AECOM Environment

Submitted to:
Consolidated Edison Company of NY
Astoria, New York

Submitted by:
AECOM
Westford, MA
60155456.312
December 2010

Alternatives Analysis Report

Former East 19th Street Station
(NYSDEC Site # V00542)
New York, New York
Voluntary Cleanup Agreement (VCA) Index D2-0003-02-08

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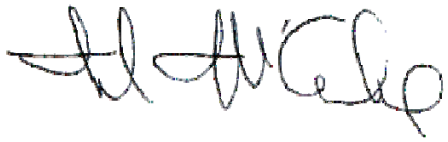

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Prepared By Mark M. McCabe, Project Manager

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Reviewed By Aimee Fitzpatrick, PE

CERTIFICATION

I, Aimee Fitzpatrick, certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and that this 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) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.

Aimee Fitzpatrick

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December 8, 2010
Date

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List of Acronyms

AAR	Alternatives Analysis Report
AWQSGVs	Ambient Water Quality Standards or Guidance Values
BEEI	Bureau of Environmental Exposure Investigation
bgs	Below ground surface
BTEX	Benzene, toluene, ethylbenzene, and xylene
Con Edison	Consolidated Edison Company of New York, Inc.
DER-10	Technical Guidance for Site Investigation and Remediation
DNAPL	Dense non-aqueous phase liquid
ENSR	ENSR Corporation
ft	Feet
HASP	Health and Safety Plan
ISMP	Interim Site Management Plan
LNAPL	Light non-aqueous phase liquid
MGP	Manufactured Gas Plant
NAPL	Non-aqueous phase liquid
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OLM	Oil-like material
PAHs	Polycyclic aromatic hydrocarbons
RAOs	Remedial Action Objectives
ROW	Right-of-Way
RAWP	Remedial Action Work Plan
RETEC	The RETEC Group, Inc.
RI	Remedial Investigation (RI)
RIR	Remedial Investigation Report
RRUSCOs	Restricted Residential Use Soil Cleanup Objectives
SCS	Site Characterization Study
SMP	Finalized Site Management Plan
SVOCs	Semivolatile Organic Compounds
TLM	Tar-like material
TOGs	Technical and Operations Guidance Series
VCA	Voluntary Cleanup Agreement
VOCs	Volatile Organic Compounds

Executive Summary

The former East 19th Street Station site is located adjacent to the Avenue C Loop Road on the south side of East 19th Street between Avenues A and B, in an area that is currently part of the Stuyvesant Town residential apartment complex. Consolidated Edison Company of New York, Inc. (Con Edison) is managing the former MGP site in accordance with Voluntary Cleanup Agreement (VCA) Index D2-0003-02-08 as negotiated with the New York State Department of Environmental Conservation (NYSDEC).

This Alternatives Analysis Report (AAR) presents the results of the remedial alternative selection process for the site. Con Edison has conducted a series of investigations at the site since 2001 to characterize the potential impacts of MGP residuals at the site, resulting in the following findings:

- Surface Soil – Based on historical site information and other physical evidence, e.g., lack of demolition debris or process residuals from the MGP site, the surface soils are believed to have been imported to the site after the MGP operations ceased, possibly for final grading purposes during the construction of Stuyvesant Town. Detected concentrations of constituents are likely attributable to the imported fill quality, anthropogenic sources, and/or naturally occurring sources that are not related to the former MGP operations.
- Subsurface Soil – Soil to a depth of approximately 5 feet below ground surface (ft bgs) is also believed to be imported fill that was used to grade the site during the construction of Stuyvesant Town. As a result, constituent concentrations to a depth of 5 ft bgs are generally not believed to be associated with the former MGP.

  Although limited impacts have been observed at the site in soil at depths below 5 ft bgs, a comparison of the results to the NYSDEC 6NYCRR Part 375 Soil Cleanup Objectives for Restricted Residential Use, i.e. gardens and raising of livestock are not permitted indicates only incidental exceedances of regulatory criteria for MGP constituents of interest.
- Groundwater – One unconfined, unconsolidated overburden aquifer is present beneath the site. Groundwater occurs at a nominal depth of 8 ft bgs, and flows eastward towards the East River. Recent sampling results demonstrate that dissolved-phase concentrations of MGP constituents of interest in the shallow (5-15 ft bgs) and intermediate (25-35 ft bgs) zones do not exceed their respective NYSDEC Ambient Water Quality Standard or Guidance Values (AWQSGVs).
- Indoor Air – Soil gas and indoor air samples have been obtained from and around the three buildings at the site during four separate investigations, and as recently as the first quarter of 2010. The results do not suggest that indoor air is being adversely impacted by the subsurface conditions. Although some VOCs have been detected in indoor air samples, they are likely associated with indoor sources, such as cleaning materials in basement storage areas.

A qualitative human health assessment was performed for the Stuyvesant Town Site, including the East 14th Street, East 17th Street and East 19th Street Station sites. MGP-related impacts identified at the East 14th Street, East 17th Street and East 19th Street Station sites indicated a low potential for complete risk pathways for apartment building residents, commercial building occupants, site visitors or pedestrians. However, maintenance/utility workers were determined to have the potential to be exposed to impacted soil or groundwater via direct contact (i.e., incidental ingestion, dermal contact, and inhalation of volatiles or particulates) while performing subsurface work. There is also the possibility that excavation beneath the building foundations in areas with MGP impacts could temporarily provide a potential pathway for subsurface vapors into the basement/crawl space areas of site structures. ConEdison has developed an Interim Site

Management Plan (ISMP) to ensure that procedures are in place to address potential exposure risks from MGP residuals that could be encountered during routine property management activities. As a conservative measure, the ISMP applies to the entire Stuyvesant town property and includes areas outside of the East 14th, East 17th and East 19th Street Station sites, such as the East 19th Street Station site where significant impacts have not been identified.

This AAR has been prepared in accordance with DER-10, Technical Guidance for Site Investigation and Remediation (DER-10) (NYSDEC, 2010), to define site-specific remedial action goals/objectives and identify an appropriate approach to address the environmental conditions encountered at the site. Summaries of activities/conclusions associated with the sequential steps in the alternative analysis process are provided below.

Defining Remedial Goals/Objectives

Based on the findings of the Qualitative Human Health Assessment, the Remedial Goal for the Stuyvesant Town property is to eliminate or mitigate the potential risk posed by MGP impacts that could be encountered during the course of routine site maintenance activities or as a result of changing site conditions.

Achieving the Remedial Goal will require that the remediation activities result in the elimination of the potential exposure pathways for media that exceed the applicable standards, criteria, and guidance (SCGs). The SCGs for the site include the NYSDEC Part 375 Soil Criteria for Restricted Residential Use and the NYSDEC Ambient Water Quality Standards and Guidance Values. Therefore, the following media-specific Remedial Action Objectives (RAOs) have been developed:

- Eliminate the potential for direct contact with MGP residuals for soil having constituent concentrations that exceed Part 375 soil criteria for restricted residential use;
- Eliminate the potential for direct contact/ingestion for groundwater having constituent concentrations that exceed AWQSGVs; and
- Eliminate the potential for vapor intrusion that affects indoor air quality for residents of site buildings.

These RAOs are intended to address potential risks identified in the Qualitative Human Health Assessment. When evaluating an alternative, the impacts to the current property use are also considered. In addition, the physical limitations imposed by the site setting are taken into account during the evaluations.

Identification of Applicable Technologies

The initial step in the process of selecting the appropriate remedial alternative was the identification of a set of general response actions and their evaluation using two fundamental criteria: Site-Specific Appropriateness (implementability given the current and future site use) and Protectiveness (ability to limit risk/reduce contamination). Institutional controls were identified as appropriate means to eliminate exposure pathways for MGP impacts in soil , groundwater and soil gas at the site. Excavation/disposal was identified as an appropriate general response action for impacted soil.

The second step in the analysis was the evaluation of specific treatment processes/approaches associated with those general response actions that were determined to have the potential to provide remedial benefit at the site. The technologies/approaches were reviewed based on their site-specific applicability and ability to achieve the site-specific RAOs, i.e., elimination of risk, and contaminant reduction to the extent feasible. The evaluation resulted in the identification of the following set of preferred approaches/technologies for achieving the RAOs in each of the site media.

Elimination of Risk

- Institutional Controls – provide the most comprehensive, site-wide means for eliminating the potential exposure pathways associated with MGP impacts in soil, groundwater and soil gas. In addition to controlling site activities, the Institutional Controls will require notification to Con Edison and NYSDEC of changes in site conditions/use, resulting in an evaluation of the need to conduct additional remedial activities. Note however, that specific controls are subject to review and approval by the property owner.
- Excavation and Disposal – can mitigate the direct contact risk for the primary risk receptors (construction workers) by removing impacted soil from areas where construction could take place, e.g., utility corridors in open and accessible site areas. In-situ treatment was determined to not be applicable for "shallow" impacts due to the potential for adverse surface effects, i.e., steam generation, potential for utility damage, etc.

Alternatives Evaluation

The preferred technologies/approaches were assembled into a set of three remedial alternatives for the site. Note that for the purpose of this document, the evaluation of the "Complete Restoration" alternative has not been included since the potential risk from the relatively small quantity of impacted soil would not justify the required demolition of the overlying apartment buildings. The alternatives were evaluated using a set of prescribed criteria that included: overall protection of human health and the environment, compliance with standards, criteria and guidance (SCGs), long-term effectiveness and permanence, reduction in toxicity, mobility, and volume (TMV), short-term effectiveness, implementability and cost. The final criterion, community acceptance, will be evaluated at a later time as part of the public hearing which is required by the Citizen Participation Plan. Descriptions of the alternatives and summaries of their associated evaluations are provided below:

Alternative 1 – NO ACTION

NO ACTION does not require any intrusive work; however, it does not address potential risks and does not meet the remedial objectives for the project.

Alternative 2 – Institutional Controls – includes the following activities:

- Institutional Controls as a legally binding mechanism to appropriately restrict property use, prohibit the use of groundwater and enforce the implementation of a finalized Site Management Plan (SMP). The SMP will require the use of controls to protect workers and the public during intrusive site maintenance activities. Additionally, it will require notification to Con Edison and NYSDEC of changes in site conditions/use, resulting in an evaluation and determination as to whether additional monitoring or remedial activities are required.

Institutional Controls maintains the condition of no significant risk, with no intrusive site activities and meets the remedial goal for the site. Costs are estimated to be $150,000.

Alternative 3 – Institutional Controls and Soil Removal – includes the following activities:

- Institutional Controls as a legally binding mechanism to appropriately restrict property use, prohibit the use of groundwater and enforce the implementation of a finalized Site Management Plan (SMP). The SMP will require the use of controls to protect workers and the public during intrusive site maintenance activities. Additionally, it will require notification to ConEd and NYSDEC of changes in

site conditions/use, resulting in an evaluation and determination as to whether additional monitoring or remedial activities are required.

- Proactive removal of less than 500 c.y. of impacted soil in the vadose zone to minimize the direct contact risk to construction workers.

Institutional Controls and Soil Removal maintains the conditions of no significant risk and meets the remedial goal for the site, with limited contaminant removal. However, the removal of impacted soil from the vadose zone in anticipation of potential future utility/maintenance work could be un-necessarily disruptive to site residents since future utility work may not be required in all areas to be excavated. The principal intrusive site activity (vadose zone excavation) would be conducted over a 9-month period, with costs estimated to be $1,120,000.

Recommended Alternative

Institutional Controls (Alternative 2) is the proposed remedial alternative for the site. This alternative includes the use of institutional controls as a legally binding mechanism to control potential exposure pathways for construction workers, residents and the general public. Additionally, Institutional Controls will require notification to Con Edison and NYSDEC of changes in site conditions/use, resulting in an evaluation and determination as to whether additional monitoring or remedial activities are required. Note however, that the institutional controls would have to be reviewed and approved by the site owner.

Alternative 2 was chosen because it meets the site-specific remedial goal with minimal short-term disruption/risk and provides sufficient flexibility to adjust to changes in site conditions. Alternative 2 would be implemented within a reasonable timeframe and would not require large temporary or permanent spatial considerations. This alternative does not significantly remove contamination and contaminants will remain in place, but Institutional Controls will address associated risk pathways. Additionally, the implementation of a Soil Management Plan will ensure notification of Con Edison and NYSDEC of any change in conditions and site use so that the need for additional remedial activities can be determined.

1.0 Introduction

The East 19th Street Station site is located in the borough of Manhattan in New York City, New York County, New York. The site occupied an area that is currently part of the Stuyvesant Town residential apartment complex in a 0.3-acre area located off the current East 20th Street Loop (Figure 1-1).

Consolidated Edison Company of New York, Inc. (Con Edison) is managing the site in accordance with Voluntary Cleanup Agreement (VCA) Index D2-0003-02-08 as negotiated with the New York State Department of Environmental Conservation (NYSDEC). This Alternatives Analysis Report (AAR) presents the results of the remedial alternative selection process for the site. It has been prepared in accordance with the most recent and applicable guidelines of the NYSDEC including DER-10, Technical Guidance for Site Investigation and Remediation (DER-10) (NYSDEC, 2010), to define site-specific remedial action goals/objectives, and identify an appropriate approach to address the environmental conditions encountered at the site. The document is formatted in the following manner: summaries of the site history and investigation results are presented in Section 2; the site-specific remedial goal and associated remedial action objectives are established in Section 3; an appropriate site remedy is proposed in Section 4; and references are provided in Section 5. The appendices provide summary tables for pertinent investigation data to support the evaluation of the remedial alternative.

2.0 Site History and Investigation Summary

The following discussion provides a description of the East 19th Street Station site, including: a review of its history; summaries of the findings from the environmental investigations and the associated Qualitative Human Health Exposure Assessment; and discussions of the on-going activities related to the Interim Site Management Plan (ISMP) in place at the site.

2.1 Site Description and History

2.1.1 Site Location and Description

The former East 19th Street Station site (Figure 2-1) is located adjacent to the Avenue C Loop Road on the south side of East 19th Street between Avenues A and B. The site location is within the present-day residential campus of Stuyvesant Town, which extends across 61-acres from First Avenue to Avenue C and from East 14th Street to East 20th Street. The complex includes 35 high-rise buildings, playgrounds, sport courts, and underground parking garages. The former East 19th Street Station site is designated as part of Tax Block 972 (Langan, 2002b).

The portion of the Stuyvesant Town campus associated with the East 19th Station site contains portions of a residential high-rise apartment building and a private underground parking garage. The Stuyvesant Town property has been most recently owned by an affiliate of Tishman Speyer Properties, L.P. and Blackrock Realty Advisors, Inc. The New York City Planning Commission designates the majority of the property as R7-2: Moderate to High-Density Residential District (GEI, 2007a).

2.1.2 Adjoining Property Descriptions

The remainder of the Stuyvesant Town apartment complex immediately surrounds the East 19th Street Station Site to the south, west and east. North of the site, on the north side of East 20th Street, is the Peter Cooper Village apartment complex and a restaurant on the northeast corner of the First Avenue and East 20th Street intersection. A gasoline station is located northeast of the site. Previous releases of petroleum products have been documented from a former service station facility with several underground storage tanks (USTs) at this location. Two multi-phase extraction (MPE) systems were installed south of the gasoline station between East 18th Street and East 23rd Street to address this contamination and have been decommissioned.

First Avenue (to the west of the site) consists of several northbound traffic lanes with an access road which includes parking and sidewalks along the east side. Commercial establishments, e.g., a grocery store, restaurants, etc., are located along the west side of First Avenue.

Avenue C and the elevated FDR Drive between are situated east of the Stuyvesant Town complex. Parking areas are located beneath the FDR and a waterfront park, Stuyvesant Cove Park, is located further east between the parking areas and the East River. The park property is owned by the City of New York and managed by the New York City Economic Development Corporation (EDC). The Community Environmental Corporation (CEC) leases the property from EDC and manages and operates Stuyvesant Cove Park. The park consists of landscaped areas, bike and walking paths, benches and tables. An Environmental Education Building (Solar One) is located in the northern portion of Stuyvesant Cove Park. Con Edison facilities are located east of Avenue C/FDR Drive between East 18th and East 14th Streets. These facilities include the East River Generating Station, various substations, an administration building, ball fields, and parking areas.

2.1.3 Site History

2.1.3.1 Pre-Manufactured Gas Plant

The East 19th Street Station site area was formerly part of the East River and associated marshlands well into the 1800s. With the increasing population and growing demands of New York City, the area gave way to more industrial planning and development, and as a result, the area east of First Avenue, between East 13th and East 26th Streets, required filling and reworking to extend the shoreline to its present location and elevate the grade of the land. Tenements were constructed in the area subsequent to the filling and prior to the development of the former MGP station sites as gas storage and/or gas plant facilities (GEI, 2007a).

2.1.3.2 Manufactured Gas Plant

The East 19th Street Station was part of the larger facility called the East 14th Street Works, which was operated by Con Edison's predecessor companies including the Consolidated Gas Company of New York, the New York Steam Company, the Standard Gas Company, and the Manhattan Gas Light Company (Langan, 2003). The majority of that larger facility was located on the eastern side of Avenue C between East 14th and East 16th Streets.

The East 19th Street Station reportedly began operations between 1863 and 1868 as a holder site and operated until approximately 1921. Based on the historic maps of the area, a single gas holder (approximately 500,000 cubic feet capacity) and a small-unidentified structure occupied the site.

2.1.3.3 Post-Manufactured Gas Plant

The holder station was replaced by an auto/truck garage and then sold to Improvement Garage, Inc. in 1943. Stuyvesant Town Corporation acquired the land in 1944 for the development of the Stuyvesant Town apartment complex. Approximately 3,100 residences and 500 commercial and industrial facilities were razed as part of the project. Any remaining aboveground structures initially related to the East 19th Street holder station would have been removed at that time to facilitate the redevelopment of the property as a single 13-story residential building (522 and 524 East 20th Street), a portion of an underground parking garage, and landscaped areas.

2.2 Investigation Summary

Several investigations have been performed at the East 19th Street Station site and are listed below.

- MGP Research Report and Preliminary Environmental Evaluation performed by Langan in 2001
- Evaluation of Indoor Air and Soil Gas Sampling performed by The RETEC Group, Inc. (RETEC) in 2003
- Site Characterization Study (SCS) performed by Haley & Aldrich, Inc. (H&A) in 2004
- Interim Remedial Investigation performed by GEI in 2007
- Water valve replacement activities performed by the property owner with oversight provided by RETEC/GEI in 2006 and 2007
- Remedial Investigation (RI) performed by AECOM from 2006 through 2008

The reports resulting from these investigations are listed in the reference section of this report. The results of these investigations were summarized or compiled in the Stuyvesant Town Remedial Investigation Report (RIR) (AECOM, 2009) and are briefly discussed in this subsection. For more detail on specific topics, refer to the Stuyvesant Town RIR (AECOM, 2009).

2.2.1 Site Setting

2.2.1.1 Topography and Drainage

The surface topography of Stuyvesant Town is made-land and ranges from approximately 4 to 22 feet above Mean Sea Level (MSL) (GEI, 2007a). The areas not covered by buildings were developed to include loop roads with additional parking. The property also includes a single-level parking garage that is situated only slightly below the adjacent street grade. Above the garage structure are playgrounds, landscaped areas, and paved walkways. Precipitation reaching the ground infiltrates landscaped areas or drains towards the storm water basins located along the perimeter roads and loop roads.

