available.	In order to control dissolved phase migration, would require areas to be completely surrounded. Additionally, containment would address potential exposures to future construction/utility workers. May not be required based on low/isolated concentrations of dissolved phase impacts.	No
		Slurry Walls/Jet Grout Wall	Involves excavating a trench and adding a slurry (e.g., soil/cement-bentonite mixture) to control migration of groundwater and NAPL from an area. Slurry walls are typically keyed into a low permeability unit (e.g., an underlying silt/clay layer).			No
In-Situ Treatment	Biological Treatment	Groundwater Monitoring	Natural biological, chemical, and physical processes that under favorable conditions, act without human intervention to reduce the mass, volume, concentration, toxicity, and mobility of chemical constituents. Long-term monitoring is required to demonstrate the reduction of COCs.	Easily implemented. Would require monitoring to demonstrate reduction of COCs.	May be effective if NAPL and impacted soil is addressed.	Yes
		Enhanced Biodegradation	Addition of amendments (e.g., nutrients, oxygen) to the subsurface to enhance indigenous microbial populations to improve the rate of natural biodegradation of constituents.	Would be difficult to sufficiently oxygenate the soil using amendments due to the thickness of the saturated zone and depth of impacts.	May not be effective if the subsurface conditions cannot be made and maintained aerobic. Would not be effective at restoring groundwater to pre-release/pre-disposal conditions unless MGP source materials are addressed (i.e., through containment, excavation, or stabilization). May not be required based on low/isolated concentrations of dissolved phase impacts.	No
		Biosparging	Air/oxygen injection wells are installed within the dissolved plume to enhance biodegradation of constituents by increasing oxygen availability. Low-flow injection technology may be incorporated. This technology requires long-term operation, monitoring, and maintenance of air/oxygen delivery system.	Implementable. Equipment for installing wells and injecting air/oxygen is readily available.	Could be effective at addressing dissolved-phase impacts in combination with source material mass reduction. May not be required based on low/isolated concentrations of dissolved phase impacts.	No
	Chemical Treatment	Chemical Oxidation	Oxidizing agents are added to oxidize and reduce the mass of organic constituents. In-situ chemical oxidation involves the introduction of chemicals such as ozone, hydrogen peroxide, magnesium peroxide, sodium persulfate, or potassium permanganate. Large amounts of oxidizing agents are needed to oxidize NAPL.	Implementable. Equipment and materials necessary to inject/apply oxidizing agents are readily available. May require special provisions for storage of process chemicals.	Assuming removal of source materials, this technology could meet the RAOs for groundwater. However, may not be a cost effective means to achieve the RAOs. May not be required based on low/isolated concentrations of dissolved phase impacts.	No
		Permeable Reactive Barrier (PRB)	PRBs are installed in or downgradient from the flow path of a contaminant plume. The contaminants in the plume react with the media inside the barrier to either break the compound down into harmless products or immobilize contaminants by precipitation or sorption.	Presence of existing buildings and subsurface utilities would prevent installation of a continuous barrier, limiting the implementability of this alternative.	Groundwater conditions may potentially encourage biological growth and fouling of PRB. Could be effective when combined with source removal. May not be required based on low/isolated concentrations of dissolved phase impacts.	No

See Note on Page 3.

Table 5
Remedial Technology Screening Evaluation for Groundwater

Alternatives Analysis Report
Consolidated Edison Company of New York, Inc. - Former Zerega Avenue Gas Holder Site - Bronx, New York

General Response Action	Remedial Technology Type	Technology Process Option	Description	Implementability	Effectiveness	Retained?
In-Situ Treatment (Cont.)	Extraction	Dynamic Underground Stripping and Hydrous Pyrolysis/Oxidation (DUS/HPO)	Steam is injected into the subsurface to mobilize contaminants and NAPLs. The mobilized contaminants are captured and constituents are recondensed, collected and treated. In addition, HPO can degrade contaminants in subsurface heated zones. In most cases, this technology requires long-term operation and maintenance of on-site injection, collection, and/or treatment systems.	Technically implementable. This option would require a pilot scale study to determine effectiveness. Process may result in uncontrolled NAPL migration. Not a preferred technology process due to risks and potential technical implementability issues.	This option would require a pilot scale study to determine effectiveness. Process may result in NAPL and/or dissolved plume migration. Not certain in the ability of this alternative to meet the RAOs.	No
Removal	Hydraulic Control	Vertical Extraction Wells	Vertical wells are installed and utilized to recover groundwater for treatment/disposal and containment/migration control. Typically requires extensive design/testing to determine required hydraulic gradients and feasibility of achieving those gradients.	Equipment and tools necessary to install and operate vertical extraction wells are readily available. Would require operation for an extended period of time.	Would not meet RAOs as a stand alone technology. Would likely be used in conjunction with an ex-situ treatment system (i.e., pump and treat). Pumping would be required over a prolonged period of time.	No
		Horizontal Extraction Wells	Horizontal wells are utilized to replace conventional well clusters in soil and containment/migration control.	Requires specialized horizontal drilling equipment. Not implementable.	Proven process for effectively extracting groundwater. Not likely to meet RAOs in an acceptable amount of time.	No
Ex-Situ/On-Site Treatment	Chemical Treatment	Ultra-violet (UV) Oxidation	Oxidation by subjecting groundwater to UV light and ozone. If complete mineralization is achieved, the final products of oxidation are carbon dioxide, water, and salts.	Potentially implementable. Limited space for a full-scale treatment system. Not typically used in MGP-impacted groundwater treatment train. Not effective on NAPL.	Proven process for effectively treating organic compounds. Use of this process may effectively achieve the RAOs. A bench-scale treatability study may be required to evaluate the efficiency of this process and to make project-specific adjustments to the process.	No
		Chemical Oxidation	Addition of oxidizing agents to degrade organic constituents to less-toxic byproducts.	Potentially implementable. Limited space for a full-scale treatment system. Not effective on NAPL.	A bench-scale treatability study may be required to evaluate the efficiency of this process and to make project-specific adjustments to the process. Large amounts of oxidizing agents are needed to oxidize NAPL.	No
	Physical Treatment	Carbon Adsorption	Process by which organic constituents are adsorbed to the carbon as groundwater is passed through carbon units.	Limited space for a full-scale treatment system. Potentially implementable. May be used as part of a temporary water treatment system in support of excavation dewatering activities. However, permanent on-site treatment technologies are not required because groundwater removal technologies have not been retained.	Effective at removing organic constituents. Use of this treatment process may effectively achieve the RAOs when combined with groundwater extraction.	No
		Filtration	Extraction of groundwater and treatment using filtration. Process in which the groundwater is passed through a granular media in order to removed suspended solids by interception, straining, flocculation, and sedimentation activity within the filter.		Effective pre-treatment process to reduce suspended solids. Use of this process along with other processes (i.e., that address organic constituents) could effectively achieve the RAOs.	No
		Air Stripping	A process in which VOCs are removed through volatilization by increasing the contact between the groundwater and air.		This technology process would be effective at removing VOCs from water. Process would potentially be used as part of a temporary treatment train to treat groundwater removed from excavation areas. Has potential to be used as part of a treatment system to meet the RAOs.	No
		Precipitation/ Coagulation/ Flocculation	Process which precipitates dissolved constituents into insoluble solids and improves settling characteristics through the addition of amendments to water to facilitate subsequent removal from the liquid phase by sedimentation/filtration.		Process which transforms dissolved constituents into insoluble solids by adding coagulating agents to facilitate subsequent removal from the liquid phase by sedimentation/filtration. Has potential to be used as part of a treatment system to meet the RAOs.	No
		Oil/Water Separation	Process by which insoluble oils are separated from water via physical separation technologies, including gravity separation, baffled vessels, etc.		Effective at separating insoluble oil from groundwater. This process could be used as part of the groundwater treatment train if needed to address separate-phase liquids. Has potential to be used as part of a treatment system to meet the RAOs.	No

See Note on Page 3.

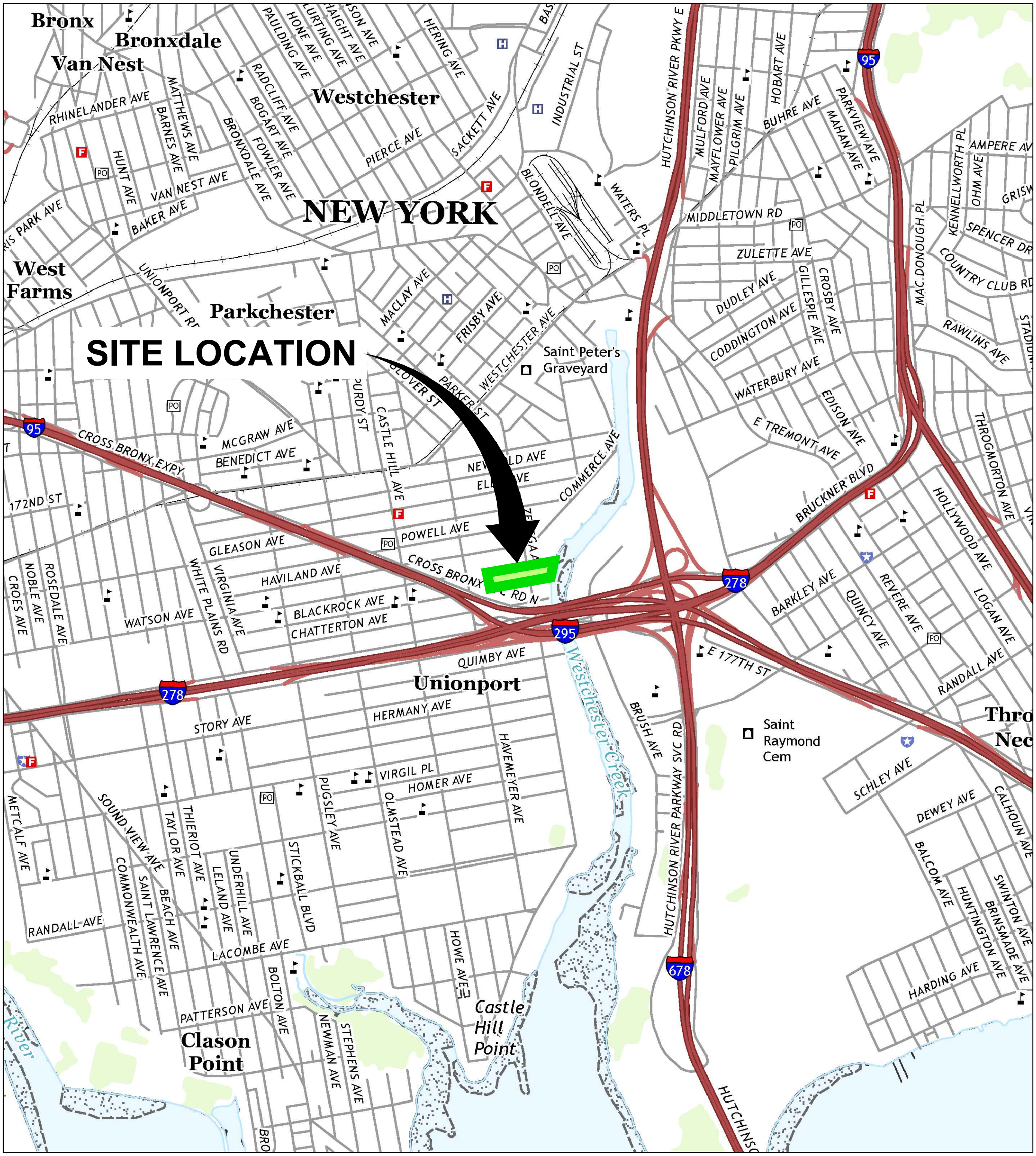
Table 5
Remedial Technology Screening Evaluation for Groundwater

