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Alexander B. Grannis
Commissioner

March 1, 2010

Neil O'Halloran, Project Manager
Consolidated Edison Company
31-01 20th Avenue, Bldg. 136
Long Island City, NY 11105-2048

Re: Remedial Investigation Report
Verizon Property
W. 18th St. Works MGP Site, V00530

Dear Mr. O'Halloran:

The New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH) have reviewed the Remedial Investigation Report dated July 22, 2009 for Block 715, Lot 59 (Verizon Building), a portion of the West 18th Street MGP site. Based on our review, the following comments are offered:

1. We disagree with the final conclusion that remedial measures for MGP-related impacts are not warranted. At a minimum, an institutional control does appear to be needed to address MGP-related contamination present on this property. Work should be initiated to develop a site management plan and to secure a deed restriction.

2. Based on the forensic analysis, it appears that the dissolved phase contamination north of the holders is at least primarily related to one or more petroleum spills and that the contamination within the holders is a combination of petroleum and MGP tar contamination. If the contamination to the north of the holders were not present, the contamination within the holders could likely be addressed with an institutional control and a monitoring program to ensure that contamination does not move off-site. Since the contamination is there, it would be very difficult to monitor the north side of the holders to document this.

3. We generally concur with the conclusion that the petroleum-related contamination represents the most significant impact to the vadose zone and shallow groundwater, beyond the immediate vicinity of the holder foundations. However, we recognize that the presence of MGP contamination could potentially complicate remediation of the contamination from the open petroleum spill associated with this property. Note that obtaining cooperation with the property owner to secure an institutional control could be more difficult while the spill remains open.

4. The comments provided herein must be addressed before we can conclusively evaluate the final conclusions and determine whether any active remediation is necessary. However, absent the ability to monitor the potential migration of dissolved phase contamination from the holders, it appears that some

active remediation may be necessary to create either 1) a condition which would ensure that contamination cannot leave the holders or 2) a condition where the monitoring could reasonably be accomplished.

5. The most significant petroleum contamination is primarily in the front of the property, outside the holders (possibly straddling the western holder). That contamination has not been delineated to the north or west. Although the Envirotrac report suggests that this is from an off-site source, there is no evidence provided to support that claim. Absent any evidence to the contrary, the area with the heaviest known contamination is assumed to be the source area.

6. There is clearly both petroleum contamination and MGP contamination inside the holders. Although it would often be assumed that the coal tar would be found at depth (at the base of the holders) and that the petroleum would be more shallow (floating at or near the water table), the forensic analysis indicates that there are areas where each is distributed vertically in the absence of the other. As such, there appears to be no easy way to divide up responsibility for the dissolved-phase contamination within the holders.

7. Page 10 of the Environtrac report indicates that the water level in the holders is now equal with the water level outside. Please discuss the potential for this to have been effected by investigation activity, including grouting procedures used and whether the floor of both holders were penetrated or only one. In addition, the results of groundwater analysis in the cluster wells (A2 A3, B2, B3, C2, C3) need to be addressed. These appear to show the highest levels of VOCs in the deeper wells, in the immediate vicinity of the coal tar.

8. If the groundwater levels inside and outside the holders has equalized, groundwater flow should be reevaluated. A change in groundwater flow could affect off-site migration of MGP contamination and the potential for off-site exposure.

9. There does not appear to be any evidence of recoverable petroleum product or MGP tar within the holders.

10. In section 4.3.4, Figure 7 is referred to as a hydrograph for the 8 wells, but it appears that data from only 5 of the wells is recorded on that figure.

11. Tanks side-gradient to the site (e.g. 456-464 W. 18th Street) should be included in the chart on page 8.

12. Boring logs were not provided for the monitoring wells identified as "MW-xx", with the exception of W-5A and MW-5B. Are those available?

13. In the boring log for Well Cluster A, were there any odors or sheen from 6-12'? Were any odors noted in Well Cluster C from 20 to 21'?

14. The conclusion that groundwater is only impacted by MGP contamination near the base of the holder is contradicted by the forensic analysis at well cluster C.

If you have any questions, please contact me at (518) 402-9686 or at the address listed above.

Sincerely,

William Ottaway, P.E.
MGP Remedial Section
Division of Environmental Remediation

ec: N. O'Halloran , Con Edison
E. Louie, P.E., Con Edison
D. Hettrick, NYSDOH
G. Cross, NYSDEC
S. Carlson, NYSDEC Reg 2
J. O'Connell, NYSDEC Reg 2

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June 3, 2010

**VIA FEDEX OVERNIGHT**

Mr. William Ottaway, P.E.
MGP Remedial Section
Division of Environmental Remediation
Remedial Bureau C, 11th Floor
New York State Department of Environmental Conservation
625 Broadway
Albany, NY 12233

**Re: Remedial Investigation Report**
**Verizon Property**
**W. 18th Street Works MGP Site – V00530**

Dear Mr. Ottaway:

This letter presents the Consolidated Edison Company of New York, Inc.'s (Con Edison's) response to New York State Department of Environmental Conservation "s (NYSDEC's) March 1, 2010 letter regarding the above-referenced *Remedial Investigation Report* (RIR). The RIR was submitted to NYSDEC on May 8, 2009. For ease of review, we have included each of NYSDEC's comments below followed by our response, in italics.

Comment 1: We disagree with the final conclusion that remedial measures for MGP-related impacts are not warranted. At a minimum, an institutional control does appear to be needed to address MGP-related contamination present on this property. Work should be initiated to develop a site management plan and to secure a deed restriction.

*Response:* *Noted - This conclusion will be revised.*

Comment 2: Based on the forensic analysis, it appears that the dissolved phase contamination north of the holders is at least primarily related to one or more petroleum spills and that the contamination within the holders is a combination of petroleum and MGP tar contamination. If the contamination to the north of the holders were not present, the contamination within the holders could likely be addressed with an institutional control and a monitoring program to ensure that contamination does not move off site. Since the contamination is there, it would be very difficult to monitor the north side of the holders to document this.

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*Response:* *We generally agree with the NYSDECs interpretation and approach. Based on the forensics analysis conducted by ARCADIS, the coal tar-related soil impacts inside the holder are limited to the deeper intervals, and the groundwater impacts constrained to the intermediate and deeper intervals. Therefore, the non-MGP related petroleum impacts could be addressed within the shallow zone, and the intermediate and deeper groundwater impacts (and associated deeper soil impacts) could be addressed thru institutional controls and monitoring.*

Comment 3: We generally concur with the conclusion that the petroleum-related contamination represents the most significant impact to the vadose zone and shallow groundwater, beyond the immediate vicinity of the holder foundations. However, we recognize that the presence of MGP contamination could potentially complicate remediation of the contamination from the petroleum spill associated with this property. Note that obtaining cooperation with the property owner to secure an institutional control could be more difficult while the spill remains open.

*Response:* *Noted. It is Con Edison's opinion based on all physical evidence and chemical data presented in the RIR that the largest percentage of impacted soil and groundwater is the direct result of multiple petroleum spills coupled with the regular, documented fluctuation of groundwater levels inside the holders. These conditions produced a significant smearing of petroleum source material throughout the fill material inside the holders, effectively creating a secondary source of petroleum-related VOCs. These water table fluctuations also caused limited mixing of the water in contact with this large zone of petroleum impacted soil with the very limited residual coal tar present in localized lenses in the bottom of the holder.*

*Con Edison concurs with NYSDEC's observation that the owner must cooperate in order to realize any institutional controls, such as deed restrictions, etc. However, given the plethora of evidence for the significant petroleum-related soil and groundwater impacts resulting from post-gas holder operations by the current property owners, Con Edison also recognizes the responsibility of Region 2 NYSDEC to enforce cleanup of such a well documented and prevalent petroleum spill. Towards this end, NYSDEC should be a key participant in any negotiations between Con Edison and the owner.*

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Comment 4: The comments provided herein must be addressed before we can conclusively evaluate the final conclusions and determine whether any active remediation is necessary. However, absent the ability to monitor the potential migration of dissolved phase contamination from the holders, it appears that some active remediation may be necessary to create either: 1) a condition which would ensure that contamination cannot leave the holders; or 2) a condition where the monitoring could reasonably be accomplished.

*Response:* *Noted. As previously discussed, forensic analysis can be used to continue to monitor for dissolved phase migration. Con Edison is also evaluating the feasibility of treating the very limited residual coal tar-related impacts via in-situ chemical oxidation or installing a low-permeability containment barrier inside the holder wall.*

Comment 5: The most significant petroleum contamination is primarily in the front of the property, outside the holders (possibly straddling the western holder). That contamination has not been delineated to the north or west. Although the Envirotrac report suggests that this is from an off-site source, there is no evidence provided to support that claim. Absent any evidence to the contrary, the area with the heaviest known contamination is assumed to be the source area.

*Response:* *Con Edison suggests that the last sentence to this comment be revised to state "...the area with the heaviest known petroleum contamination is assumed to be the source area." In addition, Con Edison also assumes that the previous petroleum releases from the USTs located within the holders on the property are the primary source of petroleum-related impacts to soil and groundwater. The associated petroleum smear zone also acts as a secondary source of impacts.*

Comment 6: There is clearly both petroleum contamination and MGP contamination inside the holders. Although it would often be assumed that the coal tar would be found at depth (at the base of the holders) and that the petroleum would be more shallow (floating at or near the water table), the forensic analysis indicates that there are areas where each is distributed vertically in the absence of the other. As such, there appears to be no easy way to divide up responsibility for the dissolved-phase contamination within the holders.

*Response:* *As presented on Figures 8 and 15, the forensic analysis of soil samples indicated that the soil samples exhibiting a coal tar signature are located in the bottom 5 feet of the holder (i.e., 20 – 25 feet below ground surface). The soil samples collected from the shallow (from 5 – 20 feet bgs) exhibited primarily a gasoline signature. Con Edison concurs that the*

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*groundwater samples collected from the intermediate zone were a mixture of petroleum and MGP-related impacts) as stated in Section 4.5 of the RIR). However, because the source of soil impacts in the shallow and intermediate zones is clearly petroleum-related, the historic (post MGP) petroleum release is therefore the predominant source of shallow and intermediate groundwater impacts.*

Comment 7: Page 10 of the Envirotrac Report indicates that the water level in the holders is now equal with the water level outside. Please discuss the potential for this to have been effected by investigation activity, including grouting procedures used and whether the floor of both holders were penetrated or only one. In addition, the results of groundwater analysis in the cluster wells (A2, A3, B2, B3, C2, and C3) need to be addressed. These appear to show the highest levels of VOCs in the deeper wells, in the immediate vicinity of the coal tar.

*Response:* *As Con Edison has not received or reviewed EnviroTrac's Report, we cannot provide a definitive response to their conclusions. However, taking EnviroTrac's conclusions outside the context of the report, Con Edison does not believe this conclusion to be valid, The basis for this position is that immediately following their completion, all borings whether for installation of a groundwater monitoring well or solely for collection for soil samples, were sealed by tremie grouting or by hydrated bentonite chips. Since Rotosonic drilling was used during advancement of these borings, both of these methods are equally effective for the purpose of sealing the boreholes.*

*Note that localized fluctuations of groundwater that have resulted in incongruous water elevations between the inside and outside of the holders is well documented of the course of several years of gauging by EnviroTrac. Variations of groundwater elevations at this site are likely affected by a variety of factors, including seasonal changes, dewatering activities at nearby construction sites, leakage of utilities (sewer, storm water, or potable water. Note that only two soil borings (SB-D and SB-A) located inside the holders extended beyond the holder bottom. Given the apparent delay of water elevation equilibration inside and outside the holders based on all previous data, it is Con Edison's conclusion that leaky boreholes would not allow equilibration of water head inside and outside the holders and hereby rejects, EnviroTrac's conclusion.*

Comment 8: If the groundwater levels inside and outside the holders has equalized, groundwater flow should be reevaluated. A change in groundwater flow could affect off-site migration of MGP contamination and the potential for off-site exposure.

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*Response:* *As presented in the RIR, none of the soil samples collected indicated the presence of potentially mobile coal tar. Where coal tar-related impacts were observed, the impacts were described primarily as staining or sheens. Because the coal tar NAPL has not been observed as present at concentrations nearing residual saturation, the potential for coal tar NAPL to become mobile is very unlikely. Based on this finding, a change in groundwater flow conditions is unlikely to result in the coal tar NAPL to become mobile. Also please see our discussion of petroleum versus coal tar impacts presented in Response 2 above.*

Comment 9: There does not appear to be any evidence of recoverable petroleum product or MGP tar within the holders.

*Response:* *Noted. However, the absence of recoverable source materials does not minimize the fact that a significant volume of soil has been impacted by petroleum due to the regular fluctuation of the water table which has effectively smeared any petroleum NAPL in a large secondary source material.*

Comment 10: In Section 4.3.4, Figure 7 is referred to as a hydrograph for the eight wells, but it appears that data from only five of the wells is recorded on that figure.

*Response:* *The final report will be revised to note that the hydrograph is for five of the eight wells. As described in Section 4.3.4, the data from five of the wells were considered usable (and were presented on Figure 7). The remaining wells had transducer malfunctions (2) or was lacking survey data and construction details.*

Comment 11: Tanks side-gradient to the site (e.g., 456-464 W. 18$^{th}$ Street) should be included in the chart on page 8.

*Response:* *The final report will be revised to address this comment.*

Comment 12: Boring logs were not provided for the monitoring wells identified as "MW-xx", with the exception of W-5A and MW-5B. Are those available?

*Response:* *Boring logs for monitoring wells installed by Con Edison's consultants were provided in the RIR (MW Clusters A, B & C, and MW-5A and MW-5B). Boring logs were not included for wells installed by others on behalf of Retaco.*

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Comment 13: In the boring log for Well Cluster A, were there any odors or sheen from 6-12"? Were there any odors noted in Well Cluster C from 20-21"?

*Response:* *As presented on the boring logs, a 1 foot zone of staining was observed from 6 to 7 feet bgs as documented on the Well Cluster A boring log. No odors were recorded; however, elevated PID readings were recorded from 10 to 17 feet bgs, indicating a large petroleum smear zone. Odors were not noted in Well Cluster C from 20 – 21 feet bgs.*

Comment 14: The conclusion that groundwater is only impacted by MGP contamination near the base of the holder is contradicted by the forensic analysis at well Cluster C.

*Response:* *See our previous responses to comments 2, 3, 5, 6, 9, and 13.*

Very truly yours,

Neil O'Halloran
Project Manager

/jlc

cc: Eddy Louie, Con Edison
Mike Wilken, Esq., Con Edison
Gardiner Cross, NYSDEC
Dawn Hettrick, NYSDOH
Sarah Carlson, NYSDEC Region 2
Jane O'Connell, NYSDEC Region 2

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# Remedial Investigation Report

West 18th Street Former Gas Works
Block 715 Lot 59

May 2009

ARCADIS



Keith White, C.P.G.
Principal Geologist



Margaret Carrillo-Sheridan, P.E.
Vice President

**Remedial Investigation Report**

West 18th Street Former Gas Works
Block 715 Lot 59

Prepared for:
Consolidated Edison Company of New York, Inc.

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## Acronyms and Abbreviations

| | |
|---|---|
| AOC | area of concern |
| AST | aboveground storage tank |
| AWQS | Ambient Water Quality Standard |
| bgs | below ground surface |
| BTEX | benzene, toluene, ethylbenzene and xylene |
| CN | cyanide |
| CO | carbon monoxide |
| COC | constituent of concern |
| Con Edison | Consolidated Edison Company of New York, Inc. |
| DO | dissolved oxygen |
| DOT | Department of Transportation |
| DNAPL | dense nonaqueous-phase liquid |
| DUSR | data usability summary report |
| EDD | electronic data deliverable |
| EDR | Environmental Data Resources Inc. |
| EnviroTrac | EnviroTrac Ltd. |
| ESA | Environmental Site Assessment |
| Gasoline Installations | Gasoline Installations, Inc. of Inwood, New York |
| GC | gas chromatograph |
| HASP | *Health and Safety Plan Former West 18th Street Works Manhattan, New York VCA Site #00530* |

| | |
|---|---|
| $H_2S$ | hydrogen sulfide |
| ID | inside diameter |
| IDW | investigation-derived waste |
| Langan | Langan Engineering |
| LEL | Lower Explosive Limit |
| LNAPL | light nonaqueous-phase liquid |
| LUST | leaking underground storage tank |
| MGP | manufactured gas plant |
| MTBE | methyl tert-butyl ether |
| NAPL | nonaqueous phase liquid |
| NAVD 1988 | North American Vertical Datum of 1988 |
| NYSDEC | New York State Department of Environmental Conservation |
| $O_2$ | oxygen |
| OLM | oil-like material |
| ORP | oxidation-reduction potential |
| OVM | organic vapor meter |
| PAH | polycyclic aromatic hydrocarbon |
| PIANOS | paraffins, isoparaffins, aromatics, naphthenes, olefins and sulfur heterocyclic hydrocarbons |
| PID | photo ionization detector |
| ppb | parts per billion |
| ppm | parts per million |

| | |
|---|---|
| property | Block 715, Lot 59 of the site |
| PSC | Public Service Commission |
| psi | pounds per square inch |
| QAPP | Quality Assurance Project Plan |
| QA/QC | quality assurance/quality control |
| report | *Remedial Investigation Report* |
| Retaco | Retaco Holding Corporation |
| RI | remedial investigation |
| RIWP | *Remedial Investigation Work Plan* |
| RSCO | Recommended Soil Cleanup Objective |
| Sanborn | Sanborn Fire Insurance map |
| SCO | Soil Cleanup Objective |
| SCS | Site Characterization Study |
| site | West 18$^{th}$ Street Former Gas Works, in Manhattan, New York |
| SOP | Standard Operating Procedure |
| Subsurface Investigation Report | *Subsurface Investigation Report Former Parking Garage 438 W. 18$^{th}$ Street New York New York NYSDEC # 01-03363* |
| STARS | Spill Technology and Remediation Series |
| SVOC | semivolatile organic compound |
| TA | Test America Laboratories |
| TCL | Target Compound List |

| | |
|---|---|
| TPH-D | total petroleum hydrocarbons as diesel |
| TRC | TRC Environmental Corporation |
| USEPA | United States Environmental Protection Agency |
| UST | underground storage tank |
| VCA | Voluntary Cleanup Agreement |
| Verizon | Verizon Communications |
| VOC | volatile organic compound |
| Worldwide | Worldwide Geosciences, Inc. |
| µg/kg | micrograms per kilogram |
| µg/L | micrograms per liter |

## Executive Summary

In 2002, Consolidated Edison Company of New York, Inc. (Con Edison) entered into a Voluntary Cleanup Agreement (VCA) with the New York State Department of Environmental Conservation (NYSDEC). Under the agreement, Con Edison agreed to investigate and, if necessary, remediate former manufactured gas plant (MGP) sites that were operated by its predecessor companies. One such site is the18th Street Former Gas Works, in Manhattan, New York (the site). The Remedial Investigation (RI) described in this Remedial Investigation Report (report) relates to a portion of that site. From approximately 1845 to 1914, Block 715, Lot 59 of the site (the property) housed two gas holders on a 20,700-square-foot (½ acre) lot located east of (and disconnected from) the main operations area of the former MGP. Con Edison is currently preparing a separate RI report that addresses the entire site, including the property. This report has been completed in advance of the site-wide RI to support pending remediation decisions related to MGP and post-MGP impacts to the property, as described below.

### Background

Historically, the property was used for a variety of purposes. A predecessor company operated two gas holders at the property for nearly 70 years. The gas holders were used to store coal gas generated at the nearby former gas plant to the west. With the end of MGP operations, the holders were razed and the property was redeveloped as a commercial garage housed in a single building that covers nearly the entire property. At some time prior to 1993, six underground storage tanks (USTs) that contained various petroleum products including gasoline and diesel fuel were installed. These six USTs were removed in December 1993. At present, the property is owned by Retaco Holding Corporation, who leases it to Verizon Communications for use as a service garage.

Multiple environmental investigations have been performed at the property by the owner and Con Edison. In 2001, the owner initiated a site investigation to evaluate apparent releases of petroleum from the USTs. The owner's investigation, which is ongoing, entailed drilling 12 soil borings, installing 13 groundwater monitoring wells, and collecting and analyzing soil and groundwater samples. Since 2004, Con Edison conducted several rounds of investigation at the property to characterize potential impacts due to the former MGP, culminating in this report. The first investigation, referred to as the Site Characterization Study, was part of a larger, preliminary investigation of the entire former MGP. The second investigation consisted of the work required to complete this RI. In total, nine soil borings were drilled, four well clusters

were installed and two test pits were excavated. The boring and wells were completed to characterize the nature and extent of MGP-related impacts to the property. The test pits were excavated to determine if remnants of the former gas holder foundations were present in the subsurface.

**Findings**

Findings of the RI activities conducted at the property are summarized below:

- The water table at the property averages about 8 feet below ground surface, but varies significantly though time. Major fluctuations in the water table (as much as 8.5 feet inside the holders and 4.5 feet outside the holders) are interpreted to reflect on-property and/or off-property changes in recharge and/or pumping.

- The subgrade portions of the gas holders remain and contain groundwater at levels typically higher than the surrounding water table.

- Leaking utilities, such as water lines and drains, are the most likely source of ongoing recharge to the holders.

- Water inside the holders is inferred to mix with water outside the holders by moving through cracks, and other localized penetrations or breaches in the holder walls.

- Documented releases of petroleum from the former USTs have created a “smear zone” in subsurface soils by floating on, and rising/falling with, the water table.

- The concentrations of selected petroleum-related compounds in some soil and groundwater samples in and near the smear zone exceed applicable criteria.

- MGP-related impacts to soil and groundwater are generally limited to near the bottoms of the holders, where localized deposits of residual coal tar are present. No evidence of potentially mobile coal tar was found, and no coal tar was identified outside the holders.

## Conclusions

Based on the results of RI activities conducted at the property, ARCADIS presents the following conclusions:

- Former USTs located inside the east holder foundation are a source of the petroleum hydrocarbons observed in soil and shallow groundwater. Based on the distribution of petroleum impacts, the presence of other unidentified leaking USTs cannot be ruled out.

- Impacts to the vadose zone and shallow groundwater are limited to petroleum products. Large fluctuations in the water table appear to have produced a smear zone of petroleum impacts.

- MGP residuals on the property do not pose a meaningful exposure risk to humans given their depth below the water table, and have only a localized effect on groundwater quality.

No further investigation or remedial actions are required to address MGP-related impacts.

# 1. Introduction

This *Remedial Investigation Report* (report) summarizes the findings for a remedial investigation (RI) conducted on a portion of the West 18th Street Former Gas Works, in Manhattan, New York (the site). This report describes work completed at Block 715, Lot 59 (the property), a parcel in the western portion of the site. The RI was conducted by ARCADIS on behalf of the Consolidated Edison Company of New York, Inc. (Con Edison) as part of the site-wide remedial investigation.

## 1.1 Project Background

Con Edison conducted the RI for the site in accordance with New York State Department of Environmental Conservation (NYSDEC) Voluntary Cleanup Agreement (VCA) No. D2-0003-02-08. This report is being submitted in advance of the Site-wide RI Report for the entire West 18th Street Former Gas Works Site. It has been prepared to provide insight into site subsurface conditions as they relate to pending and ongoing remediation decisions for impacted groundwater and soil associated with the former underground storage tanks (USTs) and the historical operations of two gas holders at the property. The information presented in this report will be summarized in the Site-wide RI Report for the W. 18th St. Former Gas Works Site.

Con Edison conducted an initial investigation of the site from 2004 to 2005 via the Site Characterization Study (SCS). Results of the SCS were presented in the Site Characterization Report prepared by TRC Environmental Corporation (TRC) in 2006 (TRC 2006a). The SCS found that soil and groundwater beneath several areas of the property had been impacted by former manufactured gas plant (MGP) operations and other sources, such as leaking underground storage tanks (LUSTs). Based on these findings, and in accordance with the terms of the VCA, Con Edison initiated an RI for the site (including the property). A *Remedial Investigation Work Plan* (RIWP) was prepared by TRC (TRC 2006b) and submitted to the NYSDEC in January 2006. The NYSDEC approved the RIWP in April 2006.

## 1.2 Remedial Investigation Objectives

The objectives of the RI, as outlined in the RIWP (TRC 2006b), were to:

- delineate the horizontal and vertical extent of MGP-impacted soil and groundwater identified during the SCS

- determine if soil and/or groundwater conditions pose an acute health risk and if so, whether the conditions warrant implementation of interim remedial measures

- provide sufficient data with which to develop a proposed site remediation strategy, if necessary

The project objectives outlined above were achieved at the property by conducting the following activities:

- installing soil borings to further evaluate subsurface conditions, for collection and analysis of soil samples, to further delineate subsurface geology and to further delineate the areas of the site containing MGP-affected soil, as identified during the SCS

- installing shallow (water table) groundwater monitoring wells and shallow/deep groundwater monitoring well clusters

- measuring groundwater elevations to clarify groundwater flow direction

- evaluating the presence of nonaqueous phase liquids (NAPLs) in the subsurface

- collecting groundwater samples from the complete groundwater monitoring well network for laboratory analysis

The RIWP (TRC 2006b) specified the number, type and location of samples and the protocols and procedures that were used during the RI. It is noted that the RI for the site is ongoing; however, soil and groundwater activities at the property have been completed, as discussed in this report.

### 1.3 Report Organization

This report is organized as follows:

- **Section 1, Introduction**, discusses the project background and objectives.

- **Section 2, Property Background**, describes the property, a history of property operation and ownership, and the previous investigations.

- **Section 3, Remedial Investigation Activities**, discusses the activities performed during this RI.

- **Section 4, Remedial Investigation Results**, presents field and analytical data collected during the RI; the conceptual model of the property subsurface based on the SCS and RI field observations, measurements and data; and a comparison of analytical data to applicable cleanup objectives.

- **Section 5, Conclusions**, summarizes the findings of the RI and the conclusions drawn.

## 2. Property Description and History

### 2.1 Property Description

The site is located in the Borough of Manhattan, New York (see Figure 1). The former MGP covers portions of five modern city blocks, parts of Route 9A and parts of the Chelsea Pier Entertainment Complex along the Hudson River bulkhead. The portion of the site that is the focus of this investigation (the property) is Block 715, tax Lot 59, which is a small parcel located along the south side of West 18th Street, between 9th and 10th Avenues.

Block 715, Lot 59 (aka 442 West 18th Street) is currently owned by Retaco Holding Corporation and is leased to Verizon Communications (Verizon). Verizon uses the property for equipment storage, vehicle storage and office space. According to the current New York City tax map, the lot is rectangular with dimensions of 225 feet along West 18th Street and 92 feet perpendicular to West 18th Street. The lot is completely covered by a 2-story brick building. Each story has a concrete floor. Access to the second story is via a concrete ramp located on the eastern side of the property.

The property is classified by New York City as 07 land use, zoned commercial (C6-3) and is part of the special West Chelsea district. Residential and commercial properties are located adjacent to the property. The property is relatively flat, with ground elevations outside the building (on the adjacent sidewalk) of approximately 11.5 feet Relative Mean Sea Level (RMSL)[1]. The slab floor inside the building is approximately 2.5 feet higher than street level.

### 2.2 Operational History of Site – MGP Operations

The following operational history of the property is based on a variety of sources, cited below, including Sanborn Fire Insurance Maps. The available Sanborn map coverage for the property is included in Appendix A. MGP operations began at the site in 1834. The West 18th Street Gas Works was the second gas plant built in New York City, and the first erected by the Manhattan Gas Light Company. Construction of the West 18th Street Gas Works began during fall 1833, and continued for the next year. By November 1834, the plant was manufacturing and distributing coal gas to customers (Collins 1934). During the nineteenth century, the West 18th Street Gas

[1] All elevations presented in this report are based on the North American Vertical Datum of 1988 (NAVD 88).

Works grew in size as the Manhattan Gas Light Company continued to purchase land and construct additional facility structures.

In 1845 and 1846, the Manhattan Gas Light Company purchased lots on Block 715 (including the property) and built two gas holders, enclosed in a brick warehouse-type structure along the south side of West 18th Street. According to historical records, the lots appeared to include the addresses of 438, 440 and 454 West 18th Street. The gas holders were each approximately 84 feet in diameter and had a storage capacity of approximately 205,000 cubic feet of gas each (Public Service Commission [PSC] 1909 and Collins 1934). Additional historical information during the period of MGP operations is summarized below:

- 1852 – The earliest map depicting the property illustrates a rectangular-shaped building occupying the south side of West 18th Street between 9th and 10th Avenues (Dripps 1852). As noted above, this building enclosed the two gas holders.

- 1859 – The Manhattan Gas Co. Gas Holder House is depicted along with a stable (Perris and Browne 1859).

- 1870s – In the early 1870s, the two gas holders on the property were replaced (PSC 1909 and Collins 1934). The 1895 Sanborn Fire Insurance map (Sanborn) indicates that the two gas holders occupied 440 and 454 West 18th Street. A store house and three unidentified structures are present on 438 and 440 West 18th Streets. The 1904 Sanborn map identifies the three unidentified structures as paint shops.

- 1885 – The Manhattan Gas Light Co. sold Tax Lots 51 and 59 to the Consolidated Gas Company.

- 1895 – Two gas holders associated with the Consolidated Gas Company are depicted between 440 and 454 West 18th Street (Sanborn 1895). The stable is now identified as a Store House and is located between 438 and 440 West 18th Street. Three unidentified structures are located at 438 West 18th Street.

- 1897 – The Consolidated Gas Company occupies Block 715, Lot 59 (Bromley 1897). The shaded area depicting the Consolidated Gas Company includes 200 feet of property along West 18th street south of 456 West 18th Street, in addition to the area of the Store House identified above. The property (438 West 18th Street)

containing the three unidentified structures noted above is identified as Block 715, Lot 51. Lot 51 is illustrated as measuring 25 feet wide.

- 1899 – The property has the same configuration as in 1897 (Bromley 1897).

- 1904 – Two gas holders of the Consolidated Gas Company are depicted (Sanborn 1904). The two gas holders, each with a capacity of 200,000 cubic feet, are contained inside a single 1-story brick building. The Store House remains and the unidentified structures at 438 West 18th Street (noted above) are identified as paint shops.

- 1911 – The property has the same configuration as in 1899 (Bromley 1911).

- 1914 – The gas holders on the property were razed.

### 2.3 Operational History of Site – Post-MGP Operations

The following summarizes the post-MGP ownership and use of the property:

- 1916 – The Consolidated Gas Company property occupies Block 715, Lot 59.

- 1920 – The Commercial Garage Co. occupies Block 715, Lot 59, which is illustrated as a rectangular property extending from 440 to 438 – 454 West 18th Street (Bromley 1920). The lot size along West 18th Street is noted as 225 feet.

- 1921 – A garage occupies the property from 442 to 454 West 18th Street (Sanborn 1921). Ten wire-glass skylights are located along the south side of the Garage. The map notes that the garage has a capacity of 235 cars. Four 500-gallon buried gasoline tanks are noted along the eastern half of the site.

- 1944 – Consolidated Gas Company sells Lot 59 to 440 West 18th St. Realty Corporation.

- 1965 – The National Auto Renting Company, Inc. becomes a tenant of the property.

- 1969 – Avis Truck Rental is depicted as the tenant (Sanborn 1969). The notation "Built 1915" indicates that a second floor may have been added to the property

after the gas holders were removed. A ramp to the second floor is shown at the location corresponding to 438 West 18th Street. An auto repair and boiler room are shown at 440 West 18th Street.

- 1975 – No changes are depicted on the 1975 Sanborn map (Sanborn 1975).

- 1979 – The property is identified as a taxi garage (Sanborn 1979). The auto repair facility is not shown. The buried gasoline tanks are not shown. All of features remain the same as depicted in 1975.

- 1980 – No changes are depicted on the 1980 Sanborn map (Sanborn 1980).

- 1983 – The property is sold to Retaco Holding Corporation (Retaco). No changes are depicted on the 1983 Sanborn map (Sanborn 1983).

- 1985 – No changes are depicted on the 1985 Sanborn map (Sanborn 1985).

- 1993 – Six USTs were removed from the property on December 12, 1993 (EnviroTrac Ltd. [EnviroTrac] 2001). Among the USTs were five 550-gallon gasoline tanks and one 4,000-gallon diesel fuel tank. The gasoline tanks were located under the northeast corner of the garage building and the diesel tank was located along the west side of the building (EnviroTrac 2001). Note that, based on personal communication between Con Edison and the current property owner (Retaco), Retaco believes the diesel tank was located on the east side of the property. The tanks were removed by Gasoline Installations, Inc. of Inwood, New York (Gasoline Installations) and, according to a notarized affidavit from December 28, 1993, no evidence of soil contamination was observed during removal of the USTs (EnviroTrac 2007). The final disposition of the USTs is unknown.

- 2001 – EnviroTrac Ltd. (EnviroTrac) of Ronkonkoma, NY, on behalf of Verizon, investigated suspect contaminated soil at the site in June 2001 (EnviroTrac 2001). Petroleum-impacted soil was identified and a Verizon representative contacted the NYSDEC Spill Hotline. The property was assigned Spill No. 01-03363 as a result of this incident.

### 2.4 Environmental Records Search Summary

An Environmental Data Resources Inc. (EDR) Radius Map™ Report (EDR 2009) was reviewed to identify documented spills/releases as well as registered USTs and

aboveground storage tanks (ASTs) in the vicinity of the property. The complete EDR report is provided as Electronic Attachment 1.

A review of the New York Leaking Storage Tank Incident Reports (LTANKS) section of the January 2009 EDR report indicated six documented petroleum spills located topographically upgradient and within approximately ¼ mile of the property. Note that each documented spill was located more than 0.125 miles (i.e., approximately 600 feet) from the property. The following table lists the location, NYSDEC spill number, spill date, closure date and distance/direction from the property for each of the documented spills.

| Location | Spill ID | Spill Date | Closure Date | Distance (miles)/ Direction |
|---|---|---|---|---|
| 166-35 9th Avenue | 8803864 | Not reported | 09/30/92 | 0.14 ENE |
| 415 W. 21st Street | 9412289 | 12/14/94 | 12/14/94 | 0.15 NE |
| 415 W. 21st Street | 9411689 | 12/02/94 | 12/02/94 | 0.15 NE |
| 440 West 22nd Street | 0512757 | 02/03/06 | 03/10/06 | 0.19 NE |
| 310 West 18th Street | 9612959 | 02/01/97 | 02/09/00 | 0.25 ESE |
| 308 West 18th Street | 9511332 | 12/07/95 | 12/08/95 | 0.25 ESE |

**Notes:**
ENE = East-northeast.
NE = Northeast.
ESE = East-southeast.

Additional information on spills and releases near the property is presented in Electronic Attachment 1.

The following table lists the location of in-service USTs or ASTs located topographically upgradient and within ⅛ mile of the property.

| Location | UST/AST | Distance (miles)/ Direction |
|---|---|---|
| 435 West 18th Street | UST | 0.01 ESE |
| 440 West 19th Street | UST | 0.05 NNE |
| 458 West 20th Street | AST | 0.1 N |
| 110 9th Avenue | AST | 0.1 SE |
| 422 West 20th Street | AST | 0.12 NNE |

**Notes:**
NNE = North-northeast.
N = North.
SE = Southeast.

### 2.5 Previous Investigations

Several investigations and monitoring programs have been completed at the property that primarily focused on the known petroleum impacts. The findings of these investigations are summarized below. Copies of all available investigation reports and monitoring data are provided on the CD that accompanies this report.

#### 2.5.1 2000 – Phase I Environmental Site Assessment

Langan Engineering (Langan) completed a Phase I Environmental Site Assessment (ESA) of the property in 2000. The report for this investigation is not available; however, the findings were later summarized in the *Subsurface Investigation Report Former Parking Garage 438 W. 18th Street New York New York NYSDEC # 01-03363* (Subsurface Investigation Report) prepared by EnviroTrac (EnviroTrac 2001). During the Phase I ESA, Langan is reported to have identified five areas of concern (AOCs) including the former USTs, former hydraulic lift system, floor drains, previous property use and asbestos-containing insulation.

#### 2.5.2 2001 – Property Renovation and Construction

In 2001, EnviroTrac observed and documented excavation activities that were conducted on the first floor of the property under the direction of Tishman Interiors. The following activities and observations were noted by EnviroTrac and are discussed in the Subsurface Investigation Report (EnviroTrac 2001):

- During construction activities, EnviroTrac noted that a rectangular excavation area, measuring approximately 20 feet by 17 feet wide and 6 feet deep, was located along the north side of the property near the current elevator shaft. Trenches to accommodate future drainage pipes were also excavated throughout the first floor of the property. Trenches measured approximately 3 feet wide and 1- to 4-feet deep.

- EnviroTrac noted the presence of conduits and pipes protruding into the south end of the excavation approximately 1 to 3 feet below the garage floor.

- On June 28, 2001, EnviroTrac (on behalf of Verizon) identified petroleum-impacted soil during renovation and construction activities at the property. As a result, Verizon contacted the NYSDEC Spill Hotline. The NYSDEC assigned spill number 01-03363 to this release.

- Photo ionization detector (PID) readings taken by EnviroTrac along the excavation walls ranged from 33 parts per million (ppm) to 403 ppm. A PID reading of 634 ppm was observed in one of the trenches. The location of this reading is unknown.

- Based on the PID readings, EnviroTrac collected five soil grab samples for laboratory analysis of volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs). Two grab samples (G-1 and G-2) were collected from within the excavation and three grab samples (G-3, G-4 and G-5) were collected within the trenches. In addition, one groundwater sample was collected from the base of the excavation for VOC and hydrocarbon fingerprint analysis.

- The highest total VOC concentration in soil (34,481 micrograms per kilogram [µg/kg]) was detected in G-1, located at the base of the excavation. VOCs were also detected in G-3 and G-4. SVOCs were detected in each soil sample. The levels of several VOCs and SVOCS in these three samples exceed their respective Spill Technology and Remediation Series (STARS) criteria (NYSDEC, 1992). Methyl tert-butyl ether (MTBE), a gasoline additive, was detected in G-3; but did not exceed its STARS criterion.

- Fingerprint analysis of the groundwater indicated a match with gasoline.

- On July 12, 2001, EnviroTrac removed and disposed of 85¼ tons of nonhazardous petroleum-impacted soil from the excavation area and trenches. Soil was disposed of at the Soil Remediation of Philadelphia facility located in Philadelphia, Pennsylvania.

- Confirmation samples outside of the excavated areas were not collected.

#### 2.5.3 2001 – Subsurface Site Investigation

In August 2001, EnviroTrac was retained by Retaco to conduct a subsurface investigation at the property. Results of the subsurface site investigation are presented in the Subsurface Investigation Report (EnviroTrac 2001) and summarized below:

- The objective of the investigation activities was to delineate the petroleum-contaminated soil and groundwater at the property.

- A GeoProbe® drill rig was used to advance 12 soil borings (B-1 through B-12, see Figure 2 for locations) to a depth of 8 feet below grade; except B-1, which is reported to have been drilled to a depth of 12 feet. One soil and one groundwater sample were collected and analyzed for VOCs and SVOCs from each soil boring. Note that, although the report indicates that the groundwater samples were collected at depths ranging from 8 to 14 feet bgs, none of the borings appear to have been drilled to that depth.

- Sample results showed that VOCs and SVOCs in soil were detected above NYSDEC TAGM 4046 Soil Cleanup Objectives (SCOs) in nine of the 12 borings. Total VOC concentrations ranged from nondetect in sample B-12 (8 feet bgs) to 235,000 micrograms per kilogram (µg/kg) in sample B-6 (8 feet bgs).

- MTBE was detected in two soil samples: B-5 at 8 feet bgs and B-7 at 8 feet bgs, at 138 ug/kg and 9.7 ug/kg, respectively. The sample at B-5 exceeded the relevant STARS criterion for MTBE of 120 ug/kg (NYSDEC, 1992). Groundwater analytical results indicated that VOCs in all samples exceeded their respective Ambient Water Quality Standard (AWQS; NYSDEC, 1998).

- Total VOC concentrations in groundwater ranged from 27.8 µg/L in B-1 (14 feet bgs) to 117,396 µg/L in B-12 (12 feet bgs). The BTEX compounds, along with isoproylbenzene, 1,3,5-trimethylbenzene, n-propylbenzene, 1,2,4-trimethylbenzene, MTBE were the predominant VOCs, found in 8 of the 11 samples collected

- MTBE was detected in each groundwater sample, with concentrations ranging from 23 µg/L in B-1 (14 feet bgs) to 2,205 µg/L in B-12 (12 feet bgs).

- EnviroTrac recommended additional soil and groundwater sampling to delineate the extent of soil impacts for remedial design.

- An additional 60 cubic yards (estimated 90 tons) of petroleum-impacted soil were excavated from the property in August and September 2001[2]. The impacted soil was disposed at AB Oil Service by National Waste Disposal Corporation.

[2] EnviroTrac (2001) makes no mention of post-excavation sampling.

2.5.4 2001 Monitoring Well Installation

In December 2001, EnviroTrac installed 10 monitoring wells at the property on behalf of Retaco (Figure 2). Monitoring well construction details were not provided to ARCADIS; however, well gauging conducted in 2008 indicated that wells were completed to depths from 13 feet to 15 feet bgs and were likely screened across the water table. Water levels and product thickness gauging was completed on January 10, 2002, January 18, 2002, and March 6, 2002. Groundwater samples were collected on January 18, 2002 and March 6, 2002. Results of the groundwater sampling and monitoring are provided in the *Update Report December 2001 through January 2002 Retaco Holding Corporation 438 West 18th Street New York, NY* (EnviroTrac 2002), and summarized below:

- The water table depth ranged from approximately 4 to 12 feet bgs (equivalent to approximately 0.7 to 8.2 feet RMSL, based a revised survey completed for Con Edison in 2007.

- Light nonaqueous-phase liquid (LNAPL) was detected in MW-8 during each round of gauging. The LNAPL thickness increased from 0.01 feet on January 10, 2002 to 0.12 feet on March 6, 2002.

- The highest total VOC and total SVOC concentrations were detected in MW-8 (54,931 µg/L and 5,624,770 µg/L, respectively).

- MTBE was detected at least once in each monitoring well. Detected MTBE concentrations ranged from 24.3 µg/L in MW-7 to 1,980 µg/L in MW-4.

2.5.5 2002 Fingerprint Analysis

In October 2002, EnviroTrac collected and submitted one NAPL sample from MW-8 to Worldwide Geosciences, Inc. (Worldwide) of Houston, Texas for fingerprint analysis. Worldwide concluded that the sample represented a residual 15 percent fraction of unleaded gasoline (Worldwide 2003). Worldwide also concluded the following:

> *"If coal tar derived, the hydrocarbon assemblage dissolved in this water sample would be dominated by naphthalene, methyl naphthalenes, and heavier unsubstituted polynuclear aromatic hydrocarbons. This is not the case. The naphthalene and methylnaphthalene peaks are minor peaks. The chromatographic signature shows no heavier polynuclear*

*aromatic peaks, which would elute beyond or to the right, of the methylnaphthalene peaks. There is no indication of a coal tar contribution to the MW-8 sample."*

### 2.5.6 2004 Groundwater Sampling

EnviroTrac collected groundwater samples from each of the monitoring wells in January 2004. Samples were submitted to South Mall Analytical Labs, Inc. of Plainview, NY for VOC analysis. A review of the analytical reports indicates that VOCs (including MTBE) were detected in groundwater samples collected from each of the wells sampled. MTBE concentrations ranged from 105 µg/L in MW-1 to 543 µg/L in MW-5.

### 2.5.7 2005 Monitoring Well Installation

In February 2005, EnviroTrac installed three additional monitoring wells (MW-11, MW-12 and MW-13) at the property on behalf of Retaco. Wells MW-11 and MW-12 are located on the sidewalk adjacent to the property and MW-13 is located on the north side of West 18th Street across from the property. Each well is screened across the water table. Note that at the time of the RI, MW-13 was not accessible due to ongoing construction activities across from the property (Tax Block 716, Lot 9).

Results of the monitoring well installation and groundwater sampling are provided in the Subsurface Investigation Report (EnviroTrac 2005) and summarized below:

- Groundwater samples were collected from MW-8, MW-11, MW-12 and MW-13 and submitted for VOC and SVOC analysis. VOCs, including MTBE were detected in MW-8, MW-11 and MW-13. Only MTBE was detected in MW-13.