2.2.1.2 Site Infrastructure

The utility infrastructure underlying Stuyvesant Town is complex and not completely documented. H&A conducted a review of available utility maps in 2004 and determined that a dense network of numerous private and public utility lines of varying size are present beneath the site. Additionally, a large number of inactive and abandoned lines that once served the pre-Stuyvesant Town community are believed to traverse the site. These utilities are not completely detailed on existing site plans.

2.2.1.3 Site Geology

The site geology consists of four units of varying thickness and distribution across the site. Starting at ground surface, these units consist of fill; organic clay, silt, and or peat; glacial deposits and bedrock.

The fill layer beneath the former MGP station consists of intermixed sand, silt, and gravel with varying amounts of brick, concrete, boulders, wood, ash, cinders, metal fragments, and glass. Clinker and ash-like material along with bricks and concrete, were occasionally observed in split-spoon samples during the investigations. The fill most likely reflects man-made disturbances to pre-existing natural soils from historical building construction and eastern expansion of the shoreline. The fill layer in this portion of the Stuyvesant Town property extends to approximately 23 to 25 ft bgs.

Deposits of organic material were encountered within and beneath the fill layer at the site, as well as in nearby adjacent areas. The deposits consist mainly of gray to black clayey silt, organic silt, and brown to black peat and are characterized by an organic or hydrogen sulfide-like odor. In a number of borings, shell fragments were found along with plant material. The organic deposits found during the various drilling activities are consistent with low energy marsh and mud flat environments, which existed in the area up through the early 1800s. The organic deposits, therefore, reflect those former mud flats and stream and creek beds known to have fed the East River in this area. The inconsistencies in the presence of these deposits are attributable to the infilling and leveling activities associated with extending the shoreline eastward.

Glacial deposits were encountered beneath the fill and peat/organic deposit layers. The deposits consist primarily of glacial lacustrine deposits that were interbedded and underlain by layers of glacial till and outwash. The majority of the environmental borings drilled during the site characterization and remedial investigation activities at Stuyvesant Town were completed within the glacial deposits. The glacial lacustrine deposits consist of layers of gray to red-brown sand, silty sand, silt and clay, and clay. There is a fine-grained sand layer beneath the fill/organic deposits, where they are present. This fine-grained sand layer may be remnants of the damming of the Hudson River by the Harbor Hill Terminal Moraine, which dammed the river to the south (Meguerian, 2003).

Also underlying the Stuyvesant Town apartment complex/former East 19th Street MGP Station is the Inwood Marble formation. The Inwood Marble is a metamorphic rock generally described as white to blue-gray, fine to coarse grained calcitic to dolomitic marble, middle Ordovician to Late Cambrian in age (Baskerville, 1994).

It is present approximately 60 to 80 ft bgs at the East 19th Street Station site and is part of the northeast-southeast trending Cameron thrust fault which reportedly bisects the Stuyvesant Town property. According to the 2002 MGP Research Reports published by Langan, bedrock in the vicinity of the fault dips roughly 45 degrees to the northwest (GEI, 2007a). Borings advanced at the former East 19th Street Station did not extend to bedrock.

2.2.1.4 Site Hydrogeology

There is no surface water on the site. The East River is the closest surface water body to the site and is located over 1,000 ft from the East 19th Street Station site boundary to the east. The East River is classified by the NYSDEC as a Class I saline surface water, i.e., used for ship traffic, but not contact recreational purposes. The East River is tidally influenced and has measurable effects on groundwater elevations in adjacent areas.

One unconfined, unconsolidated overburden aquifer is present beneath the site. Shallow (5 to 15 ft bgs), intermediate (25 to 35 ft bgs) and deep (40 to 70 ft bgs) zones within the overburden aquifer were evaluated during the site investigations. Groundwater occurs at on-site locations at a nominal depth of 8 ft bgs. The groundwater flow direction in all of the depth zones is to the east-southeast towards the East River. However, flow may vary locally due to the heterogeneity of fill materials in the upper portions of the aquifer, or the effect of man-made structures.

The horizontal gradients across the Stuyvesant Town site range from 0.01 ft/ft and 0.002 ft/ft for the shallow zone, and 0.008 ft/ft to 0.005 ft/ft for the intermediate zone (GEI, 2007a). Calculations were not conducted for the deep groundwater zone due to the limited number of monitoring wells screened in this interval. The vertical gradient between the units is generally downward at the site. Based on calculated horizontal gradients and hydraulic conductivities, the average linear flow velocity across the site for the shallow zone has been estimated to range between approximately 390 ft/yr and 520 ft/yr. The estimated linear flow velocity in the intermediate zone is estimated to be approximately 70 ft/yr. According to the 2006 data, there was a slight downward gradient between the shallow and intermediate groundwater zones for the majority of the well clusters within the former East 19th Street Station and surrounding areas. These downward gradients were in the range of -0.137 for the East 19th Street Station 9MWS05/19MWD05, with a slight upward gradient (0.009) within the background monitoring well cluster located west of the site (GEI, 2007a).

2.2.2 Investigation Data Summary

This section presents a summary of the findings of the previous investigations and includes field observations and analytical results by media including surface soil, subsurface soil, groundwater, and soil gas/indoor air.

2.2.2.1 Surface Soil

The surface of the site is covered with high-rise apartment buildings, landscaped areas, asphalt roads/ walkways, concrete parking garage and paved recreational areas. As noted in the previous investigation reports, the surface soil appears generally distinct from the MGP-impacted lower fill and soil material. Based on historical site information and other physical evidence, e.g., lack of demolitions debris or process residuals from the MGP, the surface soils were imported to the site after the MGP operations ceased, possibly for final grading purposes during the construction of the Stuyvesant Town complex. It is likely that any elevated concentrations of semivolatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), and metals observed in the site surface soils are attributable to the imported fill quality, anthropogenic sources, and/or naturally occurring sources that are not related to the former MGP operations.

2.2.2.2 Subsurface Soil

A cross section, providing a summary of the physical evidence of MGP-related impacts in the subsurface is presented as Figure 2–2. Physical impacts observed in the subsurface at the East 19th Street Station during the SC included a piece of solid tar-like material (TLM) encountered between 16 and 17 ft bgs in boring 19GH003 and slight petroleum/bituminous odors from 9 to 11 ft bgs in boring 19GH001. No other visible impacts, e.g., tar-blebs, staining, or sheen were noted during the SC or IRI activities. However, subsequent work during the water valve excavations at off-site locations indicated that oil like material (OLM), sheen, and staining were encountered from 9.5 to 16.6 ft bgs in boring 19WVSB02 and MGP odors/staining were observed at four locations along the East 20th Street Loop in shallow (5 ft. bgs) and intermediate (12-13 ft. bgs) soil (GEI 2007b).

Analytical data for the soil samples collected as part of the investigations were compared to the NYSDEC 6NYCRR Part 375 Restricted Residential Use Soil Cleanup Objectives (RRUSCOs), and the results are presented in Appendix A of this report: Table A-1 provides a summary of the results for shallow soils (fill to depths of 0.1-7 ft bgs), while summaries for intermediate/ soils (fill at depths of 7-16 ft bgs) and deep soils (fill and native soil at depths below 16 ft bgs) are presented in Tables A-2 and A-3, respectively. Table A-1 also provides a comparison of constituent concentrations to background levels developed for representative locations in Manhattan (RETEC, 2007). As indicated, constituent concentrations in site soils in the 0 to 5 ft. bgs interval are consistent with background levels. Locations exhibiting exceedances of the RRUSCO criteria (for at least one MGP constituent) in the shallow, intermediate and deep soil intervals are identified in Figures 2-3A, 2-3B and 2-3C, respectively. The figures illustrate that constituent impacts are generally limited to shallow soil, and are likely associated with urban fill. One incidental impact for Benzo(a)anthracene was identified during the water valve replacement activities (19WVSB02, 10-12 ft bgs). The concentration associated with the exceedance (1.7 mg/Kg versus the Part 375 criteria of 1 mg/Kg) is consistent with Benzo(a)anthracene levels in urban fill. Concentrations of MGP constituents at the remaining intermediate/ deep soil locations do not exceed regulatory criteria.

2.2.2.3 Groundwater

One unconfined, unconsolidated overburden aquifer is present beneath the site. Groundwater samples have been collected from a monitoring well cluster located immediately southeast of the footprint of the former East 19th Street Station. Based on the analytical results and conclusions from the RI, the main MGP-related compounds detected in the groundwater samples were BTEX and occasionally PAHs. Iron, manganese, and sodium were the only metals detected at concentrations exceeding the AWQSGV in groundwater beneath the East 19th Street Station. As indicated in the RIR, these metals are not considered to be associated with the former MGP station operations. A summary of the groundwater analytical results for the site monitoring wells, with a comparison of the data to the NYSDEC Ambient Water Quality Standards or Guidance Values (AWQSGVs) listed in Technical and Operations Guidance Series (TOGs) 1.1.1, is presented in Appendix B. The results are presented in Table B-1 for the shallow (5 to 15 ft bgs) and intermediate (25 to 35 ft bgs) zones. As illustrated in the table, dissolved phase concentration of MGP constituents, are not present at levels greater than regulatory criteria.

2.2.2.4 Indoor Air and Soil Gas

Soil gas and indoor air samples were obtained from and around the building associated with the East 19th Street Station during the investigations of the site. A summary of the soil gas/indoor air data is provided in Appendix C as Table C-1. A review of the soil gas data indicates the presence of detectable levels of aromatic hydrocarbons, alkanes, methyl tert-butyl ether (MTBE) and chlorinated solvents. These constituents suggest that subsurface conditions have been impacted by petroleum (alkanes, aromatics and MTBE), cleaning solvents (chlorinated compounds) and potentially by MGP residuals (aromatics). Note however that several

constituents thought to be specific to MGP residuals (indane, indene and thiophene) were not present in soil gas. Associated indoor air data demonstrates that only chlorinated solvents and alkanes were present at significant levels, i.e., greater than the established background criteria (95th percentile). These results further demonstrate that indoor air was not being adversely impacted by the subsurface conditions and that the vapor intrusion pathway is not complete. Although some VOCs were detected in indoor air samples, it is likely that indoor sources, e.g., cleaning supplies were likely responsible for their presence.

2.3 Qualitative Human Health Assessment

A qualitative human health assessment was performed for the Stuyvesant Town Site. Based on the MGP-related impacts identified at the East 14th, East 17th and East 19th Street Station sites, a low potential for complete risk pathways was identified for apartment building residents, commercial building occupants, site visitors or pedestrians. Additionally, subsurface maintenance/utility workers have the potential to be exposed to impacted soil or groundwater via direct contact (i.e., incidental ingestion, dermal contact, and inhalation of volatiles or particulates) while performing subsurface work. There is also the possibility that excavation beneath the building foundations could temporarily provide a potential pathway for subsurface vapors into the basement/crawl space areas of site structures. ConEdison has developed an Interim Site Management Plan (ISMP) to ensure that procedures are in place to address potential exposure risks from MGP residuals that could be encountered during routine property management activities. As a conservative measure, the ISMP applies to areas outside of the East 14th, East 17th and East 19th Street Station sites.

2.4 Interim Site Management Plan

ConEdison has developed ISMP to ensure that procedures are in place to address potential exposure risks from MGP residuals that could be encountered during routine property management activities. The ISMP provides for the protection of the general public, residents, site workers, and the environment during invasive site work and is designed to eliminate the exposure pathways for subsurface soils, groundwater, and soil gas. When invasive site work is conducted, the ISMP provides support and guidance for utility and maintenance workers who will conduct any utility repairs, fence repairs, tree planting, construction, etc., within the property boundaries below a depth of four feet or beneath a concrete foundation or slab in site buildings. Specific details in the ISMP include methods for the identification of contaminated material and requirements for the following activities: soil and groundwater management, air monitoring and odor control, waste characterization and disposal, equipment decontamination, work area isolation and engineering controls, health and safety, and emergency response. Discussions of on-going ISMP activities related to indoor air monitoring and non-aqueous phase liquid (NAPL) monitoring are provided below.

2.4.1 Indoor Air Monitoring

Monitoring is being conducted on an annual basis in the basement/crawlspace areas of the site building to confirm that indoor air has not been impacted by MGP residuals. The most recent data was collected in January 2010. Indoor air samples were collected using laboratory certified, six-liter volume Summa canisters. The sampling locations were consistent with those used in previous sampling events.

Volatile organic compounds (VOCs) were detected in each of the indoor air samples at concentrations ranging from 1 to 63 µg/m^3. Summaries of the results from the 2009 and 2010 programs are provided in Appendix C (Tables C-2 and C-3, respectively). The results demonstrate that indoor air concentrations of VOCs are generally consistent with background levels established by NYSDOH. Concentrations of constituents that were greater than established background levels (90th percentile) or ambient air continue to be limited to chlorinated constituents at concentrations ranging from 1 to 5 µg/m^3, and are thought to be associated with indoor sources.

2.4.2 NAPL Monitoring

Water level measurements are being collected from the existing monitoring well network on a quarterly basis, and as recently as December of 2009. NAPL has not been observed in the monitoring wells associated with the East 19th Street Station Site. These results are consistent with the findings of the RIR. In a letter dated August 10, 2010, the NYSDEC agreed with a recommendation to discontinue monitoring activities for wells on the East 19th Street site.

3.0 Remedial Action Goals and Objectives

3.1 Remedial Goal

Based on the findings of the Qualitative Human Health Assessment, the Remedial Goal for the Stuyvesant Town property is to eliminate or mitigate the potential risk posed by MGP impacts that could be encountered during the course of routine site maintenance activities or, as a result of changing site conditions.

3.2 Remedial Action Objectives

Achieving the Remedial Goal for the property will require that the remediation activities result in the elimination of the potential exposure pathways for media that exceed the applicable standards, criteria, and guidance (SCGs). The SCGs for the site include the NYSDEC Part 375 Soil Criteria for Restricted Residential Use and the NYSDEC Ambient Water Quality Standards and Guidance Values. Therefore, the following media-specific Remedial Action Objectives (RAOs) have been developed for the Stuyvesant Town property:

- Eliminate the potential for direct contact with MGP residuals for soil having constituent concentrations that exceed Part 375 soil criteria for restricted residential use;
- Eliminate the potential for direct contact/ingestion for groundwater having constituent concentrations that exceed AWQSGVs; and
- Eliminate the potential for vapor intrusion that affects indoor air quality for residents of site buildings.

An evaluation of the conditions at the East 19th Street Station Site with respect to the above goals/objectives is presented in Section 4 of this document.

4.0 Development and Analysis of Alternatives

The results from site investigation activities have identified MGP impacts in soil and groundwater at the site. The following discussion provides an evaluation of a set of alternatives determined to be appropriate for use at the East 19th Street Station site to determine if they would be effective and practical in meeting the remedial goal for the site. The following discussion provides a discussion of the media impacts (soil, groundwater, soil gas) at the site, and a review of the remedial alternatives determined to be applicable/beneficial in eliminating risk and reducing site contamination.

4.1 Summary of MGP Impacts

The results from multiple investigation activities at the East 19th Street Station demonstrate the following:

- Soil – Shallow soils (0-5 ft. bgs) are believed, based on historical information and other physical evidence, to be associated with urban fill from the period of post-MGP operations. Supporting this belief is the fact that constituent concentrations in this interval are consistent with background levels established for Manhattan. Constituent concentrations in soils at greater depth, i.e., below 5 ft. bgs, were also found to be generally consistent with background levels. Site-wide exceedances of background values (98th percentile) were limited to a single location adjacent to the East 20th Street Loop at a depth interval of 5-7 ft. bgs. However, evidence of MGP impacts, i.e., staining and odor, have been observed at several isolated off-site locations at soil depths below 5 ft. bgs. For the purpose of this evaluation, it has been assumed that the total quantity of impacted soil in the vadose zone of the site is less than 500 c.y.
- Groundwater – In multiple sample events, concentrations of MGP constituents of interest have been demonstrated to be in compliance with the NYSDEC Ambient Water Quality Standards or Guidance Values.
- Indoor Air – Results from three sampling events (2003 to 2010) have demonstrated that the vapor intrusion pathway is not complete and that the presence of constituents above established background levels are likely the use of cleaning product (chlorinated solvents) in indoor areas.

4.2 Alternatives Evaluation

The analysis of alternatives has been conducted in accordance with the guidance provided in DER-10, for sites in the Voluntary Cleanup Program, Section 4.4 (a)(2)(iv), which eliminates the requirement to formally document a Feasibility Study (FS) level evaluation of remedial approaches. A summary of the findings from the preliminary steps in the development of alternatives, i.e., the identification of general response actions and evaluation of associated technologies is provided below.

The initial step in the process of selecting an appropriate remedial alternative was the identification of a set of general response actions and their evaluation using two fundamental criteria: Site-Specific Appropriateness (implementability given the current and future site use) and Protectiveness (ability to limit risk/reduce contamination). The following response actions were determined to be applicable for use at the site:

- Institutional controls were identified as appropriate for eliminating exposure pathways for MGP impacts in soil, groundwater and soil gas at the site.

- Excavation/disposal and *in situ* treatment were identified as appropriate general response actions for impacted soil. Both actions were determined to provide some benefit in reducing site-wide levels of contamination and associated dissolved-phase concentrations of MGP constituents, but were limited by an inability to access all impacted media due to the presence of existing site structures.

The second step in the analysis was to evaluate specific treatment processes/approaches associated with those general response actions that have the potential to provide remedial benefit at the site.

The technologies/approaches were reviewed based on their site-specific applicability and ability to achieve the RAOs that have been developed for the site, i.e., elimination of risk, and contaminant reduction to the extent feasible. The evaluation resulted in the identification of the following set of preferred approaches/technologies for achieving the RAOs in each of the site media.

4.2.1 Elimination of Risk

- Institutional Controls – provide the most comprehensive, site-wide means for eliminating potential exposure pathways associated with MGP impacts in soil, groundwater and soil gas. In addition to requiring the use of protective controls during intrusive site activities, the Institutional Controls will require notification to Con Edison and NYSDEC of changes in site conditions/use, resulting in an evaluation of the need to conduct additional remedial activities. Note, however, that specific controls are subject to review and approval by the property owner.
- Excavation and Disposal – can mitigate the direct contact risk for the primary risk receptors (construction workers) by removing impacted soil from areas where construction could take place, e.g., utility corridors in open and accessible site areas. In-situ treatment was determined to not be applicable for shallow impacts due to the potential for adverse surface effects, i.e., steam generation, potential for utility damage, etc.

These preferred technologies/approaches from the previous section have been assembled into the following set of four alternatives:

- Alternative 1 – NO ACTION
- Alternative 2 – Institutional Controls
- Alternative 3 – Institutional Controls and Soil Removal

Note that for the purpose of this document, the evaluation of the “Complete Restoration” alternative has not been included since the potential risk from the relatively small quantity of impacted soil would not justify the required demolition of the overlying apartment buildings.

The following discussion reviews the selected alternatives based on their ability to meet the site-specific Remedial Goal as well as the following criteria:

- Overall protection of human health and the environment – considers how the remedial alternative prevents or mitigates potential risks under current and likely future conditions. Alternatives that maintain the current condition of no significant risk or that permanently reduce or eliminate exposure pathways under any reasonable future site use without causing significant risks during implementation, are rated as “GOOD.” A “FAIR” rating is applied to alternatives that provide adequate protection of human health and the environment but have one or more potential drawbacks, such as reliance on long-term maintenance or institutional controls, and uncertainty regarding the final levels of contamination. A “POOR” rating applies to alternatives that do not protect against reasonably foreseeable future exposures to site contaminants or may increase the likelihood of certain exposure

scenarios (e.g., increased contaminant mobility or toxicity). A rating of "UNACCEPTABLE" is given to alternatives that, on balance, pose more risks to human health and the environment than NO ACTION.