Alternatives Analysis Report
Consolidated Edison Company of New York, Inc. - Former Zerega Avenue Gas Holder Site - Bronx, New York

General Response Action	Remedial Technology Type	Technology Process Option	Description	Implementability	Effectiveness	Retained?
Off-Site Treatment and/or Disposal	Groundwater Discharge	Discharge to a local Publicly-Owned Treatment Works (POTW)	Treated or untreated water is discharged to a sanitary sewer and treated at a local POTW facility.	Implementable. Equipment and materials necessary to extract, pretreat (if necessary), and discharge the water to the sewer system are readily available. Discharges to the sewer will require a POTW-issued discharge permit.	Proven process for effectively disposing of groundwater. Typically requires the least amount of pretreatment because the discharged water will be subjected to additional treatment at the POTW. May be used in support of excavation dewatering activities. However, permanent off-site treatment/disposal technologies are not required because groundwater removal technologies have not been retained.	No
		Discharge to Surface Water via Storm Sewer	Treated or untreated water is discharged to surface water, provided that the water quality and quantity meet the allowable discharge requirements for surface waters (NYSDEC SPDES compliance).	Discharges to surface water must meet substantive requirements of a SPDES permit. Cleanup objectives and sampling requirements may be restrictive.	This technology process would effectively dispose of groundwater. Impacted groundwater would require treatment to achieve water quality discharge limits. Helps in the management of treated water, but does not directly lend to achieving the RAOs for groundwater. May be used in support of excavation dewatering activities. However, permanent off-site treatment/disposal technologies are not required because groundwater removal technologies have not been retained.	No
		Discharge to a privately-owned treatment/ disposal facility.	Treated or untreated water is collected and transported to a privately-owned treatment facility.	Equipment and materials to pretreat the water at the site are readily available on a commercial basis. Facilities capable of transporting and disposing of the groundwater are available. Treatment may be required prior to discharge.	Proven process for effectively disposing of groundwater. Typically requires the least amount of pretreatment because the discharged water will be subjected to additional treatment at the disposal facility. May be used in support of excavation dewatering activities. However, permanent off-site treatment/disposal technologies are not required because groundwater removal technologies have not been retained.	No

Note:
1. Shading indicates that technology process has not been retained for development of a remedial alternative.

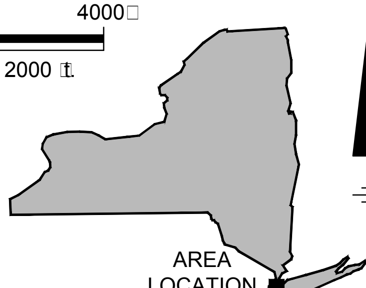
FIGURES



REFERENCE: BASE MAP USGS 7.5. MIN. TOPO. QUAD., FLUSHING, NY, 2016.

0 2000' 4000'

Approximate Scale: 1 in. = 2000 ft.

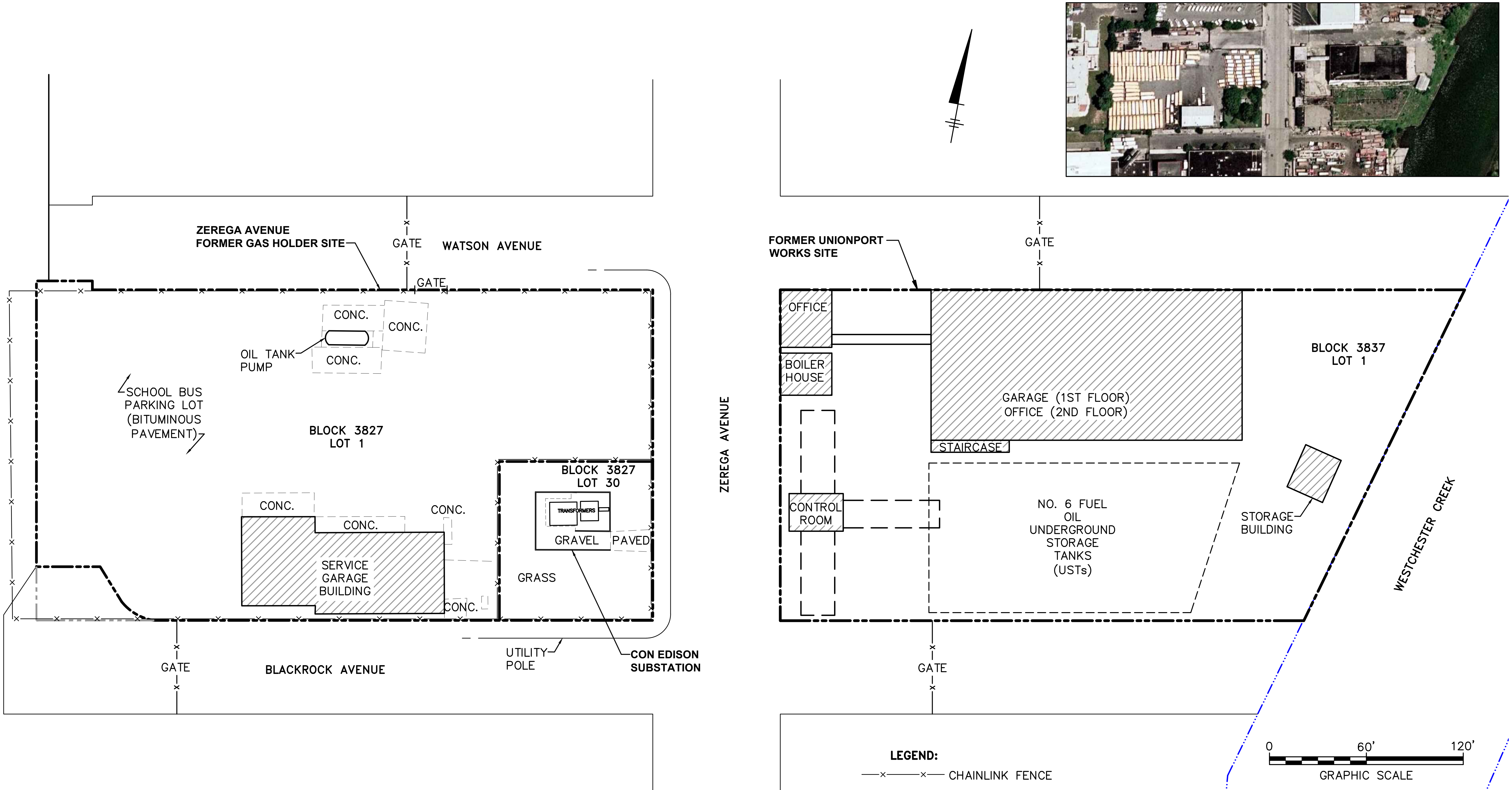


CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
FORMER ZEREGA AVENUE GAS HOLDER SITE
ALTERNATIVES ANALYSIS REPORT

SITE LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE
1



LEGEND:

CHAINLINK FENCE

PROPERTY BOUNDARY

NOTES:

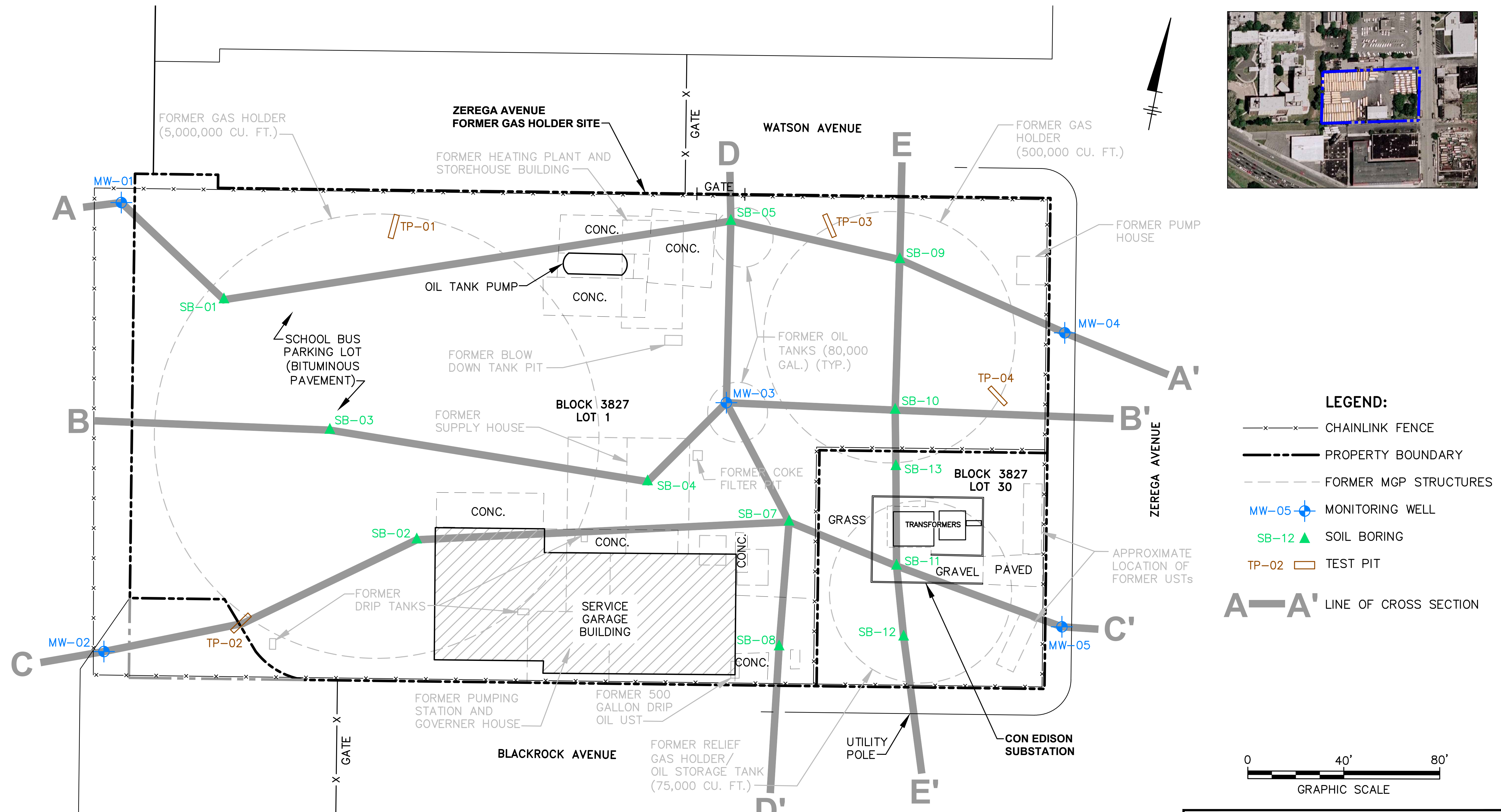
1. BASEMAP PREPARED FROM SURVEY BY MUÑOZ ENGINEERING P.C., 2008. AERIAL PHOTO FROM GOOGLE – IMAGERY, 2008.

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
FORMER ZEREGA AVENUE GAS HOLDER SITE
ALTERNATIVES ANALYSIS REPORT

CURRENT SITE LAYOUT

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2



NOTES:

1. BASEMAP PREPARED FROM SURVEY BY MUÑOZ ENGINEERING P.C., 2008. AERIAL PHOTO FROM GOOGLE – IMAGERY, 2008.
2. ALL HORIZONTAL COORDINATES ARE BASED ON NAD 1983–96, STATE PLANE COORDINATE SYSTEM – NEW YORK EAST ZONE (3101).
3. ALL ELEVATIONS REFER TO NAVD 1988 VERTICAL DATUM.

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
FORMER ZEREGA AVENUE GAS HOLDER SITE
ALTERNATIVES ANALYSIS REPORT

GEOLOGIC CROSS SECTION LOCATION MAP

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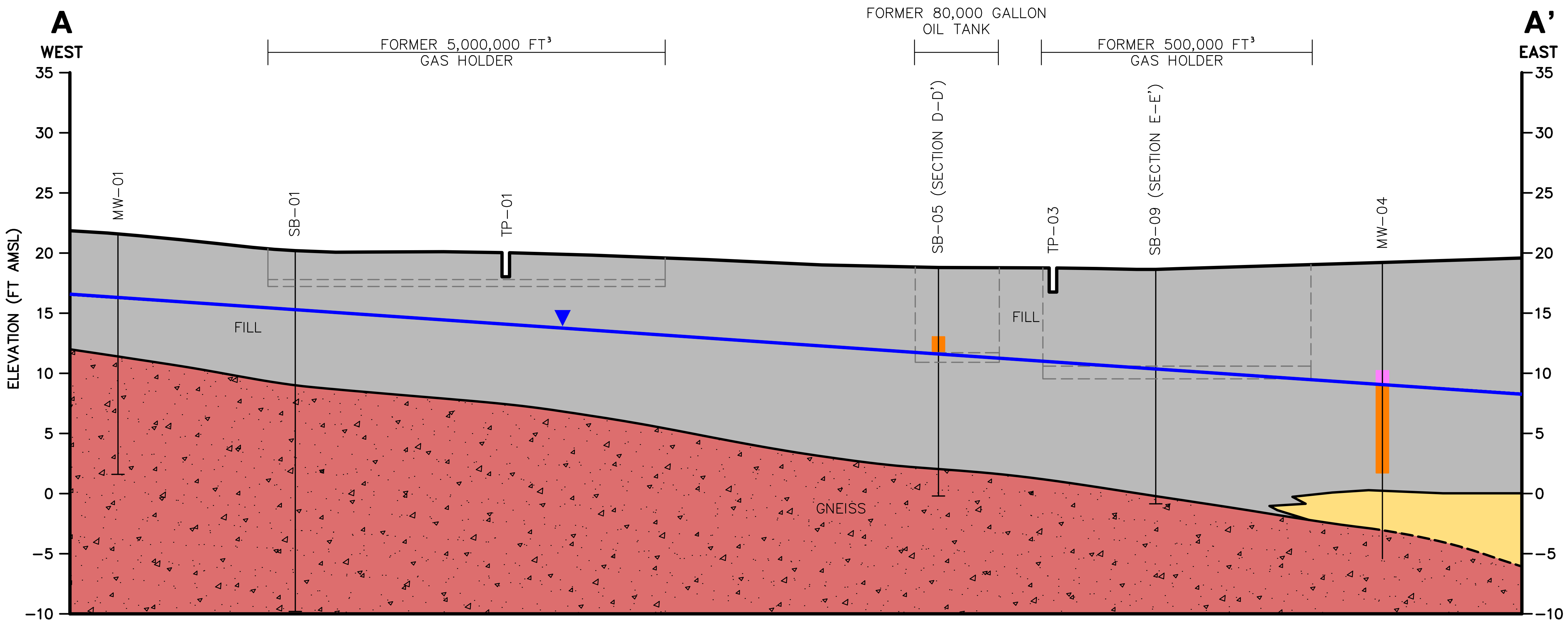
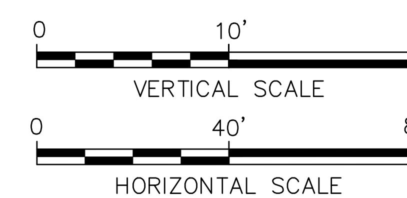
FIGURE
3





LEGEND:

SB-01/MW-01

WELL OR BORING ID

GROUND SURFACE

WATER TABLE (6/21/10)

LITHOLOGIC CONTACT
(DASHED WHERE INFERRED)

BOTTOM OF BORING

UNDIFFERENTIATED FILL

GLACIAL TILL (SAND AND SILT)

GNEISS (HARTLAND FORMATION)

OBSERVED NAPL

OBSERVED SHEEN

NOTE:

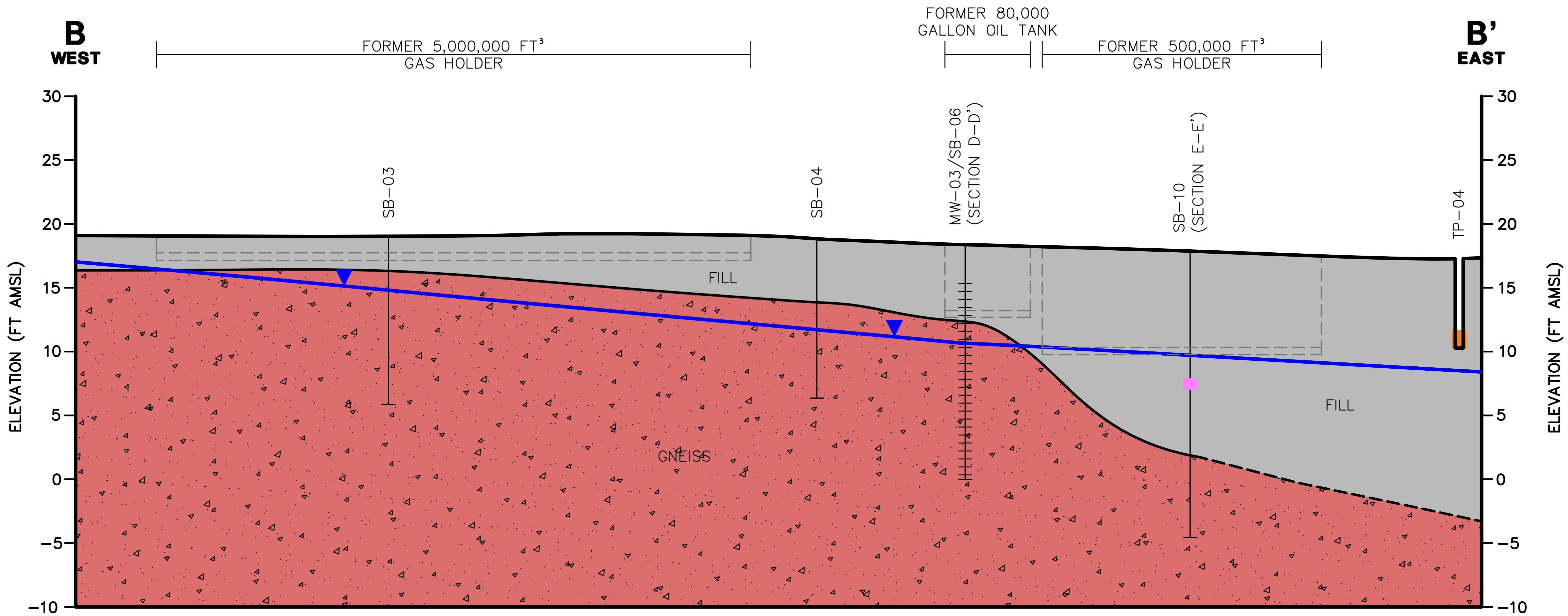
1. ELEVATION BASED ON NORTH AMERICAN DATUM OF 1983–96, NEW YORK EAST ZONE, AND NORTH AMERICAN VERTICAL DATUM OF 1988.
2. LOCATION OF FORMER MGP STRUCTURES ARE APPROXIMATE.