- Naphthalene was the only polycyclic aromatic hydrocarbon (PAH) detected in the monitoring wells sampled.

- The water table depth ranged from approximately 6 to 13 feet bgs (equivalent to approximately 0.5 to 7.1 feet RMSL, based a revised survey completed for Con Edison in 2007). Groundwater gauging indicated no measureable "product" in any of the wells.

- MW-6 was not sampled because it had been previously abandoned. The well was reported to have periodically overflowed. This phenomenon is interpreted to reflect

an efficient connection to a leaking drain pipe, which the drill rig may have nicked during installation. It is noted that of the wells installed at the property, MW-6 is the only one known to have overflowed, though all wells installed by EnviroTrac were similarly screened across the water table.

- EnviroTrac concluded "…*that off-site sources are responsible for the groundwater contamination beneath the site*."

- The EnviroTrac (2001) report provides the first mention (among previously submitted reports) that the property was formerly part of an MGP.

EnviroTrac submitted the Subsurface Investigation Report to the NYSDEC Region 2 for review and comment on April 1, 2005 (EnviroTrac 2005). The NYSDEC's response comments were provided in a letter dated May 26, 2005, and are summarized below:

- The NYSDEC disagrees with EnviroTrac's conclusion regarding the source of contamination being from off site and not from beneath the site.

- The NYSDEC believes that the wells with the greatest groundwater impacts (MW-8 and MW-11) are located downgradient of the former USTs.

- The NYSDEC concluded "*that the subject spill is the result of petroleum contamination associated with the five 550-gallon USTs and one 4000-gallon diesel UST at the site – and not the result of the MGP process"* (NYSDEC 2005).

#### 2.5.8 2007 Groundwater Sampling

EnviroTrac collected groundwater samples from MW-1 through MW-5 and MW-7 through MW-12 in March 2007 on behalf of Retaco. Samples were submitted to EcoTest Laboratories, Inc. of Babylon, NY for VOC and SVOC analysis. Results of the groundwater sampling are provided in the *Status Report Former Parking Garage 438 West 18th Street New York, New York NYSDEC # 01-03363* (EnviroTrac 2007), and are summarized below:

- Elevated concentrations of VOCs and SVOCs were detected in each well that was sampled.

- MTBE was detected in MW-1 through MW-5 and MW-10 through MW-12 at concentrations ranging from 18 µg/L in MW-4 to 390 µg/L in MW-11. While there is

no NYSDEC AWQS for MTBE, there is a guidance value, which is 10 µg/L (NYSDEC, 1998).

- Note that MTBE was not detected in MW-8 or MW-9; however, the detection limit for MTBE for these samples was 500 µg/L due to the elevated concentrations of other VOCs, including the benzene, toluene, ethylbenzene and xylene (BTEX) compounds, isopropylbenzene, n-propylbenzene, 1,3,5,-trimethylbenzene, 1,2,4,-trimethylbenzene, sec-butylbenzene and naphthalene that were present in the samples.

- PAHs were detected in each groundwater sample. Except for naphthalene and 2-methylnaphthalene, the concentration of detected PAH compounds was less than or equal to 10 µg/L.

- "Free product" was not detected in any of the monitoring wells.

## 3. Remedial Investigation Activities

This section presents the methodologies used during the field investigation of the property, as part of Con Edison's ongoing site-wide RI.

ARCADIS conducted the majority of the RI activities between August 2008 and December 2008. Relevant investigations of the property were also performed for Con Edison during the 2004 to 2005 site characterization. The scope and specific methods of the SC were reported in the Site Characterization Report (TRC 2006a), included as an Electronic Attachment 2).

Specific activities completed as part of the RI of the property to meet the objectives listed in Section 1 included:

- underground utility clearance
- community air monitoring
- subsurface soil investigation
- groundwater monitoring
- field survey
- management of investigation-derived waste (IDW)
- data validation

Each of these activities is discussed in the following subsections.

Several subcontractors performed various services during the RI of the property, as presented in the table below.

| Subcontractor | Office Location | Service Provided |
|---|---|---|
| Summit Drilling Company, Inc. | Bound Brook, NJ | Utility clearance |
| Naeva Geophysics | Congers, NY | Utility clearance |
| Boart Longyear Corp. | North Reading, MA | Rotary sonic drilling |
| Alpha Analytical – Woods Hole | Mansfield, MA | Analytical services |
| Test America Laboratories | Shelton, CT | Analytical services |
| Munoz Engineering, P.C. | New York, NY | Surveying |
| Clean Earth of North Jersey | South Kearny, NJ | Waste transport and disposal |

All work conducted during the RI was completed in general conformance with the following documents:

- *Draft DER-10 Technical Guidance for Site Investigation and Remediation* (NYSDEC 2002)
- RIWP (TRC 2006b)
- *Remedial Investigation Letter Work Plan for the West 18th Street Former Gas Works* (ARCADIS 2008)
- *Field Sampling Plan for the Remedial Investigation of the Former West 18th Street Works* (TRC 2006)
- *Health and Safety Plan Former West 18th Street Works Manhattan, New York VCA Site #00530* (HASP; ARCADIS 2006)

### 3.1 Underground Utility Clearance

Prior to initiating intrusive investigation activities, sample locations were cleared in accordance with Con Edison's utility clearance procedures. As an initial step, the New York City "One Call" organization was contacted to request utility mark-outs in accordance with Code 753, a minimum of 3 working days prior to the start of fieldwork. All mark outs by Code 753 participating companies were completed in the specified timeframes in advance of all field-intrusive activities. Renewal calls were made in accordance with the timeframes allowed in the regulations.

Subsequent to completion of the Code 753 mark outs and review of NYCDEP drawings and Con Edison utility plates for gas and electric service, the inside of the building was inspected to determine the distribution/layout of the various utilities that were identified entering the building as well as building-specific utilities (e.g., roof and or floor drains).

As an added precaution for worker safety and to minimize the potential for damage to subsurface utilities, proposed boring locations were cleared by nonmechanical means (e.g., hand digging and vacuum extraction). Soil was excavated, typically to a minimum depth of 5 feet bgs, by nonmechanical means to physically confirm the presence/ absence of subsurface utilities at each of the proposed boring locations. If proposed sample locations were determined to be too close to subsurface utilities to safely

conduct the field investigations, the boring was relocated to achieve the same investigative objective

### 3.2 Community Air Monitoring

Community air monitoring was conducted in accordance with the site-specific HASP (ARCADIS 2006). This monitoring entailed monitoring for VOC vapors (using a PID) and particulates (using a PDR100 particulate meter) at dedicated stations – one located upwind and one located downwind of the work zone. Work space air monitoring was also conducted in accordance with the HASP, using real-time, hand-held monitoring instruments including a multi-gas (Lower Explosive Limit [LEL], oxygen [$O_2$], carbon monoxide [CO] and hydrogen sulfide [$H_2S$]) monitor and a particulate meter).

### 3.3 Subsurface Soil Sampling

#### 3.3.1 Drilling Methods

Subsurface soil investigation activities conducted at the property included drilling soil borings and conducting subsurface soil sampling. As presented in the Site Characterization Report (TRC 2006a), borings completed by TRC were advanced by direct-push (i.e., GeoProbe®) drilling methods. Soil samples were collected continuously with a 2-inch-diameter stainless steel Macro Core sampler with associated polyethylene liner). At locations where monitoring wells were installed, soil borings were completed using a hollow stem auger drill rig with 4.25-inch-inside-diameter (ID) augers.

For the RI, six soil borings were completed to a maximum depth of 42 feet between August 2008 and September 2008 using rotary sonic (rotasonic) drilling methods. Figure 2 presents the locations of soil borings drilled during the RI. Note that the soil borings completed during the previous investigation by EnviroTrac are also shown on Figure 2. Soil boring logs describing the soils encountered and soil boring depth are provided in Appendix B.

During rotasonic drilling, soil samples were collected continuously from the ground surface to the bottom of the borings using 2-foot-long, 4-inch-diameter core barrels lined with a plastic sleeve. The completion of the soil borings followed a consistent methodology, as follows:

- Soil samples were retrieved continuously from grade to the total boring depth using plastic-lined core barrels. Recovered soil samples were reviewed and screened for VOCs using an organic vapor meter (OVM) equipped with a PID.

- Selected samples were submitted for laboratory analyses, as described in Section 3.3.2.

- Upon completion, each soil boring was backfilled with bentonite or completed as a monitoring well.

### 3.3.2 Sample Collection and Analysis

Up to four soil samples were collected from each soil boring and submitted under chain of custody protocols to Test America Laboratories (TA) of Shelton, CT, for analysis of the following parameters:

- Target Compound List (TCL) VOCs by United States Environmental Protection Agency (USEPA) Method 8260B

- TCL SVOCs by USEPA Method 8270C

- total and amenable cyanide by USEPA Method 9012B

Analytical reports from TA are provided on the accompanying CD. The selection rationale for soil samples for analysis followed the procedures presented in the RI Letter Work Plan (ARCADIS 2008). Samples were selected for analysis as follows:

- one sample from within the first 5 feet of the boring if impacts are observed

- one sample from the soil/water table interface

- one sample from the interval exhibiting the highest PID readings and/or exhibiting the highest visual evidence of MGP impacts

- one sample from below visually impacted soils (for vertical delineation)

- one sample from the bottom of the boring, typically at the base of the gas holder or above the silty clay layer

In addition to the analyses listed above, seven soil samples were analyzed for fingerprint analysis using a suite of volatile hydrocarbons collectively called PIANOS compounds. This suite of more than 100 compounds represents paraffins, isoparaffins, aromatics, naphthenes, olefins and sulfur heterocyclic hydrocarbons. PIANOS analysis has been found to be essential for identifying the sources of hydrocarbons (e.g., gasoline, diesel, coal tar) of concern when VOCs are present in environmental samples (Stout et al. 2002; Sauer and Costa 2003).

In general, samples submitted for PIANOS analyses were selected from material that appeared to contain both potentially non-MGP- and MGP-related impacts, based on visual and olfactory observations as well as PID readings.

The specific soil samples collected during the RI along with the sample date, sample depth and analysis performed are listed in Table 1. Analytical methods, sample handling procedures and laboratory protocols are outlined in the RIWP (TRC 2006b). Sample analyses followed the NYSDEC ASP-2000 analytical protocol and included quality assurance/quality control (QA/QC) samples as required by the Quality Assurance/Quality Control Project Plan (QAPP) included with the RIWP (TRC 2006b).

### 3.4 Groundwater Monitoring

#### 3.4.1 Monitoring Well Installation/Development

Nine groundwater monitoring wells were installed at the property during the RI to better characterize groundwater quality, patterns of groundwater flow and the presence of NAPL. SCS and RI monitoring well locations are shown on Figure 2. Table 2 summarizes the monitoring well construction details for each well installed at the property. Appendix B includes the monitoring well construction logs.

Each monitoring well was installed and constructed in conformance with the following specifications:

- Wells were constructed with 2-inch-ID, threaded, flush-joint, schedule 40 PVC casing and screen.

- Screens were 2 or 4 feet long with 10-slot (0.01-inch) openings.

- The annulus around the screens was backfilled with appropriately sized clean silica sand (e.g., Morie No. 1) to a minimum height of 1 foot above the top of the screen.

- The remainder of the annular space was filled with bentonite to near the ground surface. The bentonite was allowed to hydrate for a minimum of 24 hours before well development.

- Each monitoring well was fitted with a sealed cap (J-plug) and was contained in a flush-mounted vault. The J-plug keeps surface water from infiltrating into the well during rain events, high water conditions, and other weather events.

- The concrete seal or pad was sloped slightly to channel water away from the well, and was deep enough to remain stable during freezing and thawing of the ground.

Monitoring wells were developed a minimum of 24 hours after installation using pump and surge methods. Prior to development, fluid levels and the total depth for each well were measured to the nearest 0.01 foot using a clean electronic oil/water interface probe. No LNAPL or dense nonaqueous-phase liquid (DNAPL) was observed in any of the wells to be developed.

Dedicated polyethylene tubing, 2-inch submersible pumps and a surge block were used to develop the wells. The surge block was fastened to a 1-inch threaded PVC pipe, and then lowered to the well screen interval. The surge block was repeatedly lifted and dropped (surged) across a short section of the well screen, then lifted out of the well to allow the pump to be dropped to remove the suspended material. This process of surging/pumping was repeated until all sections of the well screen had been developed. Development continued until a minimum of three well volumes had been evacuated and/or for a maximum of 2 hours. Periodic groundwater quality field parameters were measured during the well purging. These parameters included pH, temperature, conductivity and turbidity. Well development logs are included in Appendix C. Purge water was contained within 55-gallon drums and staged at the site.

### 3.4.2 Groundwater Level Measurements and Sampling

From September 30 through October 2, 2008, ARCADIS collected groundwater samples from 18 monitoring wells on the property and adjacent sidewalk on West 18th Street. The wells sampled are summarized in Table 1. Groundwater samples were

submitted under chain of custody protocols to TA of Shelton, Connecticut for analysis of the following parameters:

- VOCs by USEPA Method 8260B
- SVOCs by USEPA Method 8270C
- total cyanide by USEPA Method 9012B

Prior to sample collection, each monitoring well was gauged to measure and record the static groundwater level and to determine the presence or absence of NAPL. Measurements were recorded in the field notebook. Water level and NAPL measurements are presented in Table 4.

Low-flow purge and sampling was conducted using bladder and/or peristaltic pumps. Bladder pumps were used in the majority of the wells, but in situations where insufficient water was present in the well (i.e. < 1 foot) a peristaltic pump was used. Groundwater field parameters measured during purging include conductivity, dissolved oxygen (DO), oxidation-reduction potential (ORP), pH, temperature and turbidity. Field parameters were monitored until stabilized following the criteria set forth in the USEPA's Standard Operating Procedure (SOP) #GW0001 for Low Stress/Flow Groundwater Sampling. The final water quality parameters for each well sampled are provided in Table 3.

Analytical reports from TA and Alpha Analytical are provided on the accompanying CD as Electronic Attachment 4.

### 3.4.3 Groundwater Elevation Study

Pressure transducers were deployed in eight monitoring wells to continuously measure and record changes in groundwater elevation for 2 weeks. This information was used to further characterize patterns of groundwater flow patterns on the property and to determine the relationship between groundwater levels inside and outside the gas holder structures. Eight miniTROLL® data logging pressure transducers were installed on November 20, 2008 and retrieved on December 3, 2008. Pressure ratings for the transducers were 30 pounds per square inch (psi) for all transducers, except for MW-B3, which was 15 psi. Pressure transducers were deployed in five Con Edison

monitoring wells (MW-B3, MW-C3, MW-5A, MW-5B and MW-A3) and in three Retaco monitoring wells (MW-8, MW-9 and MW-A)[3].

Prior to installation, each probe was programmed to measure and record water levels continuously at 5-minute intervals. In addition, all probe tests were programmed to start simultaneously. Digital data files of the transducer output are included on the accompanying CD as Electronic Attachment 3.

### 3.5 Property Survey

Munoz Engineering, P.C. completed a survey of all SCS and RI soil boring and monitoring well locations, as well as all monitoring wells installed on the property by others. The survey included the position, surface elevation and, in the case of monitoring wells, measuring-point elevations. Note that elevations used in this report are referenced to NAVD 88, as described in Section 2.1.

### 3.6 Management of Investigation-Derived Waste

IDW generated during the RI included:

- drill cuttings
- decontamination fluids
- development and purge water
- personal protective equipment
- sampling equipment

All IDW was placed in Department of Transportation- (DOT-) approved 55-gallon open or closed-topped drums. The drums were labeled as IDW and temporarily stored in a secured area designated by Con Edison. The drums were stored on the property until waste characterization results were received from the analytical laboratory (TA). Once the waste characterization results were received, the IDW was transported off site and disposed of at a Con Edison-approved disposal facility.

[3] Well MW-A was installed by Retaco in late 2008, approximately 35 east of MW-12 on the sidewalk adjacent to West 18th Street. Construction details, survey or other data from MW-A were not available at the time of this submittal.

### 3.7 Data Management

All electronic data deliverables (EDDs) received from the laboratory were entered into a Microsoft® Office Access-based project-specific database maintained by ARCADIS.

### 3.8 Data Validation/Data Usability Summary Report

ARCADIS validated all analytical data. The review criteria for the RI data are from the following USEPA Region 2 guidance documents:

- *SOP Number HW-24, Revision 1, June 1999, Validating Volatile Organic Compounds by SW-846 Method 8260B* (USEPA 1999)
- *SOP Number HW-22, Revision 2, June 2001, Validating Semi-Volatile Organic Compounds by SW-846 Method 8270* (USEPA 2001)
- *SOP Number HW-2, Revision 11, January 1992, Evaluation of Metals Data for the CLP Program* (USEPA 1992) (Note this reference applies to validation of CN analytical data)

In accordance with the Quality Assurance Project Plan (QAPP; TRC 2004), quality assurance/quality control (QA/QC) samples were collected periodically throughout the RI. Analytical results for the blind duplicate samples and corresponding sample are presented in the data summary tables (Tables 7, 8, 11, and 12). Data usability summary reports (DUSRs) for all laboratory sample delivery groups are presented on the accompanying CD as Electronic Attachment 5. Complete laboratory reports are provided on the CD that accompanies this report.

## 4. Remedial Investigation Results

This section summarizes the findings of the RI. These findings include interpretations of the property geology and hydrogeology based on field observations, the occurrence and distribution of potential MGP and non-MGP impacts to soil and groundwater based on field screening and laboratory sample results, and a forensic data analysis to evaluate the nature of sources contributing to the impacts reported in soil and groundwater.

### 4.1 Regional Geology

The geology of Manhattan is characterized by crystalline metamorphic bedrock overlain by glacial deposits that, in turn, are typically overlain by post-glacial alluvial deposits and fill. The bedrock beneath the site is the Cambrian-aged Hartland Formation schist (Merguerian 1983), which is encountered at approximately 72 feet bgs. The surficial deposits have been mapped locally as till (Cadwell 1989), though no till has been observed in borings completed on the property or on site. The uppermost native sediments in the area are interpreted to be post-glacial fluvial deposits. These native sediments are typically overlain by urban fill, most significantly along the coastal areas of Manhattan, which is where the site is located. The site and vicinity are extensively developed, such that constructed features are now also significant components of the surficial geologic environment.

### 4.2 Property Geology

Based on observations at 14 soil borings completed during the SCS and RI, the stratigraphy of the property may be divided into four units. From the surface-down, the units are:

- ***Fill Unit***, an approximately 20-foot-thick, highly heterogeneous interval that encompasses the remnant foundations of the east and west gas holders
- ***Silty Clay Unit***, a thin and discontinuous unit present beneath the fill at the property and interpreted to be contiguous with similar materials observed in other portions of the site located to the west
- ***Sand Unit***, an approximately 40-foot-thick, laterally extensive section of stratified alluvial sands
- ***Bedrock***, inferred to be schist of the Hartland Formation

These units are depicted on two cross-sections (Figures 3 and 4). Section A-A' trends east to west, parallel to West 18th Street through the two gas holders. Section B-B' trends north-south, perpendicular to West 18th Street. The sections also depict the shallow water table surface, and show the approximate location of former MGP structures and underground petroleum storage tanks. Each of the stratigraphic units encountered at the property is described in further detail below.

#### 4.2.1 Fill Unit

The Fill Unit comprises materials typically found in urban environments. The fill observed at the property is highly heterogeneous, consisting of construction debris (e.g., slag, coal and rock fragments, brick, wood, glass) intermingled with brown to black sand, gravel and silt. The Fill Unit includes buried utilities and intact foundations, most significantly the circular foundations of Gas Holders 1 (east) and 2 (west) that encompass a large portion of the property's footprint. The thickness of the Fill Unit (and the assumed depth of the holders) is between 20 and 23 feet, and is fairly consistent across the property.

#### 4.2.2 Silty Clay Unit

The Silty Clay Unit underlies the fill on the western edge of the property, but appears to pinch out toward the east. The Silty Clay Unit, a gray to tan silty clay with trace fine sand, is interpreted to be contiguous with similar soil observed west of the property in other portions of the site. The Silty Clay Unit was encountered in two borings (SB-5 and SB-6) on the western edge of the property at 20 and 26 feet bgs, respectively. The Silty Clay Unit is 6 feet thick at SB-5 and 2 feet thick at SB-6 (Figure 3).

#### 4.2.3 Sand Unit

The Sand Unit immediately underlies the Fill Unit across the majority of the center and eastern portions of the property as the intervening Silty Clay Unit there is discontinuous or absent. The Sand Unit consists of stratified layers of well-sorted, fine-to-medium sands interbedded with poorly sorted sand. Lenses of silt and gravel observed at SB-6 (the only boring to have reached the bottom of the Sand Unit at the property) suggest a high degree of heterogeneity, consistent with deposition in a fluvial environment. The Sand Unit is interpreted to be laterally continuous beneath the property, approximately 45 feet thick extending to the bedrock surface, and at a depth of approximately 72 feet at soil boring SB-6.

#### 4.2.4 Bedrock

Regional geology literature indicates that the site is underlain by schist of the Hartland Formation. One boring (SB-6) was completed to bedrock in which schist was encountered at 72 feet bgs.

### 4.3 Property Hydrogeology

This section describes the hydrogeology of the property, including recharge, hydrostratigraphy and groundwater flow.

#### 4.3.1 Runoff and Recharge

The property is located approximately 800 feet east of the Hudson River. The Hudson River at this location is at sea level, with a mean tidal range of 4.3 feet. Though the Hudson River forms the natural base-level discharge, the surface and shallow groundwater systems in Manhattan have been significantly altered by urban development. The property and most of the surrounding areas are covered by impervious surfaces, and the majority of stormwater runoff is captured by storm or combined sewers.

Groundwater recharge in the vicinity is likely dominated by indirect sources such as leaking water distribution and sewer lines, and improperly plumbed floor or roof drains. Limited direct recharge may also occur in grass-covered portions of adjacent parcels. Older sewers (storm, sanitary or combined sewers), in particular, can leak several gallons per foot of drain.

#### 4.3.2 Hydrostratigraphy

The water table at the property occurs in the Fill Unit at depths that have ranged historically from approximately 4 to 15 feet bgs. The Fill and underlying Sand Units form distinct hydrostratigraphic intervals, as discussed below.

The saturated portion of the fill is highly heterogeneous, consisting of a variety of fill types. The fill is interpreted, in general, as a highly permeable medium; however, isolated zones such as utility corridors are anticipated to form preferential pathways. The fill is also laterally discontinuous. Within the bounds of the property, the fill is parceled into several disconnected or poorly connected cells divided by the fully penetrating foundations of the east and west holders. The holder foundations are

interpreted to be somewhat leaky (likely via discrete breaches rather than general porosity). As a result of the discrete breaches or flow pathways for each of the holder foundations, the ability of water levels to equilibrate with the ambient groundwater levels is different for each of the holders.

The Sand Unit is a stratified system, and therefore highly anisotropic. Permeability is interpreted to be greatest in the horizontal plane focused in the most coarse-grained sand beds. Interbedded fine-grained sands and silts will inhibit vertical migration.

#### 4.3.3 Groundwater Flow

Groundwater flow in the Fill Unit is tightly constrained by the geometry of available flow paths through and around the holder foundations. As discussed below, each holder foundation forms a semi-enclosed vessel. Flow though the foundations is interpreted to occur only through discrete breaches resulting from cracks, mortar degradation, construction excavations (e.g., elevator pit excavation), or other penetrations of the walls for utilities such as roof drains or water service lines.

Groundwater elevations measured at the property's monitoring wells on seven occasions between January 2002 and September 2008 (summarized in Table 4) repeatedly fall into three separate populations with similar water levels: wells completed inside the east holder, wells completed inside the west holder and wells outside the holders. The following table summarizes the average water-level elevation in each group to illustrate several observations about groundwater flow.

| Location | Average Head in Well Groupings in Each Gauging Round (feet RMSL) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1/10/02 | 1/18/02 | 3/6/02 | 1/27/04 | 2/15/05 | 3/19/07 | 9/29/08 |
| East Holder | 8.3 | 7.9 | 8.2 | 6.1 | 6.3 | 5.7 | -0.3 |
| West Holder | 6.4 | 6.2 | 6.9 | 5.9 | 5.7 | 4.8 | 1.7 |
| Outside Holders | 3.0 | 1.2 | 1.8 | 0.2 | 0.6 | -0.4 | -0.7 |

**Note:**
East holder average excludes water-levels recorded at well MW-6.

Water level elevations for each group identified in the above table along with observations about groundwater flow, are discussed below:

- During each gauging round, water levels measured within the former gas holder foundations were higher than the water levels measured outside of the former holders. Groundwater levels inside the holders, therefore, are interpreted to not be in equilibrium with the water table outside the holders, most likely because the holder foundations restrict free movement of groundwater. The higher heads observed within the holders may be explained in several ways:

  - A localized source of recharge exists for each holder (i.e., to maintain the higher heads), such as a leaking water distribution lines or drains.

  - Short-term spikes in water-levels outside the holders due to intense rain events may periodically overtop the holder walls (or bring levels to the height of significant breaches in the foundations), thereby filling the holders from the outside. The levels observed during the seven gauging rounds reflect temporal snapshots after the levels outside the holders have equilibrated. Because the holder foundations retard groundwater flow, levels inside the holders equilibrate more slowly and remain higher than levels outside the holder until the next large recharge event.

- Water levels in the east holder typically averaged 1 to 2 feet higher than in the west holder (until September 2008). This consistent water-level difference suggests that, historically, either the rate of recharge to the east holder is greater than west holder or the east holder leaks less than the west holder.

- Groundwater elevations declined significantly in each location in September 2008. This observation suggests that external conditions changed, that either a source of recharge was removed (e.g., a leaking pipe was repaired) or groundwater pumping was initiated (e.g., for basement or excavation dewatering). Because the external change clearly had effects inside both holders, it demonstrates that the holders are not completely isolated from the outside aquifer.

- Of the water-level changes observed in September 2008, the head in the east holder dropped most radically (an average of 6 feet relative to the prior round in March 2007). Despite the significant water-level drop, levels inside the holder are still greater than those outside the holder. The significant decline in levels in the east holder suggests that, in addition to the external change mentioned above,

either a source of recharge to the east holder was eliminated, or the holder foundation was further breached. The trend could also be explained by pumping inside the holder (e.g., if a dewatering system was installed inside the Verizon building).

- For three water level rounds completed between January and March 2002, well MW-6 had a head 2 to 3 feet lower than the heads at the other wells completed inside the east holder (all of which typically had heads within 0.1 feet of each other). Well MW-6 is suspected to have breached a drain pipe, and was decommissioned shortly after installation. Although water levels in MW-6 were the lowest within the east holder during the three reported gauging events, the well is also reported to have overflowed periodically. Both the high and low cases are best explained by the influence of the drain pipe. During rain events, flow in the pipe discharged from the breach at MW-6 and temporarily drove water levels above ground surface (allowing the well to flow). Under equilibrated conditions, the low head at MW-6 likely reflects that the well is adjacent to an efficient breach in the holder. The breach may be the pipe itself, the fill around the pipe, or a gap in the foundation where the pipe exits to the street. It is worth noting that the well is located in the northwest portion of the holder near the building elevator shaft, where it is inferred that excavation for building construction may have removed a portion of the holder wall.

Under the hydraulic conditions observed, groundwater is interpreted to discharge outward from each of the holders into the surrounding fill materials (Figures 5 and 6). This relationship did not change even after the significant drop in heads that occurred in all locations in September 2008. Flow is expected to be focused in a few discrete breaches in the holder walls rather than be evenly distributed radially. As noted above, short-term spikes in water levels outside the holders due to intense rain events may periodically overtop the holder walls (or bring levels to the height of significant breaches in the foundations), thereby filling the holders from the outside. In this manner, water from within each holder could be exchanged indirectly. To account for the observed distribution of petroleum-related constituents (discussed below), including impacts inside the western holder, either periodic flow such as this must occur into the holders from the surrounding formation, or additional sources of petroleum must exist above or connected to the western holder.

Outside the holders, the direction of groundwater flow in the fill is expected to be driven by preferential pathways (such as utility corridors) and off-site pumping stresses. Under natural gradient conditions, flow is expected to be directed toward and discharge to the

Hudson River. Because groundwater elevations are currently below sea level, shallow groundwater is inferred as being captured in a dewatering system.

#### 4.3.4 Continuous Water Level Survey

Continuous water-level monitoring was completed over 12 days in November and December 2008 to further assess temporal trends in groundwater elevations inside and outside the two holders. Eight wells were included in the survey:

- MW-B3, located inside the east holder
- MW-C3 and MW-A3, located inside the west holder
- MW-8, MW-9 and MW-A[4] located outside the holders to the north
- MW-5A and MW-5B, located outside the holders to the west.

Figure 7 is a hydrograph illustrating the water-level trends observed in the eight wells during the 12-day monitoring period. Digital files of the transducer data are included on the accompanying CD as Electronic Attachment 3. As indicated on Figure 7, the groundwater elevations in most wells (i.e., MW-C3, MW-8, MW-9 MW-5A and MW-5B) fluctuated less than ±0.5 feet during the 12-day monitoring period. Groundwater elevations at MW-B3 decreased approximately 3 feet during the same 12-day monitoring period, though this decrease is suspected to represent a transducer malfunction. A similarly anomalous rise in water levels at MW-A3 during this period is also suspected to reflect transducer malfunction.

No tidal influences were observed, despite the proximity of the tidally influenced Hudson River. Two precipitation events that occurred during the monitoring period created a limited hydraulic response at three of the wells, including the two wells installed inside the holders. (The response observed at MW-9, outside the holders, does not clearly show the influence of the recharge events.) The observed response to recharge confirms that, despite the preponderance of impervious surfaces in the vicinity, stormwater recharges shallow groundwater, presumably through leakage of storm or combined sewers or roof drains. The generally uniform response to recharge events observed inside and outside the holders supports the inference that the holders are hydraulically connected with the surrounding fill materials.

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[4] As noted previously, construction and survey details for well MW-A (installed by Retaco in late 2008) are not available. For this reason, transducer data from this well have not been reduced, but are provided digitally as Electronic Attachment 3.

### 4.4 Nature and Extent of Impacts

Soil and groundwater at the site are impacted by a combination of petroleum compounds and MGP materials. Field observations, analytical results and forensic data analysis, discussed in this section, show that:

- The majority of vadose zone and shallow groundwater impacts are petroleum-related, and are derived from leaking USTs above the water table.

- MGP impacts are less significant and less widespread, limited to the base of the gas holder foundations, where slow diffusion occurs from isolated pockets of highly weathered residual coal tar.

The following subsections describe the nature and extent of petroleum and MGP-related impacts at the property.

#### 4.4.1 Field Screening and Direct Observations of Impacts

During the SCS and RI, direct physical evidence of both petroleum and MGP-related impacts was documented in subsurface soils. Observational evidence of impacts included odors, staining, sheens and oil-like material (OLM). Field screening for VOCs in soil using a PID also provided strong evidence of the distribution of impacted soils.

In general, visual and olfactory evidence of petroleum impacts was widespread in vadose zone soil and in shallow groundwater. Evidence of MGP-related impacts was typically found near the base of the gas holders, if at all. Field observations recorded during the SCS and RI related to petroleum and/or MGP-related impacts are summarized in Table 5.

From the Site Characterization Study (2006a), TRC found that, with the exception of SB-1, which could not be advanced to the water table, the soil encountered in the remaining six borings revealed evidence of petroleum, fuel oil, gasoline, and/or MGP-related odors. Petroleum odors were most frequently observed in the soil borings (SB-2, SB-4, SB-5A, SB-5B, and SB-6). A petroleum sheen was also observed in soil samples from SB-4, SB-5A, SB-5B, and SB-6). MGP related odors were observed in only two borings (SB-2 and SB-4), and OLM was observed in SB-4 between 19-21 feet bgs.

Several key field observations include:

- Sheens, accompanied by petroleum- or gasoline-like odors, were observed in SB-4, SB-5, SB-6, MW-5A and MW-5B. Sheens were observed in depths ranging from 6 to 22 feet bgs.

- Trace NAPL, accompanied by a strong petroleum-like odor, was observed in soil at SB-6 at a depth of 13 to 16 feet bgs. SB-6 is located adjacent and to the west of the east holder.

- OLM accompanied by a strong MGP-related odor was observed at SB-4 at a depth of 19 to 21 feet bgs, just above the holder bottom. SB-4 is located in the northeast quadrant of the east holder.

- PID readings for total VOCs recorded during the SCS and RI ranged across the full scale of the monitoring instrument (i.e., 0 to >9,999 ppm). PID readings greater than 1,000 ppm were typically associated with petroleum- or gasoline-impacted material, and occurred between 11 and 19 feet bgs. Coal tar impacts are interpreted to have produced one PID reading greater than 1,000 ppm, from the 19- to 21-foot interval in SB-4.

The observed petroleum impacts are consistent with releases from USTs in the vadose zone. Where detected, petroleum-related impacts, present as sheens, LNAPL, petroleum (gasoline) odors and/or elevated total VOCs concentrations based on PID, were detected in the shallower soils. The majority of these impacts were detected in the vicinity of the water table and the associated smear zone resulting from wide historical fluctuations of the water table, which ranged over as much as 8.5 feet during the site investigations (as discussed in Section 4.3). In general, field evidence of MGP-related impacts was limited to deeper intervals near the base of the remnant holder foundations. No evidence of MGP-related impacts has been observed outside the gas holders.

Figure 8 illustrates the distribution of PID readings recorded during the SC and RI as a function of depth. Each slice represents the maximum PID reading recorded at each soil boring within the represented 5-foot elevation interval. Note that only PID readings greater than 10 ppm are depicted. Figure 8 also includes summaries of the soil PIANOS analyses presented as pie charts, in which each slice represents the total concentration of each of the PIANOS compound groups. These data are discussed in Section 4.5.6 and in Appendix D, and are summarized below:

- In the 0- to 10-foot interval (top slice), PID values greater than 1,000 ppm were recorded in unsaturated soils (top slice) near the location of the former USTs in the east holder.

- In the 10- to 14-foot interval (second slice), PID values greater than 1,000 ppm are more widely distributed, reflecting smearing and lateral transport on the water table. The hot-spot beneath the UST in the east holder extends northwest of the holder, suggesting preferential flow out of the east holder to the northwest. Additional significant impacts are present inside the west holder and immediately outside the holder's west side. These observations suggest an additional source or sources contributing petroleum inside and/or adjacent to the west holder. PIANOS results for soil samples collected within the 10- to 14-foot interval indicated a distinct gasoline chemical signature. Strong petroleum-like odors were also noted within this interval.

- In the 14- to 20-foot interval (third slice), the gasoline/petroleum signature is still dominant and correlated with elevated PID impacts; however, impacts are decreasing with depth below the water table.

- From 20 to 25 feet (bottom slice), elevated PID readings (greater than 1,000 ppm) are associated with a gasoline-impacted soil downgradient of the two gas holders, as well as gasoline-/coal-tar-impacted soil and OLM within the west holder.

#### 4.4.2 NAPL

Measurable thicknesses of LNAPL have been observed periodically in monitoring wells on the property. Measurable DNAPL has not been observed. During the most recent round of groundwater measurements (September 29, 2008), 0.02 foot of LNAPL was measured in monitoring well MW-9 (Table 4). Historically, measurable LNAPL has also been detected in MW-8. Note that both wells are located hydraulically outside the gas holders, northwest of the known former UST locations inside the east holder.

As discussed in Section 2, six USTs were removed from the property on December 12, 1993. Among the USTs were five 550-gallon gasoline tanks and one 4,000-gallon diesel fuel tank, all located within the footprint of the former east holder (Figure 2). Based on test trenches completed during the SCS and soil borings completed during the SCS and RI, the areas of the two former gas holders investigated appeared to be locally intact. As such, the most likely sources of petroleum-related constituents at the property are the former USTs, while the two gas holders are the most likely source of

MGP-related impacts. No evidence of the former USTs were observed or detected during the SCS and RI.

The occurrence of measurable LNAPL outside the holders to the north (but not within the holders themselves) suggests that a preferential pathway may exist in the vadose zone connecting the known USTs to the region outside the holder to the northwest. The observation of petroleum NAPL in soil at SB-6 (also outside the holder foundation, but northwest of west holder) implies high mobility of LNAPL in the smear zone. The observation of LNAPL may also reflect the presence of as-yet undetected leaking USTs.

### 4.5 Analytical Results

#### 4.5.1 Review of Historical Groundwater Analytical Data

As discussed in Section 2.5, EnviroTrac conducted five rounds of groundwater sampling on behalf of Retaco. The results discussed below are based on reports provided by EnviroTrac and reviewed by ARCADIS. Note that the specific groundwater sampling protocol used by EnviroTrac is unknown, but based on reports, there is no mention of purging to stabilization prior to sampling. Therefore, the groundwater samples collected by EnviroTrac are considered to be grab samples, which are not necessarily representative of water quality in the aquifer. It is also noted that the analytical data provided by EnviroTrac was not validated.

VOCs and PAHs were detected in historical groundwater samples. Table 6 provides the total number of samples, maximum detected concentration, number of detects and frequency (percentage) of detections for each compound that was detected. VOCs were the most frequently detected compounds, with ethylbenzene, naphthalene (reported as a VOC[5]) and xylenes detected in each groundwater sample. Other VOCs detected in at least 90 percent of the groundwater samples include 1,2,4-trimethylbenze, benzene, isopropylbenze, MTBE (a gasoline additive), n-propylbenzene and toluene. Fluorene and naphthalene were the most frequently detected PAH compounds. These compounds are also found in diesel and fuel oil.

[5] EnviroTrac reported naphthalene concentrations resulting from two different analyses: USEPA Method 8260 (VOCs) and Method 8270 (SVOCs). The results are similar but not identical. In the TRC 2005 Site Investigation Report, for example, groundwater analyzed from MW-8 was reported to contain naphthalene concentrations of 70 ppb using Method 8260 and 130 ppb using Method 8270. For ARCADIS sampling results, naphthalene is reported only as an SVOC.

The historical sampling results indicate widespread impacts of petroleum compounds, particularly BTEX compounds and MTBE, in shallow groundwater. Elevated concentrations of naphthalene may indicate a minor comingled component derived from MGP residuals and/or diesel/fuel oil. Figure 9 presents the distribution of detected VOCs in groundwater for sampling conducted by EnviroTrac. In addition, the MTBE and total VOC concentration for the March 2007 sampling event is graphically represented by colored circles placed next to each monitoring well location. Circles are color-coded according to the magnitude of the concentration as shown in the legend. The distribution of detected VOCs in groundwater is summarized below:

- MTBE concentrations have historically occurred at greater than 100 µg/L in all shallow groundwater locations shown (including locations inside the holders and outside to the north of the holders). Because MTBE is a gasoline additive, it is a clear tracer for gasoline impacts. Note that, where the MTBE concentration for MW-9 was reported as nondetect, the analysis was subject to an elevated detection limit of 500 µg/L.

- Concentrations of VOCs (including MTBE) are highly variable with time. Because the petroleum source material appears to be distributed in a broad smear zone across the water table and vadose zone, VOC dissolution into groundwater is interpreted to vary over short time periods due to changes in water table elevation or in response to recharge occurring through impacted soils.

- In March 2007, total VOC concentrations of greater than 10,000 µg/L were detected in MW-8, MW-9 and MW-11, outside the holder to the north. Wells MW-8 and MW-9 were most impacted with petroleum range hydrocarbons, consistent with the periodic observations of LNAPL in those wells.

#### 4.5.2 SCS and RI Analytical Data Summary

The following sections summarize the environmental conditions at the property based on soil and groundwater analytical data collected during the SCS and RI. Soil analytical data are compared to the Recommended Soil Cleanup Objectives (RSCOs) provided in TAGM 4046 (NYSDEC 1994). Groundwater analytical data are compared to the AWQS, Class GA criteria (NYSDEC 1998).

#### 4.5.3 Data Usability Assessment Summary

DUSRs for the RI analytical data were prepared according to NYSDEC guidelines and are provided on the accompanying CD as Electronic Attachment 5.. The results of the data review conducted by ARCADIS indicate that the analytical data are acceptable for use in the assessment of soil and groundwater environmental conditions at the property.

#### 4.5.4 Soil Analytical Results

The following discussion of soil analytical results is based on 24 soil samples (including seven samples submitted for forensics via PIANOS analysis) collected during RI activities at the property. Validated soil analytical results for VOCs, SVOCs and cyanide are provided in Tables 7a, 7b and 7c respectively. PIANOS results are provided in Table 8. Applicable RSCOs are also provided in the data tables. Soil concentrations that exceed applicable RSCOs are shaded gray in the data tables. Summary statistics, including the minimum detected concentration, maximum detected concentration, number of samples analyzed, number of samples with a detected concentration, frequency of detects, number of samples detected above the RSCO and frequency of detected samples above the RSCO for each constituent are provided in Table 9.

##### 4.5.4.1.1 VOCs

Nine VOCs were detected in soil samples. Seven of these VOCs (acetone, benzene, ethylbenzene, methylene chloride, tetrachloroethene and total xylenes) exceeded their respective RSCOs. Acetone and methylene chloride are common laboratory contaminants and, as such, are excluded from further discussion.

From Table 9, BTEX compounds are the most prevalent VOCs detected in soil. Benzene, total xylenes, ethylbenzene, and total VOCs were detected at concentrations that exceeded their respective RSCO in at least 50 percent of the samples. Figure 10 presents the distribution of the major VOCs in subsurface soil, for each soil boring completed during the SCS and RI. Concentrations that exceed the RSCO are shaded yellow. Data boxes are not shown for borings SB-1, SB-3 and SB-D, because no VOCs were detected in soil at those locations. The distribution of VOCs in subsurface soil at the property is summarized below:

- At least one sample from each soil boring completed during the SCS and RI contained at least one BTEX compound, except for SB-1, SB-3 and SB-D (all located on the south side of the property).

- In general, BTEX and total VOCs were detected above their respective RSCOs from approximately 11 feet to 22 feet bgs within each of the two former gas holders and between the holders to the north.

- The highest VOC concentrations detected are interpreted to reflect a combination of petroleum and MGP-related impacts. Elevated detections at 11- to 17-foot depths (i.e., at MW-A, SB-C) are attributed to gasoline impacts. Elevated VOC detections at depths of 20 to 21 feet (i.e., samples from SB-2, SB-4 and SB-A taken at the base of the gas holders) are attributed to MGP-impacts. The high VOC concentrations detected at SB-C at 22 feet bgs (outside the holder) is attributed to gasoline, and is considered evidence of vertical smearing resulting from periodic low water-table occurring outside the holders. Forensic analysis supporting the attribution of gasoline or MGP source materials is presented in Section 4.5.6 and in Appendix D.

4.5.4.1.2 SVOCs

All 16 PAH compounds and approximately 10 additional SVOCs have been detected in soil samples collected on the property. Analytical results are summarized in Table 7b; a statistical analysis of SVOC detections is provided in Table 9.

Fourteen of the 16 PAHs (all except acenaphthene and benzo(g,h,i)perylene) were detected at least once at a concentration greater than the RSCO. The non-PAH SVOCs 2-methylnaphthalene, dibenzofuran, 2-methylphenol, 4-methylphenol and phenol also exceeded their respective RSCOs at least once. Total SVOC concentrations also exceeded the 500,000 µg/kg criterion listed in TAGM 4046 in one sample (Well Cluster C, 21 ft bgs). Note that substituted phenols, including 2-methylphenol and 4-methyphenol, are considered to be degradation products of coal tar. Naphthalene and benzo(a)pyrene exceeded RSCOs most frequently. Other SVOCs that were detected above their respective RSCO in at least 20 percent of the samples include dibenzo(a,h)anthracene, benzo(a)anthracene and chrysene.

Figure 11 presents the distribution of total SVOCs, total PAHs and the individual PAH compounds naphthalene and benzo(a)pyrene for each soil boring completed during the SCS and RI. Concentrations that exceed the RSCO are shaded yellow. The

distribution of total SVOCs, total PAHs and individual PAHs (naphthalene and benzo(a)pyrene) is summarized below:

- Soil samples collected from soil borings for well clusters WC-A, WC-B and WC-C and from soil borings SB-A, SB-C, SB-2 and SB-4 contained at least one PAH at a concentration above its respective RSCO.

- SB-D contained several phenolic compounds above their respective RSCO; however, no PAHs were detected at concentrations above their RSCO.