- Compliance with standards, criteria and guidance values (SCGs) – addresses whether the remedy will meet the remedial goals and SCGs presented in Section 3. For the purpose of this evaluation, the principal applicable standards/criteria have been assumed to be the Part 375 soil criteria for restricted residential use and the Ambient Water Quality Standards and Guidance Values for groundwater. A rating of "GOOD" is given to alternatives that are expected to achieve all the remedial goals and either achieves the SCGs or is expected to result in significant reductions (90% or more) in current concentrations. A rating of "FAIR" is given if an alternative will achieve the remedial goals but is not expected to achieve the SCGs. A rating of "POOR" is given if an alternative is not expected to achieve most of the remedial goals and SCGs.
- Long-term effectiveness and permanence – evaluates the magnitude of remaining risks and the adequacy and reliability of controls. Alternatives received a rating of "GOOD" if there is a reasonable expectation that the primary objectives can be met and maintained. Alternatives that do not require maintenance of any on-going site controls generally were rated higher than alternatives that required on-going maintenance activities. Alternatives that completely remove or destroy contaminants received a better rating than alternatives that change the chemical composition or rely on containment. If an alternative has been successfully implemented at another MGP site under similar conditions and demonstrated long-term effectiveness, the remedial action generally receives a rating of "GOOD". A rating of "FAIR" was given to alternatives that had a reasonable expectation of providing a permanent remedy. Alternatives with a "FAIR" rating may result in contaminants remaining in place and may require long-term maintenance of controls. A "POOR" rating was given to alternatives that do not remove or treat contaminants, do not provide adequate controls to prevent future exposure scenarios, or rely on on-going maintenance of controls that will be difficult to assure. A rating of "UNACCEPTABLE" is given to technologies that have been tested under similar conditions and were found to be ineffective.
- Reduction in toxicity, mobility, and volume (TMV) – considers the quantity of contaminants that are permanently destroyed, immobilized, or otherwise treated. The degree, to which the treatment may be irreversible, and the nature and amount of treatment residuals are considered. Alternatives that remove contaminants from the site or that fully treat (i.e., mineralize) contaminants received a rating of "GOOD." A rating of "FAIR" was provided to alternatives that immobilize contaminants, reduce contaminants to less toxic forms, or provide only partial treatment. Treatment alternatives that are reversible or provide no significant reduction in toxicity, mobility, or volume received a rating of "POOR." A rating of "UNACCEPTABLE" was given to technologies which under similar circumstances increased the toxicity, mobility, or volume of contaminants.
- Short-term effectiveness – evaluates potential risks to the public, remediation workers, and the environment during implementation of the remedy. The duration of remedial activities is also considered. Alternatives with minimal intrusive site work received a rating of "GOOD" for short-term effectiveness. Alternatives that pose short-term risks that can be effectively managed received a rating of "FAIR." Alternatives received a rating of "POOR" if they present significant short-term risks and the ability to fully control these risks is uncertain. In general, alternatives that include bringing partially treated or untreated contaminants to the surface received a rating of "FAIR" if potential exposures are short and easily controlled. If contaminants are brought to the surface over a long period of time and exposures are difficult to control, a rating of "POOR" was given to the alternative. A rating of "UNACCEPTABLE" is given to technologies that, despite implementation of control technologies, would still present unacceptable risks to receptors.
- Implementability – considers potential obstacles to construction of the remedy at the site. The availability of personnel and equipment to implement the remedy is considered, as is the need for

permits and the likelihood of obtaining regulatory approvals. Site owner acceptance of the alternative is also a key issue. The expected effectiveness and ability to monitor the effectiveness of the alternative are also considered. Alternatives that are known to have been successfully implemented at similar sites receive a rating of "GOOD." Alternatives that are likely to be implemented successfully but where uncertainty exists in terms of effectiveness, ability to confirm treatment, or require extensive permitting received a rating of "FAIR." A "POOR" rating was given to alternatives that are expected to be difficult to implement. A rating of "UNACCEPTABLE" is given to alternatives that are not possible to implement.

- Cost – provides an estimate of the capital and operational costs for the alternatives for reference and comparison. Summary sheets providing the basis for the cost estimates are included in Appendix D of this document.

The final criterion, community acceptance, will be evaluated at a later date as part of the public hearing which is required by the Citizen Participation Plan.

Each of the proposed alternatives is described below, and evaluated in terms of the above criteria as well as the site-specific remedial goal, i.e., eliminating potential exposure pathways for users of the property, and removing sources of MGP contamination to the extent feasible. As required in DER-10, the description of each alternative includes a discussion of its size/configuration, schedule, disposal options, permit requirements and other factors required for evaluation. A summary of the findings from the evaluation is presented in Table 4-1.

4.3 Alternative 1 – NO ACTION

There are no activities associated with the NO ACTION alternative. This option would not have any spatial, disposal or permit requirements. There are also no limitations or other factors necessary to evaluate this alternative.

4.3.1 Remedial Goal Evaluation

4.3.1.1 Elimination of Potential Exposure Pathways

NO ACTION would not change current conditions at the site and therefore, would not eliminate or manage the potential exposure pathways for soil, groundwater or soil gas.

4.3.1.2 Reduction/Mitigation of Contamination

NO ACTION would have no significant effect on the levels of contamination at the site. The only means of contaminant reduction would be via natural attenuation processes. The timeframe for remediation with this alternative is estimated to be more than 100 years for natural processes to degrade constituents of interest at subsurface locations.

4.3.2 Criteria Evaluation

4.3.2.1 Overall Protection of Public Health and the Environment

NO ACTION is rated as "POOR" for overall protection of public health and the environment. Although current site conditions do not pose a significant risk to public health or the environment, NO ACTION would not address the potential risk posed by changes in site conditions or activities.

4.3.2.2 Compliance with Standards, Criteria and Guidance (SCGs)

NO ACTION is rated as "POOR" for this criterion. This alternative does not achieve the remedial goal and does not result in site-wide compliance with the SCGs. NO ACTION would not result in the reduction of contaminant concentrations in soil, groundwater or soil gas other than from the potential effect of natural processes.

4.3.2.3 Long-term Effectiveness and Permanence

NO ACTION is rated "POOR" for this criterion. Since no activity would be conducted to remediate site impacts, contaminants will remain in place with no means to control the potential exposure pathways.

4.3.2.4 Reduction in Toxicity, Mobility and Volume

NO ACTION is rated "POOR" for this criterion. NO ACTION would not result in the reduction of contaminant concentrations or volumes in soil, groundwater or soil gas other than from the potential effect of natural processes.

4.3.2.5 Short-term Effectiveness

NO ACTION is rated "GOOD" for this criterion. This alternative poses no significant potential implementation risks to the public, remediation workers, or the environment as no intrusive site work is proposed

4.3.2.6 Implementability

NO ACTION is rated "GOOD" for this criterion since implementation would require no coordination with property owners and would provide no disruption to residents.

4.3.2.7 Cost

There would be no cost for this alternative.

4.4 Alternative 2 – Institutional Controls

This alternative includes the following:

- Institutional Controls as a legally binding mechanism to appropriately restrict property use, prohibit the use of groundwater, and enforce the implementation of a finalized Site Management Plan (SMP). The SMP will require the use of controls to protect workers and the public during intrusive site maintenance activities. Additionally, it will require notification to Con Edison and NYSDEC of changes in site conditions/use, resulting in an evaluation and determination as to whether additional monitoring or remedial activities are required.

4.4.1 Description of Activities

4.4.1.1 Institutional Controls

The optimization of the current site management practices will include the use of Institutional Controls to meet the NYSDEC requirement for Restricted Residential Use (Part 375-1.8 (g)(2)(i), i.e. general prohibition of vegetable gardens, single family housing, and public recreation having a reasonable potential for contact with MGP impacted soil; prohibit the use of groundwater and installation of pumping wells; and ensure the implementation of the SMP at the East 19th Street site in required situations to eliminate potential exposure pathways for construction workers, residents and the general public. The SMP will place restrictions and requirements on the methods used during excavation or management of soil and/or groundwater and soil gas during indoor work. The SMP will provide protection for the public, site workers, and the environment during

invasive site work and is designed to eliminate the exposure pathway of soils, groundwater and associated soil gas. When invasive site work is conducted, the SMP will provide support and guidance for utility and maintenance workers that will conduct any utility repairs, fence repairs, tree planting, construction, etc., within the property boundaries below a depth of four feet or below a concrete foundation or slab in site buildings. As stated above, the SMP will also require notification to Con Edison and NYSDEC of a change in site conditions or use of the site. At that time, it will be determined if additional monitoring or remedial activities will be required. Note however, that specific requirements of any Institutional Controls will require the review and approval of the property owner.

4.4.1.2 Summary of Remedial Processes

There are no remedial processes associated with the alternative. It is anticipated that the development of the SMP and implementation of Institutional Controls at the site would be completed in 3-6 months.

4.4.2 Remedial Goal Evaluation

4.4.2.1 Elimination of Potential Exposure Pathways

Institutional Controls will control soil, groundwater, and soil-gas exposure pathways for existing conditions, and require a notification to Con Edison and NYSDEC of a change in site conditions/use so that a determination can be made regarding the need to conduct additional monitoring or remedial activities.

4.4.2.2 Reduction/Mitigation of Contamination

The Institutional Controls alternative would likely have little effect on the site-wide levels of contamination. The timeframe for remediation with this alternative is estimated to be more than 100 years for natural processes to degrade constituents of interest at on-site locations.

4.4.3 Criteria Evaluation

4.4.3.1 Overall Protection of Public Health and the Environment

The Institutional Controls alternative is rated "FAIR" for the overall protection of public health and the environment. This alternative maintains the current condition of no significant risk through the implementation of legally enforceable Institutional Controls that prohibit the use of groundwater, and require the use of protective management practices for soil, groundwater and soil gas during intrusive work, or as a result of a change in site conditions/use.

4.4.3.2 Compliance with Standards, Criteria and Guidance (SCGs)

Institutional Controls is rated "FAIR" since it meets the majority of remedial goals and SCGs. Legally enforceable institutional controls would address the potentially complete risk pathways, and in, accordance with NYSDEC Part 375-6.5 (a)(1)(ii), would reduce the number of potential exceedances of criteria by eliminating the requirement to consider soil cleanup objectives for the protection of groundwater.

4.4.3.3 Long-term Effectiveness and Permanence

The alternative is rated "FAIR" for long-term effectiveness and permanence. Although contamination will remain in place, exposure will be effectively controlled due to the legally enforceable nature of the Institutional Controls.

4.4.3.4 Reduction in Toxicity, Mobility and Volume

The alternative is rated "POOR" for this criteria since there will be no active removal/treatment of impacted media.

4.4.3.5 Short-term Effectiveness

Institutional Controls is rated "GOOD" for short-term effectiveness. This alternative incorporates only minimally intrusive activities, e.g., indoor air monitoring, with no short-term risks.

4.4.3.6 Implementability

The alternative is rated "GOOD" for this criterion since it requires only modest modification to the approach that is currently being used at the site. Note that the use of Institutional Controls will require agreement from the owner of the property.

4.4.3.7 Cost

The costs for the Institutional Controls alternative is estimated to be $150,000, to reflect costs for the preparation of the SMP and legal costs for the implementation of the Institutional Controls on the property.

4.5 Alternative 3 – Institutional Controls and Soil Removal

This alternative includes the following:

- Institutional Controls as a legally binding mechanism to appropriately restrict property use, prohibit the use of groundwater, and enforce the implementation of a finalized Site Management Plan (SMP). The SMP will require the use of controls to protect workers and the public during intrusive site maintenance activities. Additionally, it will require notification to Con Edison and NYSDEC of changes in site conditions/use, resulting in an evaluation and determination as to whether additional monitoring or remedial activities are required.
- Removal of less than 500 c.y. of impacted soil in the vadose zone from accessible areas of the site to minimize the direct contact risk to construction workers.

4.5.1 Description of Activities

4.5.1.1 Institutional Controls

Descriptions of the proposed Institutional Controls were discussed previously in Section 4.4.1.1.

4.5.1.2 Removal of Impacted Soil from the Vadose Zone

Excavation and off-site disposal of vadose zone soil in accessible areas would consist of the following basic elements: site preparation, excavation shoring (trench boxes), excavation of impacted soils, loading, transport/disposal of impacted soil, backfilling, and site restoration. Each of these elements is discussed in the paragraphs that follow.

The evaluation of excavation considers the removal of the soil from the initial level of MGP impacts (5 ft bgs) to a depth of approximately 8 ft bgs in accessible areas of the site to address the potential direct contact risk to construction workers. Site preparation activities would include erecting fencing, setting up site trailers, erosion controls, soil stockpile areas, soil loading areas, decontamination stations, and baseline air monitoring. Soil removal in open areas would be conducted using conventional excavation equipment, while soil immediately adjacent to utility lines would be removed using an air knife and vacuum truck.

Measures to mitigate odor, noise, and dust during excavation would be deployed, and a fence-line monitoring program would be used to identify any potential vapor/particulate impacts to the public, so controls could be employed. Contaminated soil would be placed in lined and covered stockpile areas or loaded directly into trucks for subsequent transport off-site.

Excavated soils would be sent to a permitted off-site landfill or thermal desorption facility. Waste characterization sampling would be conducted. Documentation would include waste profile sheets and waste manifests. Soils would be loaded on site into trucks. Trucks would be inspected, decontaminated as necessary, and covered prior to leaving the site.

Once the excavation depth is reached, the excavation would be backfilled using common borrow from a clean off-site source. Site restoration would begin with final grading of the site, removal of remediation support equipment/facilities, and restoration of paved roads, walkways, grass areas, trees, and other site features.

4.5.1.3 Summary of Remedial Processes

Excavation is the remedial activity included in Alternative 3.

1. Size and configuration of process options: Excavation – less than 500 c.y of MGP-impacted soil would be removed from accessible site areas. Fencing, site trailers, erosion controls and soil stockpile areas would require placement, and trench boxes would be used for shoring. Soil stockpile and equipment decontamination areas would be needed. Approximately 25 truckloads of soil would be removed.
2. Time for remediation: Excavation, site restoration, and implementation of Institutional Controls would require up to 9 months to complete.
3. Spatial requirements: The estimated excavation area is approximately 3,600 square feet. Additional space would be necessary for soil stockpiles, heavy equipment staging, etc.
4. Options for disposal: On-site treatment of the excavated soil would not be feasible. Off-site disposal would primarily be at a thermal desorption facility. Wastes that do not meet the size requirements (greater than 3-inch diameter) would be disposed at a landfill permitted to handle MGP wastes.
5. Permit requirements: The excavation would require construction permits.
6. Limitations or other factors necessary to evaluate the alternative: None.

4.5.2 Remedial Goal Evaluation

4.5.2.1 Elimination of Potential Exposure Pathways

The alternative would address the potential risk through proactive remediation (removal of impacted soil from accessible areas of the vadose zone), and institutional controls that: ensure safe work practices and use of measures to protect residents/general public for construction work conducted beneath/immediately adjacent to site buildings; restrict the use of groundwater; and require a notification to Con Edison and NYSDEC of a change in site conditions/use so that a determination can be made regarding the need to conduct additional monitoring or remedial activities.

4.5.2.2 Reduction/Mitigation of Contamination

The alternative would remove impacts from the accessible areas of the vadose zone.

4.5.3 Criteria Evaluation

4.5.3.1 Overall Protection of Public Health and the Environment

Institutional Controls and Soil Removal is rated as "FAIR" for overall protection of public health and the environment. This alternative maintains the current condition of no significant risk by removing impacted soil from the vadose zone in accessible areas of the site. Additionally, the alternative will control potential risk through the implementation of legally enforceable Institutional Controls that prohibit the use of groundwater, and require the use of protective management practices for soil, groundwater and soil gas during intrusive work, or as a result of a change in site conditions/use.

4.5.3.2 Compliance with SCGs

The alternative is rated "FAIR" for compliance with the SCGs. Soil removal in the vadose zone would increase compliance with direct contact criteria for soil. Legally enforceable institutional controls would address the potentially complete risk pathways and eliminate the requirement to consider soil cleanup objectives for the protection of groundwater when evaluating soil impacts.

4.5.3.3 Long-term Effectiveness and Permanence

The alternative is rated as "FAIR" for this criterion due to the legally binding nature of the deed restrictions and the removal of vadose zone impacts in accessible areas.

4.5.3.4 Reduction of Toxicity, Mobility, or Volume with Treatment

Institutional Controls and Soil Removal is rated as "Poor" for this criterion. This alternative would result in limited removal of contamination (up to approximately 5%) in on-site areas.

4.5.3.5 Short-term Effectiveness

The alternative is rated as "FAIR" for this criterion. It poses potential risks to the public and remediation workers during excavation activities. Impacted soils will be stockpiled at the surface, potentially resulting in fugitive emissions (i.e., dust and odor).

4.5.3.6 Implementability

The alternative is rated as "FAIR" for this criterion. Soil excavations would disrupt site activities and limit building access. Institutional controls would need to be approved by the site owners.

4.5.3.7 Cost

The capital cost for Institutional Controls and Soil Removal is estimated to be $1,120,000 (Table D-1).They include $970,000 for the excavation and disposal of 500 c.y. of MGP-impacted soil; and $150,000 for the development of an SMP and legal costs for the implementation of the Institutional Controls.

5.0 Recommended Alternative

Institutional Controls (Alternative 2) is the proposed remedy for the site. This alternative includes:

- Institutional Controls as a legally binding mechanism to appropriately restrict property use, prohibit the use of groundwater, and enforce the implementation of a finalized Site Management Plan (SMP). The SMP will require the use of controls to protect workers and the public during intrusive site maintenance activities. Additionally, it will require notification to Con Edison and NYSDEC of changes in site conditions/use, resulting in an evaluation and determination as to whether additional monitoring or remedial activities are required.

A detailed description of the proposed remedy and an analysis of the remedy's compliance with the seven evaluation criteria are discussed in Section 4.4. Alternative 2 was chosen because it eliminates the potential risk from residual MGP impacts with a minimum of disruption to routine site activities and short-term risk to site residents. Additionally, the approach provides sufficient flexibility to adjust to changes in site conditions. Remedial activities would be implemented within a reasonable timeframe and would not require large temporary or permanent spatial considerations. Contaminants will remain in subsurface locations, but legally enforceable institutional controls will be in place, and the SMP will require that additional monitoring or remedial measures be implemented, if required by a change in site conditions or use. Note however, that the formal implementation of Institutional Controls as deed restrictions will require the review and approval of site owners.

5.1 Alternatives Summary

A brief summary is provided below for Alternatives 1 and 3, providing reasons why these were not chosen as the recommended alternative.

Alternative 1 – NO ACTION does not meet the Remedial Goals for the project.

Alternative 3 – Institutional Controls and Soil Removal maintains the conditions of no significant risk and meets the RAOs, with limited contaminant removal. However, the removal of impacted soil from the vadose zone in anticipation of potential future utility/maintenance work would result in the loss of access to areas of the property for an extended period of time. These activities could be un-necessarily disruptive to site residents since future utility work may not be required in the excavation areas.