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
FORMER ZEREGA AVENUE GAS HOLDER SITE
ALTERNATIVES ANALYSIS REPORT

GEOLOGIC CROSS SECTION A-A'

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4



0 10' 20'
VERTICAL SCALE

0 40' 80'
HORIZONTAL SCALE

LEGEND:

MW-03/SB-06 — WELL OR BORING ID

GROUND SURFACE

WATER TABLE (6/21/2010)

LITHOLOGIC CONTACT (DASHED WHERE INFERRED)

SCREEN

BOTTOM OF BORING

UNDIFFERENTIATED FILL

GNEISS (HARTLAND FORMATION)

OBSERVED NAPL

OBSERVED SHEEN

NOTE:

1. ELEVATIONS BASED ON NORTH AMERICAN DATUM OF 1983–96, NEW YORK EAST ZONE, AND NORTH AMERICAN VERTICAL DATUM OF 1988.
2. LOCATION OF FORMER MGP STRUCTURES ARE APPROXIMATE

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
FORMER ZEREGA AVENUE GAS HOLDER SITE
ALTERNATIVES ANALYSIS REPORT

GEOLOGIC CROSS SECTION B-B'

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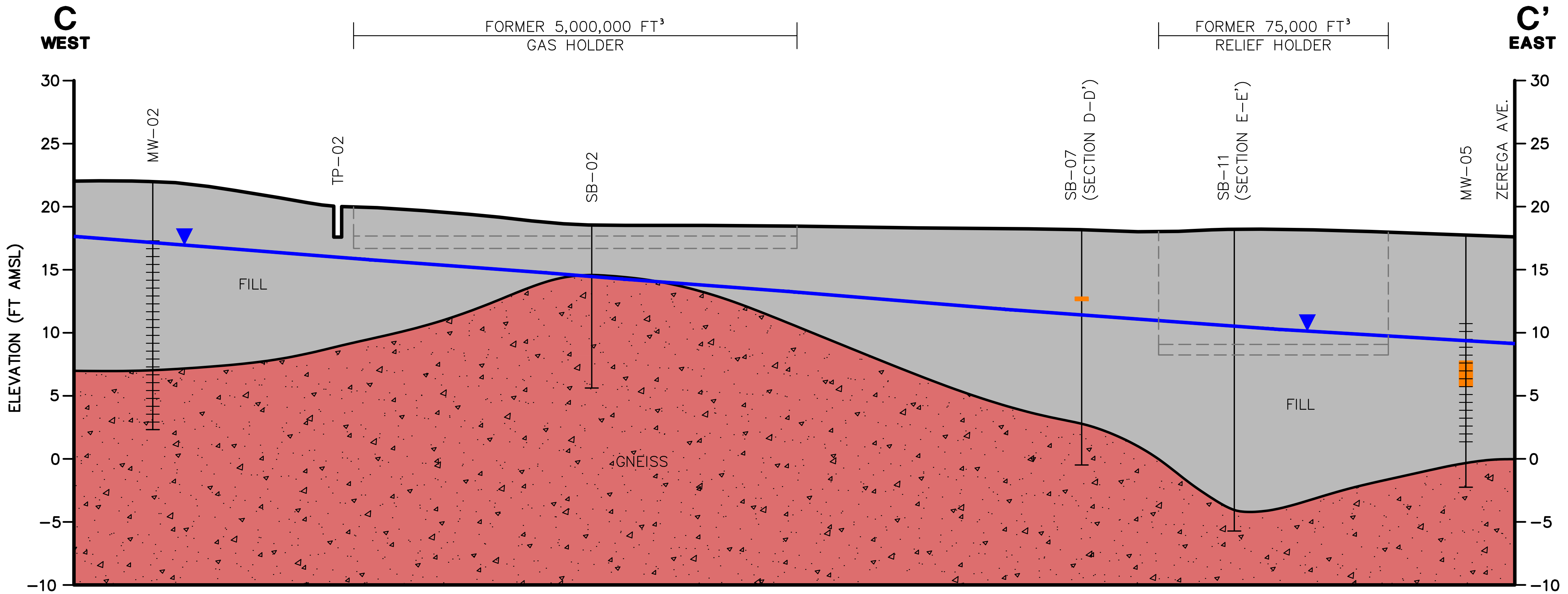
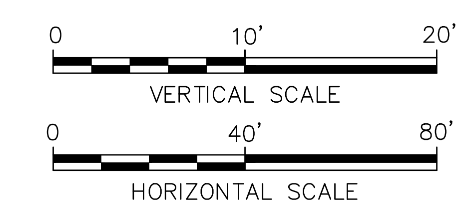
FIGURE
5





LEGEND:

SB-01/MW-01 — WELL OR BORING ID

GROUND SURFACE

LITHOLOGIC CONTACT (DASHED WHERE INFERRED)

WATER TABLE (6/21/2010)

SCREEN

BOTTOM OF BORING

UNDIFFERENTIATED FILL

GNEISS (HARTLAND FORMATION)

OBSERVED NAPL

OBSERVED SHEEN

NOTE:

1. ELEVATION BASED ON NORTH AMERICAN DATUM OF 1983–96, NEW YORK EAST ZONE, AND NORTH AMERICAN VERTICAL DATUM OF 1988.
2. LOCATION OF FORMER MGP STRUCTURES ARE APPROXIMATE.

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
FORMER ZEREGA AVENUE GAS HOLDER SITE
ALTERNATIVES ANALYSIS REPORT

GEOLOGIC CROSS SECTION C-C'

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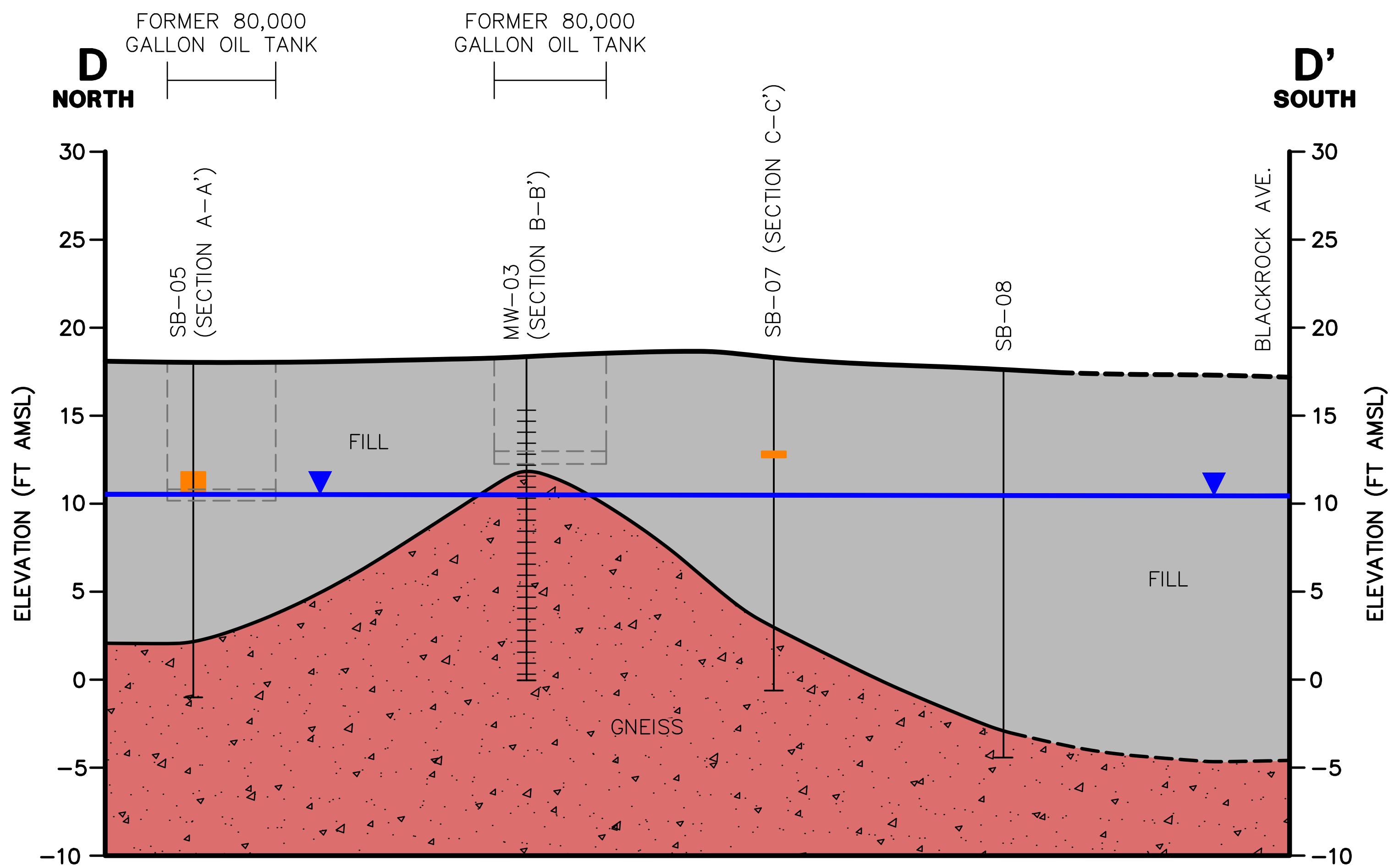
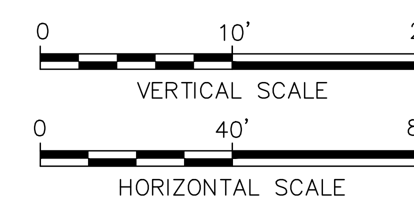
FIGURE
6





LEGEND:

SB-01/MW-01 — WELL OR BORING ID

GROUND SURFACE

WATER TABLE (6/21/2010)

LITHOLOGIC CONTACT (DASHED WHERE INFERRED)

SCREEN

BOTTOM OF BORING

UNDIFFERENTIATED FILL

GNEISS (HARTLAND FORMATION)

OBSERVED NAPL

OBSERVED SHEEN

NOTE:

1. ELEVATION BASED ON NORTH AMERICAN DATUM OF 1983-96, NEW YORK EAST ZONE, AND NORTH AMERICAN VERTICAL DATUM OF 1988.
2. LOCATION OF FORMER MGP STRUCTURES ARE APPROXIMATE.