- In general, PAHs and total SVOCs were detected above their respective RSCOs from approximately 12 feet to 22 feet bgs within each of the two former gas holders. Within this interval, the total PAH concentration typically increased with depth, reflecting a residual source located in the base of the holders.

- The highest total SVOC (2,800 mg/kg) and PAH concentrations were detected in a sample collected at the base of the east holder at Well Cluster C. As noted above, this sample was described as stained and, based on PIANOS analysis, had a fingerprint resembling coal tar. The second highest total SVOC (728 mg/kg) concentration was detected in one sample collected at SB-4, also at the base of the east holder (19 to 21 feet bgs). This sample was described as having a strong MGP-related odor and as containing OLM.

- Note that the majority of samples collected at the base of the holders contained significantly lower total PAH concentrations (relative to SB-4). This variation in concentrations supports observations that coal tar is not uniformly distributed across the holder bases (e.g., as in a DNAPL pool), but rather exists only in isolated residual pockets.

- Total SVOC and PAH concentrations in samples collected below 22 feet bgs (i.e., SB-A and SB-C) are less than their respective RSCOs.

#### *4.5.4.2 Cyanide*

Total cyanide (CN) was detected in approximately 60 percent of the samples collected during the RI (Tables 7c and 9). Amenable CN was detected in two samples.

The highest concentration of total CN (58,000 µg/kg) was detected in SB-A at a depth of 21 feet bgs. This sample location is at the base of the west holder. Amenable CN

was not detected in any samples collected from SB-A. Total CN was also detected in the SB-B (the east holder), SB-C (outside and between the former gas holders), Well Cluster A (the west holder), and Well Cluster C (the west holder) at concentrations less than 27,700 µg/kg.

Amenable CN was detected in well cluster C at a depth of 11 feet bgs (2,000 µg/kg) and 21 feet bgs (7,400 µg/kg). The percent amenable to total CN for each sample was 91 percent in the sample collected at 11 feet bgs and 27 percent for the sample collected at 21 feet bgs.

### 4.5.5 Groundwater Analytical Results

The following discussion of the groundwater analytical results is based on one round of groundwater sampling completed in September 2008. Groundwater samples were collected from seven monitoring wells installed during the RI (Well Cluster A, Well Cluster B and Well Cluster C), two wells installed during the SC (MW-5A and MW-5B), and 10 wells installed by EnviroTrac on behalf of Retaco (MW-1 through MW-10).

Groundwater samples were analyzed for VOCs, SVOCs and CN. In addition, eight groundwater samples were submitted for PIANOS forensics analysis from the six RI wells (well clusters A, B and C.) and two wells installed by EnviroTrac (MW-4 and MW-8). Validated groundwater analytical results for VOCs, SVOCs and CN are provided in Tables 10a, 10b and 10c respectively. PIANOS results are provided in Table 11.

Summary statistics, including the minimum detected concentration, maximum detected concentration, number of samples analyzed, number of samples with a detected concentration, frequency of detects, number of samples detected above the class GA standard and the frequency of detected samples above the class GA standard for each constituent are provided in Table 12.

#### *4.5.5.1 VOCs*

The VOCs detected in groundwater include the BTEX compounds, acetone, 4-methyl-2-pentanone, styrene, 1,1,1-trichloroethane, 2-butanone, 2-hexanone and tetrachloroethene. Of these analytes, the BTEX compounds styrene and 1,1,1-trichloroethane are the only VOCs that exceed the Class GA standard. As noted above, acetone is a common laboratory contaminant and is excluded from further discussion. Analytical results are presented in Table 10a.

Benzene was the most prevalent VOC detected in groundwater (Table 12). The concentration of benzene exceeded the class GA groundwater standard (1 µg/L) in 25 of 26 (96 percent) of the groundwater samples. The concentration of total xylenes, ethylbenzene and toluene exceeded their respective standard in 92, 77 and 73 percent of the samples, respectively. It is noted that BTEX is a significant component of gasoline. Figure 12 presents the distribution of the VOC in groundwater. Concentrations that exceed the GA standard are shaded yellow. The distribution of VOCs in groundwater is summarized below:

- Except for MW-5B, which is screened from 32 to 42 feet bgs, at least one VOC exceeded criteria in each monitoring well sampled in September 2008.

- Benzene concentrations in samples collected from wells screened across the water table ranged from 21 µg/L in MW-5A to 7,400 µg/L in MW-11.

- Benzene concentrations in samples collected from shallow wells located within the west holder ranged from 390 µg/L in MW-7 to 2,500 µg/L in MW-3. Benzene concentrations in samples collected from shallow wells located within the east holder ranged from 52 µg/L in MW-C2 to 4,000 µg/L in MW-A2. Benzene concentrations in samples collected from shallow wells located outside the two former gas holders ranged from 21 µg/L in MW-5A to 7,400 µg/L in MW-11.

- Elevated BTEX concentrations are associated with both shallow petroleum impacts and deeper impacts related to MGP residuals. In this context, the VOC impacts to groundwater are consistent with the distribution of impacts discussed previously. As detailed in Section 4.5.6 and Appendix D, forensic analysis encompassing the broader suite of PIANOS analyses can clearly distinguish the separate sources of impacts.

The gasoline additive MTBE was also detected in all but one (MW-5B) of the monitoring wells sampled in October 2008. Figure 13 summarizes the detections. Detected MTBE concentrations ranged from 13 µg/L in MW-4 (inside the east holder) to 490 µg/L in MW-11 (north and outside of the west holder), indicating widespread MTBE impacts throughout the property. There is no Class GA standard for MTBE; however, there is a guidance value of 10 µg/L (NYSDEC, 1998). The spatial distribution of MTBE detections in conjunction with groundwater flow at the site provides further evidence that one or more undocumented LUSTs or petroleum source material may exist in the western holder and/or outside the holders to the north.

MTBE has been detected in both shallow groundwater, as expected based on its association with a petroleum (gasoline) source, and in deeper groundwater samples where MGP residuals represent the predominant impacts. The vertical distribution of the MTBE, particularly inside both holders, is interpreted to reflect a combination of downward diffusion (from a shallow source) and possibly mixing of water in the holders during periods when they received focused recharge (e.g., during storm events).

MTBE concentrations have decreased through time in some locations (see Figure 9). The latest round of groundwater sampling results provided by Retaco (March 2007) indicates similar concentrations of MTBE to the September 2008 sampling results. This may indicate that dissolved MTBE has reached equilibrium with groundwater. However, because MTBE concentrations have not decreased since March 2007, an ongoing subsurface residual source of MTBE may also be present. Note that the only soil sample that contained a detectable concentration of MTBE (17 µg/kg) was collected at Well Cluster A at a depth of 17 feet bgs. As noted above, the highest concentration of MTBE in groundwater was detected at the same location (MW-A2).

#### *4.5.5.2 SVOCs*

Eight PAHs, four phenols and five additional SVOCs have been detected in groundwater at the property (Table 10b). Of these compounds, four PAHs (naphthalene, fluorene, acenaphthene and phenanthrene) and four phenols (phenol, 4-methylphenol, 2-methylphenol and 2,4-dimethylphenol) exceed Class GA guidance values at least once in site groundwater. Naphthalene was the most prevalent SVOC, detected in groundwater in 92 percent of samples and exceeding criteria in 62 percent of samples (Table 12). It is noted that naphthalene is a common component of fuel oil, diesel and coal tar. The compound phenol exceeded criteria most frequently (72 percent of samples). The other constituents of concern (COCs) listed above were detected at concentrations greater than their respective Class GA standard or guidance values in less than 30 percent of the samples.

Figure 14 presents the distribution of the SVOC COCs in groundwater. On Figure 14, data boxes containing the concentration of each COC are provided for each monitoring well sampled during the RI. Concentrations that exceed the GA standard or guidance value are shaded yellow. The distribution of the SVOC COCs in groundwater is summarized below:

- The highest concentrations of both phenol and naphthalene occur at well MW-C3, a location interpreted to be screened near MGP residuals at the base of the east holder.

- Low to moderate concentrations of SVOCs are present throughout the site, with some correlation to the distribution of BTEX compounds, as discussed previously.

The forensic analysis (Section 4.5.6) shows that the distribution of SVOCs in groundwater is consistent with a shallow, widespread petroleum source and a deeper coal-tar source in the base of the former gas holders. The modest concentrations of SVOCs in wells screened near the base of the gas holders (excluding MW-C3, discussed above) supports observational evidence that coal tar is present only in residual pockets .

#### *4.5.5.3 Cyanide*

Validated total CN groundwater analytical results are provided in Table 10c and show that total CN was detected in each groundwater sample. Total CN concentrations ranged from 3.8 µg/L in MW-5B to 540 µg/L in MW-A3. Less than 50 percent of the samples contained a total CN concentration greater than the Class GA groundwater standard of 200 µg/L.

### 4.5.6 Forensics Results

The following discussion is based on the results of the forensic analysis performed on select soil and groundwater samples collected during the RI. The forensics analysis and results are discussed in *Forensic Evaluation to Differentiate Petroleum Product Volatile Hydrocarbons (e.g., BTEX) From Those of Coal Tar in Soils and Groundwater at the Con Edison Former West 18th Street MGP Site (Verizon Property) in New York, New York* (ARCADIS 2009). The complete forensics report is provided in Appendix D and summarized below.

Tables 8 and 11 summarize the PIANOS and total petroleum hydrocarbons as diesel (TPH-D) results for soil and groundwater, respectively. Table 13 summarizes the PIANOS results and TPH fingerprint interpretation of the soil and groundwater samples along with the relative percent of the major hydrocarbon groups in the soil and groundwater samples containing gasoline and/or coal tar.

Compositional histograms of PIANOS compounds for soil and groundwater results (Figures 15 and 16) were generated for the site. The histograms also include representative samples of gasoline and coal tar NAPL in soil.

Figures 15 and 16 reveal that the gasoline standard and coal tar NAPL compositional characteristics of the two products are quite contrasting. Coal tar contains almost exclusively aromatic compounds with relatively trace amounts of the thiophenes and high-molecular-weight *n*-alkanes, whereas the petroleum product is represented by all of the PIANOS groups.

These histograms, along with the gas chromatograph (GC) fingerprints from the TPH-D analysis helped determine the predominant product type in the samples collected during the RI. Results of the evaluation of GC fingerprints of the samples tested are summarized in Table 13.

Via the PIANOS analysis, samples may be distinguished as having gasoline, coal tar or mixed source. The major conclusions include:

- The sample locations at SB-C, Well Cluster A (shallow), SB-B (shallow) and MW-8 contain chemical signatures for both soil and groundwater that most closely resemble gasoline products.

- Well cluster A and SB-B deeper soil and groundwater reveal chemical signatures resembling a mixture of gasoline and coal tar.

- Well cluster C (shallow/deep) reveals coal tar products in soil and groundwater samples.

These forensic conclusions agree with spatial patterns observed in other data discussed throughout this report. In particular:

- Gasoline/petroleum impacts are present in shallow groundwater inside and outside the former gas holders.

- The spatial distribution of gasoline/petroleum impacts supports a source derived from the known former USTs in the east holder, but also suggests that other unknown LUSTs or off-site sources may exist.

- Inside the holders, samples show stratification of impacts: petroleum shallow, an intermediate zone of mixed sources and a deeper zone predominantly impacted by MGP residuals.

- Significant MGP-sourced impacts have not been observed outside the holders.

  - Outside the holders (e.g., at SB-C), significant BTEX and SVOC impacts detected in soil to a depth 22 feet bgs are consistent with a gasoline source. The vertical distribution observed here is attributed to the fluctuating water table, creating a smear zone of gasoline-impacted soil.

### 4.6 Risk Evaluation

A formal risk evaluation was not performed for this RI; however, the levels of MGP-related impacts noted above are consistent with those identified, evaluated, and documented in the site-wide SCS report (TRC 2006a). That study, which included the property, found the following:

> *In summary, subsurface soil and groundwater are mediums of concern that could contribute to potentially complete exposure pathways. The only receptors who may be directly exposed to subsurface soils is [sic] the construction worker. It is noted that on-Site tenants/residents and off-site tenants may be indirectly exposed to subsurface soil containing COCs if this media [sic] becomes airborne as dust (e.g., particulate inhalation during construction activities). The only receptor who may be exposed to groundwater is the construction worker. The potential for a complete exposure pathway in association with sub-slab vapors exists across the Site due to the presence of elevated VOCs in subsurface soil and groundwater. However, the majority of the VOCs detected in the shallow subsurface soil and groundwater are not attributed to MGP residues but rather are most directly to the numerous documented and suspected petroleum spills throughout and in the vicinity of the Site*.

These conditions are similar to those encountered in the subsurface at the property. Because the property is predominantly covered by concrete and is used for vehicle parking, and because shallow impacts are related to petroleum sources unrelated to the MGP, soil and/or groundwater conditions related to the MGP do not appear to pose an acute health risk.

## 5. Summary and Conclusions

An RI was conducted at the site in compliance with VCA No. D2-0003-02-08, between Con Edison and the NYSDEC. The objectives of the RI were to:

- delineate the horizontal and vertical extent of MGP-impacted soil and groundwater identified during the SCS
- determine if soil and/or groundwater conditions pose an acute health risk and, if so, if these conditions warrant implementation of interim remedial measures
- provide sufficient data with which to develop a proposed site remediation strategy, if necessary

As a result of the field sampling efforts and the analysis of environmental data collected during the field sampling efforts, the objectives of the RI have been satisfied.

### 5.1 Summary of Findings

The following summarizes findings ascertained from the data collected during the SCS and RI.

#### 5.1.1 Property History

The property history is summarized below:

- The property was associated with an MGP from 1845 to 1914.
- Two 84-foot-diameter subgrade gas holders associated with the former MGP were built on the property and enclosed in a brick building.
- The aboveground infrastructure of each gas holder was razed in 1914. The subsurface infrastructure of each gas holder remains intact and has been filled with miscellaneous urban fill.
- No other MGP structures have been identified on the property.
- Since 1921, the property has had multiple uses. Site development included the installation of five 550-gallon gasoline USTs and one 4,000-gallon diesel UST.

- Petroleum-impacted soil associated with the USTs was identified in 1993. The LUSTs were removed in 1993. Approximately 120 cubic yards of petroleum-impacted soil was removed and disposed of off site.

- In 1993, EnviroTrac (on behalf of the property owner [Retaco Holding]) began multiple soil and groundwater investigations at the property.

- Con Edison performed an SCS at the property in 2005 and an RI at the property in 2008 to address the objectives stated above.

#### 5.1.2 Property Hydrogeology

The hydrogeology at the property is summarized below:

- Four stratigraphic units were identified at the property: fill, silty clay, sand and bedrock.

- The water table is within the Fill Unit, at depths that have ranged between 4 and 15 feet bgs.

- The primary source of recharge to shallow groundwater is inferred to be leaking drains, sewers and water distribution lines. Precipitation primarily recharges shallow groundwater indirectly, by leaking out of sewers.

- Based on the available data, water levels inside the holders are higher than levels observed outside the holders. This indicates that a local source of recharge contributes water directly into the holders and that leakage of water from the holders outward could occur. The presence of petroleum impacts (including MTBE, a gasoline additive) in both holders provides additional insight into possible groundwater movement patterns. Petroleum USTs are documented to have been present only in the eastern holder. These observations suggest that either there are times when the level of water inside the holders is lower that the level outside the holders (allowing groundwater to leak into the holders), that there may be one or more undocumented LUSTs in the western holder, or a combination of both. A condition that could cause the level of water inside the holders to be lower than outside could occur during seasonally wet periods or after storm events, when water levels outside the holder rise faster than levels inside the holders. Under such conditions, water from outside the holders could move into the holders.

- Movement of water into or out of the holders is expected to occur through a few discrete breaches in the holder walls, rather uniformly through the holder walls in a radial distribution.

- There is no evidence of a hydraulic connection that would permit groundwater to flow from one holder to the other.

#### 5.1.3 Sources of Impacts

Three sources of known impacts have been identified at the property:

- five 550-gallon gasoline USTs – petroleum hydrocarbons
- one 4,000-gallon diesel UST – petroleum hydrocarbons
- two former gas holders – coal tar compounds

Each of these sources share similar organic compounds (e.g., BTEX and naphthalene); however, fingerprint analysis can be used to differentiate between petroleum and coal tar impacts because gasoline and diesel sources contain organic compounds that are not associated with coal tar sources (e.g. MTBE, paraffins).

#### 5.1.4 Environmental Conditions

As observed during the RI, environmental conditions at the property are summarized below:

- Field evidence of petroleum and coal tar impacts, including odors, staining, sheen and NAPL, were noted during SCS and RI field activities.

- Soil and groundwater analytical data indicate widespread exceedances of VOC and SVOC SCOs due to the multiple sources.

- Petroleum impacts in soil and groundwater are present throughout the unsaturated and saturated zones to depths greater than 19 feet. Weight of evidence includes:

  - visual and olfactory observations during field sampling

  - LNAPL detected in MW-9 in September 2008

  - LNAPL detected in MW-8 in 2002 by EnviroTrac and fingerprinted as gasoline

- widespread occurrence of MTBE in groundwater
- detection of MTBE in soil at depths up to 19 feet bgs
- decreasing concentrations of BTEX compounds after the USTs were removed
- documented changes in groundwater elevations of more than 8 feet indicating the potential for a large petroleum smear zone
- fingerprint analysis is consistent with field observations and other analytical data
- dynamic chemical equilibrium conditions in groundwater is consistent with the effects of a recent source removal

- Coal tar impacts are primarily limited to the base of the gas holders. Weight of evidence includes:
  - visual and olfactory observations of MGP impacts during field sampling
  - visual and olfactory MGP impacts are noted only in the borings completed inside the gas holders
  - SVOC analytical data
  - fingerprint analysis is consistent with field observations and other analytical data
  - MGP constituents have existed at the property for more than 90 years; therefore, steady-state equilibrium conditions are expected if no other sources are present

### 5.2 Final Conclusions

Based on the results of RI activities conducted at the property, ARCADIS presents the following conclusions:

- The extent of coal tar NAPL is limited to isolated residual pockets located in the base of the holder foundations. MGP residuals on the property have only a localized effect on groundwater quality in the deeper portions of the water-table aquifer (i.e., near the bases of the holders).

- Former USTs located inside the east holder foundation are a source of the petroleum hydrocarbons observed in soil and shallow groundwater. Based on the distribution of petroleum impacts, other unidentified LUSTs are suspected in the west holder and/or outside of holder foundations.

- Impacts to the vadose zone and shallow groundwater are primarily limited to petroleum-related sources that are unrelated to the former MGP. Large fluctuations in the water table appear to have produced a large smear zone of petroleum impacts.

- Groundwater typically flows outward from holders, but may periodically reverse during high-water periods. Water levels in holders may be related to leakage of roof drains from subslab conveyances and restricted flow through the holder walls.

- Based on the current configuration of the site and the findings discussed herein, MGP-related impacts pose no meaningful exposure risk to people; therefore, remedial measures for MGP-related impacts are not warranted.

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**TABLES**

**Table 1. Sample Analytical Summary, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID | Sample Depth (feet bgs) | Sample Date | TCL VOCs | TCL SVOCs | Total Cyanide | Amenable CN | TPH-DRO | PIANO |
|---|---|---|---|---|---|---|---|---|
| **Subsurface Soil** | | | | | | | | |
| SB-A | 2 | 9/5/2008 | X | X | X | X | | |
| SB-A | 8 | 9/5/2008 | X | X | X | X | | |
| SB-A | 21 | 9/5/2008 | X | X | X | X | | |
| SB-A | 32 | 9/5/2008 | X | X | X | X | | |
| SB-B | 1 | 08/20/08 | X | X | X | X | | |
| SB-B | 10 | 08/22/08 | X | X | X | X | X | X |
| SB-B | 20 | 08/22/08 | X | X | X | X | | |
| SB-C | 14 | 09/08/08 | X | X | X | X | X | X |
| SB-C | 22 | 09/08/08 | X | X | X | X | X | X |
| SB-C | 36 | 09/08/08 | X | X | X | X | | |
| SB-D | 12 | 9/4/2008 | X | X | X | X | | |
| SB-D | 24 | 9/4/2008 | X | X | X | X | | |
| WELL CLUSTER A | 12 | 08/20/08 | X | X | X | X | X | X |
| WELL CLUSTER A | 17 | 08/21/08 | X | X | X | X | X | X |
| WELL CLUSTER A | 20 | 08/21/08 | X | X | X | X | X | X |
| WELL CLUSTER C | 11 | 08/26/08 | X | X | X | X | | |
| WELL CLUSTER C | 21 | 08/26/08 | X | X | X | X | X | X |
| **Groundwater** | | | | | | | | |
| MW-1 | NA | 10/02/08 | X | X | X | | | |
| MW-10 | NA | 10/02/08 | X | X | X | | | |
| MW-11 | NA | 09/30/08 | X | X | X | | | |
| MW-12 | NA | 09/30/08 | X | X | X | | | |
| MW-2 | NA | 10/02/08 | X | X | X | | | |
| MW-3 | NA | 10/01/08 | X | X | X | | | |
| MW-4 | NA | 10/01/08 | X | X | X | | | |
| MW-5 | NA | 10/02/08 | X | X | X | | | |
| MW-5A | NA | 10/02/08 | X | X | X | | | |
| MW-5B | NA | 10/02/08 | X | X | X | | | |
| MW-7 | NA | 10/02/08 | X | X | X | | | |
| MW-8 | NA | 10/01/08 | X | X | X | | X | X |
| MW-9 | NA | 09/29/08 | | | | | X | |
| WELL CLUSTER A2 | NA | 09/30/08 | X | X | X | | X | X |
| WELL CLUSTER A3 | NA | 09/30/08 | X | X | X | | X | X |
| WELL CLUSTER B2 | NA | 10/01/08 | X | X | X | | X | X |
| WELL CLUSTER B3 | NA | 10/01/08 | X | X | X | | X | X |
| WELL CLUSTER C2 | NA | 09/30/08 | X | X | X | | X | X |
| WELL CLUSTER C3 | NA | 09/30/08 | X | X | X | | X | X |

**Notes:**
bgs = below ground surface.
CN = Cyanide.
DRO = Diesel Range Organic Compounds.
NA = not applicable.
PIANO = Paraffin, Isoparaffin, Aromatic, Naphthene, or Olefin.
SVOCs = Semi-Volatile Organic Compounds.
TCL = Target Compound List.
TPH = Total Petroleum Hydrocarbons.
VOCs = Volatile Organic Compounds.

**Table 2. Soil Boring/Monitoring Well Construction Summary, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID | Date Completed | Installed on Behalf | Unit Screened | Northing Coordinate feet | Easting Coordinate feet | Measuring Point Elev. feet (MVD) | Ground Surface Elev. feet (NAVD) | Well Diameter in. | Casing/Screen Type | Screen Slot Size in. | Screen Length feet | Sump Length feet | Depth to Screened Interval (ft. bgs) Top | Depth to Screened Interval (ft. bgs) Bottom | Well Depth feet bgs | Borehole Depth feet bgs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-1 | 1-Dec-01 | Retaco | Fill | 696348.364 | 629038.05 | 13.06 | 13.63 | 4 | PVC | NA | NA | NA | NA | NA | 13.2 | NA |
| MW-2 | 1-Dec-01 | Retaco | Fill | 696326.7858 | 629078.3363 | 13.127 | 13.76 | 4 | PVC | NA | NA | NA | NA | NA | 15.1 | NA |
| MW-3 | 1-Dec-01 | Retaco | Fill | 696301.228 | 629122.646 | 12.60 | 13.50 | 4 | PVC | NA | NA | NA | NA | NA | 14.7 | NA |
| MW-4 | 1-Dec-01 | Retaco | Fill | 696316.537 | 629148.657 | 12.265 | 12.99 | 4 | PVC | NA | NA | NA | NA | NA | 14.35 | NA |
| MW-5 | 1-Dec-01 | Retaco | Fill | 696330.95 | 629120.129 | 12.979 | 13.17 | 4 | PVC | NA | NA | NA | NA | NA | 14.1 | NA |
| MW-6 | 1-Dec-01 | Retaco | Fill | NA | | | | 4 | PVC | NA | NA | NA | NA | NA | NR | NA |
| MW-7 | 1-Dec-01 | Retaco | Fill | 696357.213 | 629171.895 | 11.975 | 12.50 | 4 | PVC | NA | NA | NA | NA | NA | 13.44 | NA |
| MW-8 | 1-Dec-01 | Retaco | NA | 696383.4066 | 629150.7432 | NA | 11.64 | 4 | PVC | NA | NA | NA | NA | NA | 17 | NA |
| MW-9 | 1-Dec-01 | Retaco | NA | 696373.302 | 629131.6719 | NA | 13.33 | 4 | PVC | NA | NA | NA | NA | NA | NR | NA |
| MW-10 | 1-Dec-01 | Retaco | Fill | 696377.8682 | 629077.4973 | 12.674 | 13.10 | 4 | PVC | NA | NA | NA | NA | NA | NR | NA |
| MW-11 | 15-Feb-05 | Retaco | NA | 696415.0391 | 629090.5043 | 11.02 | 11.16 | 1.5 | PVC | 0.20 | 9.0 | 0.0 | 10 | 19 | 19.0 | 19.0 |
| MW-12 | 15-Feb-05 | Retaco | Sand | 696353.2863 | 629203.5356 | 12.164 | 12.37 | 1.5 | PVC | 0.20 | 9.0 | 0.0 | 10 | 19 | 19.0 | 19.0 |
| MW-13 | 15-Feb-05 | Retaco | NA | | | | | 1.5 | PVC | 0.20 | NA | 0.0 | 10 | 19 | 19.0 | 19.0 |
| MW-5A | 2-May-05 | Con Edison | Silt | 696368.5487 | 629026.9493 | 13.346 | 13.84 | 2 | PVC | NA | 10.0 | 2.0 | 9 | 19 | 19.0 | 22.0 |
| MW-5B | 2-May-05 | Con Edison | Sand | 696370.0902 | 629024.1166 | 13.265 | 13.80 | 2 | PVC | NA | 10.0 | 2.0 | 32 | 42 | 42.0 | 42.0 |
| Well Cluster A1 | 21-Aug-08 | Con Edison | Fill | 696383.8404 | 629084.7592 | 12.98 | 13.18 | 2 | PVC | 0.02 | 4.0 | 2.0 | 7 | 11 | 11.0 | 21.0 |
| Well Cluster A2 | 21-Aug-08 | Con Edison | Fill | 696383.042 | 629086.614 | 12.92 | 13.18 | 2 | PVC | 0.02 | 2.0 | 2.0 | 13.5 | 15.5 | 15.5 | 21.0 |
| Well Cluster A3 | 21-Aug-08 | Con Edison | Fill | 696382.049 | 629088.454 | 12.95 | 13.20 | 2 | PVC | 0.02 | 2.0 | 2.0 | 17.7 | 19.7 | 19.7 | 21.0 |
| Well Cluster B1 | 22-Aug-08 | Con Edison | Fill | 696343.597 | 629134.927 | 13.09 | 13.34 | 2 | PVC | 0.02 | 4.0 | 2.0 | 7 | 11 | 11.0 | 20.5 |
| Well Cluster B2 | 22-Aug-08 | Con Edison | Fill | 696344.617 | 629133.371 | 13.08 | 13.34 | 2 | PVC | 0.02 | 2.0 | 2.0 | 14 | 16 | 16.0 | 20.5 |
| Well Cluster B3 | 22-Aug-08 | Con Edison | Fill | 696345.859 | 629131.98 | 12.89 | 13.26 | 2 | PVC | 0.02 | 2.0 | 2.0 | 18.5 | 20.5 | 20.5 | 20.5 |
| Well Cluster C1 | 26-Aug-08 | Con Edison | Fill | 696346.32 | 629094.088 | 13.12 | 13.46 | 2 | PVC | 0.02 | 4.0 | 2.0 | 7 | 11 | 11.0 | 21.0 |
| Well Cluster C2 | 26-Aug-08 | Con Edison | Fill | 696345.032 | 629096.366 | 13.15 | 13.39 | 2 | PVC | 0.02 | 2.0 | 2.0 | 13.5 | 15.5 | 13.5 | 21.0 |
| Well Cluster C3 | 26-Aug-08 | Con Edison | Fill | 696343.789 | 629098.528 | 13.05 | 13.34 | 2 | PVC | 0.02 | 2.0 | 2.0 | 19 | 21 | 19.0 | 21.0 |

**Notes:**
bgs = below ground surface.
in. = inches.
NA = not available; well likely installed prior to SC.
NR = Not Recorded.
PVC = polyvinyl chloride.
RI = Remedial Investigation.
SC = Site Characterization.
All elevations shown are in feet above mean sea level.
Northing and Easting coordinates in NAVD 88 Vertical Datum.

**Table 3. Groundwater Sampling Field Parameters Summary, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID | Date Sampled | Time | Minutes Elapsed | Purge/Sample Flow Rate | Temperature | pH | Specific Conductivity | Oxidation Reduction Potential | Dissolved Oxygen | Turbidity | Depth to Water |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (mL/min) | (degrees C) | (s.u.) | (mS/cm) | (mV) | (mg/L) | (NTU) | (ft bmp) |
| MW-1 | 10/02/08 | 11:20 | 20 | 300 | 20.21 | 7.18 | 2.69 | -326.8 | 0.29 | 50 | 13.55 |
| MW-2 | 10/02/08 | 14:16 | 20 | 225 | 20.57 | 6.76 | 2.51 | -60.1 | 1.27 | 160 | 13 |
| MW-3 | 10/01/08 | 14:15 | 20 | 450 | 20.4 | 6.53 | 1.57 | -126.9 | 1.55 | 9.8 | 13.02 |
| MW-4 | 10/01/08 | 12:55 | 25 | 300 | 18.6 | 6.68 | 1.11 | -131.8 | 1.69 | 27 | 12.42 |
| MW-5 | 10/02/08 | 15:10 | 35 | 225 | 21.75 | 6.73 | 2.22 | -88.3 | 1.12 | 45 | 13.88 |
| MW-5A | 10/02/08 | 13:05 | 35 | 150 | 19.95 | 7.18 | 1.73 | -333.6 | 0.38 | 50 | 16.41 |
| MW-5B | 10/02/08 | 10:58 | 40 | 450 | 18.19 | 7.08 | 0.19 | 1.8 | 1.67 | 34 | 14.3 |
| MW-7[1] | 10/02/08 | 16:45 | NA | NA | NA | NA | NA | NA | NA | NA | 12.32 |
| MW-8 | 10/01/08 | 15:45 | 20 | 225 | 21.03 | 5.99 | 5.71 | -127.8 | 0.2 | 20 | 13.95 |
| MW-9 | 0.02 FEET OF LNAPL PRESENT IN WELL. NO SAMPLE COLLECTED. | | | | | | | | | | 13.75 |
| MW-10 | 10/02/08 | 12:15 | 25 | 200 | 20.25 | 6.58 | 5.56 | -61.6 | 1.25 | 55 | 12.42 |
| MW-11 | 09/30/08 | 16:40 | 25 | 500 | 19.38 | 6.48 | 5.64 | -169.7 | 2.01 | 12 | 12.63 |
| MW-12 | 09/30/08 | 17:30 | 25 | 500 | 18.92 | 6.48 | 2.17 | -156.2 | 1.68 | 6.2 | 13.64 |
| MW-A1 | WELL WAS DRY. NO SAMPLE WAS COLLECTED. | | | | | | | | | | |
| MW-A2 | 09/30/08 | 11:40 | 30 | 100 | 21.24 | 7.47 | 3.01 | -124 | 1.86 | 680 | 14.5 |
| MW-A3 | 09/30/08 | 11:30 | 25 | 500 | 18.75 | 6.69 | 3.285 | -281.3 | 1.76 | 23 | 11.4 |
| MW-B1 | WELL WAS DRY. NO SAMPLE WAS COLLECTED. | | | | | | | | | | |
| MW-B2 | 10/01/08 | 11:40 | 40 | 100 | 21.58 | 7.03 | 2.1 | -89.9 | 4.75 | >999 | 14.5 |
| MW-B3 | 10/01/08 | 11:08 | 30 | 450 | 17.98 | 6.78 | 1.51 | -151.1 | 1.7 | 18 | 13.6 |
| MW-C1 | WELL WAS DRY. NO SAMPLE WAS COLLECTED. | | | | | | | | | | |
| MW-C2 | 09/30/08 | 13:50 | 25 | 100 | 21.42 | 7.54 | 1.28 | -96.8 | 2.18 | 160 | 14.5 |
| MW-C3 | 09/30/08 | 13:30 | 35 | 300 | 18.68 | 7.8 | 1.53 | -149.8 | 2.28 | 50 | 15.69 |

**Notes:**
ft bmp = feet below measuring point.
in. = inches.
mg/L = milligram per liter.
mL/min = milliliters per minute.
mS/cm = milliSiemens per centimeter.
mV = millivolts.
NTU = Nephelometric Turbidity Units.
s.u. = standard units.
[1]No water quality parameters were collected because of elevated turdidity in well due to removal of sediment in the well by EnviroTrac the previous day.

**Table 4. Groundwater Elevation Gauging, Remedial Investigation, Former West 18th Street Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID | Location | Measuring Point Elev. feet (NAVD) | Depth to Water | | | | | | | Water Elevation - feet (MVD) | | | | | | | Measured NAPL - feet | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 01/10/02 | 01/18/02 | 03/06/02 | 01/27/04 | 02/15/05 | 03/19/07 | 09/29/08 | 01/10/02 | 01/18/02 | 03/06/02 | 01/27/04 | 02/15/05 | 03/19/07 | 09/29/08 | 01/10/02 | 01/18/02 | 03/06/02 | 09/29/08 |
| MW-9 | Adjacent to East Holder | 13.17 | 9.27 | 11.69 | 10.2 | 12.93 | 12.64 | 12.93 | 13.75 | 3.9 | 1.48 | 2.97 | 0.24 | 0.53 | 0.24 | -0.58 | NA | NA | NA | 0.02 |
| MW-5A | Adjacent to West Holder | 13.35 | NA | NA | NA | | NA | | 14.28 | NA | NA | NA | NA | NA | NA | -0.93 | NA | NA | NA | 0 |
| MW-5B | Adjacent to West Holder | 13.27 | NA | NA | NA | | NA | | 14.2 | NA | NA | NA | NA | NA | NA | -0.93 | NA | NA | NA | 0 |
| MW-3 | East Holder | 12.6 | 4.33 | 4.68 | 4.36 | 6.45 | 5.5 | 6.94 | 12.91 | 8.27 | 7.92 | 8.24 | 6.15 | 7.1 | 5.66 | -0.31 | NA | NA | NA | 0 |
| MW-4 | East Holder | 12.27 | 4.04 | 4.38 | 4.09 | 6.17 | 6.21 | 6.64 | 12.6 | 8.23 | 7.89 | 8.18 | 6.1 | 6.06 | 5.63 | -0.33 | NA | NA | NA | 0 |
| MW-5 | East Holder | 12.98 | 4.75 | 5.08 | 4.78 | 6.86 | 6.91 | 7.45 | 13.32 | 8.23 | 7.9 | 8.2 | 6.12 | 6.07 | 5.53 | -0.34 | NA | NA | NA | 0 |
| MW-6 | East Holder | 13[1] | 6.36 | 8.07 | 7.6 | | NA | | NA | 6.64 | 4.93 | 5.4 | NA | NA | NA | NG | NA | NA | NA | NA |
| MW-7 | East Holder | 11.98 | 3.7 | 4.04 | 3.72 | 5.86 | 5.88 | 5.88 | 12.23 | 8.28 | 7.94 | 8.26 | 6.12 | 6.1 | 6.1 | -0.25 | NA | NA | NA | 0 |
| MW-B1 | East Holder | 13.09 | NA | NA | NA | | NA | | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NM |
| MW-B2 | East Holder | 13.08 | NA | NA | NA | | NA | | 13.38 | NA | NA | NA | NA | NA | NA | -0.3 | NA | NA | NA | 0 |
| MW-B3 | East Holder | 12.89 | NA | NA | NA | | NA | | 13.2 | NA | NA | NA | NA | NA | NA | -0.31 | NA | NA | NA | 0 |
| MW-1 | West Holder | 13.06 | 6.69 | 6.81 | 6.16 | 7.24 | NA | 8.19 | 11.4 | 6.37 | 6.25 | 6.9 | 5.82 | NA | 4.87 | 1.66 | NA | NA | NA | 0 |
| MW-2 | West Holder | 13.13 | 6.75 | 6.88 | 6.22 | 7.23 | 7.48 | 8.27 | 11.47 | 6.38 | 6.25 | 6.91 | 5.9 | 5.65 | 4.86 | 1.66 | NA | NA | NA | 0 |
| MW-10 | West Holder | 12.67 | 6.32 | 6.48 | 5.78 | 6.78 | NG | 7.87 | NG | 6.35 | 6.19 | 6.89 | 5.89 | NA | 4.8 | NA | NA | NA | NA | NM |
| MW-A1 | West Holder | NA | NA | NA | NA | | NA | | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NM |
| MW-A2 | West Holder | 12.92 | NA | NA | NA | | NA | | 11.27 | NA | NA | NA | NA | NA | NA | 1.65 | NA | NA | NA | 0 |
| MW-A3 | West Holder | 12.95 | NA | NA | NA | | NA | | 11.3 | NA | NA | NA | NA | NA | NA | 1.65 | NA | NA | NA | 0 |
| MW-C1 | West Holder | 13.12 | NA | NA | NA | | NA | | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NM |
| MW-C2 | West Holder | 13.15 | NA | NA | NA | | NA | | 11.44 | NA | NA | NA | NA | NA | NA | 1.71 | NA | NA | NA | 0 |
| MW-C3 | West Holder | 13.05 | NA | NA | NA | | NA | | 11.38 | NA | NA | NA | NA | NA | NA | 1.67 | NA | NA | NA | 0 |
| MW-8 | Sidewalk | 11.5 | 9.41 | 10.59 | 10.84 | 11.25 | 10.85 | 11.35 | 12.05 | 2.09 | 0.91 | 0.66 | 0.25 | 0.65 | 0.15 | -0.55 | 0.01 | 0.01 | 0.12 | 0 |
| MW-11 | Sidewalk | 11.02 | NA | NA | NA | | 10.35 | 13.51 | 11.64 | NA | NA | NA | NA | 0.67 | -2.49 | -0.62 | NA | NA | NA | 0 |
| MW-12 | Sidewalk | 12.16 | NA | NA | NA | | 11.58 | 11.73 | 12.96 | NA | NA | NA | NA | 0.58 | 0.43 | -0.8 | NA | NA | NA | 0 |
| MW-13 | Sidewalk | NA | NA | NA | NA | | 10.26 | | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

**Notes:**

[1] Estimated value based on MW-B1, MW-B2, and MW-B3

NA = not available/not applicable

All elevations shown are in NAVD 88 (NAVD) vertical datum

**Table 5. Summary of Field Observations, Remedial Investigation, Former West 18th Street Gas Works, Block 715, Lot 59, Manhattan, New York**

| Boring/ Well ID | Dates Completed | Boring Depth (ft bgs) | Field Observations | | |
|---|---|---|---|---|---|
| | | | Depth Interval (ft bgs) | Description | Maximum PID Reading (ppm) |
| SB-1 | 14-May-05 | 6 | NA | No petroleum or MGP impacts were noted. | NA |
| SB-2 | 6-May-05 | 20.5 | 0.8-2 | Strong gasoline-like odor, N/S | 22.1 |
| | | | 13-15 | Petroleum odor, N/S | 0.8 |
| | | | 15-17 | MGP-related odor, N/S | 0.5 |
| | | | 17-19 | Strong MGP-related odor | 124 |
| | | | 19-21 | Strong MGP-related odor | 19.2 |
| | | | 20.5 | Refusal due to rocks - possible bottom of Former Gas Holder #1 | NA |
| SB-3 | 6-May-05 | 20 | 13-15 | Strong gasoline-like odor, N/S | 63 |
| SB-4 | 5-May-05 | 21 | 6.5-9 | Strong gasoline-like odor, black staining, sheen | 5.7 |
| | | | 9-11 | Slight gasoline-like odor, N/S, trace sheen | 0.9 |
| | | | 11-13 | Slight petroleum odor, trace black staining, trace sheen | 4.4 |
| | | | 13-15 | Petroleum odor, N/S, sheen | 30.5 |
| | | | 15-17 | Slight MGP-related odor, N/S, sheen | 9.8 |
| | | | 17-19 | MGP-related odor, N/S, sheen | 12.9 |
| | | | 19-21 | Very strong MGP-related odor, heavy black staining, visible OLM | 3,124 |
| | | | 21 | Refusal due to rocks and brick - possible bottom of Former Gas Holder #2 | NA |
| SB-5 | 3-Jun-05 | 31 | 10-11 | Strong petroleum-like odor, sheen, N/S | 387 |
| | | | 11-15 | Very strong petroleum- like odor, black staining, sheen | 4,085 |
| | | | 15-19 | Strong petroleum-like odor, sheen, black staining on wood, trace NAPL | 198 |
| | | | 19-20 | Trace petroleum-like odor, N/S | 6.8 |
| | | | 20-25 | Very slight petroleum-like odor, N/S | 8.4 |
| SB-6 | 13-May-05 | 72 | 10-13 | Slight petroleum-like odor (stronger at tip), trace black staining | 2,060 |
| | | | 13-16 | Strong petroleum-like odor, some black staining, sheen, trace NAPL | 3,520 |
| | | | 16-19 | Slight petroleum-like odor, N/S | 134 |
| | | | 72 | Refusal due to rock (schist fragments in spoon) | NA |
| MW-5A | 2-May-05 | 22 | 10-11 | Strong petroleum-like odor, N/S, sheen | 387 |
| | | | 11-15 | Very strong petroleum-like odor, black staining, sheen | 4,085 |
| | | | 15-20 | Very strong petroleum-like odor, N/S, sheen | 1,222 |
| | | | 20-21 | Slight petroleum-like odor, N/S, sheen | 55 |
| | | | 21-22 | Slight petroleum-like odor, N/S, trace sheen | 12.4 |
| | | | 22 | Refusal due to brick/concrete | NA |
| MW-5B | 8-Jun-05 | 42 | 10-11 | Strong petroleum-like odor, N/S, sheen | 387 |
| | | | 11-15 | Very strong petroleum- like odor, black staining, sheen | 4,085 |
| | | | 15-19 | Very strong petroleum-like odor, N/S, sheen | 1,222 |
| | | | 19-21 | Sheen | NA |
| | | | 32-36 | Very slight non-MGP-related odor, N/S | 0.0 |
| TP-1B | 4-May-05 | 3 | 0-1 | Gasoline-like odor, N/S | 667 |
| | | | 2-3 | Gasoline-like odor, black staining on wood timbers | 78.2 |
| | | | 3 | Gasoline-like odor, N/S | 46.0 |
| Well Cluster A | 8/20/2008, 8/21/2008 | 21 | 11-12 | Staining | 2042 |
| | | | 15-17 | Dark brown medium to coarse SAND, wet. | 683 |
| | | | 17-20 | Timber | 88 |
| | | | 20-21 | Concrete | 83 |

See Notes on Page 2.

**Table 5. Summary of Field Observations, Remedial Investigation, Former West 18th Street Gas Works, Block 715, Lot 59, Manhattan, New York**

| Boring/ Well ID | Dates Completed | Boring Depth (ft bgs) | Field Observations | | |
|---|---|---|---|---|---|
| | | | Depth Interval (ft bgs) | Description | Maximum PID Reading (ppm) |
| Well Cluster B | 22-Aug-08 | 20.5 | 0-5.6 | Strong odors, slight staining | 9999 |
| | | | 5.6-6 | Strong odors | 1523 |
| | | | 8-10 | Strong odors | 1981 |
| | | | 10-12 | Strong odors | 908 |
| Well Cluster C | 26-Aug-08 | 25 | 19-21 | Staining | 787 |
| | | | 21-23 | Concrete (Possible holder bottom) | 232 |
| SB-A | 5-Sep-08 | 32 | 2-4 | Wood, moderate odor | 605 |
| | | | 4-6 | Wood, faint odor | 64 |
| | | | 6-8 | Faint odor | 100 |
| | | | 8-10 | Trace wood, moderate odor | 159 |
| | | | 10-12 | Trace wood, faint odors | 72 |
| | | | 14-16 | Trace wood, faint odors | 21 |
| | | | 20.8 - 21.2 | Black staining, strong odors | 79 |
| | | | 22-22.5 | Moderate odors | 511 |
| | | | | | 204 |
| SB-C | 8-Sep-08 | 42 | 9-10 | Staining, strong odors | 861 |
| | | | 10-14 | Sheen, trace staining, strong odors | 3747 |
| | | | 16-18 | Slight sheen, strong odors | 2523 |
| | | | 18-22 | Strong odors | 2522 |
| | | | 22-24 | Faint odors | 30 |
| | | | 24-26 | Moderate odors | 212 |
| | | | 26-28 | Moderate odors | 238 |
| | | | 34-36 | Faint odors | 6.1 |
| SB-D | 4-Sep-08 | 26 | | No petroleum or MGP impacts noted | 18.4 |

**Notes:**
NAPL = Nonaqueous Phase Liquid.
MGP = Manufactured Gas Plant.
N/S = No staining.
ppm = parts per million.
ft bgs = Feet below ground surface.
OLM = Oil-like Material.
Updated January 23, 2009.