6.0 References

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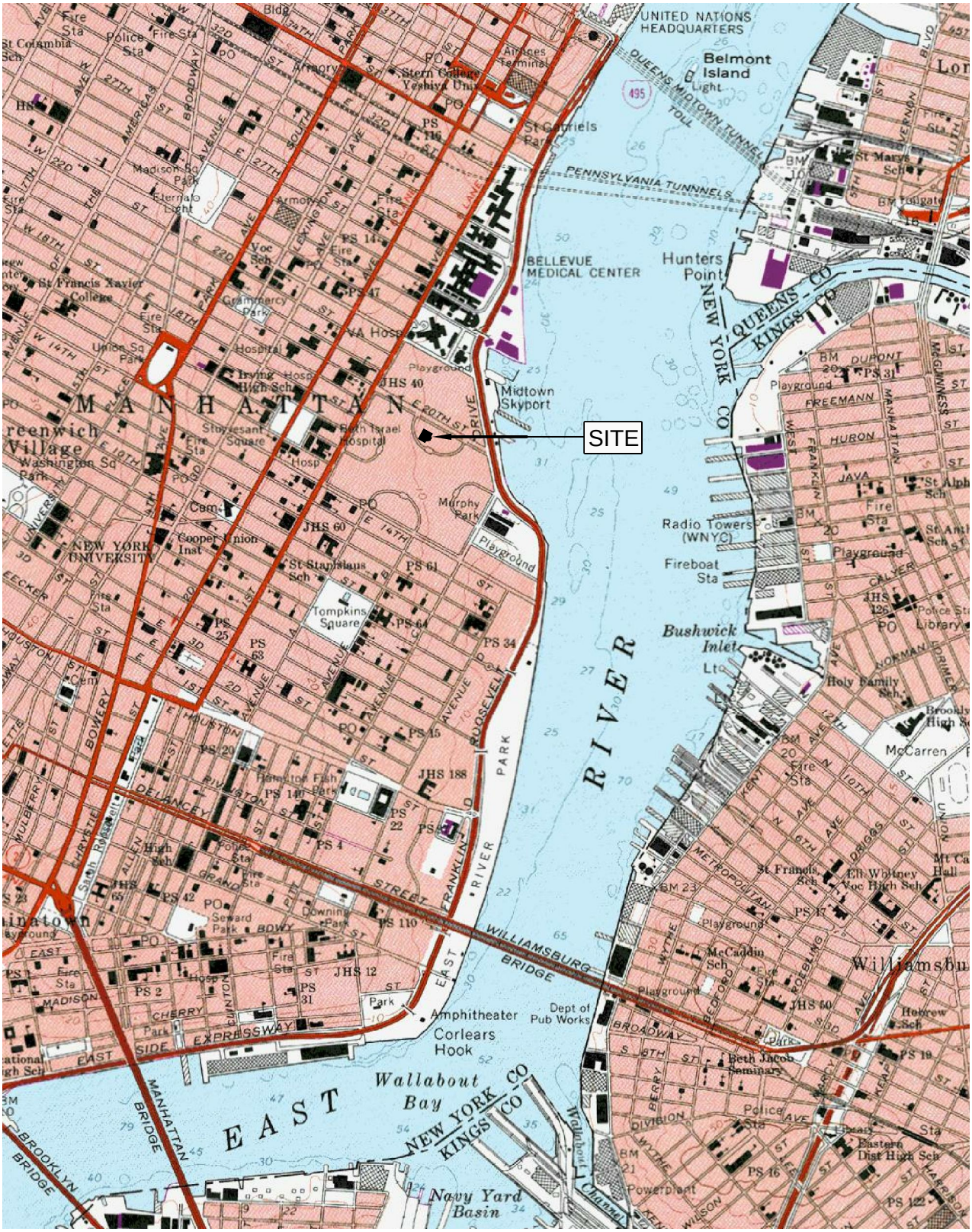
Tables

Table 4-1
East 19th Street Station
Alternatives Evaluation

Objective/Media to be Addressed	1 No Action	2 Institutional Controls	3 Institutional Controls and Soil Removal
Exposure Pathway Elimination	Existing Soil Management Plan (ISMP)	Institutional Controls (site use, excavation, GW use	Institutional Controls (site use, GW use, work under buildings)
Reduction of Contaminants			
Impacted Soil	No Activity	No Activity	Excavation (accessible areas of vadose zone (5-8 ft. bgs))
Groundwater	No Activity	No Activity	No Activity
Soil Gas[1]	No Activity	Soil Management Plan	Soil Management Plan
Evaluation Criteria			
1 Overall Protection of Public Health and Environment	**Poor** - does not address potential risks from change in site conditions	**Fair -** maintains the current condition of no significant risk by legally enforceable institutional controls. The optimized placement of recovery wells provide for the removal of the most highly concentrated site impacts and facilitates the stabilization of the dissolved-phase plume.	**Fair -** maintains the current condition of no significant risk by removing impacted soil from the vadose zone in accessible areas of the site; and legally enforceable institutional controls.
2 Compliance with Standards, Criteria and Guidance	**Poor** - does not achieve the remedial action objectives and does not result in site-wide compliance with SCGs	**Fair -** legally enforceable institutional controls address the potentially complete risk pathways, and reduce the number of potential exceedances of criteria by eliminating the requirement to consider soil cleanup objectives for the protection of groundwater.	**Fair -** soil removal in the vadose zone would increase compliance with direct contact criteria for soil. Legally enforceable institutional controls would address the potentially complete risk pathways and eliminate the requirement to consider soil cleanup objectives for the protection of groundwater when evaluating soil impacts.
3 Long-term Effectiveness and Permanence	**Poor** - contaminants will remain in-place with no means to control the potential exposure pathway	**Fair -** contamination will remain in place, but exposure will be effectively controlled by the legally enforceable deed restrictions.	**Fair -** contaminants will remain in place but potential risk will be addressed by the legally enforceable deed restrictions. and the removal of vadose zone impacts in accessible areas.
4 Reduction of Toxicity, Mobility or Volume	**Poor** - provides no significant reduction in contaminant levels	**Poor** - provides no significant reduction in contaminant levels	**Poor -** limited removal of contamination (up to approximately 5%) in on-site areas.
5 Short-term Effectiveness	**Good** - no intrusive site work	**Good** - no intrusive site work	**Fair -** poses potential risks to residents and workers during excavation activities. Impacted soils will be stockpiled at the surface, potentially resulting in fugitive emissions (i.e., dust and odor).
6 Implementability	**Good** - currently in place	**Good** - implementable without significant disruption to residents/property. Institutional Controls would require the approval of site owners.	**Fair -** soil excavations would disrupt site activities and limit building access. Institutional Controls would require the approval of the site owners.
Duration			
Implementation	NA	3-6 months	Up to 9 months
7 Estimated Cost	**No Cost**	**$150,000**	**$1,120,000**

Figures



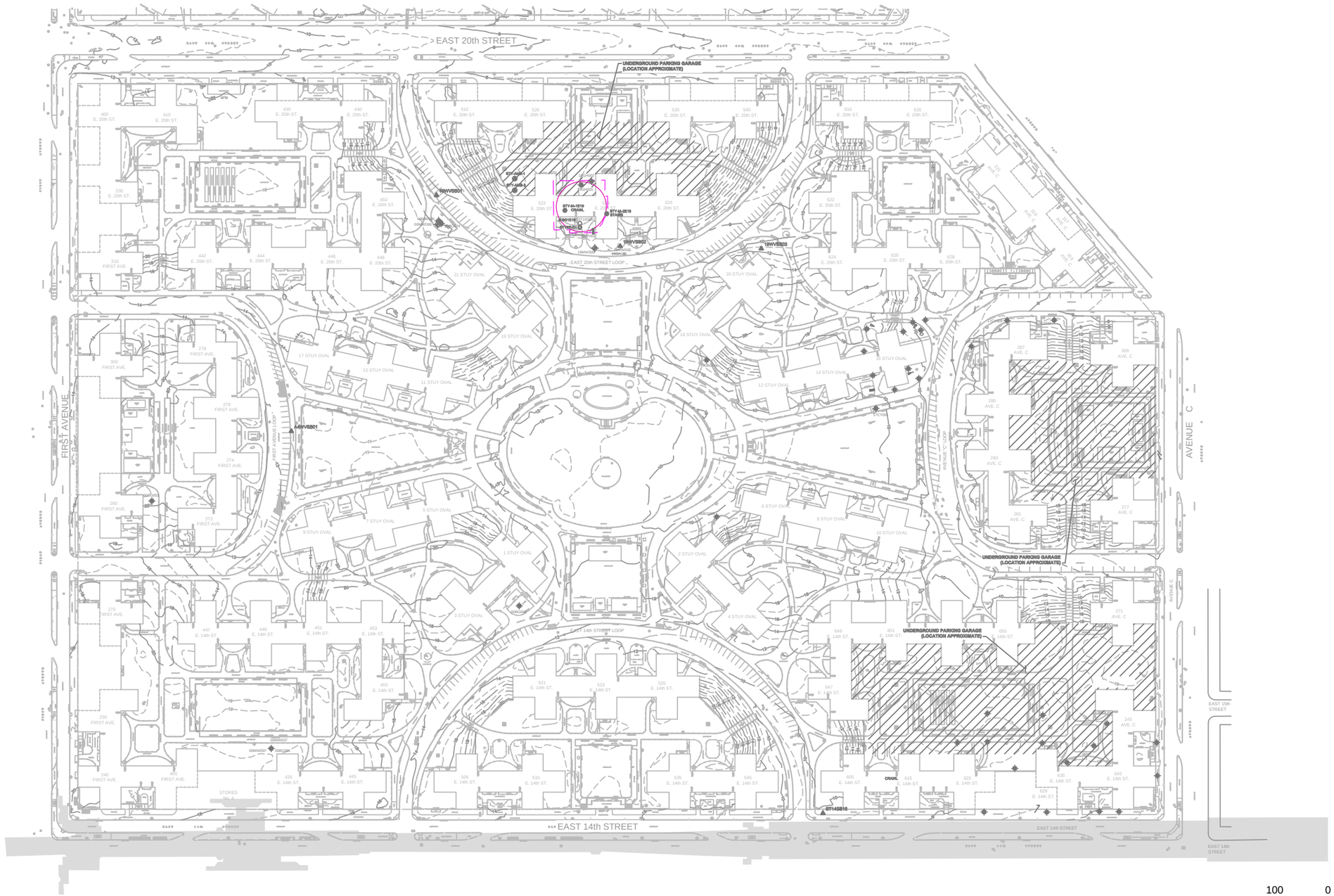
SOURCE:
BROOKLYN QUADRANGLE, NEW YORK – NEW JERSEY, USGS 7.5 MINUTE (TOPOGRAPHIC), DATED 1967, PHOTOREVISED 1981.

0 1000 2000
SCALE IN FEET

AECOM

CONSOLIDATED EDISON OF NEW YORK INC. EAST 19th STREET STATION SITE 60155456.312			SITE LOCATION MAP
DATE: 11/2010	DRWN: RCW/WFD		FIGURE 1-1

File: F:\PROJECTS\Consolidated Edison NY\StyTown\60155456-312\CADD\RASR-19thST\60136641_312-SL-03.dwg Layout: ANSI_AVI-CP User: warrenr Plotted: Nov 04, 2010 - 10:08am Xref's:



LEGEND

- LOW PRESSURE FIRE HYDRANT
- LIGHT POLE
- TRAFFIC BOX
- TRAFFIC POLE
- TRAFFIC SIGN
- ST19SB10 / ST19SB01 / 19GH001 — SOIL BORING LOCATION
- ST19SB04/ 19MWDD01 / 19MWD01 19PH001 — COMBINED MONITORING WELL AND SOIL BORING LOCATION
- 19MWDD01 / 19MWD02 — MONITORING WELL LOCATION
- MW-10 — EXISTING OFFSITE MONITORING WELL LOCATION (APPROXIMATE)
- IA-1E19-1 / STY-IA-1E19 — INDOOR AIR SAMPLE LOCATION (APPROXIMATE)
- ST19SV05 / SG1E19 — SOIL GAS SAMPLE LOCATION (APPROXIMATE)
- AMB-2 / STY-AMB-2 — AMBIENT AIR SAMPLE LOCATION (APPROXIMATE)
- 19TP001 — TEST PIT LOCATION
- 20 — GROUND SURFACE TOPOGRAPHY CONTOURS
- BOUNDARY OF FORMER 19th ST. MGP SITE
- SUBWAY
- UNDERGROUND PARKING

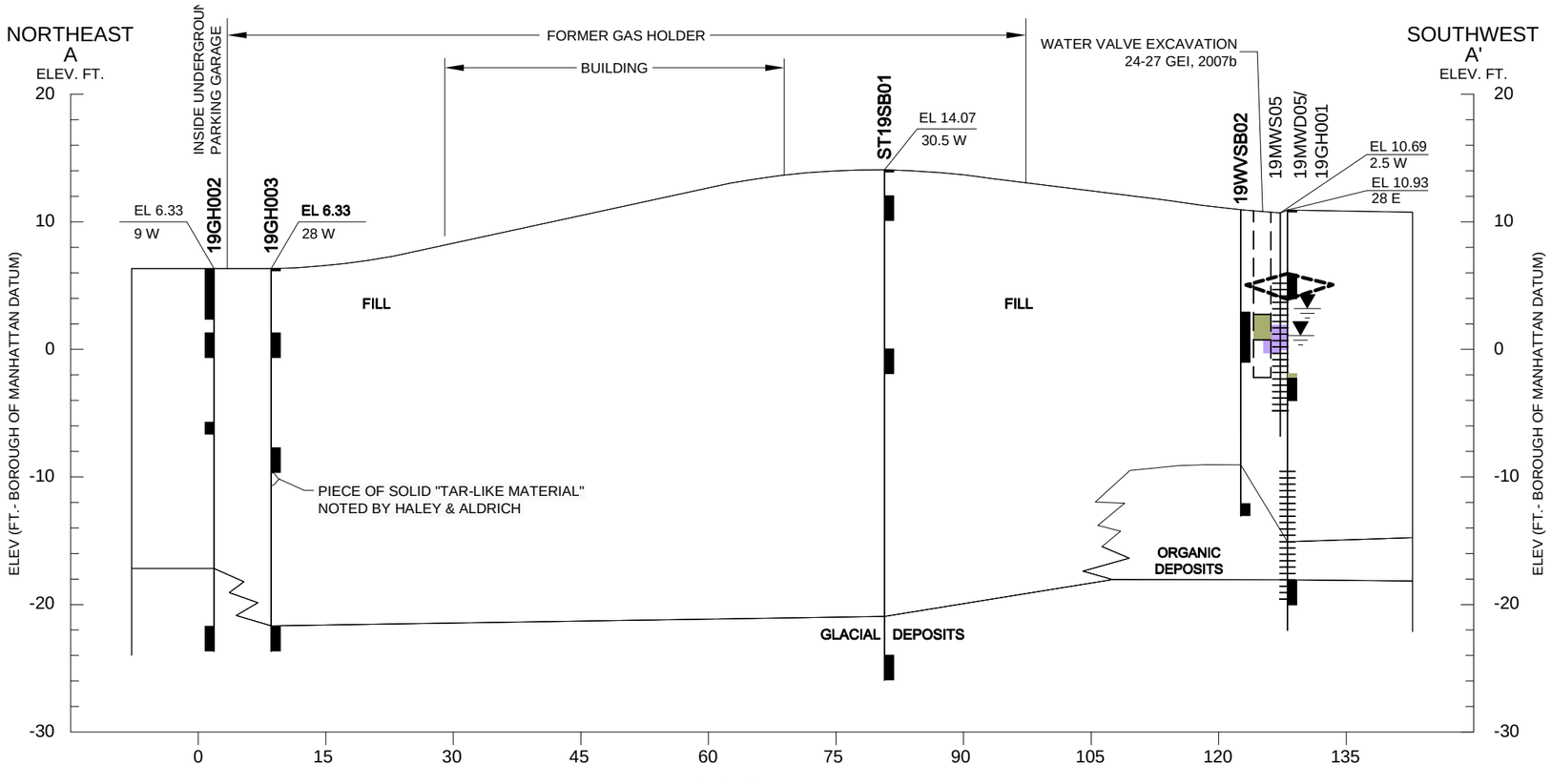
100 0 200

GRAPHIC SCALE IN FEET

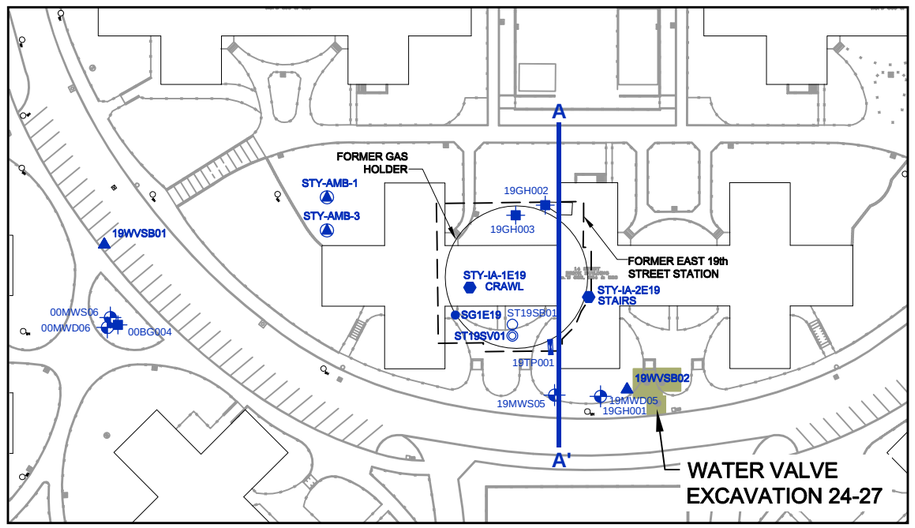
AECOM

CONSOLIDATED EDISON OF NEW YORK INC. EAST 19th STREET STATION SITE 60155456.312				**CURRENT SITE LAYOUT AND COMPOSITE HISTORICAL FEATURES**
DATE: 11/2010	DRWN: RCW/WFD			**FIGURE 2-1**

File: F:\PROJECTS\Consolidated Edison NY\StyTown\60155456-312\CADD\RASR-19thST\60155456_312-G-03.dwg Layout: SITE-HIST User: warrenr Plotted: Dec 10, 2010 - 2:40pm Xref's:



SECTION A-A'
EAST 19th STREET STATION



CROSS SECTION LOCATION

0 100 200

SOURCES:

1. FIGURE 2: SITE PLAN AND MGP FACILITIES, PREPARED FOR CONSOLIDATED EDISON COMPANY OF NEW YORK, INC., FORMER CONSOLIDATED EDISON MANUFACTURED GAS PLANTS WITHIN STUYVESANT TOWN, NEW YORK, NEW YORK, PREPARED BY HALEY & ALDRICH, SCALE: 1" = 60', DATED OCTOBER, 2004.
2. SURVEY OF MONITORING WELLS AND GEI SAMPLE LOCATIONS CONDUCTED BY GEI CONSULTANTS, INC. ON 6/8-9/06. SURVEYED BY NEW YORK STATE-LICENSED LAND SURVEYOR NO. 050146. HORIZONTAL DATUM: NEW YORK STATE PLANE COORDINATE SYSTEM, LONG ISLAND LAMBERT, NORTH AMERICAN DATUM (NAD) 83. VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM (NAVD) 88.
3. SURVEY OF ENSR/AECOM SAMPLE LOCATIONS CONDUCTED BY ENSR/AECOM IN 2008 BY A NEW YORK STATE LICENSED LAND SURVEYOR. HORIZONTAL DATUM: NEW YORK STATE PLANE COORDINATE SYSTEM, LONG ISLAND LAMBERT, NAD83. VERTICAL DATUM: NAVD88.