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
FORMER ZEREGA AVENUE GAS HOLDER SITE
ALTERNATIVES ANALYSIS REPORT

GEOLOGIC CROSS SECTION D-D'

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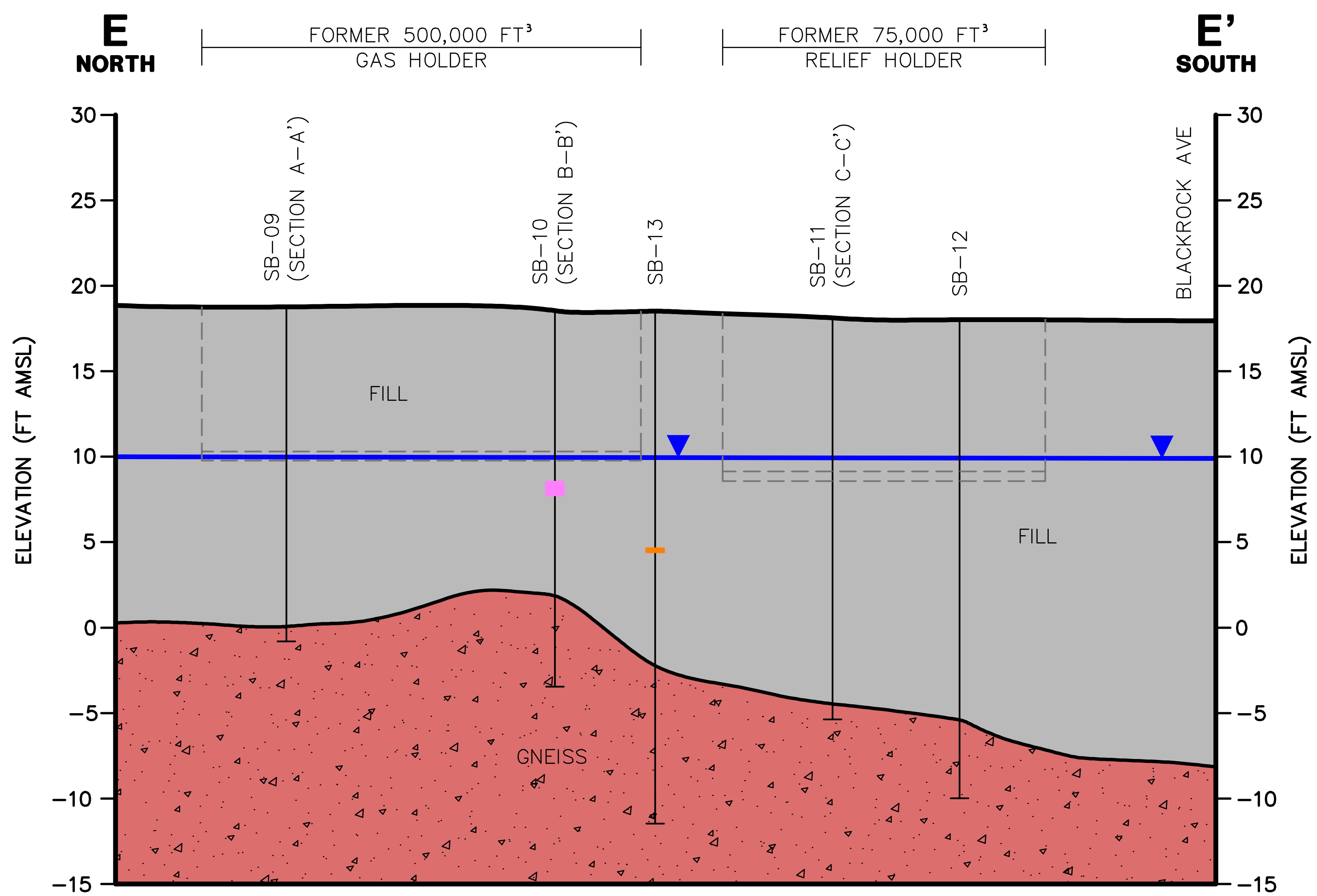
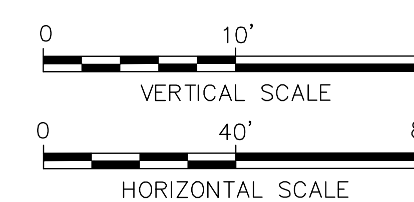
FIGURE
7





LEGEND:

- SB-13 — WELL OR BORING ID
- GROUND SURFACE
- WATER TABLE (6/21/2010)
- LITHOLOGIC CONTACT (DASHED WHERE INFERRED)
- SCREEN
- BOTTOM OF BORING
- UNDIFFERENTIATED FILL
- GNEISS (HARTLAND FORMATION)
- OBSERVED NAPL
- OBSERVED SHEEN

NOTE:

1. ELEVATION BASED ON NORTH AMERICAN DATUM OF 1983–96, NEW YORK EAST ZONE, AND NORTH AMERICAN VERTICAL DATUM OF 1988.
2. LOCATION OF FORMER MGP STRUCTURES ARE APPROXIMATE.

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
FORMER ZEREGA AVENUE GAS HOLDER SITE
ALTERNATIVES ANALYSIS REPORT

GEOLOGIC CROSS SECTION E-E'

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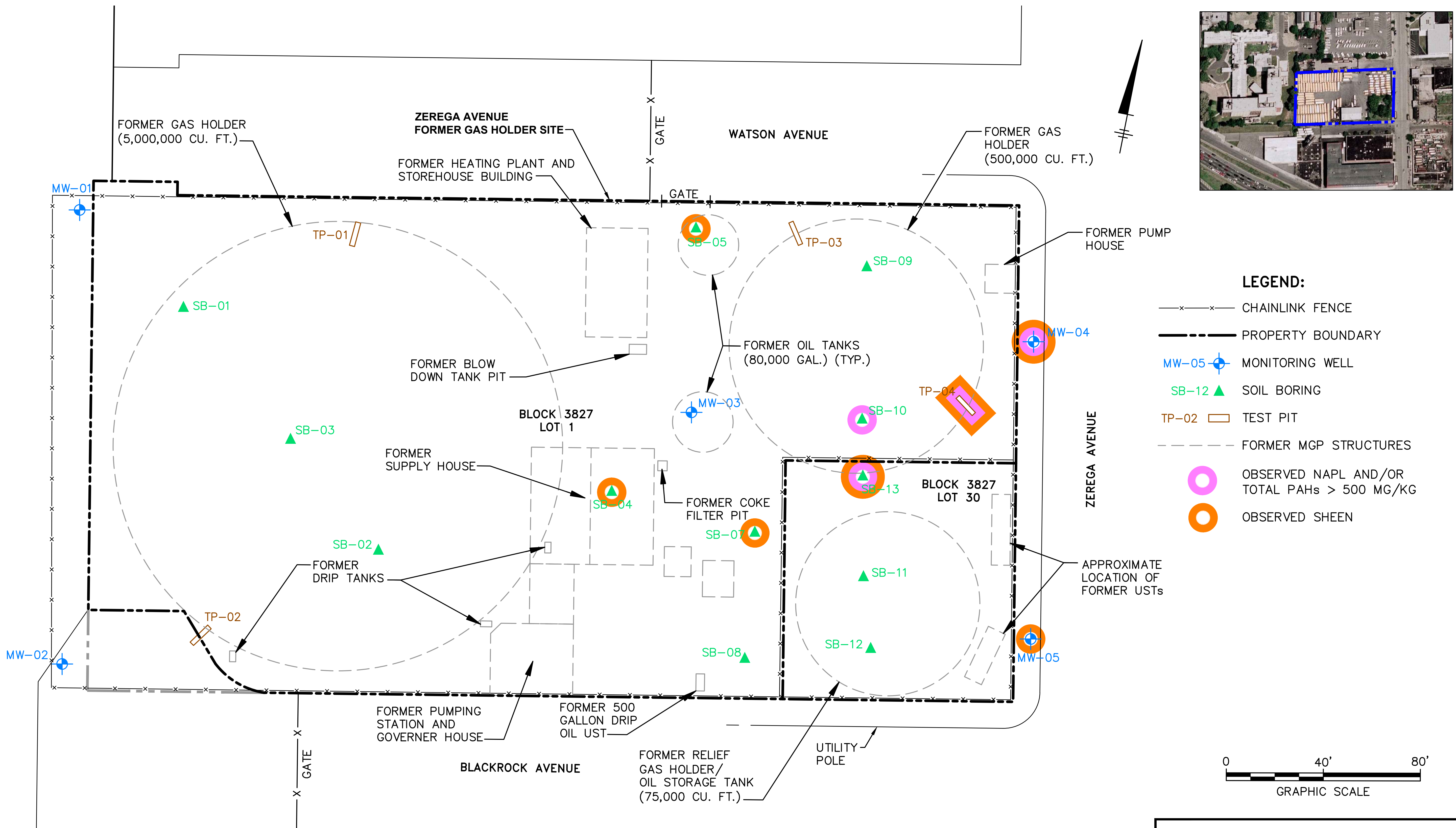
FIGURE
8