**Table 6. Summary Statistics for Historical SVOC and VOC Analytical Groundwater Data, Dates of Sample Collection: 3/19/2007, 2/15/05, 1/27/04, 3/6/03, 1/18/02, 8/21/01, Block 715, Lot 59, Manhattan, New York**

| Analyte | Minimum Detected Concentration (ug/l) | Maximum Detected Concentration (ug/l) | Total Number of Samples | Number Detected | Frequency of Detections |
|---|---|---|---|---|---|
| **Volatile Organic Compounds** | | | | | |
| 1,2,4-Trimethlybenzene | ND | 77000 | 44 | 40 | 91% |
| 1,3,5-Trimethylbenzene | ND | 29000 | 44 | 34 | 77% |
| Benzene | ND | 9600 | 44 | 42 | 95% |
| Ethylbenzene | ND | 18000 | 44 | 44 | 100% |
| Isopropylbenzene | ND | 2900 | 44 | 41 | 93% |
| MTBE | ND | 1980 | 44 | 42 | 95% |
| Naphthalene | ND | 1300 | 44 | 44 | 100% |
| n-Butylbenzene | ND | <500 | 44 | 26 | 59% |
| n-Propylbenzene | ND | 8900 | 44 | 42 | 95% |
| p-Isopropytoluene | ND | 970 | 44 | 33 | 75% |
| sec-Butylbenzene | ND | 850 | 44 | 25 | 57% |
| tert-Butylbenzene | ND | <500 | 44 | 24 | 55% |
| Toluene | ND | 20000 | 44 | 41 | 93% |
| Total Xylenes | ND | 106000 | 44 | 44 | 100% |
| Total VOCs | 50 | <136250 | 44 | 44 | 100% |
| **Semi-Volatile Organic Compounds** | | | | | |
| Acenaphthene | ND | 39.6 | 33 | 23 | 70% |
| Acenaphthylene | ND | <10 | 16 | 4 | 25% |
| Anthracene | ND | 13500 | 36 | 20 | 56% |
| Benzo(a)anthracene | ND | 5360 | 36 | 10 | 28% |
| Benzo(a)pyrene | ND | 3930 | 36 | 8 | 22% |
| Benzo(b)flouranthene | ND | 2500 | 36 | 8 | 22% |
| Benzo(g,h,I)perylene | ND | 0.75 | 36 | 6 | 17% |
| Benzo(k)flouranthene | ND | 3100 | 36 | 8 | 22% |
| Carbazole | ND | 100.8 | 12 | 4 | 33% |
| Chrysene | ND | 5730 | 36 | 10 | 28% |
| Dibenzo(a,h)anthracene | ND | <10 | 36 | 4 | 11% |
| Dibenzofuran | ND | 2.7 | 12 | 4 | 33% |
| Flouranthene | ND | 16700 | 36 | 12 | 33% |
| Fluorene | ND | 50500 | 36 | 32 | 89% |
| Indeno(1,2,3-cd)pyrene | ND | 0.64 | 36 | 6 | 17% |
| Naphthalene | ND | 5980000 | 36 | 32 | 89% |
| Phenanthrene | ND | 67000 | 36 | 30 | 83% |
| Pyrene | ND | 19500 | 36 | 20 | 56% |
| Total SVOCs | 2.7 | 6203630 | 36 | 36 | 100% |

**Notes:**
VOC = Volatile Organic Compounds.
SVOC = Semi Volatile Organic Compounds.
ND = Not Detected.
ug/l = micrograms per liter.

**Table 7a. VOCs Detected in Subsurface Soil, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID:<br>Sample Depth (ft bgs):<br>Date Collected: | NY TAGM Rec Soil Cleanup Objectives | Units | MW-5B<br>34 - 36<br>06/07/05 | MW-5B (DUP)<br>34 - 36<br>06/07/05 | SB-1<br>5 - 5.5<br>05/03/05 | SB-2<br>1 - 1.5<br>05/02/05 | SB-2<br>2 - 2.5<br>05/02/05 | SB-2<br>5 - 7<br>05/06/05 | SB-2<br>13 - 15<br>05/06/05 | SB-2<br>19 - 20.5<br>05/06/05 | SB-3<br>3 - 3.5<br>04/29/05 | SB-3<br>5 - 7<br>05/06/05 | SB-3<br>13 - 15<br>05/06/05 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Volatile Organics** | | | | | | | | | | | | | |
| 1,2-Dichloropropane | - - | ug/kg | 0.50 U | 0.48 U | 0.40 U | 0.43 U | 43 | 0.50 U | 0.45 U | 510 U | 0.43 UR | 0.44 U | 46 U |
| 1,4-Dichlorobenzene | 8,500 | ug/kg | 0.69 U | 0.66 U | 0.55 U | 0.58 U | 0.59 U | 0.68 U | 0.62 U | 630 U | 0.59 UR | 0.61 U | 56 U |
| 2-Butanone | 300 | ug/kg | 3.6 U | 3.4 U | 2.9 U | 3.0 U | 3.1 U | 3.5 U | 3.2 U | 4,600 U | 3.0 UR | 3.1 U | 410 U |
| 4-Methyl-2-pentanone | 1,000 | ug/kg | 2.5 U | 2.4 U | 2.0 U | 2.1 U | 2.1 U | 2.5 U | 2.2 U | 2,100 U | 2.1 UR | 2.2 U | 190 U |
| Acetone | 200 | ug/kg | 16 J | 4.1 U | 6.0 JB | 3.7 J | 3.6 U | 13 JB | 15 JB | 5,400 U | 12 J | 7.0 JB | 480 U |
| Benzene | 60 | ug/kg | 0.50 U | 0.49 U | 0.40 U | 0.43 U | 0.43 U | 0.50 U | 1.7 J | **22,000** | 0.43 UR | 0.44 U | 35 U |
| Carbon Disulfide | 2,700 | ug/kg | 0.46 U | 0.45 U | 0.37 U | 0.39 U | 0.40 U | 0.46 U | 0.42 U | 630 U | 0.40 UR | 0.41 U | 56 U |
| Cyclohexane | - - | ug/kg | 0.41 U | 0.39 U | 0.33 U | 0.35 U | 0.35 U | 0.40 U | 0.37 U | 1,600 J | 0.35 UR | 0.36 U | 53 U |
| Ethylbenzene | 5,500 | ug/kg | 3.0 J | 2.6 J | 0.36 U | 0.38 U | 0.38 U | 0.44 U | 0.40 U | **35,000** | 0.38 UR | 0.39 U | 59 U |
| Isopropylbenzene | - - | ug/kg | 0.52 U | 0.51 U | 0.42 U | 0.45 U | 0.45 U | 0.52 U | 0.47 U | 28,000 | 0.45 UR | 0.46 U | 48 U |
| Methyl tert-butyl ether | - - | ug/kg | 0.46 U | 0.45 U | 0.37 U | 0.39 U | 0.40 U | 0.46 U | 5.1 J | 580 U | 0.40 UR | 0.41 U | 52 U |
| Methylcyclohexane | - - | ug/kg | 0.53 U | 0.51 U | 0.42 U | 0.45 U | 0.46 U | 0.52 U | 0.48 U | 3,500 J | 0.45 UR | 0.47 U | 1,300 |
| Methylene Chloride | 100 | ug/kg | 2.3 U | 5.1 JB | 1.8 U | 6.1 | 5.9 B | 2.3 U | 2.1 U | 1,000 U | 2.0 UR | 2.0 U | 89 U |
| m-Xylene & p-Xylene | - - | ug/kg | 1.4 J | 1.1 U | 0.87 U | 0.93 U | 1.2 J | 1.1 U | 0.98 U | 13,000 J | 0.93 UR | 0.96 U | 140 U |
| o-Xylene | - - | ug/kg | 4.4 J | 4.2 J | 0.39 U | 0.41 U | 0.42 U | 0.48 U | 0.43 U | 600 U | 0.41 UR | 0.43 U | 53 U |
| Tetrachloroethene | 1,400 | ug/kg | 2.6 J | 1.5 J | 0.74 U | 0.78 U | 0.79 U | 0.91 U | 0.83 U | 540 U | 0.79 UR | 0.81 U | 47 U |
| Toluene | 1,500 | ug/kg | 0.51 U | 0.49 U | 0.41 U | 0.43 U | 0.44 U | 0.51 U | 0.46 U | 630 U | 0.44 UR | 0.45 U | 56 U |
| Total VOCs | - - | ug/kg | 22 J | 9.2 J | 6.0 J | 9.8 J | 49 | 13 J | 17 J | 57,000 | 12 J | 7.0 J | ND |

See Notes on Page 4.

**Table 7a. VOCs Detected in Subsurface Soil, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID:<br>Sample Depth (ft bgs):<br>Date Collected: | NY TAGM Rec Soil Cleanup Objectives | Units | SB-3<br>17 - 19<br>05/06/05 | SB-4<br>5 - 5.5<br>05/03/05 | SB-4<br>7 - 9<br>05/05/05 | SB-4<br>9 - 13<br>05/05/05 | SB-4<br>17 - 19<br>05/05/05 | SB-4<br>19 - 21<br>05/05/05 | SB-5A<br>17 - 19<br>05/02/05 | SB-5A<br>19 - 20<br>05/02/05 | SB-5A<br>26 - 28<br>05/03/05 | SB-5A<br>31 - 33<br>05/03/05 | SB-5B<br>10 - 11<br>05/02/05 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Volatile Organics** | | | | | | | | | | | | | |
| 1,2-Dichloropropane | - - | ug/kg | 0.46 U | 0.44 U | 0.45 U | 0.46 U | 0.47 U | 50 U | 2.4 U | 0.45 U | 0.48 U | 0.46 U | 0.43 U |
| 1,4-Dichlorobenzene | 8,500 | ug/kg | 0.63 U | 0.61 U | 0.62 U | 0.64 U | 0.65 U | 60 U | 3.3 U | 0.62 U | 0.66 U | 0.64 U | 0.58 U |
| 2-Butanone | 300 | ug/kg | 3.3 U | 3.1 U | 3.2 U | 3.3 U | 3.3 U | 440 U | 17 U | 3.2 U | 3.4 U | 3.3 U | 3.0 U |
| 4-Methyl-2-pentanone | 1,000 | ug/kg | 2.3 U | 2.2 U | 2.2 U | 2.3 U | 2.3 U | 210 U | 12 U | 2.3 U | 2.4 U | 2.3 U | 2.1 U |
| Acetone | 200 | ug/kg | 13 JB | 8.1 JB | 19 JB | 28 JB | 19 JB | 520 U | 20 U | 3.8 U | 16 JB | 17 JB | 3.6 U |
| Benzene | 60 | ug/kg | 0.46 U | 0.44 U | 0.45 U | 2.4 J | 0.47 U | **19,000** | 14 J | 0.45 U | 0.48 U | 0.47 U | 0.43 U |
| Carbon Disulfide | 2,700 | ug/kg | 0.43 U | 0.41 U | 0.42 U | 0.43 U | 0.44 U | 61 U | 2.2 U | 0.42 U | 0.44 U | 0.43 U | 0.39 U |
| Cyclohexane | - - | ug/kg | 0.38 U | 0.36 U | 0.37 U | 1.4 J | 0.38 U | 57 U | 1.9 U | 0.37 U | 0.39 U | 0.38 U | 0.35 U |
| Ethylbenzene | 5,500 | ug/kg | 0.41 U | 0.39 U | 0.40 U | 0.41 U | 0.42 U | **48,000 D** | 60 | 0.40 U | 0.43 U | 0.41 U | 0.38 U |
| Isopropylbenzene | - - | ug/kg | 0.48 U | 0.46 U | 0.47 U | 2.1 J | 2.2 J | 3,000 | 2.5 U | 0.47 U | 0.50 U | 0.49 U | 0.45 U |
| Methyl tert-butyl ether | - - | ug/kg | 2.1 J | 0.41 U | 0.42 U | 0.43 U | 0.44 U | 56 U | 2.2 U | 2.7 J | 0.44 U | 0.43 U | 0.39 U |
| Methylcyclohexane | - - | ug/kg | 0.49 U | 0.47 U | 5.7 | 5.0 J | 0.50 U | 230 J | 100 | 0.48 U | 0.51 U | 0.49 U | 0.45 U |
| Methylene Chloride | 100 | ug/kg | 2.1 U | 2.5 JB | 2.4 JB | 2.1 U | 2.8 J | 97 U | 37 | 6.9 | 2.2 U | 3.7 JB | 2.0 U |
| m-Xylene & p-Xylene | - - | ug/kg | 1.0 U | 0.96 U | 0.98 U | 1.4 J | 1.0 U | 56,000 | 250 | 3.9 J | 1.0 U | 1.0 U | 0.93 U |
| o-Xylene | - - | ug/kg | 0.45 U | 0.43 U | 0.43 U | 0.45 U | 0.46 U | 22,000 | 8.7 J | 0.44 U | 0.46 U | 0.45 U | 0.41 U |
| Tetrachloroethene | 1,400 | ug/kg | 0.85 U | 0.81 U | 0.83 U | 0.85 U | 0.87 U | 52 U | 4.4 U | 0.83 U | 0.88 U | 0.85 U | 0.78 U |
| Toluene | 1,500 | ug/kg | 0.47 U | 0.45 U | 0.46 U | 0.47 U | 0.48 U | **29,000** | 2.4 U | 0.46 U | 0.49 U | 0.47 U | 0.43 U |
| Total VOCs | - - | ug/kg | 13 J | 11 J | 21 J | 30 J | 22 J | 96,000 | 110 J | 6.9 | 16 J | 21 J | ND |

See Notes on Page 4.

**Table 7a. VOCs Detected in Subsurface Soil, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID:<br>Sample Depth (ft bgs):<br>Date Collected: | NY TAGM Rec Soil Cleanup Objectives | Units | SB-5B<br>11 - 12<br>05/02/05 | SB-5B<br>21 - 22<br>05/02/05 | SB-6<br>10 - 12<br>05/12/05 | SB-6<br>13 - 15<br>05/12/05 | SB-6<br>19 - 21<br>05/12/05 | SB-6<br>24 - 26<br>05/12/05 | SB-6<br>28.5 - 30.5<br>05/12/05 | TP-1B<br>1 - 1.5<br>05/04/05 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Volatile Organics** | | | | | | | | | | |
| 1,2-Dichloropropane | - - | ug/kg | 34 U | 0.48 U | 0.45 U | 48 U | 0.49 U | 0.48 U [0.48 U] | 0.47 U | 0.44 U [0.43 UJ] |
| 1,4-Dichlorobenzene | 8,500 | ug/kg | 42 U | 1.8 J | 0.61 U | 58 U | 0.67 U | 0.66 U [0.66 U] | 0.65 U | 0.60 U [6.0 J] |
| 2-Butanone | 300 | ug/kg | 300 U | 3.4 U | 3.2 U | 430 U | 3.5 U | 3.4 U [3.4 U] | 3.3 U | 3.1 U [15 J] |
| 4-Methyl-2-pentanone | 1,000 | ug/kg | 140 U | 2.6 J | 2.2 U | 200 U | 2.4 U | 2.4 U [2.4 U] | 2.3 U | 2.2 U [2.2 UJ] |
| Acetone | 200 | ug/kg | 360 U | 4.0 U | 7.9 JB | 500 U | 34 BJ | 19 JB [19 JB] | 12 JB | 8.2 JB [81 BJ] |
| Benzene | 60 | ug/kg | 26 U | 2.0 J | 0.45 U | 36 U | **87** | 0.49 U [0.48 U] | 0.47 U | 0.44 U [0.44 UJ] |
| Carbon Disulfide | 2,700 | ug/kg | 42 U | 0.44 U | 0.41 U | 59 U | 7.0 | 0.45 U [0.45 U] | 0.44 U | 0.41 U [0.40 UJ] |
| Cyclohexane | - - | ug/kg | 39 U | 0.39 U | 0.36 U | 55 U | 5.7 J | 0.39 U [0.39 U] | 0.38 U | 0.36 U [0.35 UJ] |
| Ethylbenzene | 5,500 | ug/kg | **18,000** | 5.5 J | 0.40 U | **70,000 DJ** | 0.44 U | 2.7 J [0.43 U] | 2.8 J | 0.39 U [4.4 J] |
| Isopropylbenzene | - - | ug/kg | 4,000 | 0.50 U | 0.47 U | 7,700 | 4.1 J | 0.51 U [0.50 U] | 0.49 U | 0.46 U [0.46 UJ] |
| Methyl tert-butyl ether | - - | ug/kg | 39 U | 0.44 U | 0.41 U | 54 U | 23 | 0.45 U [0.45 U] | 0.44 U | 0.41 U [0.40 UJ] |
| Methylcyclohexane | - - | ug/kg | 2,800 | 0.51 U | 0.47 U | 20,000 | 6.0 J | 0.51 U [0.51 U] | 0.50 U | 0.47 U [4.1 J] |
| Methylene Chloride | 100 | ug/kg | 67 U | 6.7 | 2.0 U | 94 U | 2.3 U | 2.2 U [2.2 U] | 2.2 U | 3.6 JB [2.2 J] |
| m-Xylene & p-Xylene | - - | ug/kg | 74,000 D | 22 | 0.97 U | 320,000 DJ | 2.1 J | 13 [4.4 J] | 15 | 0.96 U [67 J] |
| o-Xylene | - - | ug/kg | 18,000 | 5.3 J | 0.43 U | 120,000 DJ | 0.47 U | 4.0 J [1.2 J] | 5.1 J | 0.43 U [150 J] |
| Tetrachloroethene | 1,400 | ug/kg | 35 U | 0.88 U | 0.82 U | 50 U | 0.90 U | 0.89 U [0.88 U] | 0.86 U | 0.81 U [0.80 UJ] |
| Toluene | 1,500 | ug/kg | 42 U | 3.0 J | 0.45 U | **59,000 DJ** | 5.0 J | 3.6 J [1.7 J] | 2.1 J | 0.45 U [5.7 J] |
| Total VOCs | - - | ug/kg | 18,000 | 20 J | 7.9 J | 130,000 J | 130 J | 25 J [21 J] | 17 J | 12 J [110 J] |

See Notes on Page 4.

**Table 7a. VOCs Detected in Subsurface Soil, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

**Notes:**

- - = no SCO exists for the specified compound.
B = Detected in Equipment Blank.
bgs = below ground surface.
D = compounds analyzed at a dilution.
E = Analyte exceeds equipment calibration range.
J = indicates an estimated value.
ND = None detected.
NYS DEC = New York State Department of Environmental Conservation.
SVOCs=Semivolatile organic compounds.
TAGM = NYSDEC Soil Cleanup Objective as per NYS Technical Administrative Guidance Memo (TAGM) 4046, 1994.
U = indicates the constituent was not detected at the PQL. The value preceding the U indicates the PQL.
ug/Kg = micrograms per Kilogram.
UJ = estimated non-detect.
VOCs = volatile organic compounds.
Total VOC concentrations exclude MTBE.
MW-5B (34-36) duplicate refers to field sample ID MW-55B (34-36).

**Table 7b. SVOCs Detected in Subsurface Soil, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID:<br>Sample Depth (ft BGS):<br>Date Collected: | NY TAGM Rec Soil Cleanup Objectives | Units | SB-1<br>5 - 5.5<br>05/03/05 | SB-2<br>1 - 1.5<br>05/02/05 | SB-2<br>2 - 2.5<br>05/02/05 | TP-1B<br>1 - 1.5<br>05/04/05 | SB-2<br>5 - 7<br>05/06/05 | SB-2<br>13 - 15<br>05/06/05 | SB-2<br>19 - 20.5<br>05/06/05 | SB-3<br>5 - 7<br>05/06/05 | SB-3<br>13 - 15<br>05/06/05 | SB-3<br>17 - 19<br>05/06/05 | SB-4<br>5 - 5.5<br>05/03/05 | SB-4<br>7 - 9<br>05/05/05 | SB-4<br>9 - 13<br>05/05/05 | SB-4<br>17 - 19<br>05/05/05 | SB-4<br>19 - 21<br>05/05/05 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Semivolatile Organics** | | | | | | | | | | | | | | | | | |
| 1,1-Biphenyl | - - | ug/kg | 54 U | 58 U | 59 U | 60 U [59 UJ] | 68 U | 62 U | 520 | 60 U | 62 U | 63 U | 60 U | 61 U | 63 U | 63 U | 8,600 |
| 2,4-Dimethylphenol | - - | ug/kg | 52 U | 56 U | 56 U | 58 U [57 UJ] | 65 U | 59 U | 67 U | 58 U | 59 U | 61 U | 58 U | 58 U | 61 U | 61 U | 650 U |
| 2-Methylnaphthalene | 36,400 | ug/kg | 55 U | 120 J | 59 U | 1,700 [1,700] | 69 U | 63 U | 5,300 D | 61 U | 63 U | 64 U | 61 U | 61 U | 99 J | 64 U | **60,000 D** |
| 2-Methylphenol | 100 | ug/kg | 55 U | 59 U | 59 U | 61 U [60 UJ] | 68 U | 62 U | 71 U | 60 U | 62 U | 63 U | 61 U | 61 U | 64 U | 64 U | 680 U |
| 4-Methylphenol | 900 | ug/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | 50,000 | ug/kg | 59 U | 76 J | 63 U | 65 UJ [64 UJ] | 73 U | 67 U | 870 | 65 U | 67 U | 68 U | 65 U | 65 U | 68 U | 68 U | 19,000 |
| Acenaphthylene | 41,000 | ug/kg | 54 U | 57 U | 58 U | 59 U [58 UJ] | 67 U | 61 U | 250 J | 59 U | 61 U | 62 U | 59 U | 60 U | 62 U | 62 U | 9,100 |
| Anthracene | 50,000 | ug/kg | 50 U | 53 U | 91 J | 55 U [54 UJ] | 62 U | 57 U | 880 | 55 U | 57 U | 58 U | 55 U | 55 U | 58 U | 58 U | 32,000 DJ |
| Benzo(a)anthracene | 224 | ug/kg | 46 U | 49 U | 88 J | 51 U [50 UJ] | 58 U | 52 U | **770** | 51 U | 52 U | 53 U | 51 U | 51 U | 54 U | 59 J | **23,000** |
| Benzo(a)pyrene | 61 | ug/kg | 53 U | **62 J** | **110 J** | **79 J [74 J]** | 66 U | 60 U | **480** | 58 U | 60 U | 61 U | 58 U | 59 U | 61 U | 61 U | **18,000 J** |
| Benzo(b)fluoranthene | 1,100 | ug/kg | 36 U | 65 J | 180 J | 84 J [84 J] | 45 U | 41 U | 460 | 40 U | 41 U | 42 U | 44 J | 40 U | 42 U | 49 J | **20,000 J** |
| Benzo(g,h,i)perylene | 50,000 | ug/kg | 55 U | 58 UJ | 59 U | 130 J [110 J] | 68 U | 62 U | 170 J | 60 U | 62 U | 63 U | 60 U | 61 U | 64 U | 63 U | 3,600 J |
| Benzo(k)fluoranthene | 1,100 | ug/kg | 73 U | 78 UJ | 82 J | 80 U [79 UJ] | 91 U | 82 U | 170 J | 80 U | 82 U | 84 U | 80 U | 81 U | 85 U | 84 U | **6,900 J** |
| bis(2-Ethylhexyl)phthalate | 50,000 | ug/kg | 63 U | 68 U | 68 U | 410 [280 J] | 150 J | 140 J | 82 U | 270 J | 72 U | 160 J | 70 U | 84 J | 74 U | 74 U | 790 U |
| Butylbenzylphthalate | 50,000 | ug/kg | 53 U | 57 U | 58 U | 280 J [190 J] | 74 J | 130 J | 69 U | 59 U | 61 UR | 88 J | 59 U | 59 U | 62 U | 62 U | 660 U |
| Carbazole | - - | ug/kg | 50 U | 54 U | 54 U | 56 U [55 UJ] | 63 U | 57 U | 560 | 55 U | 57 U | 58 U | 56 U | 56 U | 59 U | 59 U | 12,000 |
| Chrysene | 400 | ug/kg | 59 U | 63 U | 110 J | 66 U [64 UJ] | 74 U | 67 U | **660** | 65 U | 67 U | 68 U | 66 U | 66 U | 69 U | 69 U | **20,000** |
| Dibenzo(a,h)anthracene | 14 | ug/kg | 41 U | 44 UJ | 45 U | 46 U [45 UJ] | 52 U | 47 U | 53 U | 46 U | 47 U | 48 U | 46 U | 46 U | 48 U | 48 U | **680 J** |
| Dibenzofuran | 6,200 | ug/kg | 55 U | 100 J | 59 U | 60 U [59 UJ] | 68 U | 62 U | 1,200 | 60 U | 62 U | 63 U | 60 U | 61 U | 64 U | 63 U | **24,000** |
| Di-n-Butylphthalate | 8,100 | ug/kg | 50 U | 54 U | 54 U | 56 U [55 UJ] | 63 U | 57 U | 65 U | 55 U | 57 U | 58 U | 56 U | 56 U | 59 U | 58 U | 620 U |
| Di-n-Octylphthalate | 50,000 | ug/kg | 56 U | 60 U | 61 U | 62 U [61 UJ] | 70 U | 64 U | 72 U | 62 U | 64 U | 65 U | 62 U | 63 U | 65 U | 65 U | 700 U |
| Fluoranthene | 50,000 | ug/kg | 49 U | 52 U | 250 J | 54 U [53 UJ] | 69 J | 56 U | 1,700 | 54 U | 56 U | 57 U | 85 J | 55 U | 57 U | 83 J | 50,000 D |
| Fluorene | 50,000 | ug/kg | 56 U | 64 J | 60 U | 62 U [60 UJ] | 69 U | 63 U | 1,400 | 61 U | 63 U | 64 U | 62 U | 62 U | 65 U | 65 U | 35,000 D |
| Indeno(1,2,3-cd)pyrene | 3,200 | ug/kg | 42 U | 45 U | 45 U | 100 J [93 J] | 52 U | 48 U | 190 J | 46 U | 48 UJ | 48 U | 46 U | 47 U | 49 U | 49 U | 2,400 J |
| Naphthalene | 13,000 | ug/kg | 56 U | 110 J | 61 U | 1,400 [1,200] | 70 U | 64 U | 11,000 D | 62 U | 64 U | 65 U | 82 J | 63 U | 370 J | 66 U | **220,000 D** |
| Phenanthrene | 50,000 | ug/kg | 53 U | 91 J | 280 J | 92 J [88 J] | 67 J | 60 U | 3,800 JD | 58 U | 83 J | 61 U | 110 J | 59 U | 65 J | 71 J | **110,000 D** |
| Phenol | 30 | ug/kg | 50 U | 53 U | 54 U | 55 U [54 UJ] | 62 U | 57 U | 64 U | 55 U | 57 U | 58 U | 55 U | 56 U | 58 U | 58 U | 620 U |
| Pyrene | 50,000 | ug/kg | 58 U | 62 U | 380 | 100 J [100 J] | 74 J | 66 U | 1,800 | 64 U | 66 U | 67 U | 88 J | 65 U | 68 U | 79 J | **54,000 D** |
| Total SVOCs | - - | ug/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

See Notes on Page 5.

**Table 7b. SVOCs Detected in Subsurface Soil, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID:<br>Sample Depth (ft BGS):<br>Date Collected: | NY TAGM Rec Soil Cleanup Objectives | Units | MW-5B<br>17 - 19<br>05/02/05 | MW-5B<br>19 - 20<br>05/02/05 | MW-5B (DUP)<br>19 - 20<br>05/02/05 | MW-5B<br>26 - 28<br>05/03/05 | MW-5B<br>31 - 33<br>05/03/05 | MW-5B<br>34 - 36<br>06/07/05 | MW-5A<br>10 - 11<br>05/02/05 | MW-5A<br>11 - 12<br>05/02/05 | MW-5A<br>21 - 22<br>05/02/05 | TP-1B<br>1 - 1.5<br>05/04/05 | SB-6<br>10 - 12<br>05/12/05 | SB-6<br>13 - 15<br>05/12/05 | SB-6<br>19 - 21<br>05/12/05 | SB-6<br>24 - 26<br>05/12/05 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Semivolatile Organics** | | | | | | | | | | | | | | | | |
| 1,1-Biphenyl | - - | ug/kg | 65 U | 62 U | 63 U | 65 U | 63 U | 68 U | 58 U | 58 U | 66 U | 60 U [59 UJ] | 61 U | 150 J | 67 U | 66 U [66 U] |
| 2,4-Dimethylphenol | - - | ug/kg | 62 U | 60 U | 61 U | 63 U | 60 U | 66 U | 56 U | 56 U | 63 U | 58 U [57 UJ] | 59 U | 63 U | 64 U | 63 U [64 U] |
| 2-Methylnaphthalene | 36,400 | ug/kg | 86 J | 63 U | 64 U | 66 U | 64 U | 69 U | 79 J | 4,700 D | 67 U | 1,700 [1,700] | 62 U | 3,800 D | 68 U | 67 U [67 U] |
| 2-Methylphenol | 100 | ug/kg | 65 U | 63 U | 64 U | 66 U | 63 U | 69 U | 59 U | 58 U | 66 U | 61 U [60 UJ] | 61 U | 66 U | 67 U | 66 U [67 U] |
| 4-Methylphenol | 900 | ug/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Acenaphthene | 50,000 | ug/kg | 70 U | 67 U | 69 U | 70 U | 68 U | 74 U | 63 U | 62 U | 71 U | 65 UJ [64 UJ] | 66 U | 70 U | 72 U | 71 U [71 U] |
| Acenaphthylene | 41,000 | ug/kg | 64 U | 61 U | 63 U | 64 U | 62 U | 67 U | 57 U | 57 U | 65 U | 59 U [58 UJ] | 60 U | 64 U | 66 U | 65 U [65 U] |
| Anthracene | 50,000 | ug/kg | 59 U | 57 U | 58 U | 59 U | 57 U | 62 U | 53 U | 53 U | 60 U | 55 U [54 UJ] | 56 U | 60 U | 61 U | 60 U [60 U] |
| Benzo(a)anthracene | 224 | ug/kg | 55 U | 53 U | 54 U | 55 U | 53 U | 58 U | 49 U | 49 U | 56 U | 51 U [50 UJ] | 52 U | 55 U | 57 U | 56 U [56 U] |
| Benzo(a)pyrene | 61 | ug/kg | 63 U | 61 U | 62 U | 63 U | 61 U | 66 U | 57 U | 56 U | 64 U | **79 J [74 J]** | 59 U | 63 U | 65 U | 64 U [64 U] |
| Benzo(b)fluoranthene | 1,100 | ug/kg | 43 U | 42 U | 42 U | 43 U | 42 U | 45 U | 39 U | 39 U | 44 U | 84 J [84 J] | 41 U | 44 U | 45 U | 44 U [44 U] |
| Benzo(g,h,i)perylene | 50,000 | ug/kg | 65 U | 63 U | 64 U | 65 U | 63 U | 68 U | 58 U | 58 U | 66 U | 130 J [110 J] | 61 U | 65 U | 67 U | 66 U [66 U] |
| Benzo(k)fluoranthene | 1,100 | ug/kg | 86 U | 83 U | 85 U | 87 U | 84 U | 91 U | 78 U | 77 U | 88 U | 80 U [79 UJ] | 81 U | 87 U | 89 U | 88 U [88 U] |
| bis(2-Ethylhexyl)phthalate | 50,000 | ug/kg | 75 U | 73 U | 74 U | 76 U | 88 J | 79 U | 68 U | 92 J | 76 U | 410 [280 J] | 71 U | 210 JB | 160 J | 170 J [140 JB] |
| Butylbenzylphthalate | 50,000 | ug/kg | 63 U | 61 U | 62 U | 64 U | 62 U | 67 U | 57 U | 57 U | 64 U | 280 J [190 J] | 60 U | 64 U | 66 U | 64 U [65 U] |
| Carbazole | - - | ug/kg | 60 U | 58 U | 59 U | 60 U | 58 U | 63 U | 54 U | 53 U | 61 U | 56 U [55 UJ] | 56 U | 60 U | 62 U | 61 U [61 U] |
| Chrysene | 400 | ug/kg | 70 U | 68 U | 69 U | 71 U | 68 U | 74 U | 63 U | 63 U | 71 U | 66 U [64 UJ] | 66 U | 71 U | 73 U | 71 U [72 U] |
| Dibenzo(a,h)anthracene | 14 | ug/kg | 49 U | 48 U | 48 U | 49 U | 48 U | 52 U | 44 U | 44 U | 50 U | 46 U [45 UJ] | 46 U | 50 U | 51 U | 50 U [50 U] |
| Dibenzofuran | 6,200 | ug/kg | 65 U | 63 U | 64 U | 65 U | 63 U | 68 U | 58 U | 58 U | 66 U | 60 U [59 UJ] | 61 U | 65 U | 67 U | 66 U [66 U] |
| Di-n-Butylphthalate | 8,100 | ug/kg | 60 U | 58 U | 59 U | 60 U | 70 J | 63 U | 54 U | 53 U | 61 U | 56 U [55 UJ] | 56 U | 60 U | 62 U | 61 U [61 U] |
| Di-n-Octylphthalate | 50,000 | ug/kg | 67 U | 64 U | 66 U | 67 U | 65 U | 70 U | 60 U | 60 U | 68 U | 62 U [61 UJ] | 63 U | 67 U | 69 U | 68 U [68 U] |
| Fluoranthene | 50,000 | ug/kg | 58 U | 56 U | 57 U | 59 U | 57 U | 61 U | 53 U | 52 U | 59 U | 54 U [53 UJ] | 55 U | 59 U | 60 U | 59 U [60 U] |
| Fluorene | 50,000 | ug/kg | 66 U | 64 U | 65 U | 67 U | 64 U | 70 U | 60 U | 79 J | 67 U | 62 U [60 UJ] | 62 U | 110 J | 68 U | 67 U [68 U] |
| Indeno(1,2,3-cd)pyrene | 3,200 | ug/kg | 50 U | 48 U | 49 U | 50 U | 48 U | 52 U | 45 U | 44 U | 51 U | 100 J [93 J] | 47 U | 50 U | 51 U | 51 U [51 U] |
| Naphthalene | 13,000 | ug/kg | 190 J | 65 U | 66 U | 67 U | 65 U | 71 U | 73 J | 6,900 DJ | 68 U | 1,400 [1,200] | 63 U | 6,600 D | 69 U | 68 U [68 U] |
| Phenanthrene | 50,000 | ug/kg | 63 U | 60 U | 61 U | 63 U | 61 U | 66 U | 56 U | 100 J | 63 U | 92 J [88 J] | 59 U | 120 J | 65 U | 63 U [64 U] |
| Phenol | 30 | ug/kg | 59 U | 57 U | 58 U | 60 U | 58 U | 63 U | 54 U | 53 U | 60 U | 55 U [54 UJ] | 56 U | 60 U | 61 U | 60 U [61 U] |
| Pyrene | 50,000 | ug/kg | 69 U | 67 U | 68 U | 70 U | 67 U | 73 U | 63 U | 62 U | 70 U | 100 J [100 J] | 65 U | 70 U | 72 U | 70 U [71 U] |
| Total SVOCs | - - | ug/kg | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

See Notes on Page 5.

**Table 7b. SVOCs Detected in Subsurface Soil, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID:<br>Sample Depth (ft BGS):<br>Date Collected: | NY TAGM Rec Soil Cleanup Objectives | Units | SB-6<br>28.5 - 30.5<br>05/12/05 | SB-A<br>2<br>09/05/08 | SB-A<br>8<br>09/05/08 | SB-A<br>21<br>09/05/08 | SB-A<br>32<br>09/05/08 | SB-C<br>14<br>09/08/08 | SB-C<br>22<br>09/08/08 | SB-C<br>36<br>09/09/08 | SB-D<br>12<br>09/04/08 | SB-D<br>24<br>09/04/08 | WELL CLUSTER A<br>12<br>08/20/08 | WELL CLUSTER A<br>17<br>08/21/08 | WELL CLUSTER A<br>20<br>08/21/08 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Semivolatile Organics** | | | | | | | | | | | | | | | |
| 1,1-Biphenyl | - - | ug/kg | 54 U | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2,4-Dimethylphenol | - - | ug/kg | 52 U | 300 U | 300 U | 300 U | 270 U | 280 U | 300 U | 330 U | 300 U [290 U] | 310 U | 300 U | 340 U | 320 U |
| 2-Methylnaphthalene | 36,400 | ug/kg | 55 U | 300 U | 300 U | 7,200 D | 270 U | 16,000 D | 22,000 D | 330 U | 300 U [290 U] | 110 J | 5,100 D | 1,200 | 540 |
| 2-Methylphenol | 100 | ug/kg | 55 U | 300 U | 300 U | 300 U | 270 U | 280 U | 300 U | 330 U | 300 U [290 U] | **520** | 300 U | 340 U | 320 U |
| 4-Methylphenol | 900 | ug/kg | NA | 300 U | 300 U | 300 U | 270 U | 280 U | 300 U | 330 U | 300 U [290 U] | **1,700** | 300 U | 340 U | 320 U |
| Acenaphthene | 50,000 | ug/kg | 58 U | 300 U | 300 U | 2,300 | 270 U | 130 J | 120 J | 330 U | 300 U [290 U] | 110 J | 850 | 130 J | 360 |
| Acenaphthylene | 41,000 | ug/kg | 53 U | 300 U | 300 U | 1,800 D | 270 U | 280 U | 300 U | 330 U | 300 U [290 U] | 310 U | 300 U | 120 J | 180 J |
| Anthracene | 50,000 | ug/kg | 50 U | 300 U | 88 J | 3,800 | 270 U | 280 U | 110 J | 330 U | 300 U [290 U] | 91 J | 350 | 220 J | 450 |
| Benzo(a)anthracene | 224 | ug/kg | 46 U | 170 J | 120 J | **2,700** | 270 U | 280 U | 110 J | 330 U | 77 J [60 J] | 310 U | **240 J** | **600** | **310 J** |
| Benzo(a)pyrene | 61 | ug/kg | 52 U | **290 J** | 300 U | **1,900** | 270 U | 280 U | **68 J** | 330 U | 300 U [61 J] | 310 U | **200 J** | **500** | **230 J** |
| Benzo(b)fluoranthene | 1,100 | ug/kg | 36 U | 270 J | 120 J | **1,600** | 270 U | 280 U | 300 U | 330 U | 100 J [71 J] | 310 U | 270 J | 610 | 250 J |
| Benzo(g,h,i)perylene | 50,000 | ug/kg | 54 U | 450 | 93 J | 1,100 | 270 U | 280 U | 300 UJ | 330 U | 86 J [68 J] | 310 U | 91 J | 180 J | 73 J |
| Benzo(k)fluoranthene | 1,100 | ug/kg | 72 U | 85 J | 300 U | 590 | 270 U | 280 U | 300 U | 330 U | 300 U [290 U] | 310 U | 95 J | 250 J | 110 J |
| bis(2-Ethylhexyl)phthalate | 50,000 | ug/kg | 63 U | 300 U | 300 U | 300 UB | 650 UB | 280 U | 2,300 | 6,200 | 330 UB [550 UB] | 310 UB | 88 J | 210 J | 300 J |
| Butylbenzylphthalate | 50,000 | ug/kg | 53 U | 300 U | 300 U | 300 U | 270 U | 280 U | 300 U | 330 U | 300 U [290 U] | 310 U | 300 U | 340 U | 320 U |
| Carbazole | - - | ug/kg | 50 U | 300 U | 300 U | 1,100 | 270 U | 280 U | 73 J | 330 U | 300 U [290 U] | 310 U | 450 | 140 J | 270 J |
| Chrysene | 400 | ug/kg | 59 U | 200 J | 100 J | **2,500** | 270 U | 280 U | 86 J | 330 U | 82 J [65 J] | 310 U | 250 J | **550** | 290 J |
| Dibenzo(a,h)anthracene | 14 | ug/kg | 41 U | **270 J** | 300 U | 300 U | 270 U | 280 U | 300 U | 330 U | 300 U [290 U] | 310 U | 300 U | **54 J** | 320 U |
| Dibenzofuran | 6,200 | ug/kg | 54 U | 300 U | 300 U | 2,500 | 270 U | 280 U | 150 J | 330 U | 300 U [290 U] | 73 J | 440 | 74 J | 290 J |
| Di-n-Butylphthalate | 8,100 | ug/kg | 50 U | 300 U | 300 U | 300 U | 270 U | 280 U | 300 U | 330 U | 300 U [290 U] | 310 U | 300 U | 340 U | 320 U |
| Di-n-Octylphthalate | 50,000 | ug/kg | 56 U | 300 U | 300 U | 300 U | 270 U | 280 U | 300 U | 330 U | 300 U [290 U] | 310 U | 300 U | 340 U | 320 U |
| Fluoranthene | 50,000 | ug/kg | 49 U | 210 J | 300 J | 5,000 | 270 U | 280 U | 240 J | 330 U | 150 J [110 J] | 110 J | 900 | 1,500 | 790 |
| Fluorene | 50,000 | ug/kg | 55 U | 300 U | 300 U | 4,000 D | 270 U | 180 J | 420 | 330 U | 300 U [290 U] | 110 J | 660 | 130 J | 480 |
| Indeno(1,2,3-cd)pyrene | 3,200 | ug/kg | 42 U | 430 | 300 U | 1,300 | 270 U | 280 U | 300 U | 330 U | 300 U [73 J] | 310 U | 100 J | 220 J | 87 J |
| Naphthalene | 13,000 | ug/kg | 56 U | 73 J | 170 J | **24,000 D** | 270 U | **22,000 D** | **47,000 D** | 330 U | 300 U [290 U] | 180 J | 10,000 D | 2,600 | 760 |
| Phenanthrene | 50,000 | ug/kg | 52 U | 180 J | 290 J | 11,000 D | 270 U | 250 J | 510 | 330 U | 100 J [92 J] | 260 J | 1,100 | 760 | 1,300 |
| Phenol | 30 | ug/kg | 50 U | 300 U | 300 U | 300 U | 270 U | 280 U | 300 U | 330 U | 300 U [290 U] | **1,500** | 300 U | 340 U | 320 U |
| Pyrene | 50,000 | ug/kg | 58 U | 250 J | 240 J | 4,900 | 270 U | 280 U | 220 J | 330 U | 140 J [110 J] | 120 J | 460 | 640 | 390 |
| Total SVOCs | - - | ug/kg | NA | 2,900 J | 1,500 J | 79,000 | ND | 39,000 J | 73,000 J | 6,200 | 740 J [710 J] | 4,900 J | 22,000 J | 11,000 J | 7,500 J |

See Notes on Page 5.