LEGEND

CONTACT

19MWD03

SOIL BORING OR MONITORING WELL IDENTIFICATION

OBSERVED APPARENT GROUNDWATER TABLE

ANALYTICAL SOIL SAMPLE INTERVAL

MONITORING WELL SCREENED INTERVAL

PHYSICAL OBSERVATIONS

- TAR SATURATED
- TAR BLEBS
- TAR STAINING OR SHEEN
- MGP-LIKE ODORS
- PETROLEUM STAINING OR SHEEN
- PETROLEUM-LIKE ODORS
- INFERRED IMPACTS LIMIT

AECOM

Consolidated Edison of New York, Inc Stuyvesant Town Former MGP Sites 60136641.312		**EAST 19th STREET STATION** **CROSS SECTION A-A'**
DATE: 03/2010	DRWN: RCW/WFD	**FIGURE 2-2**

File: F:\PROJECTS\Consolidated Edison NY\StyTown\60155456-312\CADD\RASR-19thST\60155456_312-C-03.dwg Layout: IMPACT-S-SOIL User: warrenr Plotted: Dec 10, 2010 - 2:40pm Xref's:

510 E. 20th ST.

520 E. 20th ST.

530 E. 20th ST.

522 E. 20th ST.

524 E. 20th ST.

526 E. 20th ST.

FORMER GAS HOLDER

FORMER EAST 19th STREET STATION

MGP STAINING AND ODOR ~5 FT BGS

STY-AMB-1

STY-AMB-3

19WVSB01

19GH002

19GH003

STY-IA-1E19 CRAWL

STY-IA-2E19 STAIRS

SG1E19

ST19SB01

ST19SV01

19TP001

19WVSB02

19MWS05

19MWD05

19GH001

00MWS06

00MWD06

00BG004

EAST 20th STREET LOOP

LEGEND

- LOW PRESSURE FIRE HYDRANT
- LIGHT POLE
- TRAFFIC BOX
- TRAFFIC POLE
- TRAFFIC SIGN
- ST19SB10 / ST19SB01 / 19GH001 — SOIL BORING LOCATION
- ST19SB04/ 19MWDD01 / 19MWD01 14PH001 — COMBINED MONITORING WELL AND SOIL BORING LOCATION
- 19MWDD01 / 19MWD02 — MONITORING WELL LOCATION
- MW-10 — EXISTING OFFSITE MONITORING WELL LOCATION (APPROXIMATE)
- IA-1E19-1 / STY-IA-1E19 — INDOOR AIR SAMPLE LOCATION (APPROXIMATE)
- ST19SV05 / SG1E19 — SOIL GAS SAMPLE LOCATION (APPROXIMATE)
- AMB-2 / STY-AMB-2 — AMBIENT AIR SAMPLE LOCATION (APPROXIMATE)
- 19TP001 — TEST PIT LOCATION
- 20 — GROUND SURFACE TOPOGRAPHY CONTOURS
- BOUNDARY OF FORMER MGP SITE
- COMPLIANT WITH MGP-RELATED PART 375 RESTRICTED RESIDENTIAL USE SOIL CLEANUP OBJECTIVES (RRUSCOs)
- EXCEEDANCE OF MGP-RELATED PART 375 RESTRICTED RESIDENTIAL USE SOIL CLEANUP OBJECTIVES (RRUSCOs)
- OBSERVATIONS OF MGP ODOR AND STAINING (GEI, 2007b)

20 0 40

GRAPHIC SCALE IN FEET

AECOM

CONSOLIDATED EDISON OF NEW YORK INC.
EAST 19th STREET STATION SITE
60155456.312

DATE: 11/2010 | DRWN: RCW/WFD

SUMMARY OF MGP IMPACTS SHALLOW SOIL (0.1 TO 7 FT. BGS)

FIGURE 2-3A

EAST 20th STREET

EAST 20th STREET

510 E. 20th ST.

520 E. 20th ST.

530 E. 20th ST.

540 E. 20th ST.

522 E. 20th ST.

524 E. 20th ST.

526 E. 20th ST.

21 STUY OVAL

20 STUY OVAL

EAST 20th STREET LOOP

FORMER GAS HOLDER

FORMER EAST 19th STREET STATION

STY-AMB-1

STY-AMB-3

19WVSB01

19GH002

19GH003

STY-IA-1E19 CRAWL

STY-IA-2E19 STAIRS

SG1E19

ST19SB01

ST19SV01

19TP001

19WVSB02

19MWS05

19MWD05

19GH001

00MWS06

00MWD06

00BG004

MGP STAINING AND ODOR ~8-10 FT BGS

MGP STAINING AND ODOR ~12 FT BGS

19WVSB03

MGP STAINING AND ODOR ~13 FT BGS

LEGEND

- LOW PRESSURE FIRE HYDRANT
- LIGHT POLE
- TRAFFIC BOX
- TRAFFIC POLE
- TRAFFIC SIGN
- ST19SB10 / ST19SB01 / 19GH001 — SOIL BORING LOCATION
- ST19SB04/19MWDD01 / 19MWD01 / 19PH001 — COMBINED MONITORING WELL AND SOIL BORING LOCATION
- 19MWDD01 / 19MWD02 — MONITORING WELL LOCATION
- MW-10 — EXISTING OFFSITE MONITORING WELL LOCATION (APPROXIMATE)
- IA-1E19-1 / STY-IA-1E19 — INDOOR AIR SAMPLE LOCATION (APPROXIMATE)
- ST19SV05 / SG1E19 — SOIL GAS SAMPLE LOCATION (APPROXIMATE)
- AMB-2 / STY-AMB-2 — AMBIENT AIR SAMPLE LOCATION (APPROXIMATE)
- 19TP001 — TEST PIT LOCATION
- GROUND SURFACE TOPOGRAPHY CONTOURS
- BOUNDARY OF FORMER MGP SITE
- COMPLIANT WITH MGP-RELATED PART 375 RESTRICTED RESIDENTIAL USE SOIL CLEANUP OBJECTIVES (RRUSCOs)
- EXCEEDANCE OF MGP-RELATED PART 375 RESTRICTED RESIDENTIAL USE SOIL CLEANUP OBJECTIVES (RRUSCOs)
- OBSERVATIONS OF MGP ODOR AND STAINING (GEI, 2007b)

30 0 60

GRAPHIC SCALE IN FEET

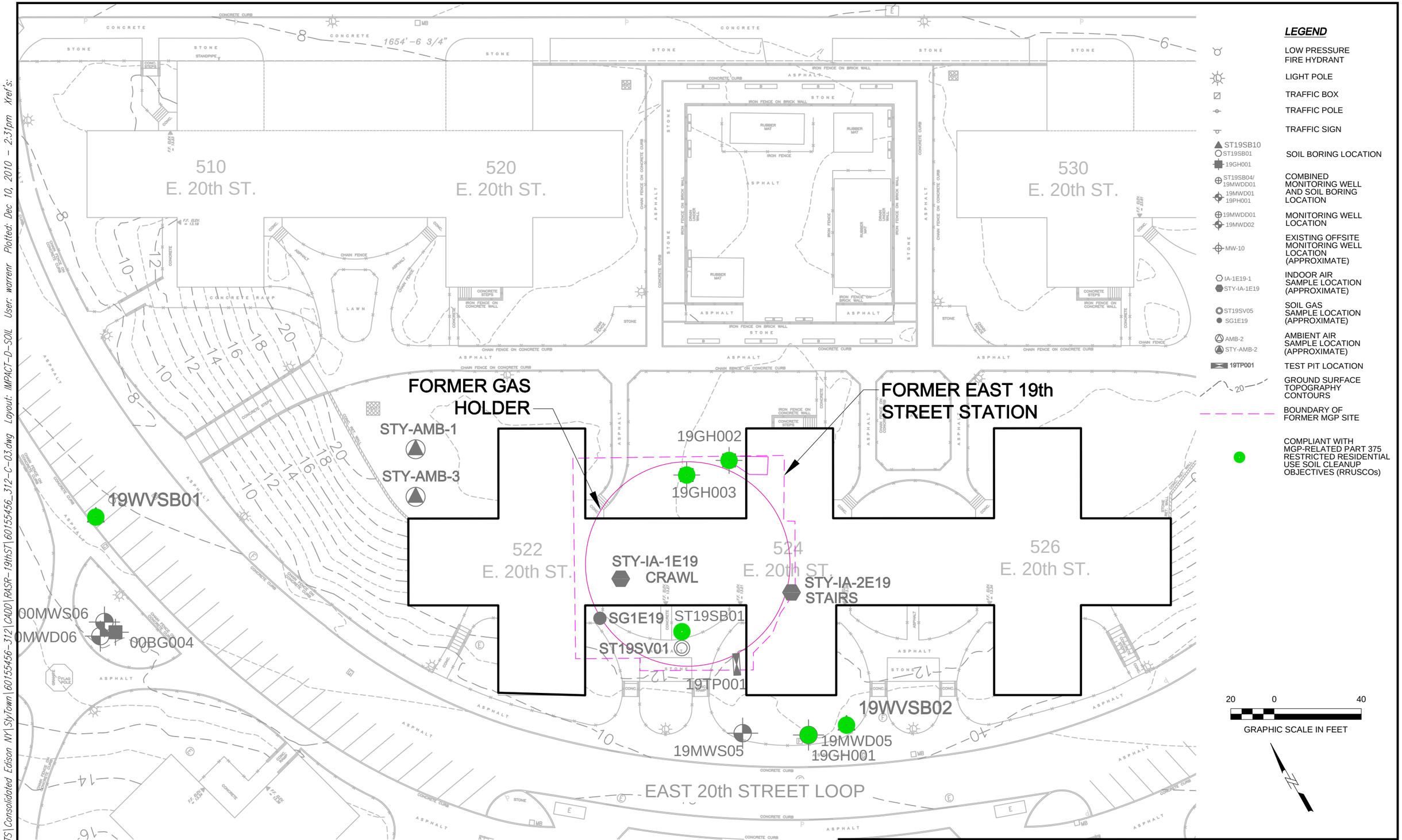
AECOM

CONSOLIDATED EDISON OF NEW YORK INC.
EAST 19th STREET STATION SITE
60155456.312

DATE: 11/2010 | DRWN: RCW/WFD

SUMMARY OF MGP IMPACTS INTERMEDIATE SOIL (7 - 16 FT. BGS)

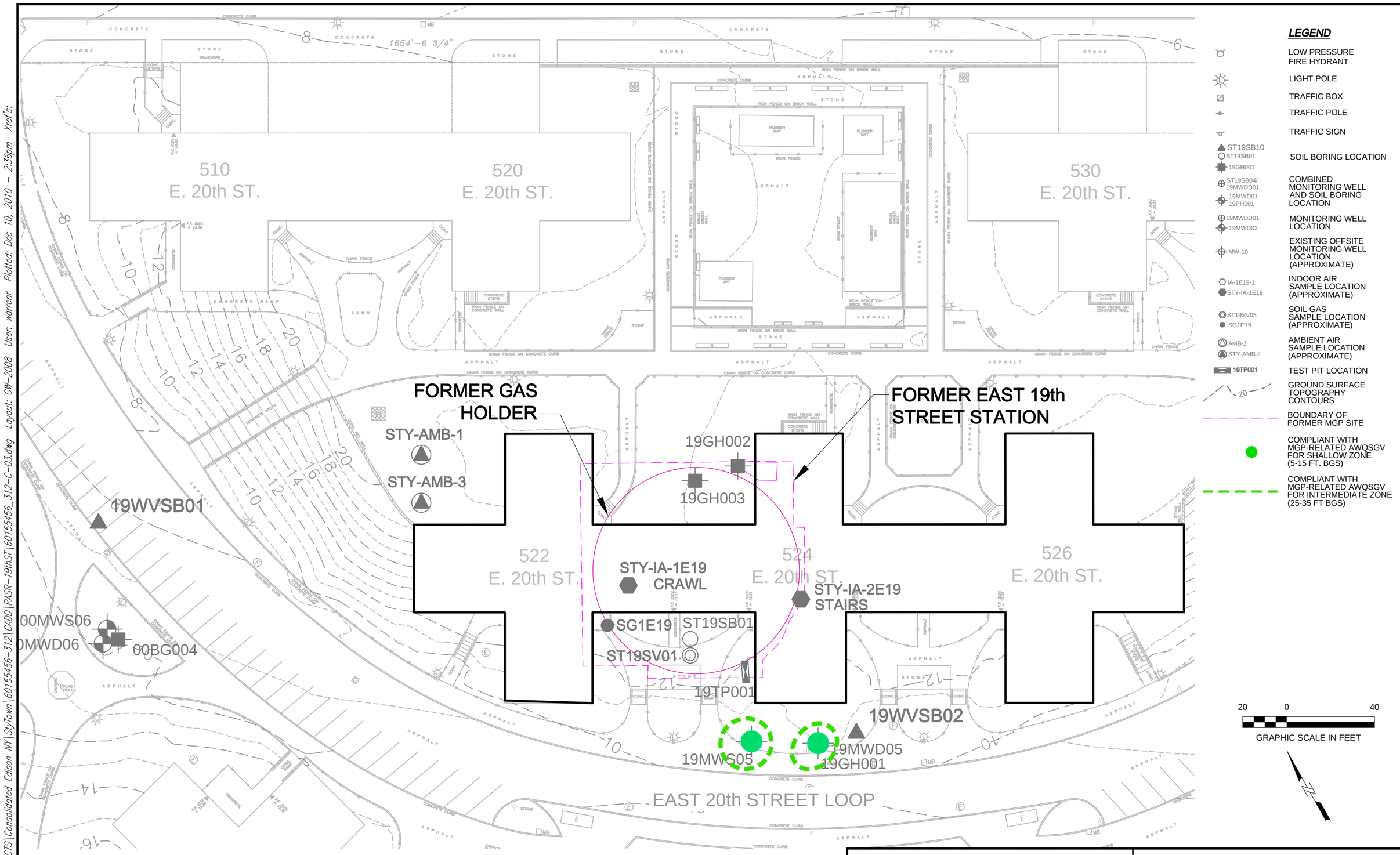
FIGURE 2-3B



AECOM

CONSOLIDATED EDISON OF NEW YORK INC. EAST 19th STREET STATION SITE 60155456.312		**SUMMARY OF MGP IMPACTS DEEP SOIL (BELOW - 16 FT. BGS)**
DATE: 11/2010	DRWN: RCW/WFD	**FIGURE 2-3C**

File: F:\PROJECTS\Consolidated Edison NY\SiyTown\60155456-312\CADD\PASR-19thST\60155456_312-C-03.dwg Layout: IMPACT-D-SOIL User: warrenr Plotted: Dec 10, 2010 - 2:31pm Xref's:



AECOM

CONSOLIDATED EDISON OF NEW YORK INC. EAST 19th STREET STATION SITE 60155456.312			**SUMMARY OF GROUNDWATER MONITORING RESULTS (2008)**
DATE: 11/2010	DRWN: RCW/WFD		**FIGURE 2-4**

File: F:\PROJECTS\Consolidated Edison NY\StyTown\60155456-312\CADD\RASR-19thST\60155456_312-G-03.dwg Layout: GW-2008 User: warrenr Plotted: Dec 10, 2010 - 2:36pm Xref's:

Appendix A

Summary of Soil Results

Table A-1
Summary of Soil Results
East 19th Street Station Site
Shallow Soil (0.1-7 ft. bgs)