NOTES:

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CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
FORMER ZEREGA AVENUE GAS HOLDER SITE
ALTERNATIVES ANALYSIS REPORT

SUMMARY OF SOIL IMPACTS

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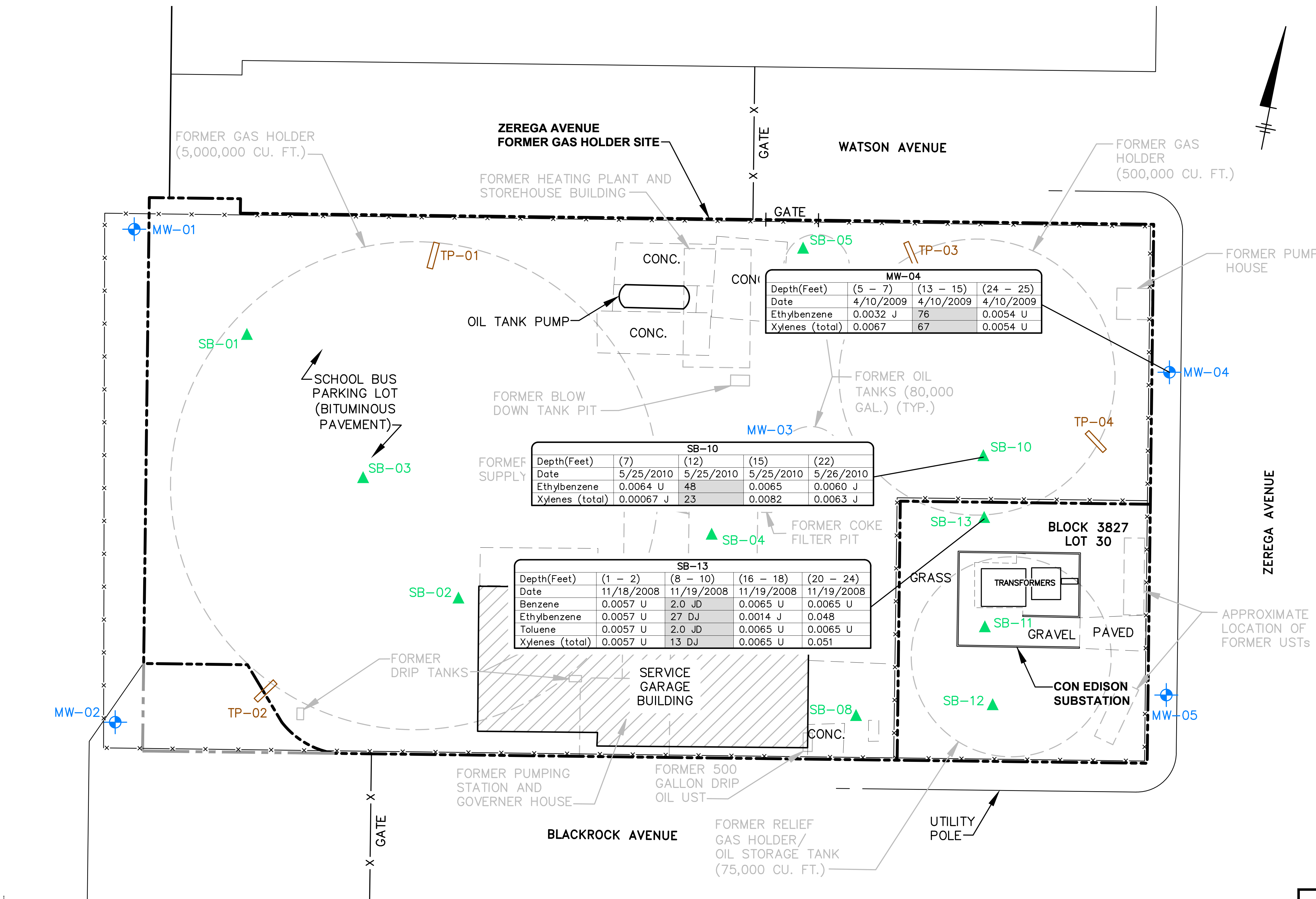
FIGURE
9



MW–04

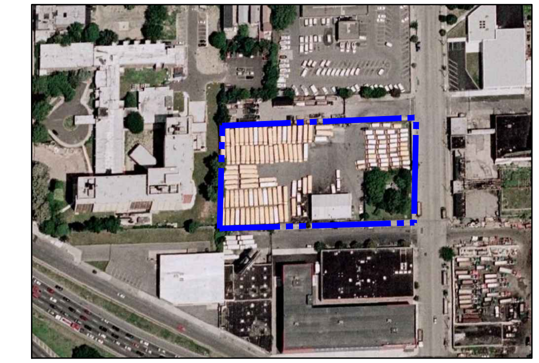
Depth(Feet)	(5 – 7)	(13 – 15)	(24 – 25)
Date	4/10/2009	4/10/2009	4/10/2009
Ethylbenzene	0.0032 J	76	0.0054 U
Xylenes (total)	0.0067	67	0.0054 U

SB–10

Depth(Feet)	(7)	(12)	(15)	(22)
Date	5/25/2010	5/25/2010	5/25/2010	5/26/2010
Ethylbenzene	0.0064 U	48	0.0065	0.0060 J
Xylenes (total)	0.00067 J	23	0.0082	0.0063 J

SB–13

Depth(Feet)	(1 – 2)	(8 – 10)	(16 – 18)	(20 – 24)
Date	11/18/2008	11/19/2008	11/19/2008	11/19/2008
Benzene	0.0057 U	2.0 JD	0.0065 U	0.0065 U
Ethylbenzene	0.0057 U	27 DJ	0.0014 J	0.048
Toluene	0.0057 U	2.0 JD	0.0065 U	0.0065 U
Xylenes (total)	0.0057 U	13 DJ	0.0065 U	0.051



LEGEND:

- CHAINLINK FENCE
- PROPERTY BOUNDARY
- FORMER MGP STRUCTURES
- MW–05 MONITORING WELL
- SB–12 SOIL BORING
- TP–02 TEST PIT
- D COMPOUND QUANTITATED USING A SECONDARY DILUTION
- J ESTIMATED VALUE
- U COMPOUND NOT DETECTED AT INDICATED DETECTION LIMIT

0 40' 80'
GRAPHIC SCALE

NOTES:

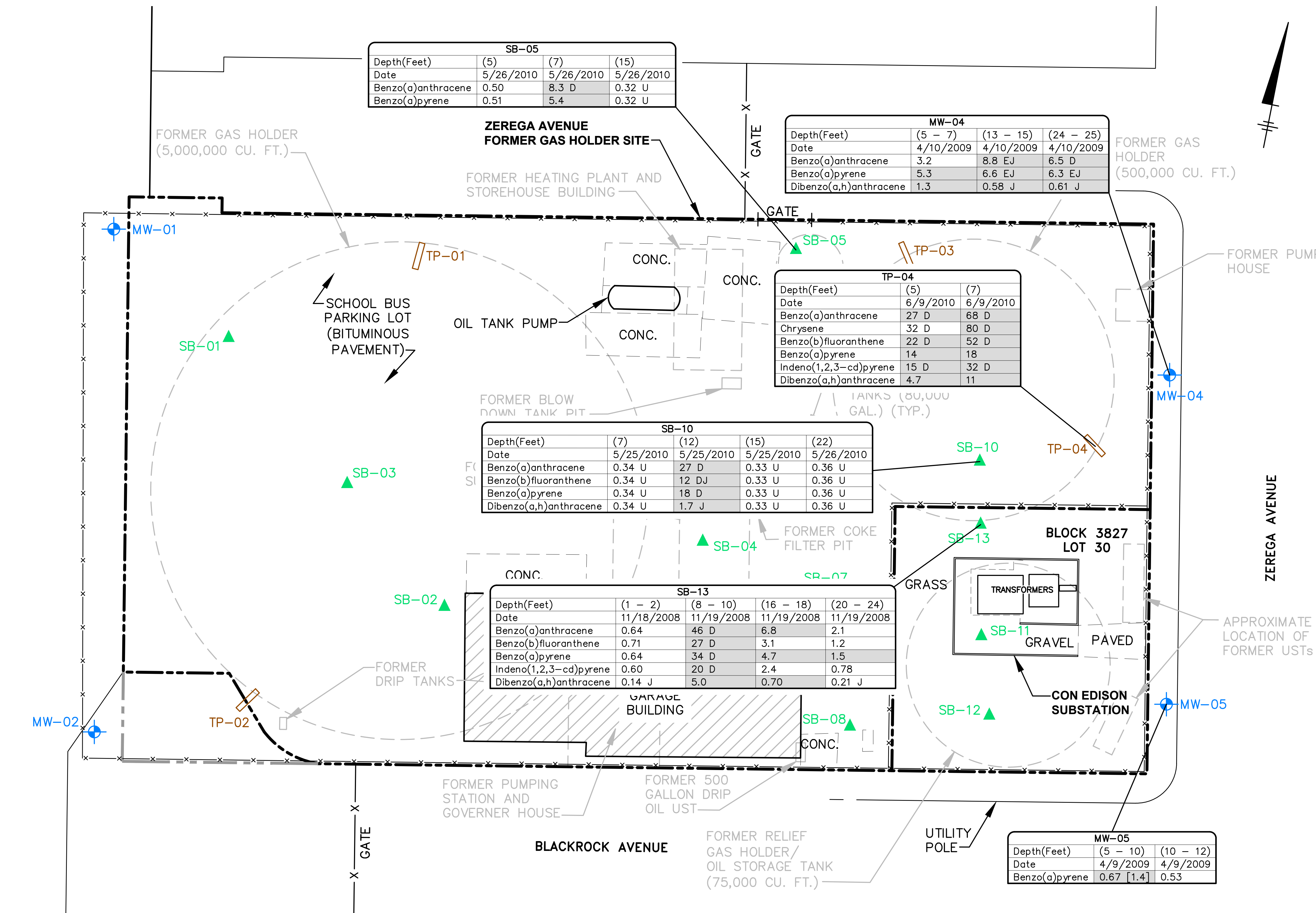
1. BASEMAP PREPARED FROM SURVEY BY MUÑOZ ENGINEERING P.C., 2008. AERIAL PHOTO FROM GOOGLE – IMAGERY, 2008.
2. ALL HORIZONTAL COORDINATES ARE BASED ON NAD 1983–96, STATE PLANE COORDINATE SYSTEM – NEW YORK EAST ZONE (3101).
3. ALL ELEVATIONS REFER TO NAVD 1988 VERTICAL DATUM.
4. SHADED DATA INDICATES EXCEEDANCE OF RESTRICTED SOIL CLEANUP OBJECTIVES (SCOs) FOR PROTECTION OF GROUNDWATER.
5. ALL VALUES ARE IN MILLIGRAMS PER KILOGRAM.