**Table 7b. SVOCs Detected in Subsurface Soil, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID:<br>Sample Depth (ft BGS):<br>Date Collected: | NY TAGM Rec Soil Cleanup Objectives | Units | WELL CLUSTER B<br>1<br>08/20/08 | WELL CLUSTER B<br>10<br>08/22/08 | WELL CLUSTER B<br>20<br>08/22/08 | WELL CLUSTER C<br>11<br>08/26/08 | WELL CLUSTER C<br>21<br>08/26/08 |
|---|---|---|---|---|---|---|---|
| **Semivolatile Organics** | | | | | | | |
| 1,1-Biphenyl | - - | ug/kg | NA | NA | NA | NA | NA |
| 2,4-Dimethylphenol | - - | ug/kg | 120 J | 290 U | 300 U | 300 U | 6,300 U |
| 2-Methylnaphthalene | 36,400 | ug/kg | 5,500 D | 5,000 | 3,900 | 94 J | **270,000 E** |
| 2-Methylphenol | 100 | ug/kg | 300 U | 290 U | 300 U | 300 U | **2,900 J** |
| 4-Methylphenol | 900 | ug/kg | 300 U | 290 U | 300 U | 300 U | 6,300 U |
| Acenaphthene | 50,000 | ug/kg | 300 U | 490 | 730 | 300 U | 33,000 |
| Acenaphthylene | 41,000 | ug/kg | 300 U | 290 U | 900 | 300 U | **130,000 D** |
| Anthracene | 50,000 | ug/kg | 98 J | 170 J | 2,100 | 96 J | **140,000 D** |
| Benzo(a)anthracene | 224 | ug/kg | 110 J | 170 J | **1,200** | 81 J | **110,000** |
| Benzo(a)pyrene | 61 | ug/kg | **130 J** | **170 J** | **770** | **74 J** | **78,000** |
| Benzo(b)fluoranthene | 1,100 | ug/kg | 260 J | 140 J | 710 | 88 J | **63,000** |
| Benzo(g,h,i)perylene | 50,000 | ug/kg | 75 J | 140 J | 440 | 83 J | 34,000 |
| Benzo(k)fluoranthene | 1,100 | ug/kg | 54 J | 49 J | 280 J | 300 U | **27,000** |
| bis(2-Ethylhexyl)phthalate | 50,000 | ug/kg | 1,800 | 77 J | 840 | 27,000 D | 1,500 J |
| Butylbenzylphthalate | 50,000 | ug/kg | 300 U | 290 U | 300 U | 300 U | 6,300 U |
| Carbazole | - - | ug/kg | 300 U | 290 U | 660 | 300 U | 59,000 |
| Chrysene | 400 | ug/kg | 130 J | 210 J | **1,100** | 95 J | **100,000** |
| Dibenzo(a,h)anthracene | 14 | ug/kg | **51 J** | **62 J** | **160 J** | 300 U | **14,000** |
| Dibenzofuran | 6,200 | ug/kg | 300 U | 170 J | 1,500 | 300 U | **100,000** |
| Di-n-Butylphthalate | 8,100 | ug/kg | 300 U | 290 U | 300 U | 300 U | 6,300 U |
| Di-n-Octylphthalate | 50,000 | ug/kg | 300 U | 290 U | 300 U | 64 J | 6,300 U |
| Fluoranthene | 50,000 | ug/kg | 140 J | 400 | 2,500 | 200 J | **220,000 D** |
| Fluorene | 50,000 | ug/kg | 91 J | 390 | 1,700 | 70 J | **150,000 D** |
| Indeno(1,2,3-cd)pyrene | 3,200 | ug/kg | 140 J | 100 J | 490 | 77 J | **38,000** |
| Naphthalene | 13,000 | ug/kg | 5,800 | 2,500 | **16,000 D** | 300 U | **640,000 E** |
| Phenanthrene | 50,000 | ug/kg | 180 J | 840 | 5,900 D | 350 | **420,000 D** |
| Phenol | 30 | ug/kg | 300 U | 290 U | 300 U | 300 U | 6,300 U |
| Pyrene | 50,000 | ug/kg | 100 J | 370 | 2,300 | 210 J | **190,000 D** |
| Total SVOCs | - - | ug/kg | 15,000 J | 11,000 J | 44,000 J | 29,000 J | 2,800,000 J |

See Notes on Page 5.

**Table 7b. SVOCs Detected in Subsurface Soil, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

**Notes:**
- - = no SCO exists for the specified compound.
B = Detected in Equipment Blank.
bgs = below ground surface.
D = compounds analyzed at a dilution.
E = Analyte exceeds equipment calibration range.
J = indicates an estimated value.
ND = None detected.
NYS DEC = New York State Department of Environmental Conservation.
R = Data rejected based upon TRC data validation.
SCO = Soil Cleanup Objectives.
SVOCs=Semivolatile organic compounds.
TAGM = NYSDEC Soil Cleanup Objective as per NYS Technical Administrative Guidance Memo (TAGM) 4046, 1994.
U = indicates the constituent was not detected at the PQL. The value preceding the U indicates the PQL.
ug/Kg = micrograms per Kilogram.
UJ = estimated non-detect.
VOCs = volatile organic compounds.
MW-5B (19-20) duplicate refers to field sample ID SB-85A (19-20).

**Table 7c. Cyanide Detected in Subsurface Soil, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID: | Depth (ft bgs) | Date Collected | Amenable Cyanide (ug/kg) | Cyanide (ug/kg) |
|---|---|---|---|---|
| SB-1 | 5 - 5.5 | 5/3/2005 | 510 UJ | 508 U |
| SB-2 | 1 - 1.5 | 5/2/2005 | 539 U | 539 U |
| | 2 - 2.5 | 5/2/2005 | 543 U | 543 U |
| | 5 - 7 | 5/6/2005 | 630 U | 628 U |
| | 13 - 15 | 5/6/2005 | 570 U | 569 U |
| | 19 - 20.5 | 5/6/2005 | 650 U | 190,000 |
| TP-1B | 1 - 1.5 | 5/4/2005 | 560 [550] | 2,180 J [1,770] |
| SB-3 | 5 - 7 | 5/6/2005 | 560 U | 556 U |
| | 13 - 15 | 5/6/2005 | 580 U | 577 U |
| | 17 - 19 | 5/6/2005 | 580 U | 581 U |
| SB-4 | 5 - 5.5 | 5/3/2005 | 560 UJ | 556 U |
| | 7 - 9 | 5/5/2005 | 560 U | 564 U |
| | 9 - 13 | 5/5/2005 | 590 U | 588 U |
| | 17 - 19 | 5/5/2005 | 590 U | 590 U |
| | 19 - 21 | 5/5/2005 | 5,600 | 627 U |
| MW-5B | 17 - 19 | 5/2/2005 | 604 U | 604 U |
| | 19 - 20 | 5/2/2005 | 577 U | 577 U |
| | 26 - 28 | 5/3/2005 | 600 UJ | 600 U |
| | 31 - 33 | 5/3/2005 | 580 UJ | 583 U |
| | 34 - 36 | 6/7/2005 | 610 U | 613 U |
| MW-5A | 10 - 11 | 5/2/2005 | 1,800 | 2,890 |
| | 11 - 12 | 5/2/2005 | 537 U | 1,070 |
| | 21 - 22 | 5/2/2005 | 600 U | 660 |
| SB-6 | 10 - 12 | 5/12/2005 | 1,400 J | 3,080 J |
| | 13 - 15 | 5/12/2005 | 600 U | 1,630 |
| | 19 - 21 | 5/12/2005 | 620 U | 616 |
| | 24 - 26 | 5/12/2005 | 610 U [610 U] | 609 U [610 U] |
| | 28.5 - 30.5 | 5/12/2005 | 590 U | 590 U |

**Notes:**

bgs = below ground surface.

J = Indicates an estimated value.

U = Indicates the constituent was not detected at the Practical Quantitation Limit (PQL). The value preceding the U indicates the PQL.

ug/kg = micrograms per kilogram.

**Table 8. Results of PIANOS Analyses for Subsurface Soil, Remedial Investigation, Block 175, Lot 59, Manhattan, New York**

| Location ID: | | SB-B | SB-C | DUP-01 | SB-C | WELL CLUSTER A | WELL CLUSTER A | WELL CLUSTER A | WELL CLUSTER C |
|---|---|---|---|---|---|---|---|---|---|
| Sample Depth (Feet): | | 10 | 14 | SB-C(14) | 22 | 12 | 17 | 20 | 21 |
| Date Collected: | Units | 08/22/08 | 09/08/08 | 09/09/08 | 09/08/08 | 08/20/08 | 08/21/08 | 08/21/08 | 08/26/08 |
| **VOCs - PIANOS** | | | | | | | | | |
| 1,1,4-Trimethylcyclohexane | ug/kg | 390 U | 2100 | 2000 | 5,900 | 430 U | 94 U | 94 U | 6,100 U |
| 1,1-Dimethylcyclopentane | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 6,100 U |
| 1,2,3,4-Tetramethylbenzene | ug/kg | 5,000 | 12000 | 8900 | 26,000 | 6,200 | 1,300 | 79 J | 4,800 J |
| 1,2,3,5-Tetramethylbenzene | ug/kg | 16,000 | 42000 | 38000 | 100,000 | 22,000 | 4,900 | 170 | 6,500 |
| 1,2,3-TMCP(ccc)/2-Octene (trans) | ug/kg | 520 J | 1,600 J | 1600 | 4,500 | 1,200 | 350 | 190 U | 12,000 U |
| 1,2,3-Trimethylbenzene | ug/kg | 22,000 | 61000 | 59000 | 160,000 | 16,000 | 7,500 | 260 | 21,000 |
| 1,2,3-Trimethylcyclopentane (ctc) | ug/kg | 880 | 3900 | 4600 | 25,000 | 2,100 | 790 | 94 U | 6,100 U |
| 1,2,4,5-Tetramethylbenzene | ug/kg | 11,000 | 27000 | 25000 | 64,000 | 17,000 | 3,500 | 130 | 3,800 J |
| 1,2,4-Triethylbenzene | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 6,100 U |
| 1,2,4-Trimethylbenzene | ug/kg | 85,000 B | 300000 | 300000 | 780,000 | 110,000 B | 38,000 B | 1,300 B | 86,000 B |
| 1,2-Dibromoethane | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 6,100 U |
| 1,2-Dichloroethane | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 6,100 U |
| 1,2-Diethylbenzene | ug/kg | 1,400 | 3700 | 3400 | 10,000 | 1,900 | 470 | 21 J | 6,100 U |
| 1,2-Dimethyl-3-ethylbenzene | ug/kg | 4,500 | 12000 | 10000 | 29,000 | 2,900 | 1,300 | 39 J | 1,000 J |
| 1,2-Dimethyl-4-ethylbenzene | ug/kg | 17,000 | 47000 | 44000 | 130,000 | 13,000 | 5,500 | 160 | 5,000 J |
| 1,2-Dimethylcyclohexane (cis) | ug/kg | 1,700 | 6500 | 5300 | 21,000 | 3,800 | 1,100 | 32 J | 6,100 U |
| 1,2-Dimethylcyclohexane (trans) | ug/kg | 750 | 3500 | 2200 | 16,000 | 1,900 | 350 | 23 J | 6,100 U |
| 1,3,5-Triethylbenzene | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 6,100 U |
| 1,3,5-Trimethylbenzene | ug/kg | 25,000 | 82000 | 82000 | 240,000 | 24,000 | 11,000 | 360 | 34,000 |
| 1,3-Diethylbenzene | ug/kg | 8,500 | 21000 | 20000 | 54,000 | 11,000 | 2,900 | 100 | 1,300 J |
| 1,3-Dimethyl-2-ethylbenzene | ug/kg | 1,700 | 3600 | 4200 | 10,000 | 2,200 | 530 | 21 J | 550 J |
| 1,3-Dimethyl-4-ethylbenzene | ug/kg | 11,000 | 28000 | 26000 | 78,000 | 11,000 | 3,500 | 99 | 2,400 J |
| 1,3-Dimethyl-5-ethylbenzene | ug/kg | 22,000 B | 55000 | 52000 | 140,000 | 32,000 B | 7,400 B | 280 B | 4,700 JB |
| 1,3-Dimethylcyclopentane (cis) | ug/kg | 700 | 5300 | 6300 | 51,000 | 2,400 | 1,300 | 37 J | 6,100 U |
| 1,3-DMCP (trans)/2-Methyl-1-hexene | ug/kg | 1,200 | 8900 | 11000 | 82,000 | 3,900 | 2,100 | 46 J | 12,000 U |
| 1,4-Dimethyl-2-ethylbenzene | ug/kg | 13,000 | 34000 | 32000 | 89,000 | 15,000 | 4,200 | 110 | 2,400 J |
| 1,4-Dimethylcyclohexane (trans) | ug/kg | 690 | 3200 | 3100 | 12,000 | 2,100 | 550 | 18 J | 6,100 U |
| 1-Decene | ug/kg | 390 U | 5200 | 6800 | 16,000 | 430 U | 94 U | 94 U | 6,700 |
| 1-Heptene/1,2-DMCP (trans) | ug/kg | 760 J | 5300 | 6400 | 84,000 | 2,700 | 1,600 | 27 J | 12,000 U |
| 1-Hexene | ug/kg | 390 U | 930 U | 790 U | 7,100 | 430 U | 30 J | 94 U | 6,100 U |
| 1-Methyl-2-ethylbenzene | ug/kg | 11,000 | 52000 | 51000 | 150,000 | 9,900 | 8,100 | 210 | 6,900 |
| 1-Methyl-2-isopropylbenzene | ug/kg | 260 J | 650 J | 610 J | 1,800 | 460 | 120 | 94 U | 6,100 U |
| 1-Methyl-2-propylbenzene | ug/kg | 5,600 | 15000 | 14000 | 49,000 | 5,300 | 2,000 | 58 J | 700 J |
| 1-Methyl-3-ethylbenzene | ug/kg | 34,000 | 150000 | 150000 | 440,000 | 23,000 | 18,000 | 580 | 22,000 |
| 1-Methyl-3-isopropylbenzene | ug/kg | 2,400 | 8000 | 7500 | 28,000 | 2,000 | 1,100 | 27 J | 950 J |
| 1-Methyl-3-propylbenzene | ug/kg | 13,000 | 39000 | 38000 | 130,000 | 9,500 | 5,200 | 150 | 1,700 J |
| 1-Methyl-4-ethylbenzene | ug/kg | 22,000 | 70000 | 70000 | 220,000 | 21,000 | 9,500 | 330 | 12,000 |
| 1-Methyl-4-propylbenzene | ug/kg | 7,800 B | 21,000 B | 20,000 B | 69,000 B | 12,000 B | 3,100 B | 96 B | 1,200 JB |
| 1-Methylnaphthalene | ug/kg | 8,900 B | 14,000 B | 12,000 B | 17,000 B | 7,100 B | 1,200 B | 470 B | 170,000 B |
| 1-Nonene | ug/kg | 980 U | 2,300 U | 2,000 U | 2,600 U | 1,100 U | 240 U | 230 U | 3,000 J |
| 1-Octene | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 6,100 U |
| 1-Pentene | ug/kg | 390 U | 930 U | 790 U | 4,100 | 430 U | 94 U | 94 U | 6,100 U |
| 1-t-Butyl-3,5-Dimethylbenzene | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 6,100 U |
| 2,2,3-Trimethylbutane | ug/kg | 390 U | 170 J | 210 J | 3,600 | 74 J | 68 J | 94 U | 6,100 U |
| 2,2,3-Trimethylpentane | ug/kg | 590 | 2100 | 2400 | 17,000 | 1,100 | 350 | 6.6 J | 6,100 U |
| 2,2,4-Trimethylpentane | ug/kg | 7,600 | 29000 | 34000 | 260,000 | 7,400 | 2,500 | 91 J | 6,100 U |
| 2,2-Dimethylbutane | ug/kg | 390 U | 240 J | 270 J | 7,900 | 430 U | 130 | 94 U | 6,100 U |
| 2,2-Dimethylhexane | ug/kg | 220 J | 1600 | 1800 | 13,000 | 960 | 340 | 11 J | 6,100 U |
| 2,2-Dimethylpentane | ug/kg | 390 U | 510 J | 610 J | 9,000 | 230 J | 240 | 94 U | 6,100 U |
| 2,3,3-Trimethylpentane | ug/kg | 7,200 | 22000 | 25000 | 170,000 | 11,000 | 3,500 | 120 | 6,100 U |
| 2,3,4-Trimethylpentane | ug/kg | 8,200 | 25000 | 28000 | 180,000 | 10,000 | 3,200 | 110 | 6,100 U |
| 2,3-Dimethylbutane | ug/kg | 390 U | 710 J | 950 | 46,000 | 290 J | 600 | 94 U | 6,100 U |
| 2,3-Dimethylheptane | ug/kg | 2,400 | 7300 | 8200 | 36,000 | 7,900 | 1,800 | 64 J | 6,100 U |
| 2,3-Dimethylhexane | ug/kg | 3,900 | 14000 | 15000 | 83,000 | 8,800 | 2,800 | 97 | 6,100 U |
| 2,3-Dimethylpentane | ug/kg | 1,800 | 13000 | 15000 | 180,000 | 4,800 | 2,700 | 82 J | 6,100 U |
| 2,4-Dimethylhexane | ug/kg | 3,500 | 15000 | 17000 | 97,000 | 9,400 | 3,300 | 120 | 6,100 U |
| 2,4-Dimethylpentane | ug/kg | 300 J | 3900 | 4600 | 61,000 | 1,200 | 1,100 | 34 J | 6,100 U |
| 2,5-Dimethylheptane | ug/kg | 4,700 | 15000 | 15000 | 67,000 | 18,000 | 4,500 | 160 | 6,100 U |
| 2,5-Dimethylhexane | ug/kg | 2,700 | 12000 | 14000 | 94,000 | 7,600 | 2,500 | 83 J | 6,100 U |
| 2-Ethylthiophene | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 800 J |
| 2-Heptene (cis) | ug/kg | 390 U | 2300 | 2700 | 15,000 | 180 J | 330 | 94 U | 6,100 U |
| 2-Heptene (trans) | ug/kg | 160 J | 1900 | 2200 | 14,000 | 140 J | 340 | 94 U | 6,100 U |

See Notes on Page 3.

**Table 8. Results of PIANOS Analyses for Subsurface Soil, Remedial Investigation, Block 175, Lot 59, Manhattan, New York**

| Location ID: | | SB-B | SB-C | DUP-01 | SB-C | WELL CLUSTER A | WELL CLUSTER A | WELL CLUSTER A | WELL CLUSTER C |
|---|---|---|---|---|---|---|---|---|---|
| Sample Depth (Feet): | | 10 | 14 | SB-C(14) | 22 | 12 | 17 | 20 | 21 |
| Date Collected: | Units | 08/22/08 | 09/08/08 | 09/09/08 | 09/08/08 | 08/20/08 | 08/21/08 | 08/21/08 | 08/26/08 |
| **VOCs - PIANOS (Cont.)** | | | | | | | | | |
| 2-Hexene (cis) | ug/kg | 390 U | 630 J | 730 J | 16,000 | 430 U | 150 | 94 U | 6,100 U |
| 2-Hexene (trans) | ug/kg | 390 U | 930 | 1100 | 24,000 | 62 J | 220 | 94 U | 6,100 U |
| 2-Methyl-1,3-butadiene | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 6,100 U |
| 2-Methyl-1-butene | ug/kg | 390 U | 930 U | 790 U | 7,700 | 430 U | 30 J | 94 U | 6,100 U |
| 2-Methyl-2-pentene | ug/kg | 51 J | 1500 | 1800 | 40,000 | 230 J | 400 | 94 U | 6,100 U |
| 2-Methylheptane | ug/kg | 10,000 | 37000 | 42000 | 200,000 | 33,000 | 8,000 | 350 | 6,100 U |
| 2-Methylhexane | ug/kg | 2,800 | 23000 | 27000 | 260,000 | 13,000 | 7,600 | 230 | 6,100 U |
| 2-Methylnaphthalene | ug/kg | 18,000 B | 31,000 B | 26,000 B | 41,000 B | 13,000 B | 2,200 B | 660 B | 300,000 B |
| 2-Methylnonane | ug/kg | 8,100 | 23000 | 25000 | 83,000 | 19,000 | 4,100 | 170 | 6,100 U |
| 2-Methyloctane | ug/kg | 9,500 | 29000 | 29000 | 110,000 | 32,000 | 7,900 | 290 | 6,100 U |
| 2-Methylpentane | ug/kg | 100 J | 5000 | 5300 | 250,000 | 2,000 | 3,400 | 100 | 6,100 U |
| 2-Methylthiophene | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 1,100 J |
| 2-Nonene | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 6,100 U |
| 2-Octene (cis) | ug/kg | 450 | 2100 | 2100 | 7,000 | 430 U | 240 | 94 U | 6,100 U |
| 2-Pentene (cis) | ug/kg | 390 U | 930 U | 790 U | 7,400 | 430 U | 94 U | 94 U | 6,100 U |
| 2-Pentene (trans) | ug/kg | 390 U | 930 U | 790 U | 16,000 | 430 U | 31 J | 94 U | 6,100 U |
| 3,3-Diethylpentane | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 6,100 U |
| 3,3-Dimethylheptane | ug/kg | 310 J | 1300 | 1400 | 8,900 | 1,600 | 400 | 8.4 J | 6,100 U |
| 3,3-Dimethyloctane | ug/kg | 390 U | 980 | 1000 | 4,900 | 880 | 200 | 94 U | 6,100 U |
| 3,3-Dimethylpentane | ug/kg | 68 J | 780 J | 900 | 9,200 | 440 | 310 | 94 U | 6,100 U |
| 3,4-Dimethylheptane | ug/kg | 2,600 | 4400 | 4200 | 15,000 | 11,000 | 2,600 | 98 | 6,100 U |
| 3,5-Dimethylheptane | ug/kg | 1,300 | 3900 | 3700 | 18,000 | 5,400 | 1,300 | 46 J | 6,100 U |
| 3-Ethylhexane | ug/kg | 1,800 | 6200 | 7300 | 36,000 | 6,200 | 1,700 | 78 J | 6,100 U |
| 3-Ethylpentane | ug/kg | 360 J | 2600 | 2900 | 22,000 | 1,600 | 700 | 94 U | 6,100 U |
| 3-Heptene (cis) | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 6,100 U |
| 3-Heptene (trans) | ug/kg | 300 J | 3000 | 3200 | 15,000 | 240 J | 440 | 94 U | 6,100 U |
| 3-Methyl-1-butene | ug/kg | 390 U | 930 U | 790 U | 930 J | 430 U | 94 U | 94 U | 6,100 U |
| 3-Methylheptane | ug/kg | 10,000 | 37000 | 42000 | 210,000 | 36,000 | 9,300 | 470 | 6,100 U |
| 3-Methylhexane | ug/kg | 3,400 | 26000 | 30000 | 270,000 | 15,000 | 7,400 | 250 | 6,100 U |
| 3-Methylnonane | ug/kg | 6,100 | 18000 | 19000 | 56,000 | 19,000 | 4,000 | 130 | 6,100 U |
| 3-Methyloctane | ug/kg | 9,400 | 27000 | 30000 | 110,000 | 34,000 | 8,000 | 320 | 6,100 U |
| 3-Methylpentane | ug/kg | 88 J | 4000 | 4600 | 180,000 | 1,600 | 2,800 | 75 J | 6,100 U |
| 3-Methylthiophene | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 890 J |
| 3-Nonene (cis) | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 6,100 U |
| 3-Nonene (trans) | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 6,100 U |
| 4-Methyl-1-pentene | ug/kg | 390 U | 930 U | 790 U | 3,200 | 430 U | 18 J | 94 U | 6,100 U |
| 4-Methylheptane | ug/kg | 3,900 | 15000 | 17000 | 78,000 | 14,000 | 4,200 | 160 | 6,100 U |
| 4-Methyloctane | ug/kg | 6,600 | 20000 | 23000 | 90,000 | 26,000 | 6,200 | 250 | 6,100 U |
| Benzene | ug/kg | 340 J | 1100 | 1400 | 1,900 | 870 | 2,000 | 910 | 220,000 |
| Benzothiophene | ug/kg | 1,200 | 2300 | 2000 | 5,100 | 550 | 130 | 49 J | 47,000 |
| Cyclohexane | ug/kg | 110 J | 1900 | 2200 | 47,000 | 470 | 450 | 94 U | 6,100 U |
| Cyclopentane | ug/kg | 390 U | 930 U | 79 J | 15,000 | 430 U | 69 J | 94 U | 6,100 U |
| Diisopropyl Ether (DIPE) | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 6,100 U |
| Ethyl Tertiary Butyl Ether (ETBE) | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 6,100 U |
| Ethylbenzene | ug/kg | 19,000 | 70,000 B | 73,000 B | 240,000 B | 25,000 | 13,000 | 470 | 180,000 |
| Ethylcyclopentane | ug/kg | 1,400 | 6800 | 8100 | 44,000 | 3,700 | 1,500 | 45 J | 6,100 U |
| Hexylbenzene | ug/kg | 800 | 1500 | 1400 | 2,600 | 430 | 82 J | 94 U | 6,100 U |
| Indane | ug/kg | 15,000 | 37000 | 36000 | 97,000 | 23,000 | 7,000 | 1,400 | 28,000 |
| Isobutylbenzene | ug/kg | 1,500 | 4400 | 4500 | 19,000 | 3,000 | 740 | 23 J | 6,100 U |
| Isobutylcyclohexane | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 6,100 U |
| Isopentane | ug/kg | 390 U | 930 J | 420 J | 170,000 | 220 J | 600 | 46 J | 1,000 JB |
| Isopropylbenzene | ug/kg | 3,300 | 13000 | 12000 | 44,000 | 7,900 | 2,300 | 120 | 3,500 J |
| Isopropylcyclohexane | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 6,100 U |
| Isopropylcyclopentane | ug/kg | 600 | 1700 | 1600 | 5,800 | 1,300 | 380 | 94 U | 6,100 U |
| Methyl tert-butyl ether | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 17 J | 94 U | 6,100 U |
| Methylcyclohexane | ug/kg | 2,500 | 16000 | 18000 | 190,000 | 6,700 | 2,900 | 87 J | 6,100 U |
| Methylcyclopentane | ug/kg | 270 J | 5200 | 6100 | 160,000 | 1,600 | 2,100 | 51 J | 6,100 U |
| MMT | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 6,100 U |
| Naphthalene | ug/kg | 18,000 | 39000 | 36000 | 88,000 | 23,000 | 5,000 | 950 | 1,100,000 |
| n-Butylbenzene | ug/kg | 5,500 | 15,000 B | 14,000 B | 50,000 B | 8,700 | 2,100 | 72 J | 1,300 JB |
| n-Decane | ug/kg | 8,000 | 24000 | 25000 | 89,000 | 6,700 | 2,800 | 97 | 7,700 |

See Notes on Page 3.

**Table 8. Results of PIANOS Analyses for Subsurface Soil, Remedial Investigation, Block 175, Lot 59, Manhattan, New York**

| Location ID: | | SB-B | SB-C | DUP-01 | SB-C | WELL CLUSTER A | WELL CLUSTER A | WELL CLUSTER A | WELL CLUSTER C |
|---|---|---|---|---|---|---|---|---|---|
| Sample Depth (Feet): | | 10 | 14 | SB-C(14) | 22 | 12 | 17 | 20 | 21 |
| Date Collected: | Units | 08/22/08 | 09/08/08 | 09/09/08 | 09/08/08 | 08/20/08 | 08/21/08 | 08/21/08 | 08/26/08 |
| **VOCs - PIANOS (Cont.)** | | | | | | | | | |
| n-Dodecane | ug/kg | 6,300 B | 13,000 B | 13,000 B | 34,000 B | 2,300 B | 570 B | 36 JB | 6,200 B |
| n-Heptane | ug/kg | 4,100 | 32000 | 36000 | 420,000 | 15,000 | 6,200 | 210 | 6,100 U |
| n-Hexane | ug/kg | 180 J | 6100 | 7100 | 270,000 | 1,900 | 2,900 | 83 J | 6,100 U |
| n-Octane | ug/kg | 9,700 | 37000 | 35000 | 240,000 | 26,000 | 8,100 | 290 | 2,300 J |
| Nonane | ug/kg | 8,300 | 28000 | 30000 | 130,000 | 14,000 | 5,200 | 180 | 4,100 J |
| n-Propylbenzene | ug/kg | 14,000 | 43000 | 44000 | 150,000 | 31,000 | 8,500 | 260 | 2,700 J |
| n-Propylcyclopentane | ug/kg | 1,300 | 3600 | 3600 | 14,000 | 2,400 | 680 | 94 U | 6,100 U |
| n-Undecane | ug/kg | 7,300 | 17000 | 16000 | 48,000 | 3,300 | 1,100 | 41 J | 6,800 B |
| o-Xylene | ug/kg | 17,000 | 94000 | 99000 | 300,000 | 8,900 | 15,000 | 410 | 100,000 |
| p/m-Xylene | ug/kg | 67,000 | 300000 | 300000 | 980,000 | 45,000 | 47,000 | 1,400 | 260,000 |
| Pentadecane | ug/kg | 1,300 | 1,200 J | 890 J | 360 J | 240 J | 40 J | 230 U | 2,500 J |
| Pentane | ug/kg | 390 U | 960 B | 480 JB | 93,000 B | 230 JB | 320 B | 41 JB | 2,200 JB |
| Pentylbenzene | ug/kg | 1,500 B | 3,100 B | 3,000 B | 7,300 B | 1,200 B | 230 B | 15 JB | 670 JB |
| p-Isopropyltoluene | ug/kg | 1,100 | 2900 | 2600 | 7,900 | 1,500 | 440 | 14 J | 670 J |
| sec-Butylbenzene | ug/kg | 1,500 | 4200 | 4000 | 17,000 | 3,000 | 720 | 24 J | 6,100 U |
| Styrene | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 4,300 J |
| TAME | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 6,100 U |
| tert-Butylbenzene | ug/kg | 68 J | 160 J | 160 J | 310 J | 430 U | 94 U | 94 U | 6,100 U |
| Tertiary butanol | ug/kg | 980 U | 2,300 U | 2,000 U | 2,600 U | 1,100 U | 240 U | 230 U | 15,000 U |
| Tetradecane | ug/kg | 2,300 | 2800 | 1800 | 2,600 | 440 | 66 J | 94 U | 2,800 J |
| Thiopene | ug/kg | 390 U | 930 U | 790 U | 1,100 U | 430 U | 94 U | 94 U | 1,700 J |
| Toluene | ug/kg | 4,800 B | 39,000 B | 43,000 B | 47,000 B | 190 JB | 650 B | 26 JB | 240,000 B |
| Tridecane | ug/kg | 4,400 | 6900 | 6100 | 14,000 | 870 | 180 | 11 J | 3,900 J |
| **DRO** | | | | | | | | | |
| C10-C28 DRO | ug/kg | 918000 | 1260000 | 1780000 | 3420000 | 613000 | 202000 | 96500 | 15300000 |

**Notes:**

DRO = Diesel Range Organics.

PIANOS = Paraffin, Isoparaffin, Aromatic, Naphthene, or Olefin, Sulfur.

ug/kg = micrograms per kilogram.

VOCs = volatile organic compounds.

**Table 9. Summary Statistics for Subsurface Soil Analytical Results, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Analyte | Result Units | NY TAGM Rec Soil Cleanup Objectives (ug/kg) | Total Number of Samples | Minimum Detected Concentration (ug/kg) | Maximum Detected Concentration (ug/kg) | Number Detected | Frequency of Detects | Detected Above TAGM | Frequency of Detects Above TAGM |
|---|---|---|---|---|---|---|---|---|---|
| **VOCs** | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/Kg | 800 | 47 | 29 | 29 | 1 | 2.1% | 0 | 0.0% |
| 1,2-Dichloropropane | ug/kg | | 47 | 43 | 43 | 1 | 2.1% | | |
| 1,4-Dichlorobenzene | ug/kg | 8500 | 30 | 1.8 | 1.8 | 1 | 3.3% | 0 | 0.0% |
| 2-Butanone | ug/Kg | 300 | 47 | 21 | 21 | 1 | 2.1% | 0 | 0.0% |
| 4-Methyl-2-pentanone | ug/kg | 1000 | 47 | 2.6 | 2.6 | 1 | 2.1% | 0 | 0.0% |
| Acetone | ug/kg | 200 | 47 | 3.7 | 120000 | 25 | 53.2% | 4 | 8.5% |
| Benzene | ug/Kg | 60 | 47 | 0.75 | 600000 | 17 | 36.2% | 18 | 38.3% |
| Carbon Disulfide | ug/Kg | 2700 | 47 | 3.15 | 7 | 4 | 8.5% | 0 | 0.0% |
| Cyclohexane | ug/kg | | 30 | 1.4 | 1600 | 3 | 10.0% | | |
| Ethylbenzene | ug/Kg | 5500 | 47 | 1.3 | 620000 | 21 | 44.7% | 15 | 31.9% |
| Isopropylbenzene | ug/kg | | 30 | 2.1 | 28000 | 7 | 23.3% | | |
| Methyl tert-butyl ether | ug/kg | | 30 | 2.1 | 23 | 5 | 16.7% | | |
| Methylcyclohexane | ug/kg | | 30 | 5 | 20000 | 9 | 30.0% | | |
| Methylene Chloride | ug/kg | 100 | 47 | 2.3 | 2000 | 17 | 36.2% | 1 | 2.1% |
| m-Xylene & p-Xylene | ug/kg | | 30 | 1.2 | 320000 | 13 | 43.3% | | |
| o-Xylene | ug/kg | | 30 | 2.6 | 120000 | 9 | 30.0% | | |
| Styrene | ug/Kg | | 47 | 17000 | 17000 | 1 | 2.1% | | |
| Tetrachloroethene | ug/kg | 1400 | 47 | 1.5 | 2.6 | 2 | 4.3% | 0 | 0.0% |
| Toluene | ug/Kg | 1500 | 47 | 2.1 | 690000 | 17 | 36.2% | 11 | 23.4% |
| Xylenes (total) | ug/Kg | 1200 | 17 | 56 | 1100000 | 11 | 64.7% | 10 | 58.8% |
| Total VOCs | ug/Kg | | 13 | 3.15 | 3030000 | 10 | 76.9% | | |
| **SVOCs** | | | | | | | | | |
| 1,1-Biphenyl | ug/kg | | 30 | 150 | 8600 | 3 | 10.0% | | |
| 2,4-Dimethylphenol | ug/Kg | | 47 | 120 | 120 | 1 | 2.1% | | |
| 2-Methylnaphthalene | ug/Kg | 36400 | 47 | 79 | 270000 | 21 | 44.7% | 4 | 8.5% |
| 2-Methylphenol | ug/Kg | 100 | 47 | 520 | 2900 | 2 | 4.3% | 2 | 4.3% |
| 4-Methylphenol | ug/Kg | 900 | 17 | 1700 | 1700 | 1 | 5.9% | 1 | 5.9% |
| Acenaphthene | ug/Kg | 50000 | 47 | 76 | 33000 | 13 | 27.7% | 0 | 0.0% |
| Acenaphthylene | ug/kg | 41000 | 47 | 120 | 130000 | 7 | 14.9% | 1 | 2.1% |
| Anthracene | ug/Kg | 50000 | 47 | 88 | 140000 | 15 | 31.9% | 1 | 2.1% |
| Benzo(a)anthracene | ug/Kg | 224 | 47 | 59 | 110000 | 17 | 36.2% | 8 | 17.0% |
| Benzo(a)pyrene | ug/Kg | 61 | 47 | 62 | 78000 | 16 | 34.0% | 16 | 34.0% |
| Benzo(b)fluoranthene | ug/Kg | 1100 | 47 | 44 | 63000 | 19 | 40.4% | 3 | 6.4% |
| Benzo(g,h,i)perylene | ug/Kg | 50000 | 47 | 73 | 34000 | 15 | 31.9% | 0 | 0.0% |
| Benzo(k)fluoranthene | ug/Kg | 1100 | 47 | 49 | 27000 | 12 | 25.5% | 2 | 4.3% |
| bis(2-Ethylhexyl)phthalate | ug/Kg | 50000 | 47 | 77 | 27000 | 21 | 44.7% | 0 | 0.0% |
| Butylbenzylphthalate | ug/kg | 50000 | 47 | 74 | 235 | 4 | 8.5% | 0 | 0.0% |
| Carbazole | ug/kg | | 47 | 73 | 59000 | 9 | 19.1% | | |
| Chrysene | ug/Kg | 400 | 47 | 73.5 | 100000 | 16 | 34.0% | 6 | 12.8% |
| Dibenzo(a,h)anthracene | ug/Kg | 14 | 47 | 51 | 14000 | 7 | 14.9% | 7 | 14.9% |
| Dibenzofuran | ug/Kg | 6200 | 47 | 73 | 100000 | 12 | 25.5% | 2 | 4.3% |
| Di-n-Butylphthalate | ug/kg | 8100 | 47 | 70 | 70 | 1 | 2.1% | 0 | 0.0% |
| Di-n-Octylphthalate | ug/Kg | 50000 | 47 | 64 | 64 | 1 | 2.1% | 0 | 0.0% |
| Fluoranthene | ug/Kg | 50000 | 47 | 69 | 220000 | 20 | 42.6% | 1 | 2.1% |

**Table 9. Summary Statistics for Subsurface Soil Analytical Results, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Analyte | Result Units | NY TAGM Rec Soil Cleanup Objectives (ug/kg) | Total Number of Samples | Minimum Detected Concentration (ug/kg) | Maximum Detected Concentration (ug/kg) | Number Detected | Frequency of Detects | Detected Above TAGM | Frequency of Detects Above TAGM |
|---|---|---|---|---|---|---|---|---|---|
| **SVOCs (Cont.)** | | | | | | | | | |
| Fluorene | ug/Kg | 50000 | 47 | 64 | 150000 | 17 | 36.2% | 1 | 2.1% |
| Indeno(1,2,3-cd)pyrene | ug/Kg | 3200 | 47 | 77 | 38000 | 13 | 27.7% | 1 | 2.1% |
| Naphthalene | ug/kg | 13000 | 47 | 73 | 640000 | 23 | 48.9% | 11 | 23.4% |
| Phenanthrene | ug/kg | 50000 | 47 | 65 | 420000 | 27 | 57.4% | 2 | 4.3% |
| Phenol | ug/Kg | 30 | 47 | 1500 | 1500 | 1 | 2.1% | 1 | 2.1% |
| Pyrene | ug/Kg | 50000 | 47 | 74 | 190000 | 21 | 44.7% | 2 | 4.3% |
| Total SVOCs | ug/Kg | | 17 | 722.5 | 2820000 | 16 | 94.1% | | |
| **Cyanide** | | | | | | | | | |
| Amenable Cyanide | ug/Kg | | 30 | 555 | 5600 | 4 | 13.3% | | |
| Cyanide | ug/Kg | | 30 | 616 | 190000 | 8 | 26.7% | | |

**Table 10a. VOCs Detected in Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID: / Date Collected: | NYSDEC Class GA Standard | Units | MW-1 10/02/08 | MW-2 10/02/08 | MW-3 10/01/08 | MW-4 10/01/08 | MW-5 10/02/08 | MW-5A 10/02/08 | MW-5B 10/02/08 | MW-7 10/02/08 | MW-8 10/01/08 | MW-10 10/02/08 | MW-11 09/30/08 | MW-12 09/30/08 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Volatile Organics** | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | 5 | ug/L | 5.0 U | 5.0 U | 5.0 U | 5.0 U | 5.0 U | 5.0 U | 5.0 U | 5.0 U | 50 U | 5.0 U | 5.0 U | 20 U |
| 2-Butanone | 50 | ug/L | 10 U | 10 U | 10 UJ | 10 U | 10 U | 23 | 10 U | 10 U | 100 U | 10 U | 10 U | 40 U |
| 2-Hexanone | 50 | ug/L | 10 U | 10 UJ | 10 UJ | 10 U | 10 UJ | 10 UJ | 10 UJ | 10 U | 100 U | 10 U | 12 J | 40 UJ |
| 4-Methyl-2-pentanone | - - | ug/L | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 10 U | 4.8 J | 34 J | 10 U | 10 U | 40 U |
| Acetone | 50 | ug/L | 2.4 J | 1.7 J | 10 UJ | 17 | 3.0 J | 10 U | 1.3 J | 3.0 J | 42 J | 6.4 J | 11 | 40 U |
| Benzene | 1 | ug/L | **1,400 D** | **420 D** | **2,500 D** | **840 D** | **700 D** | **21** | 5.0 U | **390 D** | **3,500 D** | **240 D** | **7,400 D** | **1,400 D** |
| Ethylbenzene | 5 | ug/L | **6.4** | 2.2 J | **49** | **110** | **16** | **17** | 5.0 U | **5.1** | **2,100 D** | 1.8 J | **1,100 D** | **22** |
| Methyl tert-butyl ether | 10 | ug/L | **83** | **53** | **58** | **30** | **20 J** | **24** | 0.48 J | **21** | **37 J** | **39** | **500 D** | **22** |
| Methylene Chloride | 5 | ug/L | 5.0 U | 5.0 U | 5.0 U | 5.0 U | 5.0 U | 5.0 U | 5.0 U | 5.0 UB | 50 U | 5.0 U | 5.0 U | 20 U |
| Styrene | 5 | ug/L | 5.0 UJ | 5.0 U | 5.0 UJ | 5.0 U | 5.0 U | 5.0 U | 5.0 U | 5.0 U | 50 UJ | 5.0 UJ | 5.0 U | 20 U |
| Tetrachloroethene | 5 | ug/L | 5.0 U | 5.0 U | 5.0 U | 5.0 U | 1.4 J | 5.0 U | 5.0 U | 5.0 U | 50 U | 5.0 U | 5.0 U | 20 U |
| Toluene | 5 | ug/L | 2.0 J | 1.8 J | **26** | **82** | **8.0** | 5.0 U | 5.0 U | **12** | **4,700 D** | 0.96 J | **260 DJ** | **30** |
| Xylenes (total) | 5 | ug/L | **23** | **10** | **89 J** | **850** | **40** | **23** | 5.0 U | **48** | **14,000** | **5.1** | **3,400** | **130** |
| Total VOCs | - - | ug/L | 1,400 J | 440 J | 2,700 J | 1,900 | 770 J | 84 | 1.3 J | 460 J | 24,000 J | 250 J | 12,000 J | 1,600 |

See Notes on Page 3.

**Table 10a. VOCs Detected in Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID:<br>Date Collected: | NYSDEC Class GA Standard | Units | SB-B2<br>10/01/08 | SB-B3<br>10/01/08 | WELL CLUSTER A2<br>09/30/08 | WELL CLUSTER A3<br>09/30/08 | WELL CLUSTER B2<br>10/01/08 | WELL CLUSTER B3<br>10/01/08 | WELL CLUSTER C2<br>09/30/08 | WELL CLUSTER C3<br>09/30/08 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Volatile Organics** | | | | | | | | | | |
| 1,1,1-Trichloroethane | 5 | ug/L | 20 U | 20 U | 5.0 U | **20 J** | 20 U | 20 U [25 U] | 5.0 U | 20 U |
| 2-Butanone | 50 | ug/L | 40 U | 40 U | 10 UJ | 40 UJ | 40 U | 40 U [50 U] | 10 UJ | 40 U |
| 2-Hexanone | 50 | ug/L | 40 U | 40 U | 10 UJ | 40 UJ | 40 UJ | 40 UJ [50 UJ] | 10 UJ | 40 UJ |
| 4-Methyl-2-pentanone | - - | ug/L | 40 U | 40 U | 10 U | 40 UJ | 40 U | 40 U [50 U] | 10 U | 40 U |
| Acetone | 50 | ug/L | 20 J | 40 U | 9.0 J | 40 UJ | 20 J | 40 U [50 U] | 12 J | 8.1 J |
| Benzene | 1 | ug/L | **640** | **4,700** | **4,000 D** | **15,000 D** | **640 D** | **4,700 D [4,300 D]** | **58** | **3,500 D** |
| Ethylbenzene | 5 | ug/L | **120** | **65** | **1,200 D** | **360 J** | **120** | **65 [52]** | 3.1 J | **940 D** |
| Methyl tert-butyl ether | 10 | ug/L | **32** | **79** | **110 DJ** | **120 J** | NA | NA | **30** | **37** |
| Methylene Chloride | 5 | ug/L | 3.9 J | 20 U | 5.0 U | 20 UJ | 20 UB | 20 U [25 U] | 5.0 U | 20 UB |
| Styrene | 5 | ug/L | 20 U | 20 U* | 5.0 UJ | 20 UJ | 20 U | 20 UJ [25 UJ] | 5.0 UJ | **37** |
| Tetrachloroethene | 5 | ug/L | 20 U | 20 U | 5.0 U | 20 UJ | 20 U | 20 U [25 U] | 5.0 U | 20 U |
| Toluene | 5 | ug/L | **91** | **26** | **26** | **12 J** | **91** | **26 [25 J]** | **6.1** | **1,700 D** |
| Xylenes (total) | 5 | ug/L | **1,000** | **120** | **2,000 J** | **640 J** | **1,000** | **120 J [89 J]** | **9.4 J** | **2,100** |
| Total VOCs | - - | ug/L | 1,900 J | 4,900 | 7,200 J | 16,000 J | 1,900 J | 4,900 J [4,500 J] | 89 J | 8,300 J |

See Notes on Page 3.