Location ID Sample Date Sample ID depth Interval	ST-NYSDEC Part 375-6 Restricted-Res	Background Manhattan [1] Surface Soil	Background Manhattan [1] Subsurface Soil	19GH001 3/3/2004 19GH001(5-7)030304 5-7	19GH002 2/24/2004 19GH002(0-2)022404 0-2	19GH002 2/24/2004 19GH002(2-4)022404 2-4	19GH002 3/2/2004 19GH002(5-7)030204 5-7	19GH003 3/9/2004 19GH003(5-7)030904 5-7	ST19SB01 3/14/2004 ST19SB01(2-4)031404 2-4	19WVSB01 5/13/2008 19WVSB01(4-8)051308 4-8
BTEX (mg/Kg)										
Benzene	4.8			**0.0004 J**	**0.0008 J**	0.00025 U	**0.0008 J**	0.00025 U	0.028 U	0.0043 U
Total BTEX				**0.0004**	**0.0008**	ND	**0.0008**	ND	ND	ND
VOC (mg/Kg)										
Acetone	100			0.0027 UJ	**0.072 J**	**0.065 J**	**0.029 J**	0.0027 UJ	0.14 U	0.100 U
Carbon Disulfide				0.00033 U	**0.0007 J**	**0.0006 J**	**0.0005 J**	0.00034 U	0.028 U	0.0065 U
Total VOC				**0.0004**	**0.0735**	**0.0656**	**0.0303**	ND	ND	ND
VOC TICs (mg/kg)										
Total VOC TICs							**0.0056**	**0.0092**		
PAH (mg/Kg)										
2-Methylnaphthalene				**0.22 J**	**0.13 J**	**0.5 J**	**0.028 J**	0.018 U	0.37 U	0.011 U
Acenaphthene	100	0.4	0.4	**0.36 J**	**0.14 J**	**0.64 J**	**0.013 J**	0.0033 U	0.37 U	0.0087 U
Acenaphthylene	100	0.1	0.1	**0.33 J**	**0.29 J**	**0.21 J**	**0.0089 J**	0.0033 U	0.37 U	0.0059 U
Anthracene	100	1	0.7	**1.2 J**	**0.42**	**0.88**	**0.014 J**	**0.012 J**	0.37 U	**0.045 J**
Benzo(a)anthracene	1	1.8	1.6	**4.4**	**1.1**	**1.5**	**0.025 J**	**0.015 J**	**0.078 J**	**0.110 J**
Benzo(a)pyrene	1	1.7	2	0.027 UJ	**1.2**	**1.5**	**0.02 J**	**0.013 J**	**0.074 J**	**0.100 J**
Benzo(b)fluoranthene	1	1.6	2.1	0.028 UJ	**0.89**	**1.2**	**0.012 J**	**0.011 J**	**0.088 J**	**0.130 J**
Benzo(ghi)perylene	100	1	1.5	**0.62 J**	**0.74**	**0.82**	0.0041 U	0.0042 U	0.37 UJ	**0.060 J**
Benzo(k)fluoranthene	3.9	2	1.8	0.038 UJ	**1.2**	**1.6**	**0.02 J**	**0.015 J**	0.37 UJ	**0.051 J**
Chrysene	3.9	2.4	1.8	**5.8**	**1.3**	**1.7**	**0.032 J**	**0.022 J**	**0.091 J**	**0.100 J**
Dibenz(a,h)anthracene	0.33	0.3	0.4	**0.34 J**	**0.21**	**0.21**	0.0025 U	0.0026 U	***0.37 U***	0.030 U
Fluoranthene	100	4.5	2.8	**6.1**	**1.8**	**4.6**	**0.028 J**	**0.058 J**	**0.17 J**	**0.300 J**
Fluorene	100	0.4	0.3	**0.4 J**	**0.14 J**	**0.43 J**	**0.012 J**	0.0027 U	0.37 U	0.011 U
Indeno(1,2,3-cd)pyrene	0.5	1.2	1.8	**0.69 J**	**0.64**	**0.79**	**0.011 J**	0.0025 U	**0.049 J**	**0.048 J**
Naphthalene	100	0.2	0.2	**0.32 J**	**0.3 J**	**0.78**	**0.066 J**	0.0034 U	0.37 U	0.0097 U
Phenanthrene	100	3.7	2.5	**5.1**	**2**	**7.9**	**0.08 J**	**0.023 J**	**0.12 J**	**0.310 J**
Pyrene	100	3.4	2.5	**6.1**	**2.3**	**4.5**	**0.048 J**	**0.046 J**	**0.15 J**	**0.230 J**
Total PAH				**31.98**	**14.8**	**29.76**	**0.4179**	**0.215**	**0.82**	**1.484**
SVOC (mg/Kg)										
2,4-Dimethylphenol				**0.09 J**	0.035 U	**0.027 J**	0.035 U	0.036 U	0.37 U	0.012 U
2-Methylphenol	100			0.34 U	0.034 U	**0.017 J**	0.034 U	0.035 U	0.37 U	0.011 U
4-Methylphenol	100			**0.19 J**	**0.0081 J**	**0.055 J**	**0.17 J**	0.039 U	0.37 U	NS
bis(2-Ethylhexyl) phthalate				0.22 U	0.023 U	0.045 U	0.023 U	0.024 U	**0.1 J**	0.015 U
Carbazole				**0.35 J**	**0.14 J**	**0.67 J**	0.0028 U	0.0029 U	0.37 U	0.031 U
Dibenzofuran	59			**0.24 J**	**0.076 J**	**0.82**	**0.01 J**	**0.015 J**	0.37 U	0.012 U
Total SVOC				**32.85**	**15.0241**	**31.349**	**0.5979**	**0.23**	**0.92**	**1.484**
SVOC TICs (mg/kg)										
Total SVOC TICs				**658**	**3.25**	**5.12**	**3.84**		**0.884**	
Metals (mg/Kg)										
Aluminum				NS	NS	NS	NS	NS	**9500 J**	**4790**
Antimony				NS	NS	NS	NS	NS	**12.5 J**	**0.869**
Arsenic	16			NS	NS	NS	NS	NS	NS	**2.850**
Barium	400			NS	NS	NS	NS	NS	**41.1 J**	**144 J**
Beryllium	72			NS	NS	NS	NS	NS	**0.45 J**	**0.243 J**
Cadmium	4.3			NS	NS	NS	NS	NS	NS	**0.664**
Calcium				NS	NS	NS	NS	NS	**776 J**	**53600**
Chromium	180			NS	NS	NS	NS	NS	**13.9 J**	**7.310**
Cobalt				NS	NS	NS	NS	NS	**5 J**	**2.470**
Copper	270			NS	NS	NS	NS	NS	**30.9 J**	**19.3 J**
Iron				NS	NS	NS	NS	NS	**14100 J**	**7030**
Lead	400			NS	NS	NS	NS	NS	**54.1 J**	**230**
Magnesium				NS	NS	NS	NS	NS	**1880 J**	**3150**
Manganese	2000			NS	NS	NS	NS	NS	**240 J**	**170**
Mercury	0.81			NS	NS	NS	NS	NS	**0.551**	**0.693 J-**
Nickel	310			NS	NS	NS	NS	NS	**10.5 J**	**5.490**
Potassium				NS	NS	NS	NS	NS	**707 J**	**594**
Silver	180			NS	NS	NS	NS	NS	NS	**39.1**
Sodium				NS	NS	NS	NS	NS	568 UJ	**230**
Vanadium				NS	NS	NS	NS	NS	**29 J**	**9.250**
Zinc	10000			NS	NS	NS	NS	NS	**21.4 J**	**321**
Cyanide (mg/Kg)										
Cyanide, Total	27			NS	NS	NS	NS	NS	0.568 U	0.612 U

Notes:
Bolded values = detected in sample
Yellow highlighted values = exceed ST-NYSDEC Part 375-6 Restricted-Residential
[1] 95th Percentile Value (RETEC, 2007)
U = Nondetected result. The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+ = (Inorganics) The result is an estimated quantity, but the result may be biased high.
J- = (Inorganics) The result is an estimated quantity, but the result may be biased low.
R = The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet the quality control criteria. The presence of absence of the analyte cannot be verified.

Table A-2
Summary of Soil Results
East 19th Street Station Site
Intermediate Soil (7-16 ft. bgs)

Location ID Sample Date Sample ID depth Interval	ST-NYSDEC Part 375-6 Restricted-Res	19GH001 3/3/2004 19GH001(13-15)030304 13-15	19GH001 3/4/2004 19GH001(13-15)030404 13-15	19GH002 3/2/2004 19GH002(12-13)030204 12-13	19GH003 3/9/2004 19GH003(14-16)030904 14-16	ST19SB01 3/17/2004 ST19SB01(14-16)031704 14-16	19WVSB01 5/13/2008 19WVSB01(12-16)051308 12-16	19WVSB02 5/14/2008 19WVSB02(8-10)051408 8-10	19WVSB02 5/14/2008 19WVSB02(10-12)051408 10-12
BTEX (mg/Kg)									
Benzene	4.8	0.00028 U	NS	**0.001 J**	0.00025 U	0.028 U	0.0048 U	0.0042 U	0.0044 U
Toluene	100	0.00023 U	NS	**0.0016 J**	0.00022 U	0.028 U	0.0059 U	0.0052 U	0.0054 U
Total BTEX		0	NS	**0.0026**	ND	ND	ND	ND	ND
VOC (mg/Kg)									
Acetone	100	0.0028 UJ	NS	**0.028 J**	0.0026 UJ	0.14 U	0.110 U	0.100 U	0.100 U
Carbon Disulfide		0.00035 U	NS	**0.0022 J**	0.00032 U	0.028 U	0.0072 U	0.0063 U	0.0066 U
Total VOC		ND	NS	**0.0328**	ND	ND	ND	ND	ND
VOC TICs (mg/kg)									
Total VOC TICs		**0.006**		**0.0086**	**0.0163**				
PAH (mg/Kg)									
2-Methylnaphthalene		**0.71**	**0.081 J**	0.018 U	0.018 U	0.38 U	0.012 U	0.011 U	0.011 U
Acenaphthene	100	**0.42**	**0.041 J**	0.0033 U	0.0032 U	0.38 U	**0.061 J**	**0.063 J**	**0.180 J**
Acenaphthylene	100	0.0034 U	0.0034 U	**0.017 J**	0.0032 U	0.38 U	0.0064 U	0.0059 U	0.0058 U
Anthracene	100	**0.45**	**0.033 J**	**0.017 J**	**0.026 J**	0.38 U	0.015 U	**0.210 J**	**0.410**
Benzo(a)anthracene	1	**0.34**	**0.04 J**	**0.049**	**0.22**	0.38 U	0.011 U	**0.980**	**1.7**
Benzo(a)pyrene	1	**0.18**	**0.021 J**	**0.044**	**0.15**	0.38 U	0.013 U	**0.610**	**0.290 J**
Benzo(b)fluoranthene	1	**0.11**	0.0031 U	**0.03 J**	**0.26**	0.38 U	0.032 U	**0.690**	**0.450**
Benzo(ghi)perylene	100	**0.064 J**	**0.0013 J**	**0.029 J**	**0.099 J**	0.38 U	0.032 U	**0.370 J**	**0.110 J**
Benzo(k)fluoranthene	3.9	**0.16**	0.0042 U	**0.062**	**0.2 J**	0.38 U	0.020 U	**0.240 J**	**0.087 J**
Chrysene	3.9	**0.48**	**0.062 J**	**0.056 J**	**1.1**	0.38 U	0.0082 U	**1.200**	**2.100**
Dibenz(a,h)anthracene	0.33	**0.041**	0.0026 U	0.0026 U	**0.032 J**	***0.38 U***	0.032 U	**0.140 J**	**0.120 J**
Fluoranthene	100	**0.42**	**0.064 J**	**0.073 J**	**0.14 J**	0.38 U	0.011 U	**0.920**	**0.910**
Fluorene	100	**0.22 J**	**0.023 J**	0.0027 U	0.0026 U	0.38 U	0.012 U	**0.091 J**	**0.075 J**
Indeno(1,2,3-cd)pyrene	0.5	**0.067**	**0.016 J**	**0.026 J**	**0.074**	0.38 U	0.011 U	**0.410**	**0.150 J**
Naphthalene	100	**0.4 J**	**0.081 J**	**0.015 J**	**0.01 J**	**0.16 J**	0.011 U	0.0097 U	0.0096 U
Phenanthrene	100	**4.3**	**0.25 J**	**0.061 J**	**0.08 J**	0.38 U	**0.170 J**	**0.620**	**0.100 J**
Pyrene	100	**0.76**	**0.094 J**	**0.098 J**	**0.13 J**	0.38 U	**0.059 J**	**1.100**	**1.600**
Total PAH		**9.122**	**0.8073**	**0.577**	**2.521**	**0.16**	**0.290**	**7.644**	**8.282**
SVOC (mg/Kg)									
2-Methylphenol	100	0.036 U	**0.0082 J**	0.035 U	0.034 U	0.38 U	0.012 U	0.011 U	0.011 U
3+4-Methylphenols		NS	NS	NS	NS	NS	**0.083 J**	0.012 U	0.012 U
4-Methylphenol	100	**0.61**	**0.81**	**0.022 J**	0.038 U	0.38 U	NS	NS	NS
Dibenzofuran	59	**0.029 J**	**0.017 J**	0.02 U	0.02 U	0.38 U	0.014 U	**0.042 J**	**0.110 J**
Di-n-butyl phthalate		0.012 U	**0.09 J**	0.011 U	0.011 U	0.38 U	0.021 U	0.019 U	0.019 U
Phenol	100	**0.067 J**	0.054 U	0.052 U	0.051 U	0.38 U	0.012 U	0.011 U	0.011 U
Total SVOC		**9.828**	**1.7325**	**0.599**	**2.521**	**0.16**	**0.373**	**7.686**	**8.392**
SVOC TICs (mg/kg)									
Total SVOC TICs		**233.07**	**154.33**			**3.34**			
Metals (mg/Kg)									
Aluminum		NS	NS	NS	NS	**7820 J**	**4090**	**4010**	**5330**
Antimony		NS	NS	NS	NS	**13.6 J**	**0.750 J**	**1.580**	**0.517 J**
Arsenic	16	NS	NS	NS	NS	NS	**5.940**	**5.870**	**2.480**
Barium	400	NS	NS	NS	NS	**42.8 J**	**131 J**	**54.3 J**	**39.4 J**
Beryllium	72	NS	NS	NS	NS	**0.42 J**	**0.259 J**	**0.222 J**	**0.253**
Cadmium	4.3	NS	NS	NS	NS	NS	0.088 U	**0.215 J**	0.081 U
Calcium		NS	NS	NS	NS	**2170 J**	**14900**	**120000**	**20200**
Chromium	180	NS	NS	NS	NS	**16.1 J**	**8.450**	**9.230**	**7.450**
Cobalt		NS	NS	NS	NS	**7.4 J**	**3.990**	**3.240**	**4.600**
Copper	270	NS	NS	NS	NS	**30.4 J**	**75.3 J**	**28.9 J**	**13.3 J**
Iron		NS	NS	NS	NS	**13800 J**	**9840**	**9710**	**10600**
Lead	400	NS	NS	NS	NS	**29.2 J**	**237**	**124**	**20.6**
Magnesium		NS	NS	NS	NS	**2130 J**	**1730**	**37800**	**8530**
Manganese	2000	NS	NS	NS	NS	**239 J**	**243**	**199**	**127**
Mercury	0.81	NS	NS	NS	NS	**0.047 J**	**0.255 J-**	**0.527 J-**	**0.056 J-**
Nickel	310	NS	NS	NS	NS	**13.2**	**8.500**	**9.440**	**9.630**
Potassium		NS	NS	NS	NS	**911 J**	**1020**	**581**	**471**
Selenium	180	NS	NS	NS	NS	NS	**0.961**	0.663 U	0.661 U
Sodium		NS	NS	NS	NS	**591 J**	**798**	**246**	**176**
Vanadium		NS	NS	NS	NS	**23.1 J**	**15.0**	**11.6**	**10.9**
Zinc	10000	NS	NS	NS	NS	**36.5 J**	**42.7**	**56.6**	**24.1**
Cyanide (mg/Kg)									
Cyanide, Total	27	NS	NS	NS	NS	0.572 U	0.667 U	0.607 U	0.605 U

Notes:
Bolded values = detected in sample
Yellow highlighted values = exceed ST-NYSDEC Part 375-6 Restricted-Residential
U = Nondetected result. The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+ = (Inorganics) The result is an estimated quantity, but the result may be biased high.
J- = (Inorganics) The result is an estimated quantity, but the result may be biased low.
R = The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet the quality control criteria. The presence of absence of the analyte cannot be verified.

Table A-3
Summary of Soil Results
East 19th Street Station Site
Deep Soil (deeper than 16 ft. bgs)

Location ID Sample Date Sample ID depth Interval	ST-NYSDEC Part 375-6 Restricted-Res	19GH001 2/24/2004 19GH001(29-31)022404 29-31	19GH001 3/4/2004 19GH001(29-31)030404 29-31	19GH002 3/2/2004 19GH002(28-30)030204 28-30	19GH003 3/9/2004 19GH003(28-30)030904 28-30	ST19SB01 3/17/2006 ST19SB01(38-40)031706 38-40	19WVSB01 5/13/2008 19WVSB01(20-26)051308 20-26	19WVSB02 5/14/2008 19WVSB02(23-24)051408 23-24
BTEX (mg/Kg)								
Benzene	4.8	**0.001 J**	0.00025 U	0.00025 U	0.00028 U	0.025 U	0.0061 U	0.0054 U
Toluene	100	**0.0034 J**	0.00023 U	0.00022 U	0.00023 U	0.028 U	0.0075 U	0.0066 U
Total BTEX		**0.0044**	ND	ND	ND	ND	ND	ND
VOC (mg/Kg)								
Acetone	100	0.0027 UJ	0.0028 UJ	0.0026 UJ	0.0028 UJ	R	0.150 U	0.130 U
Carbon Disulfide		**0.0012 J**	0.00034 U	**0.001 J**	**0.0037 J**	0.028 U	**0.046**	0.0081 U
Total VOC		**0.0056**	0	**0.001**	**0.0037**	ND	**0.046**	ND
VOC TICs (mg/kg)								
Total VOC TICs		**0.073**	**0.2**	**0.0055**	**0.02**			
PAH (mg/Kg)								
2-Methylnaphthalene		NS	0.018 U	0.017 U	0.018 U	0.37 U	0.015 U	0.014 U
Acenaphthene	100	NS	0.0033 U	0.0031 U	0.0032 U	0.37 U	0.012 U	0.011 U
Acenaphthylene	100	NS	0.0033 U	0.0031 U	0.0032 U	0.37 U	0.0079 U	0.0074 U
Anthracene	100	NS	0.003 U	0.0028 U	0.0029 U	**0.059 J**	0.018 U	0.017 U
Benzo(a)anthracene	1	NS	0.011 U	0.010 U	0.010 U	0.37 U	0.013 U	0.012 U
Benzo(a)pyrene	1	NS	0.0029 U	0.0027 U	**0.016 J**	0.37 U	0.016 U	0.015 U
Benzo(b)fluoranthene	1	NS	0.003 U	0.0028 U	0.0029 U	0.37 U	0.039 U	0.037 U
Benzo(ghi)perylene	100	NS	0.0042 U	0.004 U	0.0041 U	0.37 U	0.039 U	0.037 U
Benzo(k)fluoranthene	3.9	NS	0.0041 U	0.0038 U	0.004 UJ	0.37 U	0.025 U	0.023 U
Chrysene	3.9	NS	0.0048 U	0.0046 U	0.0047 U	0.37 U	0.010 U	0.0094 U
Dibenz(a,h)anthracene	0.33	NS	0.0026 U	0.0024 U	0.0025 U	***0.37 U***	0.040 U	0.037 U
Fluoranthene	100	NS	0.0013 U	0.0012 U	**0.019 J**	**0.078 J**	0.013 U	0.012 U
Fluorene	100	NS	0.0027 U	0.0025 U	0.0026 U	0.37 U	0.015 U	0.014 U
Indeno(1,2,3-cd)pyrene	0.5	NS	0.0025 U	0.0024 U	0.0025 U	0.37 U	0.014 U	0.013 U
Naphthalene	100	NS	0.0034 U	0.0033 U	0.0034 U	**0.1 J**	0.013 U	0.012 U
Phenanthrene	100	NS	0.0036 U	0.0034 U	**0.017 J**	**0.15 J**	0.017 U	0.016 U
Pyrene	100	NS	0.0028 U	0.0026 U	**0.025 J**	**0.074 J**	0.012 U	0.011 U
Total PAH			ND	ND	**0.077**	**0.461**	ND	ND
SVOC (mg/Kg)								
2,4-Dimethylphenol		NS	0.036 U	0.034 U	0.035 U	0.37 U	0.016 U	0.015 U
2-Methylphenol	100	NS	0.035 U	0.034 U	0.034 U	0.37 U	0.014 U	0.014 U
3+4-Methylphenols		NS	NS	NS	NS	NS	0.016 U	0.015 U
4-Methylphenol	100	NS	0.039 U	0.037 U	0.038 U	0.37 U	NS	NS
bis(2-Ethylhexyl) phthalate		NS	0.024 U	**0.47**	0.023 U	0.37 U	0.021 U	0.019 U
Carbazole		NS	0.0029 U	0.0027 U	0.0028 U	0.37 U	0.041 U	0.039 U
Dibenzofuran	59	NS	0.02 U	0.019 U	0.02 U	0.37 U	0.017 U	0.016 U
Di-n-butyl phthalate		NS	0.011 U	0.011 U	0.011 U	0.37 U	0.025 U	0.024 U
Phenol	100	NS	0.052 U	0.05 U	0.051 U	0.37 U	0.015 U	0.014 U
Total SVOC		ND	0	**0.47**	**0.077**	**0.461**	ND	ND
SVOC TICs (mg/kg)								
Total SVOC TICs			**3.48**			**4.373**		
Metals (mg/Kg)								
Aluminum		NS	NS	NS	NS	**2040 J**	**11700**	**11000**
Antimony		NS	NS	NS	NS	**6.9 J**	**1.140**	**0.863 J**
Arsenic	16	NS	NS	NS	NS	NS	**13.8**	**8.700**
Barium	400	NS	NS	NS	NS	**14.3 J**	**36.5 J**	**31.6 J**
Beryllium	72	NS	NS	NS	NS	**0.2 J**	**0.611**	**0.588**
Cadmium	4.3	NS	NS	NS	NS	NS	**0.148 J**	0.103 U
Calcium		NS	NS	NS	NS	**1030 J**	**2830**	**2390**
Chromium	180	NS	NS	NS	NS	**9.2 J**	**27.5**	**23.6**
Cobalt		NS	NS	NS	NS	**3.1 J**	**10.6**	**9.810**
Copper	270	NS	NS	NS	NS	**6.7 J**	**17.4 J**	**14.6 J**
Iron		NS	NS	NS	NS	**4310 J**	**35300**	**27600**
Lead	400	NS	NS	NS	NS	**6.6 J**	**17.0**	**12.7**
Magnesium		NS	NS	NS	NS	**1400 J**	**6280**	**6280**
Manganese	2000	NS	NS	NS	NS	**44.6 J**	**460**	**492**
Mercury	0.81	NS	NS	NS	NS	**0.018 J**	**0.028 J-**	**0.024 J-**
Nickel	310	NS	NS	NS	NS	**10.5 J**	**24.1**	**21.9**
Potassium		NS	NS	NS	NS	**694 J**	**2990**	**2450**
Selenium	180	NS	NS	NS	NS	NS	0.893 U	0.842 U
Silver	180	NS	NS	NS	NS	NS	0.229 U	0.216 U
Sodium		NS	NS	NS	NS	**372 J**	**1640**	**1270**
Vanadium		NS	NS	NS	NS	**6.7 J**	**34.8**	**29.7**
Zinc	10000	NS	NS	NS	NS	**14.1 J**	**76.1**	**67.0**
Cyanide (mg/Kg)								
Cyanide, Total	27	NS	NS	NS	NS	0.569 U	0.817 U	0.77 U

Notes:
Bolded values = detected in sample
Yellow highlighted values = exceed ST-NYSDEC Part 375-6 Restricted-Residential
U = Nondetected result. The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J+ = (Inorganics) The result is an estimated quantity, but the result may be biased high.
J- = (Inorganics) The result is an estimated quantity, but the result may be biased low.
R = The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet the quality control criteria. The presence of absence of the analyte cannot be verified.