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
FORMER ZEREGA AVENUE GAS HOLDER SITE
ALTERNATIVES ANALYSIS REPORT

TOTAL BTEX CONCENTRATIONS FOR SOIL (mg/kg)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
10



SB-05

Depth(Feet)	(5)	(7)	(15)
Date	5/26/2010	5/26/2010	5/26/2010
Benzo(a)anthracene	0.50	8.3 D	0.32 U
Benzo(a)pyrene	0.51	5.4	0.32 U

MW-04

Depth(Feet)	(5 – 7)	(13 – 15)	(24 – 25)
Date	4/10/2009	4/10/2009	4/10/2009
Benzo(a)anthracene	3.2	8.8 EJ	6.5 D
Benzo(a)pyrene	5.3	6.6 EJ	6.3 EJ
Dibenzo(a,h)anthracene	1.3	0.58 J	0.61 J

TP-04

Depth(Feet)	(5)	(7)
Date	6/9/2010	6/9/2010
Benzo(a)anthracene	27 D	68 D
Chrysene	32 D	80 D
Benzo(b)fluoranthene	22 D	52 D
Benzo(a)pyrene	14	18
Indeno(1,2,3–cd)pyrene	15 D	32 D
Dibenzo(a,h)anthracene	4.7	11

SB-10

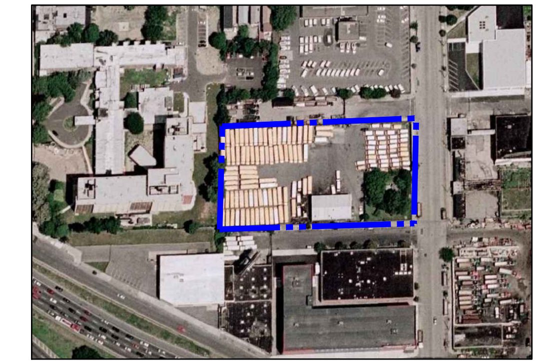
Depth(Feet)	(7)	(12)	(15)	(22)
Date	5/25/2010	5/25/2010	5/25/2010	5/26/2010
Benzo(a)anthracene	0.34 U	27 D	0.33 U	0.36 U
Benzo(b)fluoranthene	0.34 U	12 DJ	0.33 U	0.36 U
Benzo(a)pyrene	0.34 U	18 D	0.33 U	0.36 U
Dibenzo(a,h)anthracene	0.34 U	1.7 J	0.33 U	0.36 U

SB-13

Depth(Feet)	(1 – 2)	(8 – 10)	(16 – 18)	(20 – 24)
Date	11/18/2008	11/19/2008	11/19/2008	11/19/2008
Benzo(a)anthracene	0.64	46 D	6.8	2.1
Benzo(b)fluoranthene	0.71	27 D	3.1	1.2
Benzo(a)pyrene	0.64	34 D	4.7	1.5
Indeno(1,2,3–cd)pyrene	0.60	20 D	2.4	0.78
Dibenzo(a,h)anthracene	0.14 J	5.0	0.70	0.21 J

MW-05

Depth(Feet)	(5 – 10)	(10 – 12)
Date	4/9/2009	4/9/2009
Benzo(a)pyrene	0.67 [1.4]	0.53



LEGEND:

- CHAINLINK FENCE
- PROPERTY BOUNDARY
- FORMER MGP STRUCTURES
- MW-05 — MONITORING WELL
- SB-12 — SOIL BORING
- TP-02 — TEST PIT
- D — COMPOUND QUANTITATED USING A SECONDARY DILUTION
- E — ESTIMATED VALUE DETECTED AT CONCENTRATION EXCEEDING CALIBRATION RANGE
- J — ESTIMATED VALUE
- U — COMPOUND NOT DETECTED AT INDICATED DETECTION LIMIT
- [ ] — FIELD DUPLICATE VALUES SHOWN IN BRACKETS

0 40' 80'
GRAPHIC SCALE

NOTES:

1. BASEMAP PREPARED FROM SURVEY BY MUÑOZ ENGINEERING P.C., 2008. AERIAL PHOTO FROM GOOGLE – IMAGERY, 2008.
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3. ALL ELEVATIONS REFER TO NAVD 1988 VERTICAL DATUM.
4. SHADED DATA INDICATES EXCEEDANCE OF SOIL CLEANUP OBJECTIVES (SCOs) FOR RESTRICTED COMMERCIAL USE AS PER NYCRR PART 375, TABLE 375–6.8(b).
5. ALL VALUES ARE IN MILLIGRAMS PER KILOGRAM.

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
FORMER ZEREGA AVENUE GAS HOLDER SITE
ALTERNATIVES ANALYSIS REPORT

TOTAL PAH CONCENTRATIONS FOR SOIL (mg/kg)

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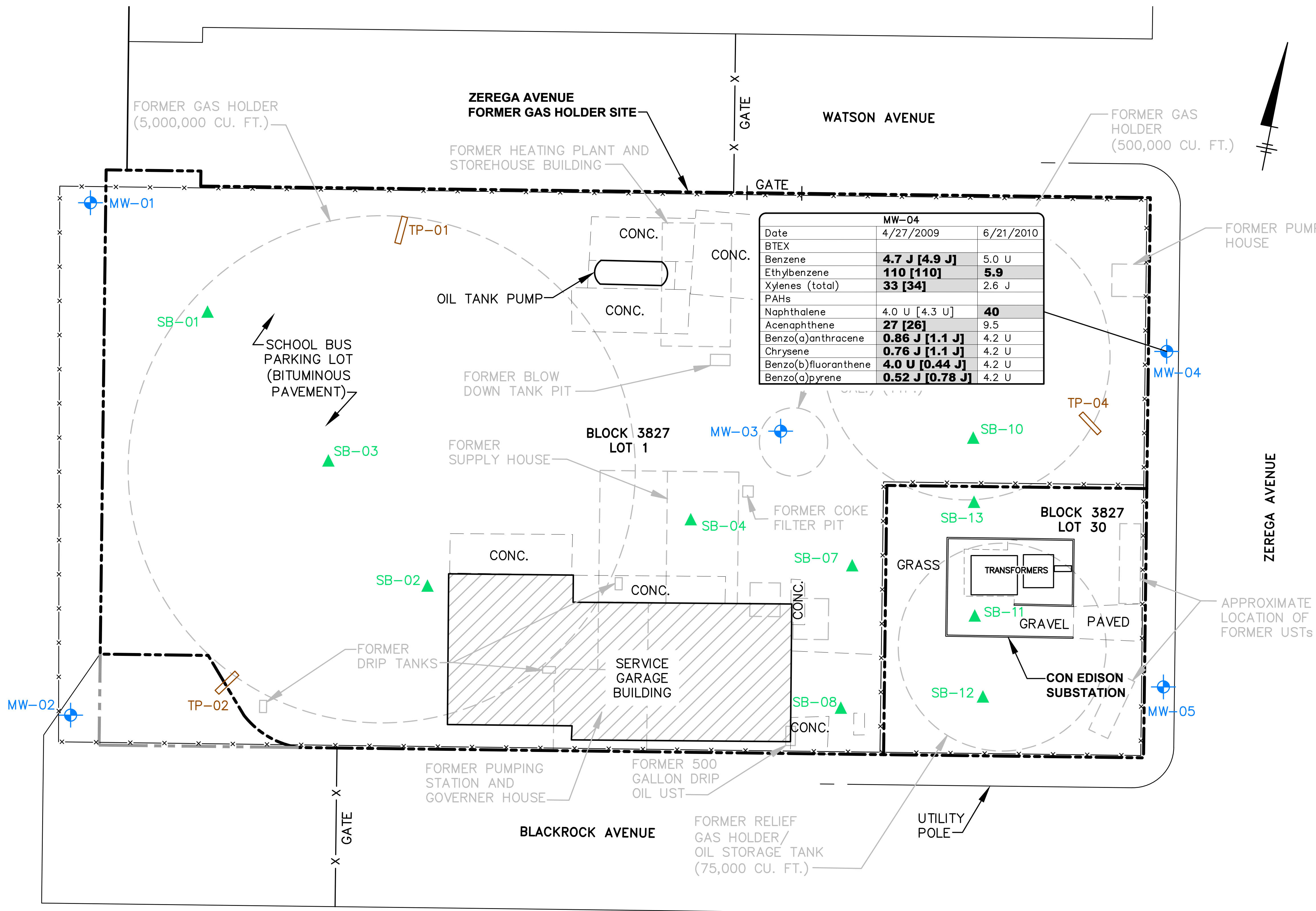
FIGURE
11



MW-04		
Date	4/27/2009	6/21/2010
BTEX		
Benzene	**4.7 J [4.9 J]**	5.0 U
Ethylbenzene	**110 [110]**	**5.9**
Xylenes (total)	**33 [34]**	2.6 J
PAHs		
Naphthalene	4.0 U [4.3 U]	**40**
Acenaphthene	**27 [26]**	9.5
Benzo(a)anthracene	**0.86 J [1.1 J]**	4.2 U
Chrysene	**0.76 J [1.1 J]**	4.2 U
Benzo(b)fluoranthene	**4.0 U [0.44 J]**	4.2 U
Benzo(a)pyrene	**0.52 J [0.78 J]**	4.2 U

LEGEND:

- CHAINLINK FENCE
- PROPERTY BOUNDARY
- FORMER MGP STRUCTURES
- MW-05 MONITORING WELL
- SB-12 SOIL BORING
- TP-02 TEST PIT
- J ESTIMATED VALUE
- U COMPOUND NOT DETECTED AT INDICATED DETECTION LIMIT
- [ ] FIELD DUPLICATE VALUES SHOWN IN BRACKETS

0 40' 80'
GRAPHIC SCALE

NOTES:

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3. ALL ELEVATIONS REFER TO NAVD 1988 VERTICAL DATUM.
4. BOLDED/SHADED DATA INDICATES EXCEEDANCE OF THE NYSDEC DIVISION OF WATER TECHNICAL AND OPERATIONAL GUIDANCE SERIES (1.1.1) AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES AND GROUNDWATER EFFLUENT LIMITATIONS.
5. ALL VALUES ARE IN MICROGRAMS PER LITER.