**Table 10a. VOCs Detected in Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

**Notes:**
{G} = indicates a guidance value.
D = compounds analyzed at a dilution.
J = indicates an estimated value.
U = indicates the constituent was not detected at the PQL. The value preceding the U indicates the PQL.
ug/L = micrograms per liter.
- - = no criterion exists for the specified compound.
PQL = practical quantitation limit.
Bolded and shaded values exceed the New York State Technical and Operational Guidance Class GA Standards or Guidance Values, June 1998.
NYSDEC = New York State Department of Environmental Conservation.
Total VOC concentrations exclude MTBE.

**Table 10b. SVOCs Detected in Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID: / Date Collected: | NYSDEC Class GA Standard | Units | MW-1 10/02/08 | MW-2 10/02/08 | MW-3 10/01/08 | MW-4 10/01/08 | MW-5 10/02/08 | MW-5A 10/02/08 | MW-5B 10/02/08 | MW-7 10/02/08 | MW-8 10/01/08 | MW-10 10/02/08 | MW-11 09/30/08 | MW-12 09/30/08 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Semivolatile Organics** | | | | | | | | | | | | | | |
| 2,4-Dimethylphenol | 1 | ug/L | 4.0 U | 4.4 U | 4.0 U | 4.0 U | 6.1 U | 4.7 U | 4.4 U | 6.1 U | 42 U | 4.6 U | **81 D** | 4.7 U |
| 2-Methylnaphthalene | - - | ug/L | 20 | 6.9 | 16 | 14 | 9.0 | 4.7 U | 4.4 U | 7.3 | 180 D | 4.6 U | 89 D | 3.2 J |
| 2-Methylphenol | 1 | ug/L | 4.0 U | 4.4 U | 4.0 U | 4.0 U | 6.1 U | 4.7 U | 4.4 U | 6.1 U | 42 U | 4.6 U | **16** | 4.7 U |
| 4-Methylphenol | 1 | ug/L | 4.0 U | 4.4 U | 4.0 U | 4.0 U | 6.1 U | 4.7 U | 4.4 U | 6.1 U | **320 D** | 4.6 U | **14** | 4.7 U |
| Acenaphthene | 20 | ug/L | **21** | 9.6 | **21** | 12 | 2.0 J | 4.7 U | 4.4 U | 1.7 J | 42 U | 3.1 J | 4.3 U | 0.95 J |
| Acenaphthylene | - - | ug/L | 4.0 U | 4.4 U | 4.0 U | 4.0 U | 6.1 U | 4.7 U | 4.4 U | 6.1 U | 42 U | 4.6 U | 4.3 U | 4.7 U |
| Anthracene | 50 | ug/L | 1.7 J | 0.58 J | 1.5 J | 0.80 J | 6.1 U | 4.7 U | 4.4 U | 6.1 U | 42 U | 4.6 U | 4.3 U | 4.7 U |
| Benzyl Alcohol | - - | ug/L | 4.0 U | 4.4 U | 4.0 U | 4.0 U | 6.1 U | 4.7 U | 4.4 U | 6.1 U | 42 U | 4.6 U | 4.3 U | 4.7 U |
| bis(2-Ethylhexyl)phthalate | 5 | ug/L | 4.0 U | 4.4 U | 4.0 U | 4.0 U | 6.1 U | 4.7 U | 4.4 U | 6.1 U | 42 U | 4.6 U | 4.3 U | 4.7 U |
| Carbazole | - - | ug/L | 48 | 4.7 | 5.3 | 3.3 J | 6.1 U | 4.7 U | 4.4 U | 6.1 U | 42 U | 1.3 J | 2.7 J | 4.7 U |
| Dibenzofuran | - - | ug/L | 8.7 | 3.5 J | 8.8 | 3.0 J | 6.1 U | 4.7 U | 4.4 U | 6.1 U | 42 U | 4.6 U | 0.45 J | 0.81 J |
| Di-n-Butylphthalate | 50 | ug/L | 4.0 U | 4.4 U | 4.0 U | 4.0 U | 6.1 U | 4.7 U | 4.4 U | 6.1 U | 42 U | 4.6 U | 4.3 U | 4.7 U |
| Fluoranthene | 50 | ug/L | 4.0 U | 4.4 U | 0.78 J | 0.61 J | 6.1 U | 4.7 U | 4.4 U | 1.0 J | 42 U | 4.6 U | 4.3 U | 4.7 U |
| Fluorene | 50 | ug/L | 9.0 | 3.7 J | 13 | 6.2 | 1.3 J | 4.7 U | 4.4 U | 1.1 J | 42 U | 1.2 J | 4.3 U | 1.2 J |
| Naphthalene | 10 | ug/L | **18** | 3.7 J | 10 | 5.2 | 7.9 | 3.2 J | 4.4 U | **11** | **660 D** | 4.6 U | **510 D** | **25** |
| Phenanthrene | 50 | ug/L | 14 | 2.9 J | 10 | 3.9 J | 1.4 J | 4.7 U | 4.4 U | 1.8 J | 42 U | 4.6 U | 0.49 J | 4.7 U |
| Phenol | 1 | ug/L | **3.5 J** | **3.3 J** | **7.9** | **3.6 J** | **3.8 J** | 4.7 U | 4.4 U | 6.1 U | **59** | 4.6 U | **45** | **13** |
| Pyrene | 50 | ug/L | 4.0 U | 4.4 U | 0.49 J | 0.44 J | 6.1 U | 4.7 U | 4.4 U | 0.97 J | 42 U | 4.6 U | 4.3 U | 4.7 U |
| Total SVOCs | - - | ug/L | 140 J | 39 J | 95 J | 53 J | 25 J | 3.2 J | ND | 25 J | 1,200 | 5.6 J | 760 J | 44 J |

See Notes on Page 3.

**Table 10b. SVOCs Detected in Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID: / Date Collected: | NYSDEC Class GA Standard | Units | WELL CLUSTER A2 09/30/08 | WELL CLUSTER A3 09/30/08 | WELL CLUSTER B2 10/01/08 | WELL CLUSTER B3 10/01/08 | WELL CLUSTER C2 09/30/08 | WELL CLUSTER C3 09/30/08 |
|---|---|---|---|---|---|---|---|---|
| **Semivolatile Organics** | | | | | | | | |
| 2,4-Dimethylphenol | 1 | ug/L | 4.3 U | 4.4 U | **51** | 4.0 U [4.0 U] | 4.2 U | 22 U |
| 2-Methylnaphthalene | - - | ug/L | 49 | 110 D | 8.4 | 37 [36] | 3.1 J | 310 |
| 2-Methylphenol | 1 | ug/L | 0.91 J | 4.4 U | 4.5 U | **1.5 J [1.1 J]** | 4.2 U | **170** |
| 4-Methylphenol | 1 | ug/L | **2.2 J** | 4.4 U | **3.9 J** | 4.0 U [4.0 U] | 0.59 J | **340** |
| Acenaphthene | 20 | ug/L | 4.0 J | **58** | 2.0 J | 18 [18] | 3.4 J | **59** |
| Acenaphthylene | - - | ug/L | 4.3 U | 4.4 U | 4.5 U | 1.2 J [4.0 U] | 4.2 U | 110 |
| Anthracene | 50 | ug/L | 0.48 J | 3.2 J | 4.5 U | 1.8 J [1.6 J] | 4.2 U | 19 J |
| Benzyl Alcohol | - - | ug/L | 0.96 J | 4.4 U | 4.5 U | 4.0 U [4.0 U] | 4.2 U | 22 U |
| bis(2-Ethylhexyl)phthalate | 5 | ug/L | 4.3 U | 4.4 U | 4.5 U | 4.0 U [4.0 U] | 0.92 J | 22 U |
| Carbazole | - - | ug/L | 9.7 | 70 | 1.1 J | 6.2 [5.3] | 2.1 J | 140 |
| Dibenzofuran | - - | ug/L | 1.8 J | 26 | 4.5 U | 6.9 [6.9] | 1.0 J | 68 |
| Di-n-Butylphthalate | 50 | ug/L | 4.3 U | 4.4 U | 4.5 U | 4.0 U [4.0 U] | 1.5 J | 22 U |
| Fluoranthene | 50 | ug/L | 4.3 U | 0.90 J | 4.5 U | 0.91 J [0.88 J] | 4.2 U | 6.9 J |
| Fluorene | 50 | ug/L | 2.1 J | 29 | 0.90 J | 11 [11] | 1.8 J | **81** |
| Naphthalene | 10 | ug/L | **200 D** | **200 D** | **36** | **99 D [85 D]** | 9.2 | **3,000 D** |
| Phenanthrene | 50 | ug/L | 1.8 J | 20 | 0.83 J | 10 [9.9] | 1.7 J | **75** |
| Phenol | 1 | ug/L | **16** | **59** | **6.4** | **8.7 J [25 J]** | 4.2 U | **180** |
| Pyrene | 50 | ug/L | 4.3 U | 4.4 U | 4.5 U | 0.67 J [0.63 J] | 0.50 J | 5.5 J |
| Total SVOCs | - - | ug/L | 290 J | 580 J | 110 J | 200 J [200 J] | 26 J | 4,600 J |

See Notes on Page 3.

**Table 10b. SVOCs Detected in Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

**Notes:**

D = compounds analyzed at a dilution.
J = indicates an estimated value.
U = indicates the constituent was not detected at the PQL. The value preceding the U indicates the PQL.
ug/L = micrograms per liter.
- - = no criterion exists for the specified compound.
PQL = practical quantitation limit.
Bolded and shaded values exceed the New York State Technical and Operational Guidance Class GA Standards or Guidance Values, June 1998.
NYSDEC = New York State Department of Environmental Conservation.

**Table 10c. Cyanide Detected in Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID | Date Collected | NYSDEC Class GA Standard | Units | Total Cyanide |
|---|---|---|---|---|
| **MW-1** | 10/02/08 | 200 | ug/L | **370** |
| **MW-2** | 10/02/08 | 200 | ug/L | **510** |
| **MW-3** | 10/01/08 | 200 | ug/L | **260** |
| **MW-4** | 10/01/08 | 200 | ug/L | 120 |
| **MW-5** | 10/02/08 | 200 | ug/L | 150 |
| **MW-5A** | 10/02/08 | 200 | ug/L | **470** |
| **MW-5B** | 10/02/08 | 200 | ug/L | 3.8 J |
| **MW-7** | 10/02/08 | 200 | ug/L | 93 |
| **MW-8** | 10/01/08 | 200 | ug/L | 7 J |
| **MW-10** | 10/02/08 | 200 | ug/L | 200 |
| **MW-11** | 09/30/08 | 200 | ug/L | 49 |
| **MW-12** | 09/30/08 | 200 | ug/L | 4.9 J |
| **WELL CLUSTER-B2** | 10/01/08 | 200 | ug/L | 200 |
| **WELL CLUSTER-B3** | 10/01/08 | 200 | ug/L | **380 J** |
| **DUP-02 WELL CLUSTER-B3** | 10/01/08 | 200 | ug/L | **350** |
| **WELL CLUSTER A2** | 09/30/08 | 200 | ug/L | **430** |
| **WELL CLUSTER A3** | 09/30/08 | 200 | ug/L | **540** |
| **WELL CLUSTER C2** | 09/30/08 | 200 | ug/L | 100 |
| **WELL CLUSTER C3** | 09/30/08 | 200 | ug/L | **450** |

**Notes:**

J = indicates an estimated value.

ug/L = micrograms per liter.

NYSDEC = New York State Department of Environmental Conservation.

Bolded and shaded values exceed the New York State Technical and Operational Guidance Class GA Standards or Guidance Values, June 1998.

**Table 11. Results of PIANOS Analyses for Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID: / Date Collected: | Units | MW-4 10/01/08 | MW-8 10/01/08 | WELL CLUSTER B2 10/01/08 | WELL CLUSTER B3 10/01/08 | DUP-02 WELL CLUSTER B3 10/02/08 | WELL CLUSTER A2 09/30/08 | WELL CLUSTER A3 09/30/08 | WELL CLUSTER C2 09/30/08 | WELL CLUSTER C3 09/30/08 |
|---|---|---|---|---|---|---|---|---|---|---|
| **VOCs - PIANOS** | | | | | | | | | | |
| 1,1,4-Trimethylcyclohexane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 1,1-Dimethylcyclopentane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 1,2,3,4-Tetramethylbenzene | ug/L | 3.0 J | 110 | 11 J | 13 J | 11 J | 26 | 18 J | 0.23 J | 8.2 J |
| 1,2,3,5-Tetramethylbenzene | ug/L | 0.55 J | 340 | 28 | 2.2 J | 100 U | 57 | 22 J | 2.0 U | 8.2 J |
| 1,2,3-TMCP(ccc)/2-Octene (trans) | ug/L | 20 U | 200 U | 40 U | 40 U | 200 U | 40 U | 200 U | 4.0 U | 80 U |
| 1,2,3-Trimethylbenzene | ug/L | 1.4 J | 1,100 | 150 | 11 J | 11 J | 320 | 66 J | 0.49 J | 70 |
| 1,2,3-Trimethylcyclopentane (ctc) | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 1,2,4,5-Tetramethylbenzene | ug/L | 3.7 J | 200 | 17 J | 14 J | 13 J | 36 | 20 J | 0.20 J | 5.8 J |
| 1,2,4-Triethylbenzene | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 1,2,4-Trimethylbenzene | ug/L | 1.0 JB | 3,800 B | 510 B | 19 JB | 20 JB | 1,300 B | 190 B | 0.68 JB | 240 B |
| 1,2-Dibromoethane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 1,2-Dichloroethane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 1,2-Diethylbenzene | ug/L | 0.65 JB | 27 JB | 3.2 JB | 2.9 JB | 100 U | 6.6 JB | 100 U | 2.0 U | 40 U |
| 1,2-Dimethyl-3-ethylbenzene | ug/L | 10 U | 91 J | 9.1 J | 20 U | 100 U | 17 J | 100 U | 2.0 U | 40 U |
| 1,2-Dimethyl-4-ethylbenzene | ug/L | 10 U | 310 | 29 | 1.4 J | 100 U | 48 | 14 J | 2.0 U | 6.4 J |
| 1,2-Dimethylcyclohexane (cis) | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 1,2-Dimethylcyclohexane (trans) | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 1,3,5-Triethylbenzene | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 1,3,5-Trimethylbenzene | ug/L | 0.80 J | 1,000 | 130 | 6.4 J | 100 U | 310 | 71 J | 0.19 J | 82 |
| 1,3-Diethylbenzene | ug/L | 3.4 J | 130 | 16 J | 13 J | 10 J | 28 | 17 J | 2.0 U | 40 U |
| 1,3-Dimethyl-2-ethylbenzene | ug/L | 1.1 J | 34 J | 4.4 J | 4.2 J | 100 U | 8.9 J | 5.0 J | 2.0 U | 40 U |
| 1,3-Dimethyl-4-ethylbenzene | ug/L | 10 U | 190 | 18 J | 20 U | 100 U | 33 | 8.0 J | 2.0 U | 3.0 J |
| 1,3-Dimethyl-5-ethylbenzene | ug/L | 6.8 JB | 380 B | 39 B | 31 B | 24 JB | 78 B | 40 JB | 0.29 JB | 7.0 JB |
| 1,3-Dimethylcyclopentane (cis) | ug/L | 10 U | 69 J | 20 U | 20 U | 100 U | 12 J | 100 U | 2.0 U | 40 U |
| 1,3-DMCP (trans)/2-Methyl-1-hexene | ug/L | 20 U | 86 J | 40 U | 40 U | 200 U | 19 J | 200 U | 4.0 U | 80 U |
| 1,4-Dimethyl-2-ethylbenzene | ug/L | 10 U | 230 | 22 | 1.6 J | 100 U | 43 | 12 J | 2.0 U | 3.2 J |
| 1,4-Dimethylcyclohexane (trans) | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 1-Decene | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 1-Heptene/1,2-DMCP (trans) | ug/L | 20 U | 61 J | 40 U | 40 U | 200 U | 11 J | 200 U | 4.0 U | 80 U |
| 1-Hexene | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 1-Methyl-2-ethylbenzene | ug/L | 4.0 J | 850 | 110 | 14 J | 11 J | 230 | 53 J | 0.29 J | 23 J |
| 1-Methyl-2-isopropylbenzene | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 1.8 J | 100 U | 2.0 U | 40 U |
| 1-Methyl-2-propylbenzene | ug/L | 10 U | 87 J | 8.2 J | 1.7 J | 100 U | 17 J | 6.5 J | 2.0 U | 40 U |
| 1-Methyl-3-ethylbenzene | ug/L | 10 U | 1,800 | 240 | 6.5 J | 100 U | 480 | 67 J | 0.26 J | 55 |
| 1-Methyl-3-isopropylbenzene | ug/L | 10 U | 41 J | 4.8 J | 20 U | 100 U | 9.9 J | 100 U | 2.0 U | 40 U |
| 1-Methyl-3-propylbenzene | ug/L | 10 U | 190 | 18 J | 20 U | 100 U | 33 | 10 J | 2.0 U | 40 U |
| 1-Methyl-4-ethylbenzene | ug/L | 10 U | 780 | 98 | 6.7 J | 100 U | 280 | 66 J | 2.0 U | 36 J |
| 1-Methyl-4-propylbenzene | ug/L | 0.50 JB | 91 JB | 7.7 JB | 2.2 JB | 100 U | 21 B | 8.0 JB | 2.0 U | 40 U |
| 1-Methylnaphthalene | ug/L | 11 JB | 91 JB | 14 JB | 41 JB | 36 JB | 27 JB | 140 JB | 0.93 JB | 170 B |
| 1-Nonene | ug/L | 25 U | 250 U | 50 U | 50 U | 250 U | 50 U | 250 U | 5.0 U | 100 U |
| 1-Octene | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 1-Pentene | ug/L | 10 U | 33 J | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |

See Notes on Page 4.

**Table 11. Results of PIANOS Analyses for Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID: / Date Collected: | Units | MW-4 10/01/08 | MW-8 10/01/08 | WELL CLUSTER B2 10/01/08 | WELL CLUSTER B3 10/01/08 | DUP-02 WELL CLUSTER B3 10/02/08 | WELL CLUSTER A2 09/30/08 | WELL CLUSTER A3 09/30/08 | WELL CLUSTER C2 09/30/08 | WELL CLUSTER C3 09/30/08 |
|---|---|---|---|---|---|---|---|---|---|---|
| **VOCs - PIANOS (Cont.)** | | | | | | | | | | |
| 1-t-Butyl-3,5-Dimethylbenzene | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2,2,3-Trimethylbutane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2,2,3-Trimethylpentane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2,2,4-Trimethylpentane | ug/L | 10 U | 82 J | 20 U | 20 U | 100 U | 5.1 J | 100 U | 2.0 U | 40 U |
| 2,2-Dimethylbutane | ug/L | 10 U | 36 J | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2,2-Dimethylhexane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2,2-Dimethylpentane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2,3,3-Trimethylpentane | ug/L | 10 U | 57 J | 20 U | 20 U | 100 U | 7.4 J | 100 U | 2.0 U | 40 U |
| 2,3,4-Trimethylpentane | ug/L | 10 U | 48 J | 20 U | 20 U | 100 U | 4.2 J | 100 U | 2.0 U | 40 U |
| 2,3-Dihydro-1-methylindene | ug/L | NA | NA | NA | NA | 0.00 | NA | NA | NA | NA |
| 2,3-Dimethylbutane | ug/L | 2.7 J | 98 J | 20 U | 20 U | 100 U | 8.2 J | 100 U | 2.0 U | 40 U |
| 2,3-Dimethylheptane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2,3-Dimethylhexane | ug/L | 10 U | 20 J | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2,3-Dimethylpentane | ug/L | 10 U | 98 J | 20 U | 2.6 J | 100 U | 17 J | 100 U | 2.0 U | 40 U |
| 2,4-Dimethylhexane | ug/L | 10 U | 20 J | 20 U | 20 U | 100 U | 4.0 J | 100 U | 2.0 U | 40 U |
| 2,4-Dimethylpentane | ug/L | 10 U | 42 J | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2,5-Dimethylheptane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2,5-Dimethylhexane | ug/L | 10 U | 15 J | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2-Ethylthiophene | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 6.0 J |
| 2-Heptene (cis) | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2-Heptene (trans) | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2-Hexene (cis) | ug/L | 10 U | 82 J | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2-Hexene (trans) | ug/L | 10 U | 85 J | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2-Methyl-1,3-butadiene | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2-Methyl-1-butene | ug/L | 10 U | 65 J | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2-Methyl-2-pentene | ug/L | 2.1 J | 120 | 20 U | 7.0 J | 100 U | 5.8 J | 100 U | 2.0 U | 40 U |
| 2-Methylheptane | ug/L | 10 U | 46 J | 20 U | 20 U | 100 U | 8.0 J | 100 U | 2.0 U | 40 U |
| 2-Methylhexane | ug/L | 10 U | 140 | 20 U | 20 U | 100 U | 28 | 100 U | 2.0 U | 40 U |
| 2-Methylnaphthalene | ug/L | 8.3 JB | 170 JB | 16 JB | 33 JB | 31 JB | 35 JB | 140 JB | 0.74 JB | 220 B |
| 2-Methylnonane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2-Methyloctane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2-Methylpentane | ug/L | 6.8 J | 420 | 20 U | 12 J | 100 U | 46 | 100 U | 2.0 U | 40 U |
| 2-Methylthiophene | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 12 J |
| 2-Nonene | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2-Octene (cis) | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2-Pentene (cis) | ug/L | 10 U | 140 | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 2-Pentene (trans) | ug/L | 10 U | 250 | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 3,3-Diethylpentane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 3,3-Dimethylheptane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 3,3-Dimethyloctane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 3,3-Dimethylpentane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 3,4-Dimethylheptane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |

See Notes on Page 4.

**Table 11. Results of PIANOS Analyses for Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID: / Date Collected: | Units | MW-4 10/01/08 | MW-8 10/01/08 | WELL CLUSTER B2 10/01/08 | WELL CLUSTER B3 10/01/08 | DUP-02 WELL CLUSTER B3 10/02/08 | WELL CLUSTER A2 09/30/08 | WELL CLUSTER A3 09/30/08 | WELL CLUSTER C2 09/30/08 | WELL CLUSTER C3 09/30/08 |
|---|---|---|---|---|---|---|---|---|---|---|
| **VOCs - PIANOS (Cont.)** | | | | | | | | | | |
| 3,5-Dimethylheptane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 3-Ethylhexane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 3-Ethylpentane | ug/L | 10 U | 13 J | 20 U | 20 U | 100 U | 3.4 J | 100 U | 2.0 U | 40 U |
| 3-Heptene (cis) | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 3-Heptene (trans) | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 3-Methyl-1-butene | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 3-Methylheptane | ug/L | 10 U | 93 J | 20 U | 20 U | 100 U | 19 J | 100 U | 2.0 U | 40 U |
| 3-Methylhexane | ug/L | 10 U | 150 | 20 U | 20 U | 100 U | 33 | 100 U | 2.0 U | 40 U |
| 3-Methylnonane | ug/L | 10 U | 13 J | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 3-Methyloctane | ug/L | 10 U | 29 J | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 3-Methylpentane | ug/L | 6.2 J | 280 | 20 U | 11 J | 100 U | 38 | 100 U | 2.0 U | 40 U |
| 3-Methylthiophene | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 10 J |
| 3-Nonene (cis) | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 3-Nonene (trans) | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 4-Methyl-1-pentene | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 4-Methylheptane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| 4-Methyloctane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| Benzene | ug/L | 690 | 3,100 | 920 | 4400 | 4200.00 | 4,000 | 13,000 | 39 | 3,500 |
| Benzofuran, 7-methyl- | ug/L | NA | NA | NA | NA | 0.00 | NA | NA | NA | NA |
| Benzothiophene | ug/L | 10 U | 75 J | 20 U | 6.6 J | 100 U | 10 J | 48 J | 2.0 U | 200 |
| Cyclohexane | ug/L | 9.2 J | 170 | 20 U | 22 | 100 U | 18 J | 100 U | 2.0 U | 40 U |
| Cyclopentane | ug/L | 18 | 230 | 8.4 J | 39 | 22 J | 4.1 J | 100 U | 2.0 U | 40 U |
| Diisopropyl Ether (DIPE) | ug/L | 3.8 J | 100 U | 14 J | 10 J | 100 U | 20 U | 100 U | 0.87 J | 40 U |
| Ethyl Tertiary Butyl Ether (ETBE) | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| Ethylbenzene | ug/L | 10 U | 2,500 | 150 | 57 | 50 J | 1,500 | 370 | 1.4 J | 1,100 |
| Ethylcyclopentane | ug/L | 10 U | 39 J | 20 U | 20 U | 100 U | 8.8 J | 100 U | 2.0 U | 40 U |
| Hexylbenzene | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| Indane | ug/L | 280 | 930 | 310 | 1100 | 930.00 | 570 | 2,600 | 36 | 590 |
| Indene | ug/L | NA | NA | NA | NA | 0.00 | NA | NA | NA | NA |
| Isobutylbenzene | ug/L | 10 U | 17 J | 20 U | 1.3 J | 100 U | 5.3 J | 100 U | 2.0 U | 40 U |
| Isobutylcyclohexane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| Isopentane | ug/L | 28 | 910 | 6.2 J | 38 | 44 J | 32 | 100 U | 2.0 U | 40 U |
| Isopropylbenzene | ug/L | 20 | 150 | 24 | 69 | 65 J | 91 | 120 | 0.61 J | 28 J |
| Isopropylcyclohexane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| Isopropylcyclopentane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| Methyl tert-butyl ether | ug/L | 13 | 33 J | 28 | 72 | 65 J | 110 | 110 | 24 | 32 J |
| Methylcyclohexane | ug/L | 5.2 J | 180 | 20 U | 13 J | 100 U | 33 | 100 U | 2.0 U | 40 U |
| Methylcyclopentane | ug/L | 25 | 560 | 6.8 J | 55 | 51 J | 71 | 25 J | 2.0 U | 40 U |
| MMT | ug/L | 25 U | 250 U | 50 U | 50 U | 250 U | 50 U | 250 U | 5.0 U | 100 U |
| Naphthalene | ug/L | 4.9 JB | 770 B | 68 B | 130 B | 110 B | 240 B | 390 B | 3.7 B | 3,300 B |
| n-Butylbenzene | ug/L | 0.80 JB | 58 JB | 3.4 JB | 3.1 JB | 100 U | 14 JB | 6.5 JB | 2.0 U | 40 U |
| n-Decane | ug/L | 10 U | 32 J | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |

See Notes on Page 4.

**Table 11. Results of PIANOS Analyses for Groundwater, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Location ID: / Date Collected: | Units | MW-4 10/01/08 | MW-8 10/01/08 | WELL CLUSTER B2 10/01/08 | WELL CLUSTER B3 10/01/08 | DUP-02 WELL CLUSTER B3 10/02/08 | WELL CLUSTER A2 09/30/08 | WELL CLUSTER A3 09/30/08 | WELL CLUSTER C2 09/30/08 | WELL CLUSTER C3 09/30/08 |
|---|---|---|---|---|---|---|---|---|---|---|
| **VOCs - PIANOS (Cont.)** | | | | | | | | | | |
| n-Dodecane | ug/L | 10 U | 72 JB | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| n-Heptane | ug/L | 10 U | 120 | 20 U | 20 U | 100 U | 15 J | 100 U | 2.0 U | 40 U |
| n-Hexane | ug/L | 1.8 J | 230 | 20 U | 2.8 J | 100 U | 23 | 100 U | 2.0 U | 40 U |
| n-Octane | ug/L | 10 U | 38 J | 20 U | 20 U | 100 U | 4.7 J | 100 U | 2.0 U | 40 U |
| Nonane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| n-Propylbenzene | ug/L | 12 | 340 | 24 | 50 | 36 J | 200 | 59 J | 2.0 U | 6.4 J |
| n-Propylcyclopentane | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| n-Undecane | ug/L | 10 U | 48 J | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| o-Xylene | ug/L | 1.3 J | 4,600 | 430 | 22 | 23 J | 970 | 120 | 1.2 J | 590 |
| p/m-Xylene | ug/L | 6.3 JB | 11,000 B | 950 B | 77 B | 76 JB | 3,400 B | 500 B | 3.1 JB | 1,300 B |
| Pentadecane | ug/L | 25 U | 250 U | 50 U | 50 U | 250 U | 50 U | 250 U | 5.0 U | 100 U |
| Pentane | ug/L | 9.4 J | 510 | 20 U | 15 J | 100 U | 14 J | 100 U | 2.0 U | 40 U |
| Pentylbenzene | ug/L | 10 U | 14 JB | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| p-Isopropyltoluene | ug/L | 10 U | 12 J | 1.6 J | 20 U | 100 U | 4.3 J | 100 U | 2.0 U | 40 U |
| sec-Butylbenzene | ug/L | 10 U | 19 J | 20 U | 20 U | 100 U | 6.8 J | 100 U | 2.0 U | 40 U |
| Styrene | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 22 J |
| TAME | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| tert-Butylbenzene | ug/L | 10 U | 100 U | 20 U | 20 U | 100 U | 20 U | 100 U | 2.0 U | 40 U |
| Tertiary butanol | ug/L | 860 | 250 U | 7,200 | 4300 | 4700.00 | 250 | 250 U | 29 | 100 U |
| Tetradecane | ug/L | 25 U | 250 U | 50 U | 50 U | 250 U | 50 U | 250 U | 5.0 U | 100 U |
| Thiopene | ug/L | 7.3 J | 100 U | 8.1 J | 37 | 33 J | 47 | 140 | 1.0 J | 36 J |
| Toluene | ug/L | 2.8 JB | 4,500 B | 120 B | 28 B | 33 JB | 28 B | 13 JB | 2.9 B | 1,900 B |
| Tridecane | ug/L | 25 U | 250 U | 50 U | 50 U | 250 U | 50 U | 250 U | 5.0 U | 100 U |
| **DRO** | | | | | | | | | | |
| C10-C28 DRO | ug/L | 884 | 141000 | 2360 | 2810 | 2970.00 | 4990 | 8170 | 1380 | 10900 |

**Notes:**

B = compounds detected in equipment blank.

D = compounds analyzed at a dilution.

J = indicates an estimated value.

U = indicates the constituent was not detected at the PQL. The value preceding the U indicates the PQL.

ug/L = micrograms per liter.

DRO = Diesel Range Organics.

PIANOS = Paraffin, Isoparaffin, Aromatic, Naphthene, Olefin , or Sulfur.

VOCs = Volatile Organic Compounds.

**Table 12. Summary Statistics for Groundwater Analytical Results, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Analyte | NYSDEC Class GA Standard (ug/L) | Total Number of Samples | Minimum Detected Concentration (ug/kg) | Maximum Detected Concentration (ug/kg) | Number Detected | Frequency of Detects | Detected Above Class GA Standard | Frequency of Detects above Class GA Standard |
|---|---|---|---|---|---|---|---|---|
| **VOCs** | | | | | | | | |
| Benzene | 1 | 26 | 21 | 15000 | 25 | 96% | 25 | 96% |
| Xylenes (total) | 5 | 26 | 4.3 | 15600 | 25 | 96% | 24 | 92% |
| Ethylbenzene | 5 | 26 | 1.4 | 2500 | 24 | 92% | 20 | 77% |
| Toluene | 5 | 26 | 0.96 | 4700 | 24 | 92% | 19 | 73% |
| Acetone | 50 | 18 | 1.3 | 42 | 13 | 72% | 0 | 0% |
| 4-Methyl-2-pentanone | NA | 18 | 4.8 | 34 | 2 | 11% | 0 | 0% |
| Styrene | 5 | 26 | 22 | 37 | 2 | 8% | 2 | 8% |
| 1,1,1-Trichloroethane | 5 | 18 | 20 | 20 | 1 | 6% | 1 | 6% |
| 2-Butanone | 50 | 18 | 23 | 23 | 1 | 6% | 0 | 0% |
| 2-Hexanone | 50 | 18 | 12 | 12 | 1 | 6% | 0 | 0% |
| Tetrachloroethene | 5 | 18 | 1.4 | 1.4 | 1 | 6% | 0 | 0% |
| Total VOCs | NA | 26 | 1.3 | 25700 | 26 | 100% | 0 | 0% |
| **SVOCs** | | | | | | | | |
| Naphthalene | 10 | 26 | 3.2 | 3300 | 24 | 92% | 16 | 62% |
| 2-Methylnaphthalene | NA | 26 | 0.74 | 310 | 23 | 88% | 0 | 0% |
| Fluorene | 50 | 18 | 0.9 | 81 | 14 | 78% | 1 | 6% |
| Acenaphthene | 20 | 18 | 0.95 | 59 | 14 | 78% | 4 | 22% |
| Phenol | 1 | 18 | 3.3 | 180 | 13 | 72% | 13 | 72% |
| Phenanthrene | 50 | 18 | 0.49 | 75 | 13 | 72% | 1 | 6% |
| Carbazole | NA | 18 | 1.1 | 140 | 12 | 67% | 0 | 0% |
| Dibenzofuran | NA | 18 | 0.45 | 68 | 11 | 61% | 0 | 0% |
| Anthracene | 50 | 18 | 0.48 | 19 | 8 | 44% | 0 | 0% |
| Pyrene | 50 | 18 | 0.44 | 5.5 | 6 | 33% | 0 | 0% |
| Fluoranthene | 50 | 18 | 0.61 | 6.9 | 6 | 33% | 0 | 0% |
| 4-Methylphenol | 1 | 18 | 0.59 | 340 | 6 | 33% | 5 | 28% |
| 2-Methylphenol | 1 | 18 | 0.91 | 170 | 4 | 22% | 3 | 17% |
| Acenaphthylene | NA | 18 | 1.2 | 110 | 2 | 11% | 0 | 0% |
| 2,4-Dimethylphenol | 1 | 18 | 51 | 81 | 2 | 11% | 2 | 11% |
| Benzyl Alcohol | NA | 18 | 0.96 | 0.96 | 1 | 6% | 0 | 0% |
| Di-n-Butylphthalate | 50 | 18 | 1.5 | 1.5 | 1 | 6% | 0 | 0% |
| bis(2-Ethylhexyl)phthalate | 5 | 18 | 0.92 | 0.92 | 1 | 6% | 0 | 0% |
| Total SVOCs | NA | 26 | 3.2 | 4600 | 25 | 96% | 0 | 0% |
| **Cyanide** | | | | | | | | |
| Total Cyanide | 200 | 18 | 3.8 | 540 | 18 | 100% | 8 | 44% |

See Notes on Page 2.

**Table 12. Summary Statistics for Groundwater Analytical Results, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

**Notes:**

NA = A GA Standard is not provided for this analyte.
DRO = Diesel Range Organics.
NYSDEC GA 2 = New York State Technical and Operational Guidance Class GA Standards Guidance Values, June 1998.
NYSDEC = New York State Department of Environmental Conservation.
PIANO = Paraffin, Isoparaffin, Aromatic, Naphthene, or Olefin.
VOCs = Volatile Organic Compounds.
SVOCs = Semi-Volatile Organic Compounds.
ug/L = micrograms per liter.

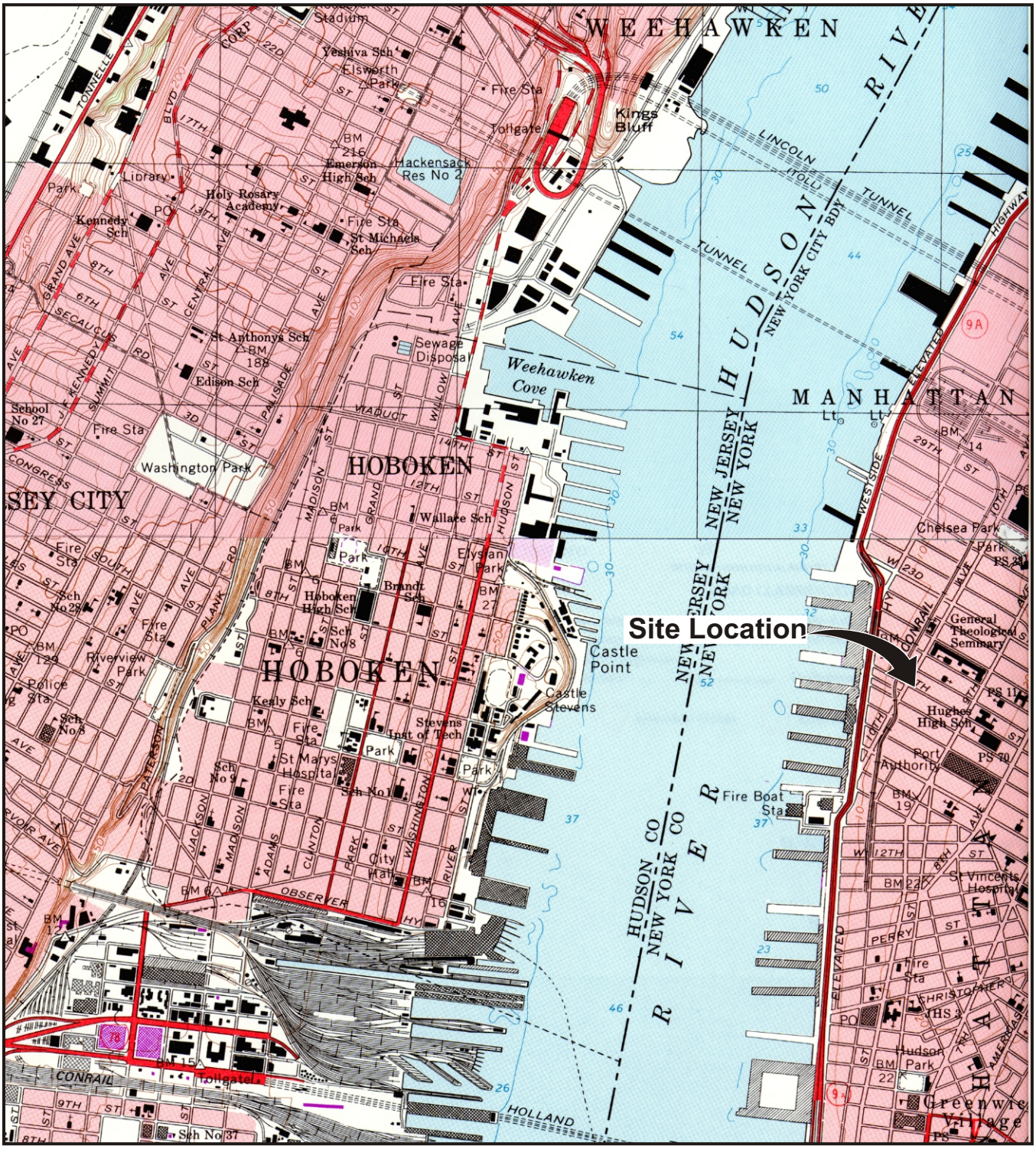
See Notes on Page 2.