Appendix B

Summary of Groundwater Results

Table B-1
East 19th Street Station Groundwater Analytical Results Summary

Sample Location:	*NYSDEC AWQSGVs*	19MWS05	19MWS05 DUP	19MWS05	19MWS05	19MWD05	19MWD05	19MWD05
Screened Interval (ft bgs):		5.5-15.5	5.5-15.5	5.5-15.5	5.5-15.5	20.5-30.5	20.5-30.5	20.5-30.5
Date Collected:		4/19/2004	4/19/2004	6/7/2006	8/19/2008	4/19/2004	6/9/2006	8/19/2008
Investigation Conducted By:		H&A	H&A	GEI	AECOM	H&A	GEI	AECOM
BTEX (ug/L)								
Benzene	1	0.6	1.3U	1U	0.52 U	0.3U	1U	0.52 U
Toluene	5	4.6	4.4	1 U	0.51 U	0.2 U	1 U	0.51 U
Ethylbenzene	5	0.6	1.8 U	1 U	0.50 U	0.4 U	1 U	0.50 U
Total BTEX	NE	5.8	4.4	ND	ND	ND	ND	ND
Other VOCs (ug/L)								
Acetone	50*	34	38 J	5 UJ	2.7 U	1.0 UJ	5 UJ	2.7 U
Dichloroethene, cis-1,2-	5	0.2 U	1.2 U	1 U	0.53 U	2.2	**7.1**	**10**
Styrene	5	1.1	1.4 U	1 U	0.48 U	0.3 U	1 U	0.48 U
Tetrachloroethene	5	0.3 U	1.6 U	1 U	0.68 U	0.7	1 U	0.68 U
Trans-1,2-dichloroethene	5	0.2 U	1.2 U	1 U	0.57 U	0.2 U	0.52 J	0.57 UJ
Trichloroethene	5	0.2 U	0.9 U	1 U	0.56 U	1.2	1.3	0.56 U
Vinyl chloride	2	0.5 U	2.6 U	1 U	0.46 U	0.5 U	0.44 J	0.46 U
Total VOCs	NE	40.9	42.4	ND	ND	4.1	9.36	10
VOC TICs (ug/L)								
Total VOC TICs	NE	226	192	NA	NA	NA	NA	NA
Noncarcinogenic PAHs (ug/L)								
Acenaphthene	20*	0.1 U	0.1 U	10 U	0.015 U	0.4	10 U	0.014 U
Phenanthrene	50*	1.1	0.8	10 U	0.034 J	0.4	10 U	0.160 J
Total Noncarcinogenic PAHs	NE	1.1	0.8	ND	0.34	0.8	ND	0.16
Total PAHs (ug/L)								
Total PAHs	NE	1.1	0.8	ND	0.034	0.8	ND	0.16
Other SVOCs (ug/L)								
Diethyl phthalate	50*	0.3 U	0.3 U	10U	0.370 U	4.9	10U	0.360 U
Methylphenol, 4-	NE	12	0.5 U	10 U	0.450 U	0.5 U	10 U	0.430 U
Phenol	NE	0.5 U	0.5 U	10 U	0.630 U	1.3	10 U	0.610 U
Total SVOCs	NE	13.1	0.8	ND	0.034	7	ND	0.16
SVOC TICs (ug/L)								
Total SVOC TICs	NE	1952	2014.2	21.9	NA	NA	68.7	NA
Total Metals (ug/L)								
Aluminum	NE	1870	1940	200U	685	223	200U	358
Arsenic	25	7.4	7.3	10 UJ	5.400 U	3.2 U	10 U	5.400 U
Barium	1000	122	124	107 J	109	259	262	271
Calcium	NE	177000	176000	155000 J	124000	48700	43300 J	50700
Chromium	50	NA	NA	NA	1.400 U	NA	NA	1.560 J
Copper	200	6	7.5	25 UJ	3.700 U	3.7 U	25 U	3.700 U
Iron	300	**14600**	**14700**	**472**	**1470**	**14500**	**14300**	**13800**
Lead	25	**50.1**	**55.2**	5 U	15	2.9 U	5 UJ	7.760 J
Magnesium	35000*	**40100**	**40200**	**39900**	22700 J	**58700**	**61100 J**	**69800 J**
Manganese	300	**542**	**542**	202 J	112	**723**	286	**334**
Mercury	0.7	0.12	0.13	0.20 UJ	0.06 UJ	0.20 U	0.2 J	0.06 UJ
Nickel	100	NA	NA	NA	4.900 U	NA	NA	12.0 J
Potassium	NE	20600	20400	30400 J	22000 J	39800	83700	65800 J
Sodium	20000	**69600**	**69000**	**115000 J**	**67900**	**47300**	**758000**	**496000**
Vanadium	NE	7.4	**5.4**	50 UJ	4.100 U	1.8 U	50 U	4.100 U
Zinc	2000*	20.4 U	23.0 U	26.3 J	41.4	6.0 U	20 UJ	34.2
Inorganics (mg/L)								
Chloride	250000	146	148	NA	NA	629	NA	NA
Fluoride	NE	0.11	0.12	NA	NA	0.37	NA	NA
Sulfate	NE	49.8	52.2	NA	NA	46	NA	NA
Nitrogen, Ammonia	NE	5.6	5.5	NA	NA	31.6	NA	NA

NOTES:

Blue indicates a detected result value that does not exceed the AWQSGV for groundwater.

Red and bold indicates a detected groundwater result exceeding the AWQSGV.

Table Abbreviations, References, and additional Notes are listed at the front of the *Chemical Data Summary Tables* group of the RI Report.

Appendix C

Summary of Indoor Air/Soil Gas Results

Table C-1
East 19th Street Station Air and Soil Gas Analytical Results Summary
Stuyvesant Town Interim Remedial Investigation Report, New York, New York

Sample ID:	*NYSDOH*	*NYSDOH*	STY-IA-1E19 CRAWL	STY-IA-2E19 STAIRS	ST19SV01	SG-1-E19
Sample Type:	*Indoor Air*	*Indoor Air*	Indoor Air	Indoor Air	Soil Gas	Soil Gas
Date Collected:	*Upper Fence*	*Upper Quartile*	01/29/2003	01/29/2003	03/16/2006	08/20/2003
Investigation Conducted by:	*(95th percentile)*	*(75th percentile)*	RETEC	RETEC	GEI	RETEC
BTEX (ug/m^3)						
Benzene	13	5.9	**5.2**	**2.8**	**17.2**	**14**
Ethylbenzene	6.4	2.8	**2.2**	**2.2**	**15.2**	**36**
Toluene	57	24.8	**12**	**8.2**	**90.5**	**110**
Xylene, o-	7.1	3.1	**2.9**	**3.7**	**17.4**	**67**
Xylenes, m,p	11	4.6	**8.6**	**8.2**	**43.4**	**160**
Other VOCs (ug/m^3)						
2,2,4-Trimethylpentane (Isooctane)	5	2.1	ND	ND	**11.7**	**81**
Acetone	115	52	**57**	**370**	8.3 U	**200**
Allyl chloride	NE	NE	NA	NA	11 U	NA
Benzyl chloride	NE	NE	ND	ND	4.6 U	ND
Bromodichloromethane	NE	NE	ND	ND	5.9 U	ND
Bromoform	NE	NE	ND	ND	9.1 U	ND
Bromomethane	0.48	<0.25	ND	ND	3.4 U	ND
Butadiene, 1,3-	NE	NE	**6.5**	ND	1.9 U	**4.5**
Butanone,2-	16	7.3	ND	ND	**3.5**	**32**
Carbon disulfide	NE	NE	ND	ND	**23.3**	**9.4**
Carbon tetrachloride	1.3	0.59	ND	ND	5.5 U	ND
Chlorobenzene	0.41	<0.25	ND	ND	4.1 U	ND
Chloroethane	0.39	<0.25	ND	ND	2.3 U	ND
Chloroform	1.2	0.54	**1.3**	ND	**33.7**	ND
Chloromethane	4.2	1.8	**1.6**	**1.6**	7.2 U	ND
Cryofluorane	0.42	<0.25	ND	ND	6.2 U	ND
Cyclohexane	6.3	2.6	ND	ND	**3.4**	ND
Dibromochloromethane	NE	NE	ND	ND	7.5 U	ND
Dibromoethane,1,2-	0.38	<0.25	ND	ND	6.8 U	ND
Dichlorobenzene,1,2-	0.48	<0.25	ND	ND	5.3 U	ND
Dichlorobenzene,1,3-	0.46	<0.25	ND	ND	5.3 U	ND
Dichlorobenzene,1,4-	1.2	0.54	**4.2**	**2.5**	5.3 U	**12**
Dichlorodifluoromethane	10	4.1	**4.3**	**4.5**	4.4 U	**3.6**
Dichloroethane,1,1-	0.38	<0.25	ND	ND	3.6 U	ND
Dichloroethane,1,2-	0.37	<0.25	ND	ND	3.6 U	ND
Dichloroethene, cis-1,2-	0.41	<0.25	ND	ND	3.5 U	ND
Dichloroethene,1,1-	0.4	<0.25	ND	ND	3.5 U	ND
Dichloropropane,1,2-	0.39	<0.25	ND	ND	4.1 U	ND
Dichloropropene, cis-1,3	0.38	<0.25	ND	ND	4 U	ND
Dichloropropene, trans-1,3	0.4	<0.25	ND	ND	4 UJ	ND
Dioxane,1,4-	NE	NE	ND	ND	12.6 U	ND
Ethanol	1300	540	**100**	**500**	6.6 U	**12**
Ethyltoluene, p-	NE	NE	ND	**7.8**	**13.3**	**82**
Heptane, n-	18	7.6	ND	ND	**36.9**	**31**
Hexachlorobutadiene	0.49	<0.25	ND	ND	37.3 U	ND
Hexane, n-	14	6	ND	ND	**12.7**	**44**
Hexanone,2-	NE	NE	ND	ND	14.3 U	ND
Isopropyl benzene	0.82	0.39	NA	NA	4.3 U	NA
Methyl tert-butyl ether	14	5.6	**5.3**	ND	3.2 U	**220**
Methyl-2-pentanone,4-	1.9	0.86	ND	ND	3.6 U	ND
Methylene chloride	16	6.6	**1.4**	**2.4**	3.1 U	ND
Naphthalene	NE	NE	**18**	ND	18.3 U	**16**
Propanol,2-	NE	NE	**5.9**	**14**	8.6 U	**3.9**
Propene	NE	NE	ND	ND	NA	ND
Propylbenzene, n-	1.5	0.69	NA	NA	4.3 U	NA
Styrene	1.4	0.64	ND	ND	3.7 U	ND
Tetrachloroethane,1,1,2,2-	0.38	<0.25	ND	ND	6 U	ND
Tetrachloroethene	2.5	1.1	**2.7**	**2.1**	**400**	**5.2**
Tetrahydrofuran	0.78	0.35	ND	ND	2.6 U	ND
Trans-1,2-dichloroethene	NE	NE	ND	ND	3.5 U	ND
Trichloro-1,2,2-trifluoroethane, 1,1,2-	2.5	1.1	ND	ND	6.7 U	ND
Trichlorobenzene,1,2,4-	0.47	<0.25	ND	ND	26 U	ND
Trichloroethane,1,1,1-	2.5	1.1	ND	ND	4.8 U	ND
Trichloroethane,1,1,2-	0.38	<0.25	ND	ND	4.8 U	ND
Trichloroethene	0.46	<0.25	ND	ND	4.7 U	ND
Trichlorofluoromethane	12	5.4	**2.4**	**2.6**	4.9 U	**1.9**
Trimethylbenzene,1,2,4-	9.8	4.3	**4.2**	**8.4**	**18.7**	**120**
Trimethylbenzene,1,3,5-	3.9	1.7	**1.5**	**3.9**	**6.9**	**32**
Vinyl Acetate	NE	NE	ND	ND	NA	ND
Vinyl chloride	0.37	<0.25	ND	ND	2.3 U	ND
VOC TICs (ug/m3)						
2,3-Dimethylpentane	5.2	2.2	ND	ND	ND	**100**
2-METHYL BUTANE	NE	NE	**17**	**12**	ND	**32**
2-Methylpentane	NE	NE	**4.7**	ND	ND	**34**
INDANE	NE	NE	ND	ND	ND	ND
INDENE	NE	NE	ND	ND	ND	ND
Thiophene	NE	NE	ND	ND	ND	ND

Notes:

Bolding indicates compound detected in sample.

Gray shading indicates indoor air concentration above respective NYSDOH 95th percentile value from referenced Indoor Air study.

Table Abbreviations, References and additional Notes are listed at the front of the Chemical Data Summary Tables group of the RI Report.

Table C-2
Indoor and Ambient Air Sample Results
Former East 19th Street MGP Station Site
February 2009

AECOM

Sample Location	CAS No.	*Former East 19th Street Station*				NYSDOH Background Indoor Air Values1	
		522 E. 20th St.	524 E. 20th St.	East 20th Street Loop Road			
Type of Sample		Crawlspace	Stairwell	Ambient Air	Ambient Air		
Sample ID		IA1E19	IA2E19	AMB1	AMB3	75th Percentile	90th Percentile
Sampling Date		2/26/2009	2/26/2009	2/26/2009	2/26/2009		
Compound (µg/m³)							
Benzene	71-43-2	**1.5**	**1.9**	**1.1**	**1.1**	5.9	15
Toluene	108-88-3	**4.0**	**6.0**	**2.4**	**2.4**	24.8	58
Ethylbenzene	100-41-4	**1.5**	**0.81**	0.70 U	0.70 U	2.8	7.4
m/p-Xylenes	136777-61-2	**4.5**	**2.6**	0.90	0.99	4.6	12
o-Xylene	95-47-6	**1.3**	**0.92**	0.70 U	0.70 U	3.1	7.6
Naphthalene	91-20-3	6.9	4.9	4.2 U	4.2 U	NL	NL
Indane	496-11-7	3.9 U	3.8 U	3.9 U	3.9 U	NL	NL
Indene	95-13-6	3.8 U	3.8 U	3.8 U	3.8 U	NL	NL
Thiophene	110-02-1	2.8 U	2.7 U	2.8 U	2.8 U	NL	NL
1,2,4-Trimethylbenzene	95-63-6	**0.79 U**	**0.88**	0.79 U	0.79 U	4.3	9.5
1,3,5-Trimethylbenzene	108-67-8	0.79 U	0.78 U	0.79 U	0.79 U	1.7	3.6
2,2,4-Trimethylpentane	540-84-1	3.8 U	3.7 U	3.8 U	3.8 U	NL	NL
2,3-Dimethylpentane	565-59-3	3.3 U	3.2 U	3.3 U	3.3 U	2.2	7.5
2-Methylpentane	107-83-5	2.8 U	2.8 U	2.8 U	2.8 U	NL	NL
4-Ethyltoluene	622-96-8	4.0 U	3.9 U	4.0 U	4.0 U	NL	NL
Carbon Disulfide	75-15-0	2.5 U	2.5 U	2.5 U	2.5 U	NL	NL
Cyclohexane	110-82-7	2.8 U	2.7 U	2.8 U	2.8 U	2.6	8.1
Heptane	142-82-5	3.3 U	3.2 U	3.3 U	3.3 U	7.6	19
Hexane	110-54-3	2.8 U	2.8 U	2.8 U	2.8 U	6	18
Isopentane	78-784	**5.5**	**6.9**	**4.5**	**4.6**	NL	NL
Styrene	100-42-5	0.68 U	0.67 U	0.68 U	0.68 U	0.64	1.3
1,1,1-Trichloroethane (1,1,1-TCA)	71-55-6	0.88 U	0.86 U	0.88 U	0.88 U	1.1	3.1
1,1,2,2-Tetrachloroethane	79-34-5	1.1 U	1.1 U	1.1 U	1.1 U	<0.25	<0.25
1,1,2-Trichloroethane	79-00-5	0.88 U	0.86 U	0.88 U	0.88 U	<0.25	<0.25
1,1-Dichloroethane	75-34-3	0.65 U	0.64 U	0.65 U	0.65 U	<0.25	<0.25
1,1-Dichloroethene	75-35-4	0.64 U	0.63 U	0.64 U	0.64 U	<0.25	<0.25
1,2,4-Trichlorobenzene	120-82-1	6.0 U	5.9 U	6.0 U	6.0 U	<0.25	3.4
1,2-Dibromoethane (EDB)	106-93-4	1.2 U	1.2 U	1.2 U	1.2 U	<0.25	<0.25
1,2-Dichlorobenzene	95-50-1	0.97 U	0.95 U	0.97 U	0.97 U	<0.25	0.72
1,2-Dichloroethane	107-06-2	0.65 U	0.64 U	0.65 U	0.65 U	<0.25	<0.25
1,2-Dichloropropane	78-87-5	0.74 U	0.73 U	0.74 U	0.74 U	<0.25	<0.25
1,3-Butadiene	106-99-0	1.8 U	1.7 U	1.8 U	1.8 U	NL	NL
1.3-Dichlorobenzene	541-73-1	0.97 U	0.95 U	0.97 U	0.97 U	<0.25	0.6
1,4-Dichlorobenzene	106-46-7	5.3	3.4	0.97 U	0.97 U	0.54	1.3
1,4-Dioxane	123-91-1	2.9 U	2.8 U	2.9 U	2.9 U	NL	NL
2-Butanone (MEK)	78-93-3	2.4 U	2.3 U	2.4 U	2.4 U	7.3	16
2-Hexanone	591-78-6	3.3 U	3.2 U	3.3 U	3.3 U	NL	NL
4-Methyl-2-pentanone	108-10-1	3.3 U	3.2 U	3.3 U	3.3 U	0.86	2.2
Acetone	67-64-1	**7.5**	**11**	**5.8**	**4.0**	52	110
Benzyl chloride	100-44-7	0.83 U	0.82 U	0.83 U	0.83 U	NL	NL
Bromodichloromethane	75-27-4	5.4 U	5.3 U	5.4 U	5.4 U	NL	NL
Bromoform	75-25-2	8.3 U	8.2 U	8.3 U	8.3 U	NL	NL
Bromomethane	74-83-9	0.62 U	0.61 U	0.62 U	0.62 U	<0.25	0.6
Carbon Tetrachloride	56-23-5	1.0 U	0.99 U	1.0 U	1.0 U	0.59	0.81
Chlorobenzene	108-90-7	0.74 U	0.73 U	0.74 U	0.74 U	<0.25	<0.25
Chloroethane	75-00-3	0.42 U	0.42 U	0.42 U	0.42 U	<0.25	<0.25
Chloroform	67-66-3	**0.79 U**	**0.77 U**	0.79 U	0.79 U	0.54	1.4
Chloromethane	74-87-3	**0.85**	**2.5**	0.99	0.96	1.8	3.3
cis-1,2-Dichloroethene	156-59-2	0.64 U	0.63 U	0.64 U	0.64 U	<0.25	<0.25
cis-1,3-Dichloropropene	10061-01-5	0.73 U	0.72 U	0.73 U	0.73 U	<0.25	<0.25
Dibromochloromethane	124-48-1	6.8 U	6.7 U	6.8 U	6.8 U	NL	NL
Ethanol	64-17-5	**39**	**63**	**3.7**	**3.6**	540	1400
Trichlorofluoromethane (Freon 11)	75-69-4	**1.9**	**1.9**	1.9	1.5	5.4	17
1,1,2-Trichlorotrifluoroethane (Freon 113)	76-13-1	1.2 U	1.2 U	1.2 U	1.2 U	1.1	1.8
1,2-Dichlorotetrafluoroethane	76-14-2	1.1 U	1.1 U	1.1 U	1.1 U	<0.25	0.52
Dichlorodifluoromethane (Freon 12)	75-71-8	**3.0**	**3.2**	3.2	3.2	4.1	15
Hexachlorobutadiene (C-46)	87-68-3	8.6 U	8.4 U	8.6 U	8.6 U	<0.25	4.6
Methyl tert-Butyl Ether (MTBE)	1634-04-4	2.9 U	2.8 U	**2.9 U**	**2.9 U**	5.6	27
Methylene Chloride (Dichloromethane)	75-09-2	0.56 U	0.55 U	0.56 U	0.56 U	6.6	22
2-Propanol	67-63-0	3.2	5.0	2.0 U	2.0 U	NL	NL
Propene	115-07-1	1.4 U	1.4 U	1.4 U	1.4 U	NL	NL
Tetrachloroethene (PCE)	127-18-4	1.2	1.1 U	**1.1 U**	**1.1 U**	1.1	2.9
Tetrahydrofuran	109-99-9	2.4 U	2.3 U	2.4 U	2.4 U	0.35	3.3
Trans-1,2-Dichloroethene	156-60-5	3.2 U	3.1 U	3.2 U	3.2 U	NA	NA
Trans-1,3-Dichloropropene	10061-02-6	0.73 U	0.72 U	0.73 U	0.73 U	<0.25	<0.25
Trichloroethene (TCE)	79-01-6	0.86 U	0.85 U	0.86 U	0.86 U	<0.25	0.48
Vinyl Chloride	75-01-4	0.41 U	0.40 U	0.41 U	0.41 U	<0.25	<0.25