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
FORMER ZEREGA AVENUE GAS HOLDER SITE
ALTERNATIVES ANALYSIS REPORT

TOTAL BTEX AND PAH CONCENTRATIONS FOR GROUNDWATER (µg/L)

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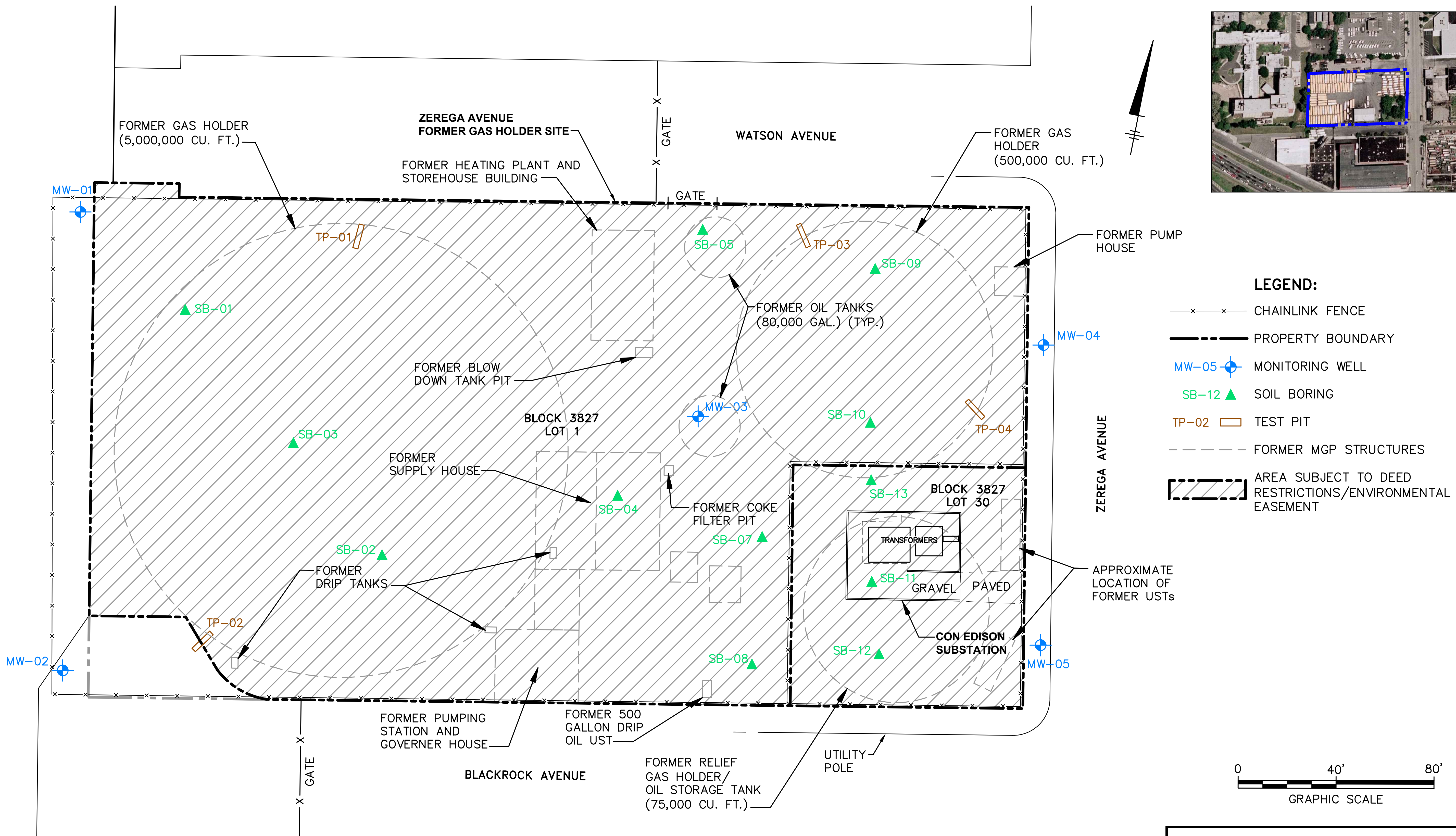
FIGURE
12



NOTES:

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3. ALL ELEVATIONS REFER TO NAVD 1988 VERTICAL DATUM.

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FORMER ZEREGA AVENUE GAS HOLDER SITE
ALTERNATIVES ANALYSIS REPORT

ALTERNATIVE 2
LONG-TERM SITE MANAGEMENT

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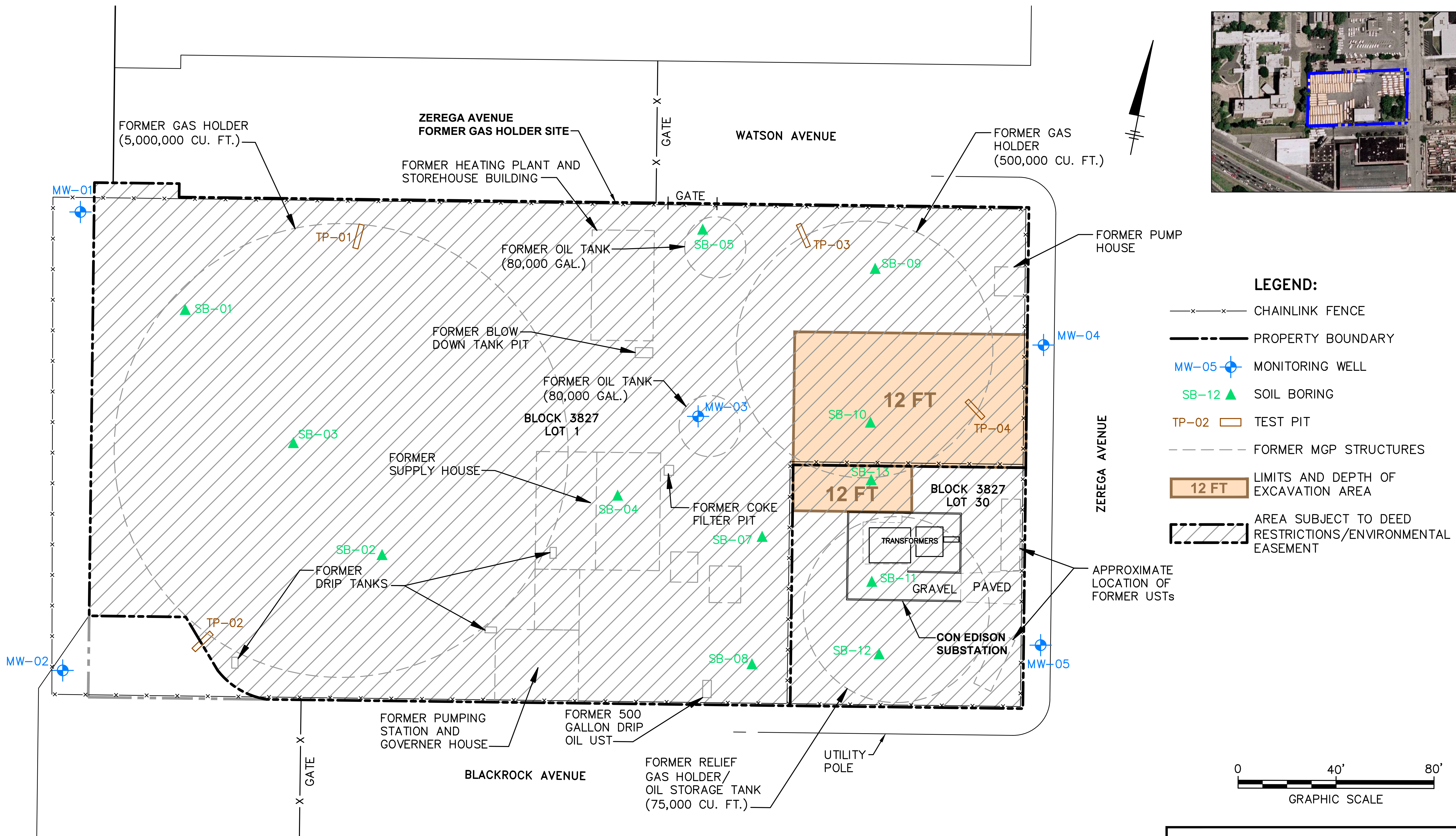
FIGURE
13



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3. ALL ELEVATIONS REFER TO NAVD 1988 VERTICAL DATUM.

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FORMER ZEREGA AVENUE GAS HOLDER SITE
ALTERNATIVES ANALYSIS REPORT

ALTERNATIVE 3
TARGETED EXCAVATION

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FIGURE
14

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