**Table 13. Summary of Forensic Evaluation and Sample Fingerprint Interpretation, Remedial Investigation, West 18th Street Former Gas Works, Block 715, Lot 59, Manhattan, New York**

| Sample Location | Percent | | | | | | TPH Fingerprint Interpretation |
|---|---|---|---|---|---|---|---|
| | Paraffins (P) | Isoparafins (I) | Aromatics (A) | Naphthenes (N) | Olefins (O) | Sulfur (S) | |
| SB-C Area | | | | | | | |
| *Soil* | | | | | | | |
| SB-C (14) | 6.9 (6.9) | 18.4 (20.2) | 70.7 (68.8) | 2.5 (2.6) | 1.4 (1.6) | 0.1 (0.1) | Gasoline Only |
| SB-C (22) | 12.5 | 32.5 | 46.2 | 5.5 | 3.4 | 0.05 | Gasoline Only |
| *Groundwater* | | | | | | | |
| MW-8 | 2.3 | 5.8 | 86.9 | 2.8 | 2.1 | 0.17 | Gasoline Only, negligible peaks after C13 |
| MW-9 | 0 | 0 | 0 | 0 | 0 | 0 | Same as MW-8 |
| Well Cluster A Area | | | | | | | |
| *Soil* | | | | | | | |
| WC-A (12) | 7.1 | 36.1 | 53 | 2.8 | 0.9 | 0.05 | Gasoline |
| WC-A (17) | 7 | 28 | 60.4 | 3.1 | 1.6 | 0.03 | Gasoline |
| WC-A (20) | 6.5 | 26.7 | 64.1 | 1.9 | 0.5 | 0.32 | Mix, mostly gasoline |
| *Groundwater* | | | | | | | |
| MW-A2 | 0.4 | 1.7 | 96.3 | 1 | 0.24 | 0.4 | Weathered gasoline |
| MW-A3 | 0 | 0 | 98.8 | 0.14 | 0 | 1.1 | Similar to MW-C3 |
| SB-B Area | | | | | | | |
| *Soil* | | | | | | | |
| SB-B (10) | 7.6 | 17.7 | 72.4 | 1.6 | 0.5 | 0.17 | Gasoline |
| *Groundwater* | | | | | | | |
| MW-B2 | 0 | 0.14 | 99.3 | 0.34 | 0 | 0.18 | Similar to MW-A2 |
| MW-B3 | 0.3(0.0) | 1.0 (0.8) | 95.8 (97.4) | 2.1 (1.3) | 0.11 (0.0) | 0.7 (0.6) | Mix |
| Well Cluster C Area | | | | | | | |
| *Soil* | | | | | | | |
| WC-C (21) | 2.9 | 0.08 | 93.1 | 0 | 0.2 | 3.8 | Fresh coal tar |
| *Groundwater* | | | | | | | |
| MW-C2 (low conc) | 0 | 0 | 98.8 | 0 | 0 | 1.2 | Weathered coal tar |
| MW-C3 | 0 | 0 | 97.3 | 0 | 0 | 2.7 | Coal tar |
| UST (4000 gal.) Area | | | | | | | |
| *Groundwater* | | | | | | | |
| MW-4 (low conc) | 1 | 3.7 | 89.6 | 4.9 | 0.2 | 0.6 | Similar to MW-B3 |
| Gasoline Standards | | | | | | | |
| Regular | 10.0 | 43.9 | 34.9 | 7.1 | 4.1 | Not Analyzed | - |
| Plus | 8.3 | 50.4 | 30.2 | 6.5 | 4.7 | Not Analyzed | - |
| Super | 5.9 | 58.7 | 26.4 | 4.9 | 4.1 | Not Analyzed | - |
| Coal Tar in Soil (from another location) | | | | | | | |
| NAPL | 0.3 | 0.1 | 90.6 | 0.0 | 0.0 | 9.1 | - |

ARCADIS

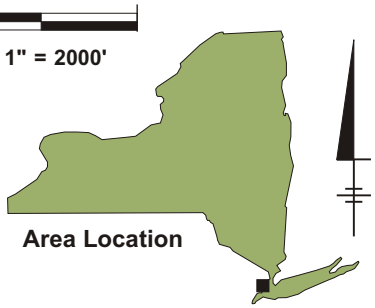
# FIGURES




**REFERENCE:** BASE MAP USGS 7.5 MIN. QUADS., JERSEY CITY, AND WEEHAWKEN, NJ - NY, 1967.

2000' 0 2000'

**Approximate Scale: 1" = 2000'**




CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
REMEDIAL INVESTIGATION BLOCK 715, LOT 59

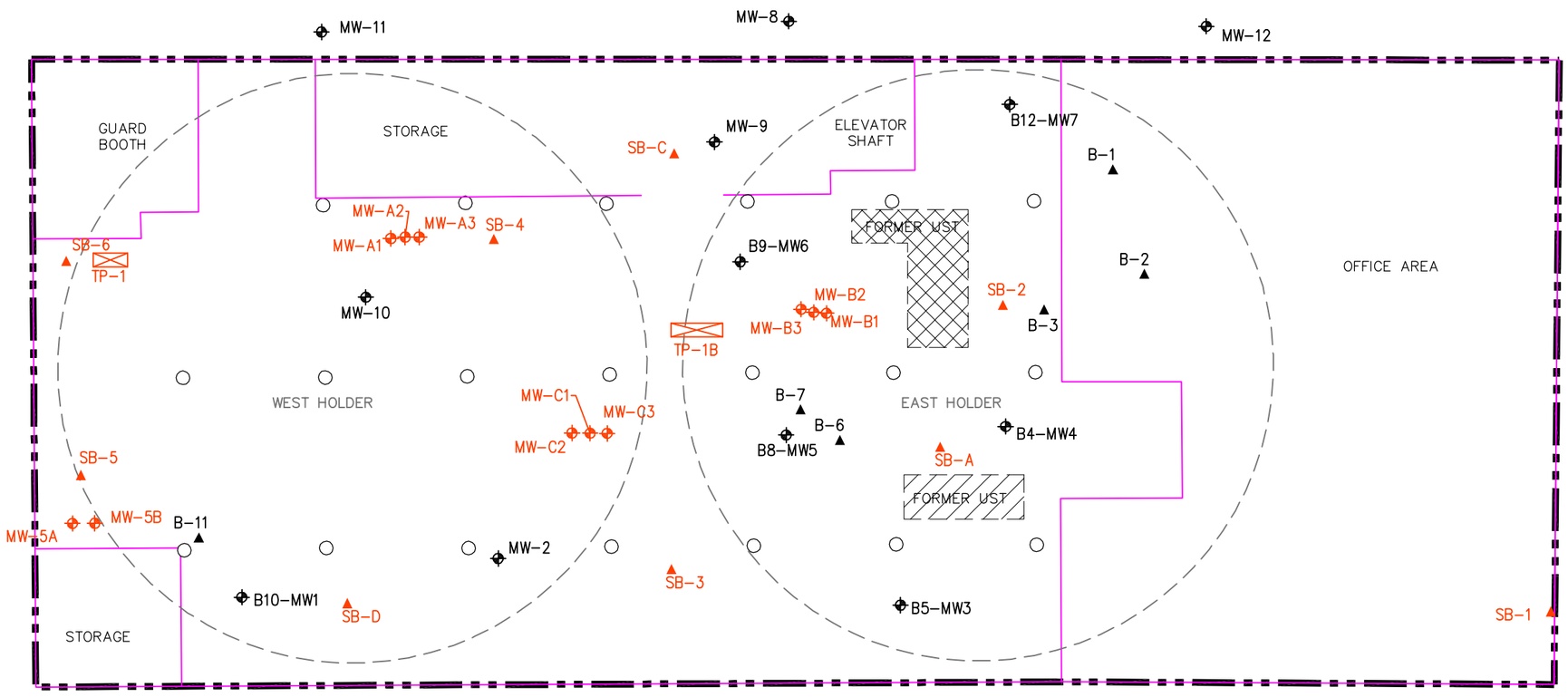
# SITE LOCATION MAP

ARCADIS

FIGURE
1

01/26/09 SYRACUSE, NY-ENV/141-DJH
B0043011/0001/00004/CDR/43011F01.CDR

CITY:SYRACUSE,NY GROUP:ENVCAD DB:A.SCHILLING,N.SMITHGALL,P. LISTER LD:A.SCHILLING TR: R. ARCO LYR:ON=*;OFF=REF; (FR2)
G:\ENVCAD\SYRACUSE\ACT\B0043011\0001\0004\DWG\43011B03.DWG LAYOUT: 2 SAVED: 4/22/2009 12:14 PM ACADVER: 17.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 4/22/2009 12:15 PM BY: LISTER, PAUL
XREFS: IMAGES: PROJECTNAME: ---
43011X00
43011X01




## LEGEND:

- PROPERTY LINE
- B-1 — SOIL BORING (RETACO)
- MW-1 — MONITORING WELL (RETACO)
- TP-2S — TEST PIT (CON EDISON)
- MW-A1 / SB-C — MONITORING WELL/SOIL BORING LOCATION (CON EDISON)
- BUILDING COLUMN
- APPROXIMATE LOCATION OF FIVE FORMER 550-GALLON UNDERGROUND GASOLINE STORAGE TANKS
- APPROXIMATE LOCATION OF FORMER 4000-GALLON UNDERGROUND GASOLINE (DIESEL) TANK
- APPROXIMATE LOCATION OF FORMER GAS HOLDERS
- APPROXIMATE LOCATION OF BUILDING WALLS

## NOTES:

1. SURVEY CONTROL WAS TAKEN FROM SITE WIDE BASE SURVEY PREPARED BY MUNOZ ENGINEERING, P.C. DATED APRIL 2007.
2. ALL ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM AS DERIVED FROM GPS.
3. HORIZONTAL COORDINATES ARE IN NYS COORDINATE SYSTEM (EAST) NAD 83 AS DERIVED FROM GPS.
4. BENCH MARK EL=12.91 X-CUT IN METAL LIGHT POLE ROUND BASE BOLT IN FRONT OF VERIZON BUILDING ON WEST 18th STREET.
5. LOCATIONS OF FORMER GAS HOLDERS ARE BASED ON SANBORN FIRE INSURANCE MAPS, DATED 1904-1985.
6. RETACO BORING AND MONITORING WELL LOCATIONS ARE BASED ON REPORTS ISSUED BY ENVIROTRAC ON BEHALF OF RETACO BETWEEN 2001 AND 2008.
7. UST LOCATIONS ARE BASED ON A SITE SUMMARY REPORT, ISSUED BY ENVIROTRAC, DATED AUGUST 2003.
8. BUILDING INTERIOR LAYOUT BASED ON FIELD RECONNAISSANCE.

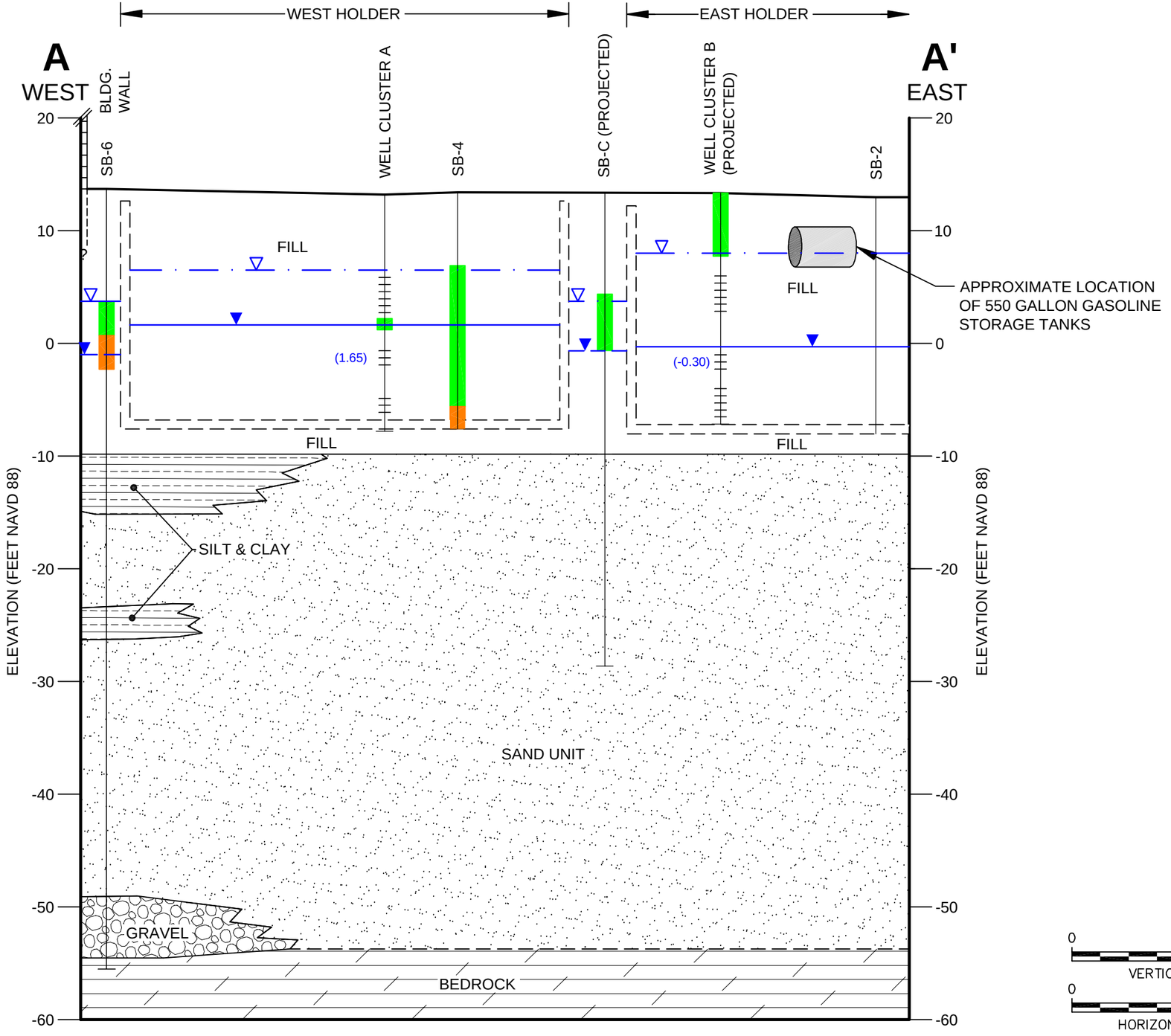
0 20' 40'
GRAPHIC SCALE

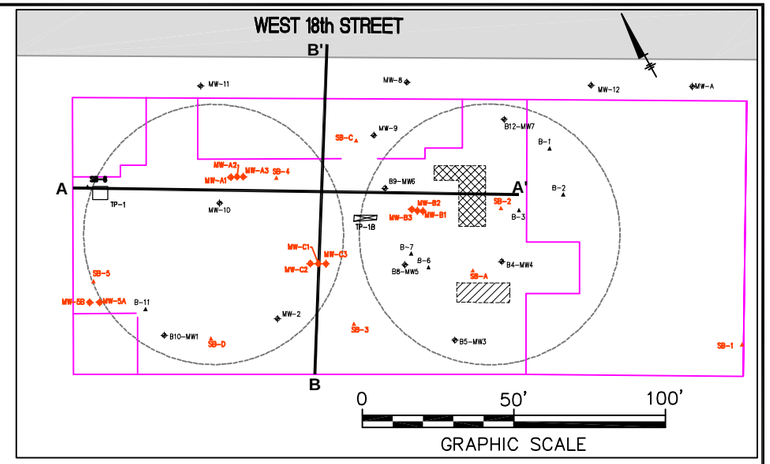
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
**REMEDIAL INVESTIGATION REPORT**
**BLOCK 715, LOT 59**

**SAMPLE LOCATION MAP**

ARCADIS

FIGURE
**2**




## LEGEND:

- SB-4 — WELL/BORING ID
- LOCAL GROUND SURFACE
- MAXIMUM WATER TABLE OBSERVED (1/10/2002)
- MINIMUM WATER TABLE OBSERVED (9/28/2008)
- LITHOLOGICAL CONTACT
- (1.65) — WELL SCREEN WITH WATER TABLE ELEVATION (9/28/2008)
- BOTTOM OF BORING

- STAINING/SHEEN
- OLM/TLM
- FILL
- POST-GLACIAL STRATIFIED SANDS
- SILT AND CLAY
- GRAVEL
- BEDROCK (HARTLAND FORMATION)

## NOTES:

1. ELEVATIONS REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)
2. HORIZONTAL LOCATION OF HOLDER WALLS BASED ON SANBORN MAPS. DEPTH TO HOLDER FLOORS ESTIMATED BASED ON DRILLING OBSERVATIONS.

0 10' 20'
VERTICAL SCALE
0 20' 40'
HORIZONTAL SCALE

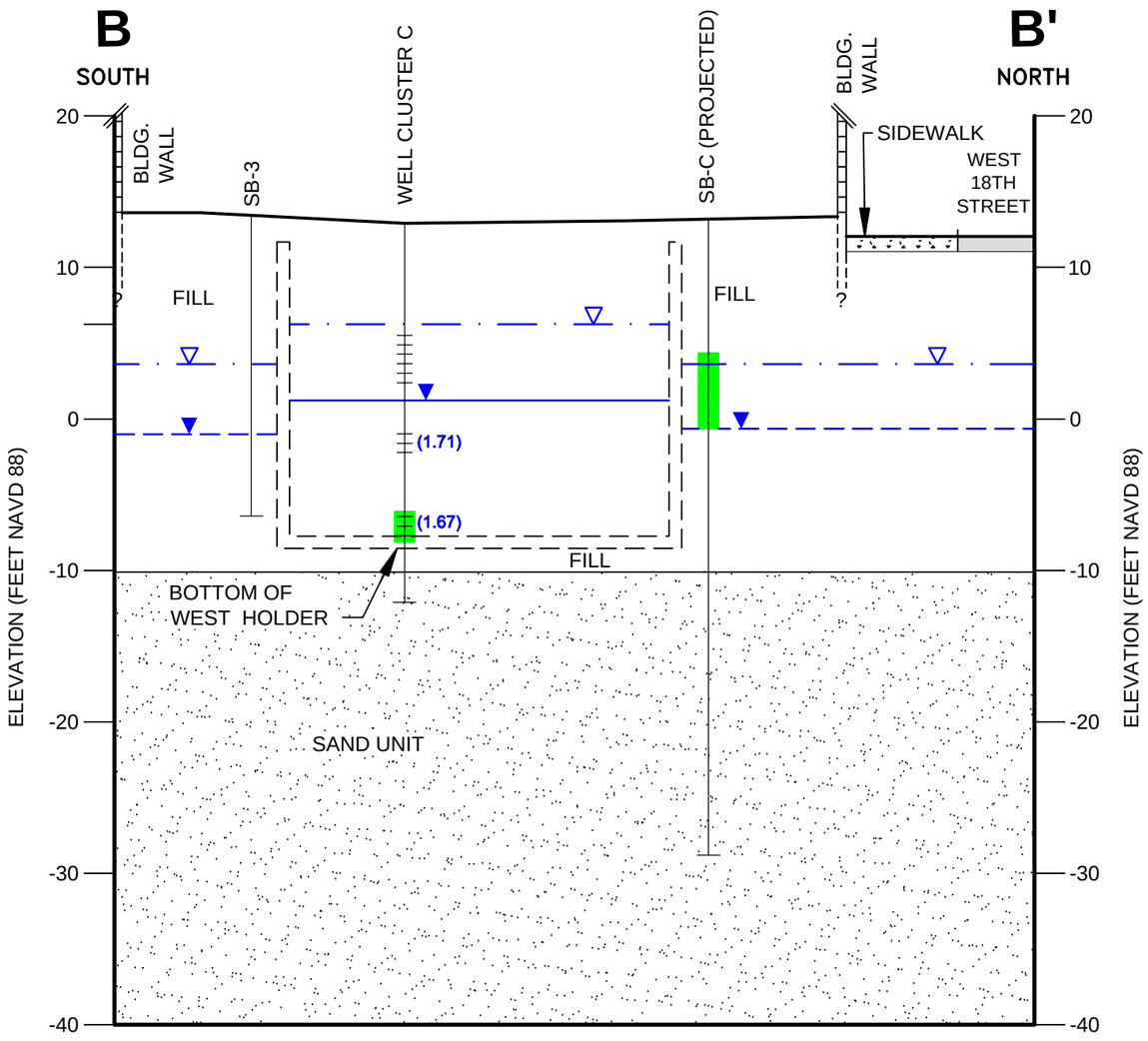
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
**REMEDIAL INVESTIGATION REPORT**
**BLOCK 715, LOT 59**

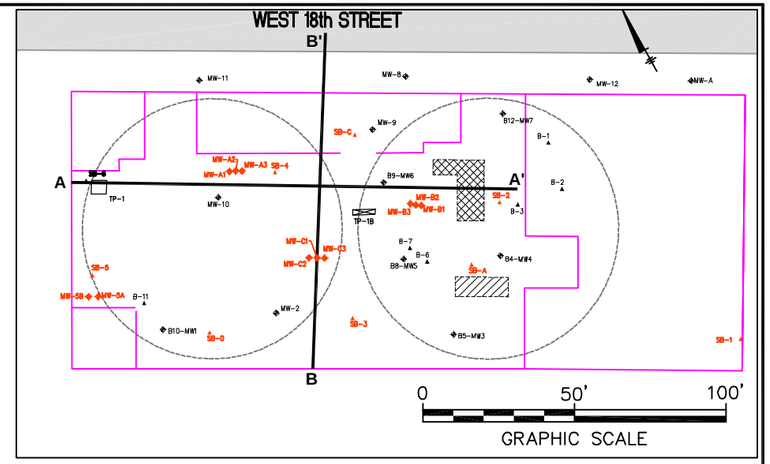
**CROSS SECTION A - A'**

ARCADIS

FIGURE
**3**

CITY:SYRACUSE GROUP: ENVCAD DB: A.SCHILLING, B. DECLERQ, P. LISTER LD: A.SCHILLING PM/TM: K. WHITE LYR: ON=*;OFF=REF; (FRZ)
G:\ENVCAD\SYRACUSE\ACTIB0043011\0000100003\DWG\43011V04.DWG LAYOUT: 3 SAVED: 5/4/2009 8:10 AM ACADVER: 17.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 5/4/2009 8:11 AM BY: LISTER, PAUL
XREFS: IMAGES: PROJECTNAME: ---
43011X00 bubbles_Page_1.tif




## LEGEND:

- SB-4 — WELL/BORING ID
- LOCAL GROUND SURFACE
- MAXIMUM WATER TABLE OBSERVED (1/10/2002)
- MINIMUM WATER TABLE OBSERVED (9/28/2008)
- LITHOLOGICAL CONTACT
- (1.71) — WELL SCREEN WITH WATER TABLE ELEVATION (9/28/2008)
- BOTTOM OF BORING
- STAINING/SHEEN
- FILL
- POST-GLACIAL STRATIFIED SANDS

## NOTES:

1. ELEVATIONS REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
2. HORIZONTAL LOCATION OF HOLDER WALLS BASED ON SANBORN MAPS. DEPTH TO HOLDER FLOORS ESTIMATED BASED ON DRILLING OBSERVATIONS.

0 10' 20'
VERTICAL SCALE

0 20' 40'
HORIZONTAL SCALE

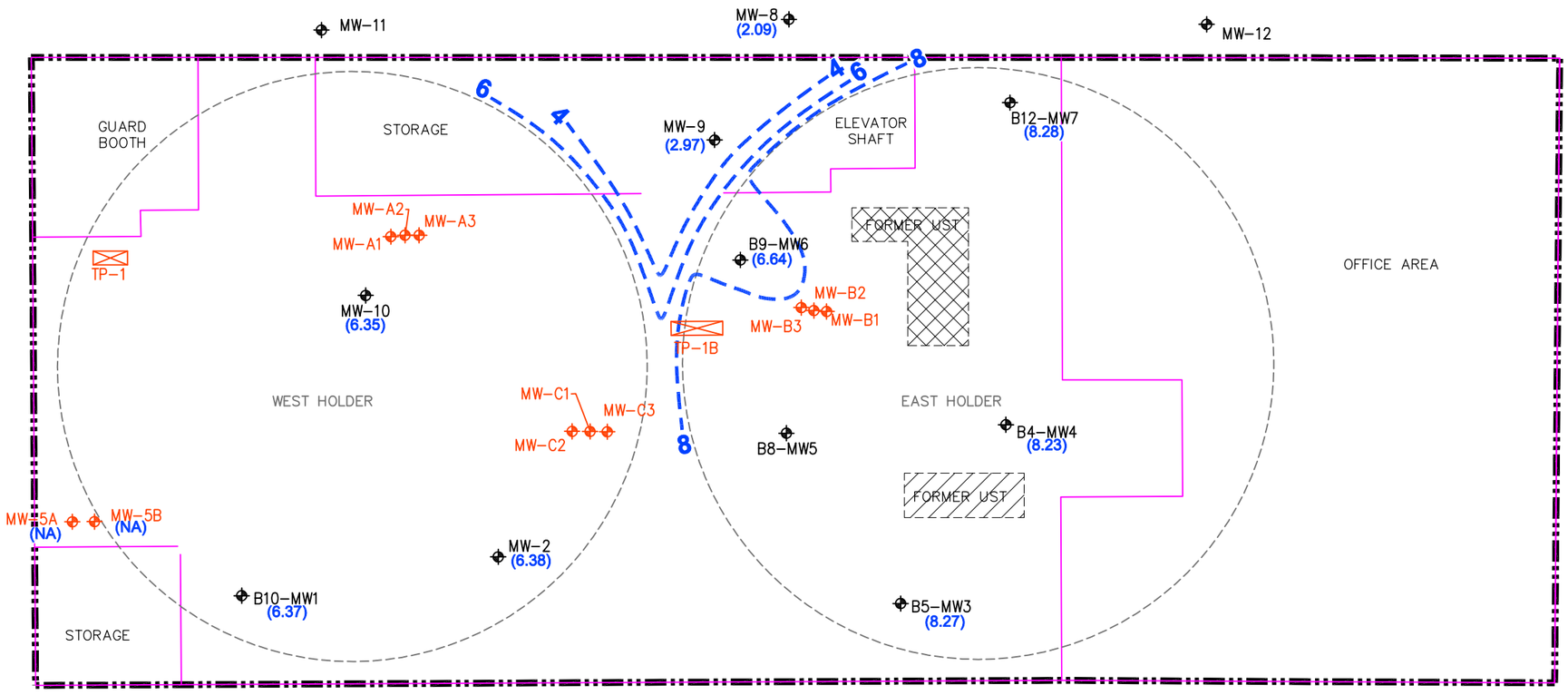
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
**REMEDIAL INVESTIGATION REPORT**
**BLOCK 715, LOT 59**

# CROSS SECTION B - B'

ARCADIS

FIGURE
**4**

CITY:SYRACUSE GROUP: ENVCAD DB: A.SCHILLING, B. DECLERQ, P. LISTER LD: A.SCHILLING PM/TM: K. WHITE LYR: ON=*;OFF=REF; (FRZ)
G:\ENVCAD\SYRACUSE\ACT\B0043011\0001\000003\DWG\43011V02.DWG LAYOUT: 4 SAVED: 5/4/2009 8:12 AM ACADVER: 17.0S (LMS TECH) PAGESETUP: ####
XREFS: IMAGES: PROJECTNAME: ---
43011X00 PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 5/4/2009 8:13 AM BY: LISTER, PAUL




## LEGEND:

- PROPERTY LINE
- MW-1 — MONITORING WELL (RETACO)
- MW-A1 — MONITORING WELL (CON EDISON)
- TP-2S — TEST PIT (CON EDISON)
- APPROXIMATE LOCATION OF FIVE FORMER 550-GALLON UNDERGROUND GASOLINE STORAGE TANKS
- APPROXIMATE LOCATION OF FORMER 4000-GALLON UNDERGROUND GASOLINE (DIESEL?) TANK
- APPROXIMATE LOCATION OF FORMER GAS HOLDER
- APPROXIMATE LOCATION OF INTERIOR WALLS
- (89.79) — WATER TABLE ELEVATION (FT RMSL)
- 8 — WATER TABLE ELEVATION CONTOUR

## NOTES:

1. SURVEY CONTROL WAS TAKEN FROM SITE WIDE BASE SURVEY PREPARED BY MUNOZ ENGINEERING, P.C. DATED APRIL 2007.
2. ALL ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM.
3. BENCH MARK EL=12.91 X-CUT IN METAL LIGHT POLE ROUND BASE BOLT IN FRONT OF SUBJECT BUILDING ON WEST 18th STREET.
4. LOCATIONS OF FORMER GAS HOLDERS ARE BASED ON SANBORN FIRE INSURANCE MAPS, DATED 1904-1985.
5. RETACO BORING AND MONITORING WELL LOCATIONS ARE BASED ON REPORTS ISSUED BY ENVIROTRAC ON BEHALF OF RETACO BETWEEN 2001 AND 2008.
6. UST LOCATIONS ARE BASED ON A SITE SUMMARY REPORT, ISSUED BY ENVIROTRAC, DATED AUGUST 2003.
7. BUILDING INTERIOR LAYOUT BASED ON FIELD MEASUREMENTS.

0 20' 40'

GRAPHIC SCALE

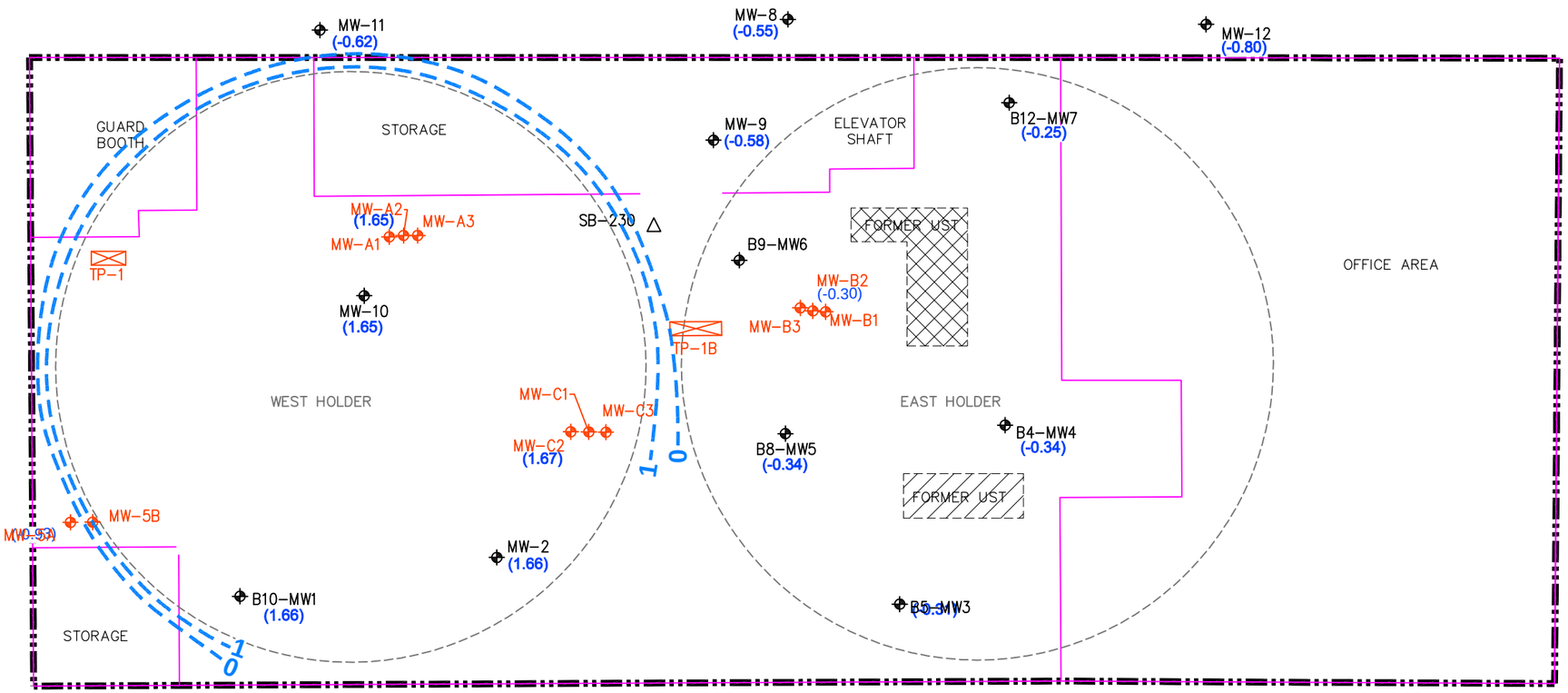
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
**REMEDIAL INVESTIGATION REPORT**
**BLOCK 715, LOT 59**

**SHALLOW GROUNDWATER ELEVATION CONTOUR MAP JANUARY 10, 2002**

ARCADIS

FIGURE 5

CITY:SYRACUSE,NY GROUP: ENVCAD DB: A. SCHILLING, N. SMITHGALL, P. LISTER LD:A.SCHILLING TR: R. ARCO LYR: ON=*OFF=REF; (FRZ)
G:\ENVCAD\SYRACUSE\ACTIB\043011\000100004\DWG\43011W07.DWG LAYOUT: 5 SAVED: 5/4/2009 11:23 AM ACADVER: 17.0S (LMS TECH) PAGESETUP: ---
XREFS: IMAGES: PROJECTNAME: ---
43011X00
43011X01




## LEGEND:

- PROPERTY LINE
- MW-1 — MONITORING WELL (RETACO)
- MW-A1 — MONITORING WELL (CON EDISON)
- TP-2S — TEST PIT (CON EDISON)
- APPROXIMATE LOCATION OF FIVE FORMER 550-GALLON UNDERGROUND GASOLINE STORAGE TANKS
- APPROXIMATE LOCATION OF FORMER 4000-GALLON UNDERGROUND TANK
- APPROXIMATE LOCATION OF FORMER GAS HOLDER
- APPROXIMATE LOCATION OF INTERIOR WALLS
- (-0.55) — WATER TABLE ELEVATION (FT RMSL)
- 1 — WATER TABLE ELEVATION CONTOUR

## NOTES:

1. SURVEY CONTROL WAS TAKEN FROM SITE WIDE BASE SURVEY PREPARED BY MUNOZ ENGINEERING, P.C. DATED APRIL 2007.
2. ALL ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM.
3. BENCH MARK EL=12.91 X-CUT IN METAL LIGHT POLE ROUND BASE BOLT IN FRONT OF SUBJECT BUILDING ON WEST 18th STREET.
4. LOCATIONS OF FORMER GAS HOLDERS ARE BASED ON SANBORN FIRE INSURANCE MAPS, DATED 1904-1985.
5. RETACO BORING AND MONITORING WELL LOCATIONS ARE BASED ON REPORTS ISSUED BY ENVIROTRAC ON BEHALF OF RETACO BETWEEN 2001 AND 2008.
6. UST LOCATIONS ARE BASED ON A SITE SUMMARY REPORT, ISSUED BY ENVIROTRAC, DATED AUGUST 2003.
7. BUILDING INTERIOR LAYOUT BASED ON FIELD MEASUREMENTS.

0 20' 40'

GRAPHIC SCALE

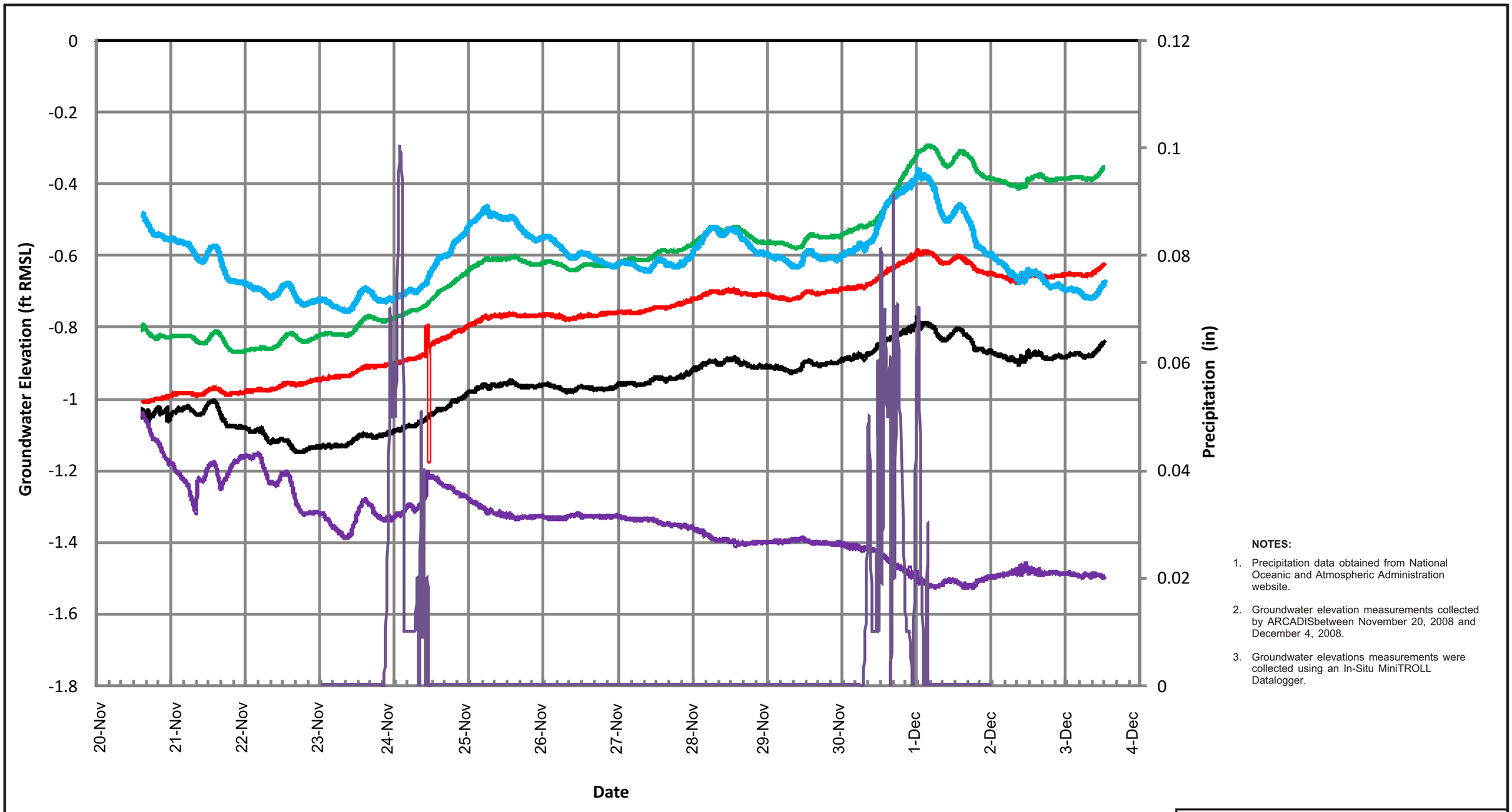
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
**REMEDIAL INVESTIGATION REPORT**
**BLOCK 715, LOT 59**

# SHALLOW GROUNDWATER ELEVATION CONTOUR MAP SEPTEMBER 28, 2008

ARCADIS

FIGURE 6

CITY:SYRACUSE GROUP:ENVCAD DB: A.SCHILLING, P. LISTER TR: M. COBB LYR: ON=*;OFF=REF,(FRZ)
G:\ENVCAD\SYRACUSE\ACTIB\043011\000\1000040DWG\43011W06.DWG LAYOUT: 6 SAVED: 5/4/2009 4:40 PM ACADVER: 17.0S (LMS TECH) PA
(LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULLCTB PLOTTED: 5/4/2009 4:40 PM BY: SCHILLING, ADAM
XREFS: PROJECTNAME: ---
IMAGES:
43011X00
43011X01




**NOTES:**

1. Precipitation data obtained from National Oceanic and Atmospheric Administration website.
2. Groundwater elevation measurements collected by ARCADISbetween November 20, 2008 and December 4, 2008.
3. Groundwater elevations measurements were collected using an In-Situ MiniTROLL Datalogger.

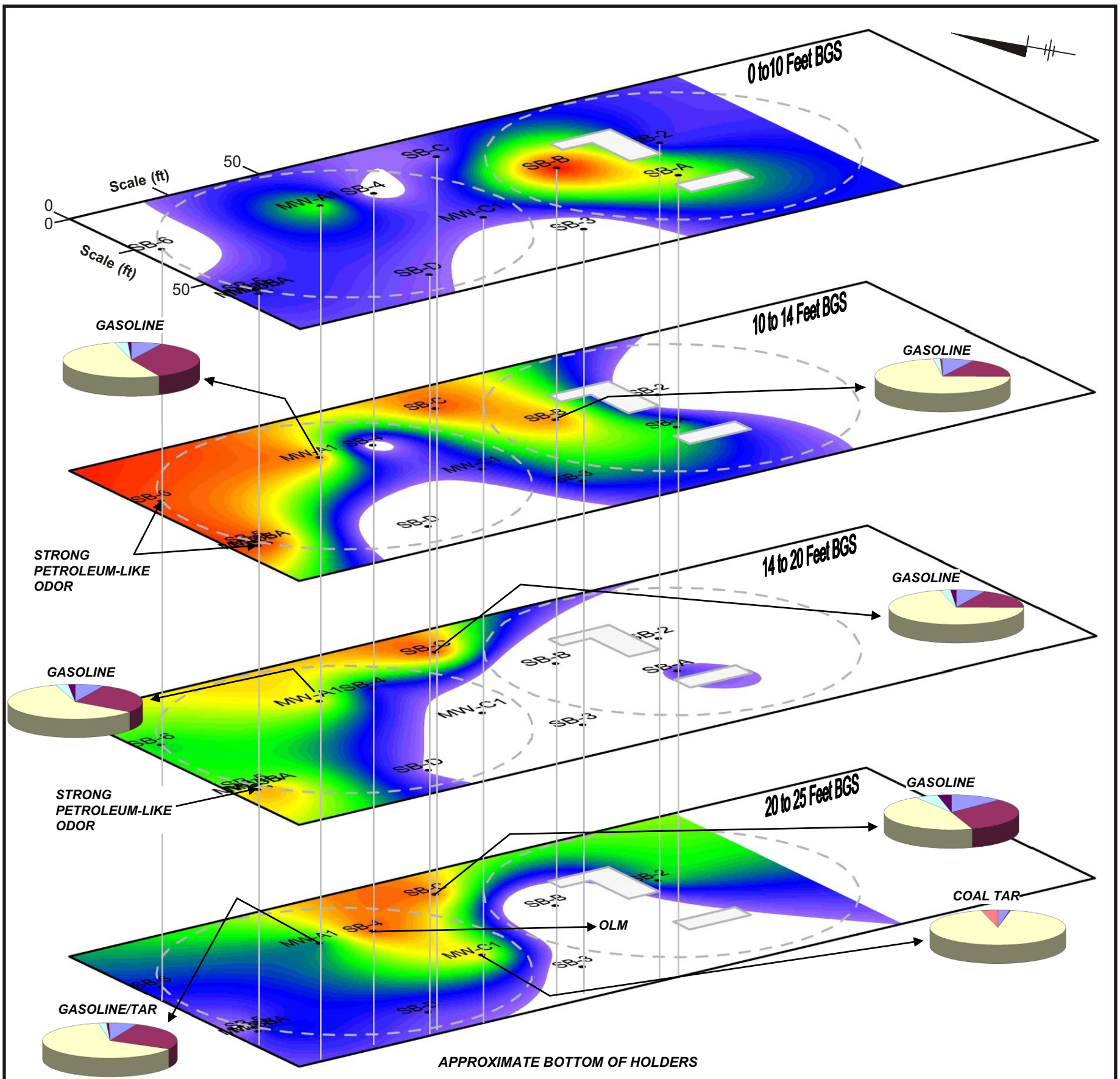
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
**REMEDIAL INVESTIGATION REPORT**
**BLOCK 715 LOT 59**

## GROUNDWATER HYDROGRAPHS

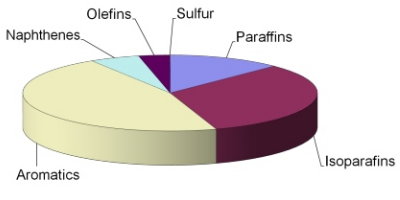
ARCADIS

FIGURE
**7**

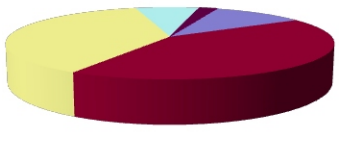
05/05/09 SYRACUSE, NY-ENV/CAD-DJH, K.SARTORI
B0043011/0001/00004/CDR/B0043011G07.CDR



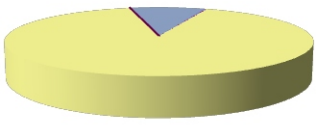

LEGEND

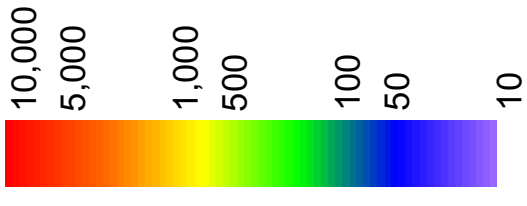



**Regular Unleaded Gasoline Standard**



**Coal Tar Standard**






TOTAL VOC PER PID (PPM)

**NOTE:**
BGS = Below Ground Surface

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
**REMEDIAL INVESTIGATION REPORT**
**BLOCK 715 LOT 59**