Notes:

All units in micrograms per cubic meter (µg/m³)

1 - New York State Department of Health, November 14, 2005.

Bold - Compound detected in a concentration greater than the method reporting limits.

Exceeds NYSDOH Background Indoor Air Values 90th Percentile

Dup - As suffix on Sample ID indicates that the sample is a field duplicate.

E - Exceeded calibration range.

NL - Not listed - data not available for background concentrations for these compounds.

U - The compound was analyzed for, but was not detected above the method reporting limit.

R - The data are unusable. The sample results are rejected due to serious deficiencies in the ability to meet quality control criteria. The presence or absence of the analyte cannot be verified.

N - The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.

NJ - The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.

J - The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample.

UJ - The analyte was analyzed for, but was not detected. The reported quantitation limit is approximated and may be UJ - inaccurate or imprecise.

Table C-3
Indoor Air Sample Results
East 17th Street Station Site
January 2010

Sample Location	CAS No.	16 South Oval			NYSDOH Background Indoor Air Values[3]	
Type of Sample		Indoor Air	Indoor Air	Indoor Air		
Sample ID		IA1E17	IA1FDE17	IA2E17		
Laboratory ID		1001301-08A	1001301-09A	1001301-10A	75th Percentile	90th Percentile
Sampling Date		1/15/2010	1/15/2010	1/15/2010		
Compound (µg/m³)						
Possibly MGP Related or Other Sources [1]						
1,2,4-Trimethylbenzene	95-63-6	1.1 U	0.75 U	**0.95**	4.3	9.5
1,3,5-Trimethylbenzene	108-67-8	1.1 U	0.75 U	0.82 U	1.7	3.6
2,2,4-Trimethylpentane	540-84-1	5.1 U	3.6 U	3.9 U	NL	NL
2,3-Dimethylpentane	565-59-3	4.4 U	3.1 U	3.4 U	2.2	7.5
2-Methylpentane	107-83-5	3.8 U	2.7 U	3.0 U	NL	NL
4-Ethyltoluene	622-96-8	5.3 U	3.7 U	4.1 U	NL	NL
Benzene	71-43-2	**1.8 J**	0.48 UJ	**4.5**	5.9	15
Carbon Disulfide	75-15-0	3.4 U	2.4 U	2.6 U	NL	NL
Cyclohexane	110-82-7	3.7 U	2.6 U	2.9 U	2.6	8.1
Ethylbenzene	100-41-4	0.94 U	0.66 U	**1.2**	2.8	7.4
Heptane	142-82-5	4.4 U	3.1 U	3.4 U	7.6	19
Hexane	110-54-3	3.8 U	2.7 U	3.0 U	6	18
Indan	496-11-7	5.2 U	3.7 U	4.1 U	NL	NL
Indene	95-13-6	5.2 U	3.6 U	4.0 U	NL	NL
Isopentane	78-784	**7.8 J**	**3.0 J**	**8.6**	NL	NL
Naphthalene	91-20-3	5.7 U	4.0 U	4.4 U	NL	NL
Styrene	100-42-5	0.92 U	0.65 U	0.72 U	0.64	1.3
Thiophene	110-02-1	3.7 U	2.6 U	2.9 U	NL	NL
Toluene	108-88-3	**8.3 J**	0.57 UJ	**11**	24.8	58
m/p-Xylenes	136777-61-2	**1.8 J**	0.66 UJ	**3.6**	4.6	12
o-Xylene	95-47-6	0.94 U	0.66 U	**1.1**	3.1	7.6
Not MGP Related [2]						
1,1,1-Trichloroethane (1,1,1-TCA)	71-55-6	1.2 UJ	**1.2 J**	**2.2**	1.1	3.1
1,1,2,2-Tetrachloroethane	79-34-5	1.5 U	1.0 U	1.2 U	<0.25	<0.25
1,1,2-Trichloroethane	79-00-5	1.2 U	0.83 U	0.92 U	<0.25	<0.25
1,1-Dichloroethane	75-34-3	0.88 U	0.62 U	0.68 U	<0.25	<0.25
1,1-Dichloroethene	75-35-4	0.86 U	0.60 U	0.67 U	<0.25	<0.25
1,2,4-Trichlorobenzene	120-82-1	8.0 U	5.6 U	6.2 U	<0.25	3.4
1,2-Dibromoethane (EDB)	106-93-4	1.7 U	1.2 U	1.3 U	<0.25	<0.25
1,2-Dichlorobenzene	95-50-1	1.3 U	0.91 U	1.0 U	<0.25	0.72
1,2-Dichloroethane	107-06-2	0.88 U	0.62 U	0.68 U	<0.25	<0.25
1,2-Dichloropropane	78-87-5	1.0 U	0.70 U	0.78 U	<0.25	<0.25
1,3-Butadiene	106-99-0	2.4 U	1.7 U	**2.6**	NL	NL
1.3-Dichlorobenzene	541-73-1	1.3 U	0.91 U	1.0 U	<0.25	0.6
1,4-Dichlorobenzene	106-46-7	**1.9 J**	0.91 UJ	**26**	0.54	1.3
1,4-Dioxane	123-91-1	3.9 U	2.7 U	3.0 U	NL	NL
2-Butanone (MEK)	78-93-3	3.2 U	2.2 U	**5.2**	7.3	16
2-Hexanone	591-78-6	4.4 U	3.1 U	3.4 U	NL	NL
4-Methyl-2-pentanone	108-10-1	4.4 U	3.1 U	3.4 U	0.86	2.2
Acetone	67-64-1	**13 J**	**7.7 J**	**42**	52	110
Benzyl chloride	100-44-7	1.1 U	0.79 U	0.87 U	NL	NL
Bromodichloromethane	75-27-4	7.3 U	5.1 U	5.6 U	NL	NL
Bromoform	75-25-2	11 U	7.8 U	8.7 U	NL	NL
Bromomethane	74-83-9	**0.95 J**	**0.78 J**	**0.81 J**	<0.25	0.6
Carbon Tetrachloride	56-23-5	1.4 U	0.96 U	1.0 U	0.59	0.81
Chlorobenzene	108-90-7	1.0 U	0.70 U	0.77 U	<0.25	<0.25
Chloroethane	75-00-3	0.57 U	0.40 U	0.44 U	<0.25	<0.25
Chloroform	67-66-3	1.0 U	0.74 U	**4.4**	0.54	1.4
Chloromethane	74-87-3	**1.0**	**1.0**	**3.8**	1.8	3.3
cis-1,2-Dichloroethene	156-59-2	0.86 UJ	**1.1 J**	0.67 U	<0.25	<0.25
cis-1,3-Dichloropropene	10061-01-5	0.98 U	0.69 U	0.76 U	<0.25	<0.25
Dibromochloromethane	124-48-1	9.2 U	6.5 U	7.2 U	NL	NL
Ethanol	64-17-5	**26 J**	**14 J**	**160 J**	540	1400
Trichlorofluoromethane (Freon 11)	75-69-4	**1.5**	**1.2**	**1.8**	5.4	17
1,1,2-Trichlorotrifluoroethane (Freon 113)	76-13-1	1.7 U	1.2 U	1.3 U	1.1	1.8
1,2-Dichlorotetrafluoroethane	76-14-2	1.5 U	1.1 U	1.2 U	<0.25	0.52
Dichlorodifluoromethane (Freon 12)	75-71-8	**1.9**	**2.0**	**2.0**	4.1	15
Hexachlorobutadiene (C-46)	87-68-3	12 U	8.1 U	9.0 U	<0.25	4.6
Methyl tert-Butyl Ether (MTBE)	1634-04-4	3.9 U	2.7 U	3.0 U	5.6	27
Methylene Chloride (Dichloromethane)	75-09-2	0.75 UJ	**1.1 J**	**1.4 J**	6.6	22
2-Propanol	67-63-0	**5.7 J**	1.9 UJ	**54**	NL	NL
Propene	115-07-1	1.9 U	1.3 U	1.4 U	NL	NL
Tetrachloroethene (PCE)	127-18-4	1.5 U	1.0 U	**2.6**	1.1	2.9
Tetrahydrofuran	109-99-9	3.2 U	2.2 U	2.5 U	0.35	3.3
Trans-1,2-Dichloroethene	156-60-5	4.3 U	3.0 U	3.3 U	NA	NA
Trans-1,3-Dichloropropene	10061-02-6	0.98 U	0.69 U	0.76 U	<0.25	<0.25
Trichloroethene (TCE)	79-01-6	1.2 U	0.82 U	0.90 U	<0.25	0.48
Vinyl Chloride	75-01-4	0.55 U	0.39 U	0.43 U	<0.25	<0.25

Notes:

All units in micrograms per cubic meter (µg/m³)

1 - These compounds may be related to either MGP sources or non-MGP sources, or both. MGP sources include MGP tars and petroleum feedstocks used in MGP processes, such as the carburetted water gas process. Non-MGP sources include cleaning products, floor wax and polish, vehicle exhaust, construction materials, and cigarette smoke.

2 - These compounds are not related to MGP sources and are present due to non-MGP sources, such as vehicle exhaust, heating and air conditioning systems, cleaning agents, art supplies, paints, etc.

3 - New York State Department of Health, November 14, 2005.

Bold - Compound detected in a concentration greater than the method reporting limits.

Exceeds NYSDOH Bakground Indoor Air Values 90th Percentile

Dup - As suffix on Sample ID indicates that the sample is a field duplicate.

NL - Not listed - data not available for background concentrations for these compounds.

U - The compound was analyzed for, but was not detected above the method reporting limit.

R - The data are unusable. The sample results are rejected due to serious deficiencies in the ability to meet quality control criteria. The presence or absence of the analyte cannot be verified.

N - The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.

NJ - The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.

J - The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample.

UJ - The analyte was analyzed for, but was not detected. The reported quantitation limit is approximated and may be UJ - inaccurate or imprecise.

Appendix D

Summary of Cost Estimates for Alternatives

Table D-1

Project Name:	19th Street Station	**Revision No.:**	0
Cost Estimate No.:	Alternative 3 Institutional Controls and Soil Removal	**Date:**	10/25/10
Client	Con-Ed	**Status:**	Draft
Location	NYC, NY	**Author:**	CCD
		Office:	WES
Project Element:	AAR	**Reviewed By:**	
Type of Estimate:	Feasibility/Conceptual		

Project Details

Project Location:	
Project Start Date:	
Project Duration:	
Type of Contract:	Direct Owner
Level of Accuracy:	*-30% to +50%*
Contingency:	20%

Scope Summary

Summarize scope of work and provide project specific details with reference to source

Document Source: _____ **Rev. Date:** _____ **Site Visit?** _____
Document Source: _____ **Rev. Date:** _____
Document Source: _____ **Rev. Date:** _____

Cost Summary

Prime Contractor Costs	$	591,515	$	970,000		
Other Contracts & Purchases	$	156,000				
Design Costs	$	220,654				
30 Year O&M NPV	$	-				
				-30%	+50%	
Project Total Estimated Cost	$	970,000	$	1,000,000	$ 1,000,000	

Notes:
1. Note intended use and audience
2. List major project assumptions
3. Accuracy ranges are based on information provided in "Association for Advancement of Cost Engineering (AACE), International Cost Estimating Classifications, 18R-97"

Estimate Type	*Accuracy Range*
Preliminary	*-50% to +100%*
Feasibility/Conceptual	*-30% to +50%*
Engineering	
30%	*-20% to +30%*
60%	*-15% to +20%*
90%	*-10% to +15%*

4. Contingency values are based on information provided in 'USEPA, Guide to Developing Cost Estimates, July 2000

Remediation Technology	*Scope Contingency*
Soil Excavation	*15% to 55%*
Groundwater Treatment (Multiple	*15% to 35%*
On-site Incineration	*15% to 35%*
Extraction Wells	*10% to 30%*
Vertical Barriers	*10% to 30%*
Synthetic Cap	*10% to 20%*
Off-site Disposal	*5% to 15%*
Off-site Incineration	*5% to 15%*
Bulk Liquid Processing	*5% to 15%*
Clay Cap	*5% to 10%*
Surface Grading/Diking	*5% to 10%*
Revegetation	*5% to 10%*

5. Values and costs are for informational purposes only. Values are not true costs because they represent a combination of fixed capital and quantity-proportional components

19th Street Station
Alternative 3 Institutional Controls and Soil Removal
Con-Ed
NYC, NY

AAR

By: CCD Rev Date: 10/25/2010

Prime Contractor Costs					0%	20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*MU*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Mobilization*	*LS*	*1*	*$300,000*	*$0*	*$60,000*	*$360,000*	*$360,000*	*61%*
2	*Excavation*	*CY*	*1,330*	*$172,929*	*$0*	*$34,586*	*$207,515*	*$156*	*35%*
3	*Excavation Shoring*	*MO*	*1*	*$20,000*	*$0*	*$4,000*	*$24,000*	*$24,000*	*4%*
				$492,929	*$0*	*$98,586*	*$591,515*		*100%*
Other Contracts & Purchases					10%	20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*MU*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Waste Disposal*	*TON*	*800*	*$120,000*	*$12,000*	*$24,000*	*$156,000*	*$195*	*100%*
				$120,000	*$12,000*	*$24,000*	*$156,000*		*100%*
Design Costs					0%	20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*MU*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Construction Oversight and Air Monitorir*	*LS*	*1*	*$122,586*	*$0*	*$24,517*	*$147,103*	*$147,103*	*67%*
2	*Engineering Design*	*LS*	*1*	*$61,293*	*$0*	*$12,259*	*$73,551*	*$73,551*	*33%*
				$183,879	*$0*	*$36,776*	*$220,654*		*100%*
Grand Total							*$968,169*		

19th Street Station
Alternative 3 Institutional Controls and Soil Removal
Con-Ed
NYC, NY
14th Street Station
AAR

Add Task | Delete Row | Add 1 Blank Row | By: CCD | Rev Date: 10/25/10

Task/Sub Task	Description	Unit		Qty	Rate	Total Cost	
Prime Contractor Costs		NOTE- All costs include contractor Overhead and Profit					
1	**Mobilization**	**LS**		**1**		**$300,000.00**	
	Mobilization	LS		1	100000	$100,000.00	
	Site Preparation and Temporary Facilities	LS		1	200000	$200,000.00	
						$0.00	
2	**Excavation**	**CY**		**1330**		**$172,929.00**	
	Excavation	CY		1330	87	$115,710.00	
	Clean Fill Material	CY		480	13.5	$6,480.00	
	Place and Compact	CY		1596	9	$14,364.00	
	Compaction Testing	EA		3	125	$375.00	
	Landscaping and Restoration	SF		3600.0	10	$36,000.00	
						$0.00	
3	**Excavation Shoring**	**MO**		**1**		**$20,000.00**	
	Modular shoring (Trench Boxes)	MO		1	20000	$20,000.00	
		0	0	0	0	$0.00	
	SUB-TOTAL CONTRACTOR					**$492,929.00**	**$492,929.00**
	Mark-up		0%				**$0.00**
	Contingency		20%				**$98,585.80**
	Total Subcontractor						**$591,514.80**
Other Contracts & Purchases							
1	**Waste Disposal**	**TON**		**800**		**$120,000.00**	
	Transportation and Disposal (RCRA - C Non-Haz)	TON		800	150	$120,000.00	
		0	0	0	0	$0.00	
	SUB-TOTAL OTHER CONTRACTS					**$120,000.00**	**$120,000.00**
	Mark-up		10%				**$12,000.00**
	Contingency		20%				**$24,000.00**
	Total Subcontractor						**$156,000.00**
Design Costs							
1	**Construction Oversight and Air Monitoring**	**LS**		**1**		**$122,585.80**	
	Construction Oversight and Air Monitoring	LS		1	$122,585.80	$122,585.80	
						$0.00	
2	**Engineering Design**	**LS**		**1**		**$61,292.90**	
	Engineering Design	LS		1	$61,292.90	$61,292.90	
						$0.00	
	SUB-TOTAL Design COSTS					**$183,878.70**	**$183,878.70**
	Mark-up		0%				**$0.00**
	Contingency		20%				**$36,775.74**
	Total Design						**$220,654.44**
	GRAND TOTAL						**$968,169.24**