**COMPARISON OF PID READINGS ODOR, AND PIANOS RESULTS IN SOIL**

ARCADIS

FIGURE
**8**

04/24/09 SYRACUSE, NY-ENV/CAD-DHOWES
B0043011/0001/00004/CDR/B0043011G01.CDR

# WEST 18th STREET

| MW–11 | | |
|---|---|---|
| Date: | 2/15/2005 | 3/19/2007 |
| MTBE (ug/L) | 520 | 390 |
| 1,2,4–Trimethylbenzene (ug/L) | 1300 | ND |
| 1,3,5–Trimethylbenzene (ug/L) | 380 | 370 |
| Benzene (ug/L) | 5600 | 6200 |
| Ethylbenzene (ug/L) | 2300 | 1000 |
| Isopropylbenzene (ug/L) | 120 | 91 |
| Naphthalene (ug/L) | 460 | 270 |
| n–Butylbenzene (ug/L) | ND | ND |
| n–Propylbenzene (ug/L) | 260 | 200 |
| Toluene (ug/L) | 910 | 1000 |
| Total Xylenes (ug/L) | 13150 | 4900 |

| MW–9 | | | | |
|---|---|---|---|---|
| Date: | 1/18/2002 | 3/6/2002 | 1/27/2004 | 3/19/2007 |
| MTBE (ug/L) | 186 | ND | 255 | ND |
| 1,2,4–Trimethylbenzene (ug/L) | 2090 | 2720 | 2400 | 77000 |
| 1,3,5–Trimethylbenzene (ug/L) | 1040 | 903 | 853 | 19000 |
| 4–Isopropyltoluene (ug/L) | ND | ND | 25.4 | ND |
| Benzene (ug/L) | 206 | 148 | 1920 | 6400 |
| Ethylbenzene (ug/L) | 326 | 338 | 3430 | 18000 |
| Isopropylbenzene (ug/L) | 39 | ND | 60 | 2800 |
| Naphthalene (ug/L) | 530 | 462 | 380 | 13000 |
| n–Butylbenzene (ug/L) | ND | ND | 115 | ND |
| n–Propylbenzene (ug/L) | 67 | 80 | 102 | 8900 |
| Toluene (ug/L) | 120 | 245 | 1400 | 20000 |
| Total Xylenes (ug/L) | 4250 | 3970 | 3295 | 106000 |

| MW–8 | | | | |
|---|---|---|---|---|
| Date: | 1/18/2002 | 3/6/2002 | 1/27/2004 | 2/15/2005 |
| MTBE (ug/L) | 238 | 242 | 114 | 70 |
| 1,2,4–Trimethylbenzene (ug/L) | 6170 | 3774 | 2770 | 3900 |
| 1,3,5–Trimethylbenzene (ug/L) | ND | 982 | 1030 | 1400 |
| Benzene (ug/L) | 3830 | 1910 | 1510 | 1900 |
| Ethylbenzene (ug/L) | 5060 | 2680 | 1370 | 650 |
| Isopropylbenzene (ug/L) | 109 | 133 | 96 | 85 |
| Naphthalene (ug/L) | 1240 | 481 | 559 | 1100 |
| n–Butylbenzene (ug/L) | 282 | ND | 77.6 | ND |
| n–Propylbenzene (ug/L) | 942 | 336 | 260 | 77 |
| Toluene (ug/L) | 11300 | 6740 | 1970 | 2000 |
| Total Xylenes (ug/L) | 25600 | 18400 | 9020 | 15600 |

| MW–12 | | |
|---|---|---|
| Date: | 2/15/2005 | 3/19/2007 |
| MTBE (ug/L) | 180 | 130 |
| 1,2,4–Trimethylbenzene (ug/L) | 1300 | 290 |
| 1,3,5–Trimethylbenzene (ug/L) | 350 | 95 |
| Benzene (ug/L) | 3000 | 3800 |
| Ethylbenzene (ug/L) | 1000 | 400 |
| Isopropylbenzene (ug/L) | 99 | 27 |
| Naphthalene (ug/L) | 580 | 110 |
| n–Butylbenzene (ug/L) | ND | ND |
| n–Propylbenzene (ug/L) | 210 | 41 |
| Toluene (ug/L) | 430 | 67 |
| Total Xylenes (ug/L) | 3830 | 1019 |

| MW–6 | | |
|---|---|---|
| Date: | 1/18/2002 | 3/6/2002 |
| MTBE (ug/L) | 416 | 135 |
| 1,2,4–Trimethylbenzene (ug/L) | 3010 | 2940 |
| 1,3,5–Trimethylbenzene (ug/L) | ND | 803 |
| Benzene (ug/L) | 612 | 203 |
| Ethylbenzene (ug/L) | 2100 | 1090 |
| Isopropylbenzene (ug/L) | 111 | 95.7 |
| Naphthalene (ug/L) | 444 | 603 |
| n–Butylbenzene (ug/L) | ND | ND |
| n–Propylbenzene (ug/L) | 284 | 265 |
| Toluene (ug/L) | 504 | 79.6 |
| Total Xylenes (ug/L) | 9910 | 7430 |

| MW–7 | | | | |
|---|---|---|---|---|
| Date: | 1/18/2002 | 3/6/2002 | 1/27/2004 | 3/19/2007 |
| MTBE (ug/L) | 24.3 | ND | 205 | 27 |
| 1,2,4–Trimethylbenzene (ug/L) | 509 | 69.2 | 367 | 3 |
| 1,3,5–Trimethylbenzene (ug/L) | ND | 26.3 | 81 | ND |
| Benzene (ug/L) | 125 | ND | 257 | 480 |
| Ethylbenzene (ug/L) | 298 | 43.2 | 179 | 2 |
| Isopropylbenzene (ug/L) | 24 | ND | 25.6 | 14 |
| Naphthalene (ug/L) | 137 | 40.5 | 74 | 5 |
| n–Butylbenzene (ug/L) | ND | ND | ND | 2 |
| n–Propylbenzene (ug/L) | 55.8 | 5.8 | 35.4 | 18 |
| Toluene (ug/L) | 1.39 | 6.1 | 12.5 | 3 |
| Total Xylenes (ug/L) | 1740 | 369 | 253.8 | 10 |

| MW–10 | | | | |
|---|---|---|---|---|
| Date: | 1/18/2002 | 3/6/2002 | 1/27/2004 | 3/19/2007 |
| MTBE (ug/L) | 139 | 139 | 301 | 38 |
| 1,2,4–Trimethylbenzene (ug/L) | 33.8 | 56.6 | 115 | ND |
| 1,3,5–Trimethylbenzene (ug/L) | 24.3 | 41 | 50 | ND |
| Benzene (ug/L) | ND | 6700 | 1530 | 190 |
| Ethylbenzene (ug/L) | 146 | 226 | 46 | ND |
| Isopropylbenzene (ug/L) | 47.6 | 60.5 | 44.3 | 22 |
| Naphthalene (ug/L) | 73.9 | 185 | 89 | ND |
| n–Butylbenzene (ug/L) | ND | ND | ND | ND |
| n–Propylbenzene (ug/L) | 35.3 | 50.3 | 55.8 | 22 |
| Toluene (ug/L) | 7.1 | 5.3 | 80.6 | <1 |
| Total Xylenes (ug/L) | 109 | 150 | 153.5 | 3 |

| MW–4 | | | | |
|---|---|---|---|---|
| Date: | 1/18/2002 | 3/6/2002 | 1/27/2004 | 3/19/2007 |
| MTBE (ug/L) | 2360 | 1980 | 126 | 18 |
| 1,2,4–Trimethylbenzene (ug/L) | ND | ND | ND | 5 |
| 1,3,5–Trimethylbenzene (ug/L) | ND | ND | ND | 2 |
| Benzene (ug/L) | 1140 | 1220 | 1200 | 950 |
| Ethylbenzene (ug/L) | 13.6 | 11.3 | ND | 2 |
| Isopropylbenzene (ug/L) | 22 | 23.9 | 15.9 | 15 |
| Naphthalene (ug/L) | 195 | 191 | ND | 5 |
| n–Butylbenzene (ug/L) | | | | 1 |
| n–Propylbenzene (ug/L) | 18 | 25 | ND | 11 |
| Toluene (ug/L) | 8.1 | 5.5 | 6.5 | 3 |
| Total Xylenes (ug/L) | 46 | 22.3 | ND | 15 |

| MW–1 | | | | |
|---|---|---|---|---|
| Date: | 1/18/2002 | 3/6/2002 | 1/27/2004 | 3/19/2007 |
| MTBE (ug/L) | 201 | 124 | 105 | 40 |
| 1,3,5–Trimethylbenzene (ug/L) | ND | ND | 5.9 | 1 |
| Benzene (ug/L) | 4720 | 5530 | 1540 | 170 |
| Ethylbenzene (ug/L) | 105 | 89.4 | 6.6 | ND |
| Isopropylbenzene (ug/L) | 18.8 | ND | 24.8 | 7 |
| Naphthalene (ug/L) | 75.2 | 64.2 | ND | 3 |
| n–Propylbenzene (ug/L) | 10 | ND | 16.4 | 4 |
| Toluene (ug/L) | ND | ND | 5.85 | ND |
| Total Xylenes (ug/L) | 49.4 | 29.2 | 21.3 | 6 |

| MW–2 | | | | |
|---|---|---|---|---|
| Date: | 1/18/2002 | 3/6/2002 | 1/27/2004 | 3/19/2007 |
| MTBE (ug/L) | 105 | 57.9 | 146 | 26 |
| 1,2,4–Trimethylbenzene (ug/L) | 21.6 | 16.1 | 8.15 | ND |
| 1,3,5–Trimethylbenzene (ug/L) | ND | 8.2 | ND | ND |
| Benzene (ug/L) | 1580 | 2310 | 503 | 69 |
| Ethylbenzene (ug/L) | 99 | 103 | ND | ND |
| Isopropylbenzene (ug/L) | 12.6 | 17.1 | 9.5 | 4 |
| Naphthalene (ug/L) | 70.6 | 99 | ND | ND |
| n–Propylbenzene (ug/L) | ND | 8.4 | 6.45 | 3 |
| tert–Butylbenzene (ug/L) | ND | ND | ND | ND |
| Toluene (ug/L) | ND | 3.7 | 9.25 | ND |
| Total Xylenes (ug/L) | 71.6 | 8.8 | ND | ND |

| MW–5 | | | | |
|---|---|---|---|---|
| Date: | 1/18/2002 | 3/6/2002 | 1/27/2004 | 3/19/2007 |
| MTBE (ug/L) | 820 | 890 | 543 | 34 |
| 1,2,4–Trimethylbenzene (ug/L) | 2850 | 2570 | 789 | 54 |
| 1,3,5–Trimethylbenzene (ug/L) | ND | 751 | 110 | 11 |
| Benzene (ug/L) | 2890 | 3180 | 3040 | 1000 |
| Ethylbenzene (ug/L) | 1180 | 1390 | 501 | 89 |
| Isopropylbenzene (ug/L) | 97 | 102 | 138 | 52 |
| Naphthalene (ug/L) | 530 | 516 | 154 | 33 |
| n–Butylbenzene (ug/L) | 53.5 | ND | 38.7 | 14 |
| n–Propylbenzene (ug/L) | 201 | 207 | 228 | 77 |
| Toluene (ug/L) | 782 | 556 | 34.6 | 6 |
| Total Xylenes (ug/L) | 9350 | 9710 | 496.2 | 21 |

| MW–3 | | | |
|---|---|---|---|
| Date: | 1/18/2002 | 3/6/2002 | 3/19/2007 |
| MTBE (ug/L) | 694 | 480 | 23 |
| 1,2,4–Trimethylbenzene (ug/L) | 1010 | 553 | 1 |
| 1,3,5–Trimethylbenzene (ug/L) | ND | 186 | ND |
| Benzene (ug/L) | 2850 | 2100 | 1200 |
| Ethylbenzene (ug/L) | 425 | 435 | 4 |
| Isopropylbenzene (ug/L) | 46.4 | 64.4 | 9 |
| Naphthalene (ug/L) | 189 | 233 | 2 |
| n–Butylbenzene (ug/L) | ND | ND | 2 |
| n–Propylbenzene (ug/L) | 27.6 | 119 | 10 |
| Toluene (ug/L) | 492 | 145 | 4 |
| Total Xylenes (ug/L) | 4790 | 1630 | 6 |

GUARD BOOTH
STORAGE
ELEVATOR SHAFT
OFFICE AREA
FORMER UST
FORMER UST
WEST HOLDER
EAST HOLDER
MW–11
MW–8
MW–12
MW–9
B12–MW7
B9–MW6
MW–10
MW–2
B8–MW5
B4–MW4
B10–MW1
B5–MW3
SB–C
SB–6
TP–1
MW–A2
MW–A1
MW–A3
SB–4
TP–1B
MW–B2
MW–B3
MW–B1
SB–2
B–3
B–2
B–1
MW–C1
MW–C3
MW–C2
B–7
B–6
SB–A
SB–5
B–11
SB–3
SB–D
SB–1

## LEGEND:

- PROPERTY LINE
- B–1 — SOIL BORING (RETACO)
- MW–1 — MONITORING WELL (RETACO)
- TP–2S — TEST PIT (CON EDISON)
- SB–C, MW–A1 — MONITORING WELL/SOIL BORING LOCATION (CON EDISON)
- BUILDING COLUMN
- APPROXIMATE LOCATION OF FIVE FORMER 550–GALLON UNDERGROUND GASOLINE STORAGE TANKS
- APPROXIMATE LOCATION OF FORMER 4000–GALLON UNDERGROUND GASOLINE DIESEL? TANK
- APPROXIMATE LOCATION OF FORMER GAS HOLDER
- APPROXIMATE LOCATION OF BUILDING WALLS

| | |
|---|---|
| J | INDICATES AN ESTIMATED VALUE |
| µg/L | MICROGRAMS PER LITER |
| MTBE | METHYL TERTIARY BUTYL ETHER |
| TVOCs | TOTAL VOLITLE ORGARNIC CARBON |

## NOTES:

1. SURVEY CONTROL WAS TAKEN FROM SITE WIDE BASE SURVEY PREPARED BY MUNOZ ENGINEERING, P.C. DATED APRIL 2007.
2. ALL ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM AS DERIVED FROM GPS.
3. HORIZONTAL COORDINATES ARE IN NYS COORDINATE SYSTEM (EAST) NAD 83 AS DERIVED FROM GPS.
4. BENCH MARK EL=12.91 X–CUT IN METAL LIGHT POLE ROUND BASE BOLT IN FRONT OF VERIZON BUILDING ON WEST 18th STREET.
5. LOCATIONS OF FORMER GAS HOLDERS ARE BASED ON SANBORN FIRE INSURANCE MAPS, DATED 1904–1985.
6. RETACO BORING AND MONITORING WELL LOCATIONS ARE BASED ON REPORTS ISSUED BY ENVIROTRAC ON BEHALF OF RETACO BETWEEN 2001 AND 2008.
7. UST LOCATIONS ARE BASED ON A SITE SUMMARY REPORT, ISSUED BY ENVIROTRAC, DATED AUGUST 2003.
8. BUILDING INTERIOR LAYOUT BASED ON FIELD RECONNAISSANCE.
9. ALL LOCATIONS ARE APPROXIMATE.

0 20' 40'
GRAPHIC SCALE

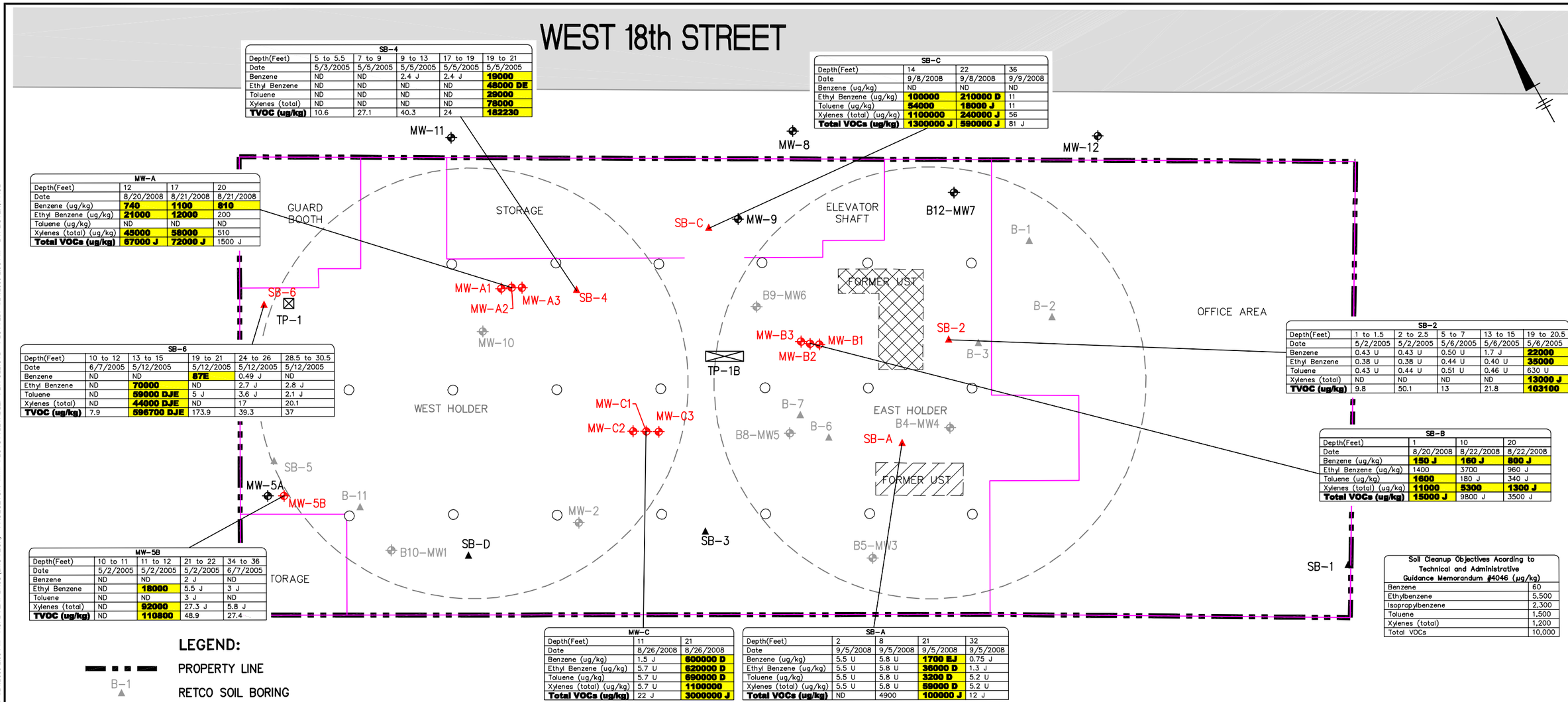
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
**REMEDIAL INVESTIGATION REPORT**
**BLOCK 715, LOT 59**

**HISTORICAL VOCs DETECTED IN GROUNDWATER**

ARCADIS

FIGURE 9

CITY:SYRACUSE,NY GROUP:ENVCAD DB:A.SCHILLING,N.SMITHGALL,P.LISTER PM:TM.M.CARRILLO-SHERIDAN TR:R.ARCO LYR:ON=*OFF=REF.(FRZ)
G:\ENVCAD\SYRACUSE\ACTIVE\B0043011\0000\100004\DWG\43011C08.DWG LAYOUT: 9 SAVED: 4/17/2009 3:36 PM ACADVER: 17.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 4/17/2009 3:36 PM BY: LISTER, PAUL
XREFS: 43011X00 43011X01 IMAGES: PROJECTNAME: ---




| SB-4 | | | | | |
|---|---|---|---|---|---|
| Depth(Feet) | 5 to 5.5 | 7 to 9 | 9 to 13 | 17 to 19 | 19 to 21 |
| Date | 5/3/2005 | 5/5/2005 | 5/5/2005 | 5/5/2005 | 5/5/2005 |
| Benzene | ND | ND | 2.4 J | 2.4 J | **19000** |
| Ethyl Benzene | ND | ND | ND | ND | **48000 DE** |
| Toluene | ND | ND | ND | ND | **29000** |
| Xylenes (total) | ND | ND | ND | ND | **78000** |
| **TVOC (ug/kg)** | 10.6 | 27.1 | 40.3 | 24 | **182230** |

| SB-C | | | |
|---|---|---|---|
| Depth(Feet) | 14 | 22 | 36 |
| Date | 9/8/2008 | 9/8/2008 | 9/9/2008 |
| Benzene (ug/kg) | ND | ND | ND |
| Ethyl Benzene (ug/kg) | **100000** | **210000 D** | 11 |
| Toluene (ug/kg) | **54000** | **18000 J** | 11 |
| Xylenes (total) (ug/kg) | **1100000** | **240000 J** | 56 |
| **Total VOCs (ug/kg)** | **1300000 J** | **590000 J** | 81 J |

| MW-A | | | |
|---|---|---|---|
| Depth(Feet) | 12 | 17 | 20 |
| Date | 8/20/2008 | 8/21/2008 | 8/21/2008 |
| Benzene (ug/kg) | **740** | **1100** | **810** |
| Ethyl Benzene (ug/kg) | **21000** | **12000** | 200 |
| Toluene (ug/kg) | ND | ND | ND |
| Xylenes (total) (ug/kg) | **45000** | **58000** | 510 |
| **Total VOCs (ug/kg)** | **67000 J** | **72000 J** | 1500 J |

| SB-6 | | | | | |
|---|---|---|---|---|---|
| Depth(Feet) | 10 to 12 | 13 to 15 | 19 to 21 | 24 to 26 | 28.5 to 30.5 |
| Date | 6/7/2005 | 5/12/2005 | 5/12/2005 | 5/12/2005 | 5/12/2005 |
| Benzene | ND | ND | **87E** | 0.49 J | ND |
| Ethyl Benzene | ND | **70000** | ND | 2.7 J | 2.8 J |
| Toluene | ND | **59000 DJE** | 5 J | 3.6 J | 2.1 J |
| Xylenes (total) | ND | **44000 DJE** | ND | 17 | 20.1 |
| **TVOC (ug/kg)** | 7.9 | **596700 DJE** | 173.9 | 39.3 | 37 |

| SB-2 | | | | | |
|---|---|---|---|---|---|
| Depth(Feet) | 1 to 1.5 | 2 to 2.5 | 5 to 7 | 13 to 15 | 19 to 20.5 |
| Date | 5/2/2005 | 5/2/2005 | 5/6/2005 | 5/6/2005 | 5/6/2005 |
| Benzene | 0.43 U | 0.43 U | 0.50 U | 1.7 J | **22000** |
| Ethyl Benzene | 0.38 U | 0.38 U | 0.44 U | 0.40 U | **35000** |
| Toluene | 0.43 U | 0.44 U | 0.51 U | 0.46 U | 630 U |
| Xylenes (total) | ND | ND | ND | ND | **13000 J** |
| **TVOC (ug/kg)** | 9.8 | 50.1 | 13 | 21.8 | **103100** |

| SB-B | | | |
|---|---|---|---|
| Depth(Feet) | 1 | 10 | 20 |
| Date | 8/20/2008 | 8/22/2008 | 8/22/2008 |
| Benzene (ug/kg) | **150 J** | **160 J** | **800 J** |
| Ethyl Benzene (ug/kg) | 1400 | 3700 | 960 J |
| Toluene (ug/kg) | **1600** | 180 J | 340 J |
| Xylenes (total) (ug/kg) | **11000** | **5300** | **1300 J** |
| **Total VOCs (ug/kg)** | **15000 J** | 9800 J | 3500 J |

| MW-5B | | | | |
|---|---|---|---|---|
| Depth(Feet) | 10 to 11 | 11 to 12 | 21 to 22 | 34 to 36 |
| Date | 5/2/2005 | 5/2/2005 | 5/2/2005 | 6/7/2005 |
| Benzene | ND | ND | 2 J | ND |
| Ethyl Benzene | ND | **18000** | 5.5 J | 3 J |
| Toluene | ND | ND | 3 J | ND |
| Xylenes (total) | ND | **92000** | 27.3 J | 5.8 J |
| **TVOC (ug/kg)** | ND | **110800** | 48.9 | 27.4 |

| MW-C | | |
|---|---|---|
| Depth(Feet) | 11 | 21 |
| Date | 8/26/2008 | 8/26/2008 |
| Benzene (ug/kg) | 1.5 J | **600000 D** |
| Ethyl Benzene (ug/kg) | 5.7 U | **620000 D** |
| Toluene (ug/kg) | 5.7 U | **690000 D** |
| Xylenes (total) (ug/kg) | 5.7 U | **1100000** |
| **Total VOCs (ug/kg)** | 22 J | **3000000 J** |

| SB-A | | | | |
|---|---|---|---|---|
| Depth(Feet) | 2 | 8 | 21 | 32 |
| Date | 9/5/2008 | 9/5/2008 | 9/5/2008 | 9/5/2008 |
| Benzene (ug/kg) | 5.5 U | 5.8 U | **1700 EJ** | 0.75 J |
| Ethyl Benzene (ug/kg) | 5.5 U | 5.8 U | **36000 D** | 1.3 J |
| Toluene (ug/kg) | 5.5 U | 5.8 U | **3200 D** | 5.2 U |
| Xylenes (total) (ug/kg) | 5.5 U | 5.8 U | **59000 D** | 5.2 U |
| **Total VOCs (ug/kg)** | ND | 4900 | **100000 J** | 12 J |

| Soil Cleanup Objectives Acording to Technical and Administrative Guidance Memorandum #4046 (µg/kg) | |
|---|---|
| Benzene | 60 |
| Ethylbenzene | 5,500 |
| Isopropylbenzene | 2,300 |
| Toluene | 1,500 |
| Xylenes (total) | 1,200 |
| Total VOCs | 10,000 |

## LEGEND:

- PROPERTY LINE
- B-1 — RETCO SOIL BORING
- MW-2 — TVOC >10,000 ug/kg AND CONCENTRATIONS ABOVE TAGM 4046 SOIL CLEANUP OBJECTIVES
- SB-D — TVOC <10,000 ug/kg AND CONCENTRATIONS ABOVE TAGM 4046 SOIL CLEANUP OBJECTIVES
- MW-C2 — NO CONCENTRATIONS ABOVE TAGM 4046 SOIL CLEANUP OBJECTIVES
- 740 — EXCEEDANCE OF NEW YORK STATE TECHINICAL AND OPERATION SOIL CLEANUP OBJECTIVES AND CLEANUP LEVELS (TAGTM 4046)
- BUILDING COLUMN
- APPROXIMATE LOCATION OF FIVE FORMER 550-GALLON UNDERGROUND GASOLINE STORAGE TANKS
- APPROXIMATE LOCATION OF FORMER 4000-GALLON UNDERGROUND GASOLINE (DIESEL?) TANK
- APPROXIMATE LOCATION OF FORMER GAS HOLDER
- APPROXIMATE LOCATION OF BUILDING WALLS

| | |
|---|---|
| VOCs | VOLATILE ORGANIC COMPOUNDS |
| J | INDICATES AN ESTIMATED VALUE |
| D | COMPOUND ANALYZED AT DILUTION |
| U | INDICATES THE CONSTITUENT WAS NOT DETECTED AT THE PQL. THE PRECEDING THE U INDICATES THE PQL |
| µg/kg | MICROGRAMS PER KILOGRAM |

## NOTES:

1. SURVEY CONTROL WAS TAKEN FROM SITE WIDE BASE SURVEY PREPARED BY MUNOZ ENGINEERING, P.C. DATED APRIL 2007.
2. ALL ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM AS DERIVED FROM GPS.
3. HORIZONTAL COORDINATES ARE IN NYS COORDINATE SYSTEM (EAST) NAD 83 AS DERIVED FROM GPS.
4. BENCH MARK EL=12.91 X-CUT IN METAL LIGHT POLE ROUND BASE BOLT IN FRONT OF VERIZON BUILDING ON WEST 18th STREET.
5. LOCATIONS OF FORMER GAS HOLDERS ARE BASED ON SANBORN FIRE INSURANCE MAPS, DATED 1904-1985.
6. RETACO BORING AND MONITORING WELL LOCATIONS ARE BASED ON REPORTS ISSUED BY ENVIROTRAC ON BEHALF OF RETACO BETWEEN 2001 AND 2008.
7. UST LOCATIONS ARE BASED ON A SITE SUMMARY REPORT, ISSUED BY ENVIROTRAC, DATED AUGUST 2003.
8. BUILDING INTERIOR LAYOUT BASED ON FIELD RECONNAISSANCE.
9. ALL LOCATIONS ARE APPROXIMATE.

0 20' 40'

GRAPHIC SCALE

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
**REMEDIAL INVESTIGATION REPORT**
**BLOCK 715, LOT 59**

**VOCs DETECTED IN SOIL**

ARCADIS

FIGURE **10**

CITY:SYRACUSE, NY GROUP: ENVCAD DB: A. SCHILLING, N. SMITHGALL, P. LISTER LD:A.SCHILLING TR: R. ARCO LYR: ON=*;OFF=REF*, (FRZ)
G:\ENVCAD\SYRACUSE\ACT\B0043011\0001\000041\DWG\43011C04.DWG LAYOUT: 10 SAVED: 4/14/2009 2:03 PM ACADVER: 17.0S (LMS TECH) PAGESETUP: ####
XREFS: 43011X00 43011X01 IMAGES: PROJECTNAME: ---
PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 4/14/2009 2:03 PM BY: LISTER, PAUL

# WEST 18th STREET

| SB–4 | | | | | |
|---|---|---|---|---|---|
| Depth(Feet) | 5 to 5.5 | 7 to 9 | 9 to 13 | 17 to 19 | 19 to 21 |
| Date | 5/3/2005 | 5/5/2005 | 5/5/2005 | 5/5/2005 | 5/5/2005 |
| Benzo(a)pyrene (ug/kg) | ND | ND | ND | ND | **18000 JE** |
| Naphthalene (ug/kg) | ND | ND | 370 J | ND | **220000 DE** |
| Total PAHs | 409 | ND | 435 | 341 | **623680** |
| **Total SVOCs (ug/kg)** | 409 | 84 | 534 | 341 | **728280E** |

| SB–C | | | |
|---|---|---|---|
| Depth(Feet) | 14 | 22 | 36 |
| Date | 9/8/2008 | 9/8/2008 | 9/9/2008 |
| Benzo(a)pyrene (ug/kg) | 280 U | **68 J** | 330 U |
| Naphthalene (ug/kg) | **22000 D** | **47000 D** | 330 U |
| Total PAHs | **22560** | **48884** | ND |
| **Total SVOCs (ug/kg)** | 39000 J | 73000 J | 6200 |

| SB–2 | | | | | |
|---|---|---|---|---|---|
| Depth(Feet) | 1 to 1.5 | 2 to 2.5 | 5 to 7 | 13 to 15 | 19 to 20.5 |
| Date | 5/2/2005 | 5/2/2005 | 5/6/2005 | 5/6/2005 | 5/6/2005 |
| Benzo(a)pyrene (ug/kg) | **62 JE** | **110 JE** | ND | ND | **770E** |
| Naphthalene (ug/kg) | 110 J | ND | ND | ND | 11000 |
| Total TPAHs | 468 | 1571 | 210 | ND | **24800** |
| **Total SVOCs (ug/kg)** | 688 | 1571 | 434 | 270 | 32180 |

| MW–A | | | |
|---|---|---|---|
| Depth(Feet) | 12 | 17 | 20 |
| Date | 8/20/2008 | 8/21/2008 | 8/21/2008 |
| Benzo(a)pyrene (ug/kg) | **200 J** | **500** | **230 J** |
| Napthalene (ug/kg) | 10,000 | 2,600 | 760 |
| Total PAHs | **15566** | **9064** | **6060** |
| **Total SVOCs (ug/kg)** | 22000 J | 11000 J | 7500 J |

| MW–C | | |
|---|---|---|
| Depth(Feet) | 11 | 21 |
| Date | 8/26/2008 | 8/26/2008 |
| Benzo(a)pyrene (ug/kg) | **74 J** | **78000** |
| Naphthalene (ug/kg) | 300 U | **640000 E** |
| Total PAHs | **1424** | **2387000** |
| **Total SVOCs (ug/kg)** | 29000 J | 2800000 J |

| MW–B | | | |
|---|---|---|---|
| Depth(Feet) | 1 | 10 | 20 |
| Date | 8/20/2008 | 8/22/2008 | 8/22/2008 |
| Benzo(a)pyrene (ug/kg) | **130 J** | **170 J** | **770** |
| Naphthalene (ug/kg) | 5800 | 2500 | **16000 D** |
| Total PAHs | **7359** | **6201** | **37280D** |
| **Total SVOCs (ug/kg)** | 15000 J | 11000 J | 44000 J |

| TP–1B | | | | |
|---|---|---|---|---|
| Depth(Feet) | 1 to 1.5 | | | |
| Date | 5/4/2005 | | | |
| Benzo(a)pyrene (ug/kg) | **79 J** | | | |
| Naphthalene (ug/kg) | 1400 | | | |
| Total PAHs | 1985 | | | |
| **Total SVOCs (ug/kg)** | 4375 | | | |

| SB–A | | | | |
|---|---|---|---|---|
| Depth(Feet) | 2 | 8 | 21 | 32 |
| Date | 9/5/2008 | 9/5/2008 | 9/5/2008 | 9/5/2008 |
| Benzo(a)pyrene (ug/kg) | **290 J** | 300 U | **1900** | 270 U |
| Naphthalene (ug/kg) | 73 J | 170 J | **24000 D** | 270 U |
| Total PAHs | **2878** | **1521** | **68490** | |
| **Total SVOCs (ug/kg)** | 2900 J | 1500 J | 79000 | ND |

| Soil Cleanup Objectives acording to Technical and Administrative Guidance Memorandum #4046 (µg/kg) | |
|---|---|
| Benzo(a)anthracene | 224 |
| Benzo(a)pyrene | 61 |
| Chrysene | 400 |
| Dibenzo(a,h)anthracene | 14 |
| Naphthalene | 13,000 |
| Total PAHs | – – |
| Total SVOCs | 500,000 |

## LEGEND:

- PROPERTY LINE
- B–1 ▲ RETCO SOIL BORING
- MW–2 ⊕ TSVOC >500,000 ug/kg AND CONCENTRATIONS ABOVE TAGM 4046 SOIL CLEANUP OBJECTIVES
- SB–D ▲ TSVOC <500,000 ug/kg AND CONCENTRATIONS ABOVE TAGM 4046 SOIL CLEANUP OBJECTIVES
- MW–C2 ⊕ NO CONCENTRATIONS ABOVE TAGM 4046 SOIL CLEANUP OBJECTIVES
- 740 EXCEEDANCE OF NEW YORK STATE TECHINICAL AND OPERATION SOIL CLEANUP OBJECTIVES AND CLEANUP LEVELS (TAGM 4046)
- ○ BUILDING COLUMN
- APPROXIMATE LOCATION OF FIVE FORMER 550–GALLON UNDERGROUND GASOLINE STORAGE TANKS
- APPROXIMATE LOCATION OF FORMER 4000–GALLON UNDERGROUND GASOLINE (DIESEL?) TANK
- APPROXIMATE LOCATION OF FORMER GAS HOLDER
- APPROXIMATE LOCATION OF BUILDING WALLS

| | |
|---|---|
| SVOCs | SEMI–VOLATILE ORGANIC COMPOUNDS |
| J | INDICATES AN ESTIMATED VALUE |
| D | COMPOUND ANALYZED AT DILUTION |
| U | INDICATES THE CONSTITUENT WAS NOT DETECTED AT THE PQL. THE PRECEDING THE U INDICATES THE PQL |
| µg/kg | MICROGRAMS PER KILOGRAMS |

## NOTES:

1. SURVEY CONTROL WAS TAKEN FROM SITE WIDE BASE SURVEY PREPARED BY MUNOZ ENGINEERING, P.C. DATED APRIL 2007.
2. ALL ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM AS DERIVED FROM GPS.
3. HORIZONTAL COORDINATES ARE IN NYS COORDINATE SYSTEM (EAST) NAD 83 AS DERIVED FROM GPS.
4. BENCH MARK EL=12.91 X–CUT IN METAL LIGHT POLE ROUND BASE BOLT IN FRONT OF VERIZON BUILDING ON WEST 18th STREET.
5. LOCATIONS OF FORMER GAS HOLDERS ARE BASED ON SANBORN FIRE INSURANCE MAPS, DATED 1904–1985.
6. RETACO BORING AND MONITORING WELL LOCATIONS ARE BASED ON REPORTS ISSUED BY ENVIROTRAC ON BEHALF OF RETACO BETWEEN 2001 AND 2008.
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8. BUILDING INTERIOR LAYOUT BASED ON FIELD RECONNAISSANCE.
9. ALL LOCATIONS ARE APPROXIMATE.

0 20' 40'
GRAPHIC SCALE

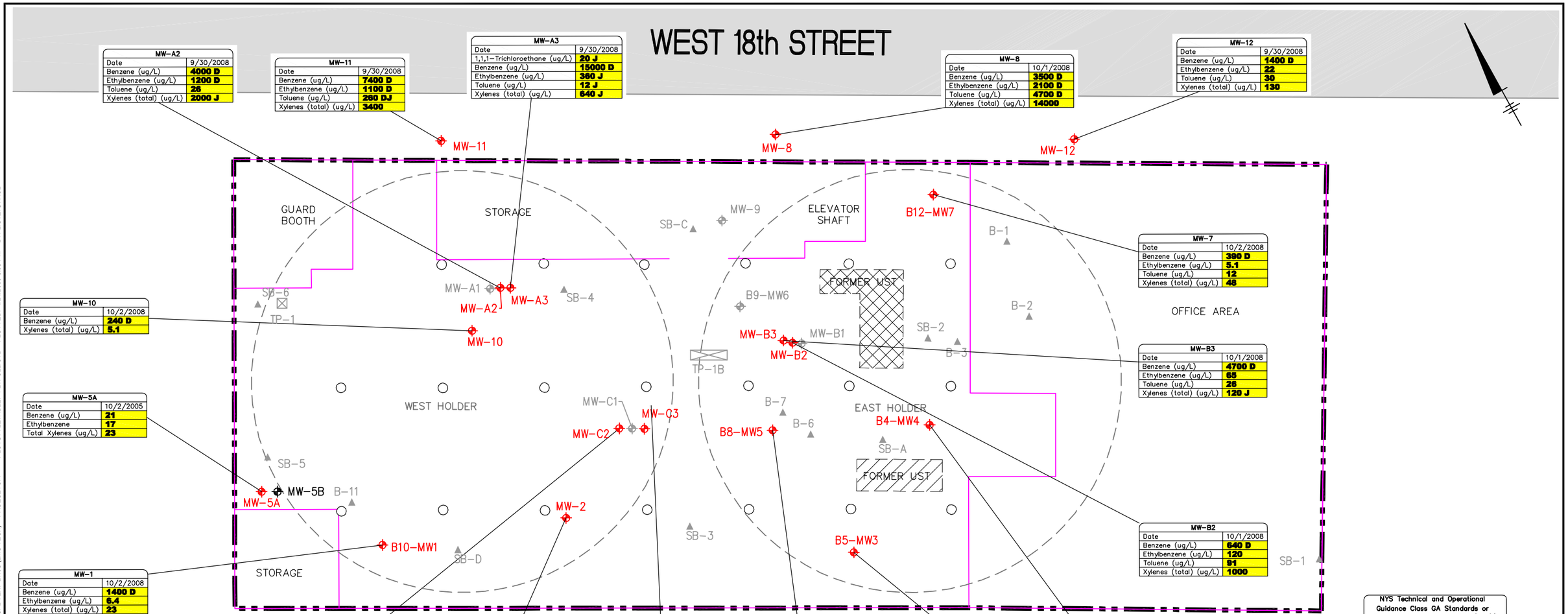
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
**REMEDIAL INVESTIGATION REPORT**
**BLOCK 715, LOT 59**

**SVOCs DETECTED IN SOIL**

ARCADIS

FIGURE
**11**

CITY:SYRACUSE,NY GROUP:ENVCAD DB:A.SCHILLING,N.SMITHGALL,P.LISTER LD:A.SCHILLING TR: R. ARCO LYR:ON=*;OFF=REF; (FRZ)
G:\ENVCAD\SYRACUSE\ACTIB\00430\011\000\11000004\DWG\43011C05.DWG LAYOUT: 11 SAVED: 4/14/2009 3:00 PM ACADVER: 17.0S (LMS TECH) PAGESETUP: ---
XREFS: 43011X00 43011X01 IMAGES: PROJECTNAME: --- PLOTTED: 4/14/2009 3:00 PM BY: LISTER, PAUL




## LEGEND:

- PROPERTY LINE
- B-2 — RETCO SOIL BORING
- SB-2 — CON EDISON SOIL BORING
- MW-2 — VOC CONCENTRATIONS ABOVE CLASS GA GROUNDWATER STANDARDS
- MW-5B — VOC CONCENTRATIONS BELOW CLASS GA GROUNDWATER STANDARDS
- 850 — EXCEEDANCE OF NEW YORK STATE TECHINICAL AND OPERATION GUIDANCE CLASS GA STANDARDS OR GUIDANCE VALUES, JUNE 1998
- BUILDING COLUMN
- APPROXIMATE LOCATION OF FIVE FORMER 550-GALLON UNDERGROUND GASOLINE STORAGE TANKS
- APPROXIMATE LOCATION OF FORMER 4000-GALLON UNDERGROUND GASOLINE (DIESEL?) TANK
- APPROXIMATE LOCATION OF FORMER GAS HOLDER
- APPROXIMATE LOCATION OF BUILDING WALLS

| | |
|---|---|
| VOCs | VOLATILE ORGANIC COMPOUNDS |
| J | INDICATES AN ESTIMATED VALUE |
| D | COMPOUND ANALYZED AT DILUTION |
| U | INDICATES THE CONSTITUENT WAS NOT DETECTED AT THE PQL. THE PRECEDING THE U INDICATES THE PQL |
| µg/L | MICROGRAMS PER LITER |

## NOTES:

1. SURVEY CONTROL WAS TAKEN FROM SITE WIDE BASE SURVEY PREPARED BY MUNOZ ENGINEERING, P.C. DATED APRIL 2007.
2. ALL ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM AS DERIVED FROM GPS.
3. HORIZONTAL COORDINATES ARE IN NYS COORDINATE SYSTEM (EAST) NAD 83 AS DERIVED FROM GPS.
4. BENCH MARK EL=12.91 X-CUT IN METAL LIGHT POLE ROUND BASE BOLT IN FRONT OF VERIZON BUILDING ON WEST 18th STREET.
5. LOCATIONS OF FORMER GAS HOLDERS ARE BASED ON SANBORN FIRE INSURANCE MAPS, DATED 1904-1985.
6. RETACO BORING AND MONITORING WELL LOCATIONS ARE BASED ON REPORTS ISSUED BY ENVIROTRAC ON BEHALF OF RETACO BETWEEN 2001 AND 2008.
7. UST LOCATIONS ARE BASED ON A SITE SUMMARY REPORT, ISSUED BY ENVIROTRAC, DATED AUGUST 2003.
8. BUILDING INTERIOR LAYOUT BASED ON FIELD RECONNAISSANCE.
9. ALL LOCATIONS ARE APPROXIMATE.

0 20' 40'
GRAPHIC SCALE

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
**REMEDIAL INVESTIGATION REPORT**
**BLOCK 715, LOT 59**

# VOCs DETECTED IN GROUNDWATER

ARCADIS

FIGURE
**12**

CITY:Syracuse DIV/GROUP:Env-141 DB:AMS NES AMS LDA:Schilling PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF* PAGESETUP: ---
G:\ENVCAD\SYRACUSE\ACT\B0043011\0001\0004\DWG\43011C02.DWG LAYOUT: 12 SAVED: 4/14/2009 3:08 PM ACADVER: 17.0S (LMS TECH) BY: LISTER, PAUL
IMAGES: PROJECTNAME: ---
XREFS: 43011X00 43011X01
PLOTTED: 4/14/2009 3:08 PM

CITY:SYRACUSE, NY GROUP: ENVCAD DB: A. SCHILLING, P. LISTER, W.JONES LD:A.SCHILLING TR: R. ARCO LYR: ON=*;OFF=REF; (FRZ)
G:\ENVCAD\SYRACUS\EACT\B0043011\0001\0000\41DWG\43011C09.DWG LAYOUT: 13 SAVED: 5/5/2009 10:51 AM ACADVER: 17.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: TEMPLATE.CTB PLOTTED: 5/5/2009 10:51 AM BY: SCHILLING, ADAM
XREFS: IMAGES: PROJECTNAME: ---
43011X00
43011X01

# WEST 18th STREET

| MW-A2 | |
|---|---|
| Date: | 9/30/2008 |
| MTBE (ug/L) | 110 DJ |

| MW-11 | |
|---|---|
| Date: | 9/30/2008 |
| MTBE (ug/L) | 500 D |

| MW-8 | |
|---|---|
| Date: | 10/1/2008 |
| MTBE (ug/L) | 37 J |

| MW-A3 | |
|---|---|
| Date: | 9/30/2008 |
| MTBE (ug/L) | 120 J |

| MW-12 | |
|---|---|
| Date: | 9/30/2008 |
| MTBE (ug/L) | 22 |

| MW-7 | |
|---|---|
| Date: | 10/2/2008 |
| MTBE (ug/L) | 21 |

| MW-10 | |
|---|---|
| Date: | 10/2/2008 |
| MTBE (ug/L) | 39 |

| MW-5B | |
|---|---|
| Date: | 10/1/2008 |
| MTBE (ug/L) | 0.48 J |

| MW-4 | |
|---|---|
| Date: | 10/1/2008 |
| MTBE (ug/L) | 30 |

| MW-5 | |
|---|---|
| Date: | 10/2/2008 |
| MTBE (ug/L) | 20 J |

| MW-5A | |
|---|---|
| Date: | 10/2/2008 |
| MTBE (ug/L) | 24 |

| MW-1 | |
|---|---|
| Date: | 10/2/2008 |
| MTBE (ug/L) | 83 |

| MW-2 | |
|---|---|
| Date: | 10/2/2008 |
| MTBE (ug/L) | 53 |

| MW-C2 | |
|---|---|
| Date: | 9/30/2008 |
| MTBE (ug/L) | 30 |

| MW-C3 | |
|---|---|
| Date: | 9/30/2008 |
| MTBE (ug/L) | 37 |

| MW-3 | |
|---|---|
| Date: | 10/1/2008 |
| MTBE (ug/L) | 58 |

GUARD BOOTH
STORAGE
ELEVATOR SHAFT
FORMER UST
OFFICE AREA
WEST HOLDER
EAST HOLDER
FORMER UST
STORAGE

MW-11
MW-8
MW-12
MW-10
MW-9
MW-A2
MW-A3
MW-A1
SB-4
SB-C
SB-6
TP-1
B12-MW7
B-1
B9-MW6
B-2
MW-B2
MW-B3
MW-B1
TP-1B
SB-2
B-3
B-7
B-6
B8-MW5
SB-A
B4-MW4
MW-C1
MW-C3
MW-C2
SB-5
MW-5B
MW-5A
B-11
MW-2
SB-3
B10-MW1
SB-D
B5-MW3
SB-1

## LEGEND:

- PROPERTY LINE
- B-1 — SOIL BORING (RETACO)
- MW-1 — MONITORING WELL (RETACO)
- TP-2S — TEST PIT (CON EDISON)
- MW-A1 / SB-C — MONITORING WELL/SOIL BORING LOCATION (CON EDISON)
- APPROXIMATE LOCATION OF FIVE FORMER 550-GALLON UNDERGROUND GASOLINE STORAGE TANKS
- APPROXIMATE LOCATION OF FORMER 4000-GALLON UNDERGROUND GASOLINE (DIESEL?) TANK
- APPROXIMATE LOCATION OF FORMER GAS HOLDER
- APPROXIMATE LOCATION OF BUILDING WALLS

| | |
|---|---|
| D | COMPOUND ANALYZED AT DILUTION |
| J | ESTIMATED CONCENTRATION |
| ND | NOT DETECTED |
| µg/L | MICROGRAMS PER LITER |
| MTBE | METHYL TERTIARY BUTYL ETHER |

| NYS TECHNICAL AND OPERATIONAL GUIDANCE CLASS GA STANDARDS OR GUIDANCE VALUES, JUNE 1998, AS AMENDED IN APRIL 2000 (µg/kg) | |
|---|---|
| MTBE (GUIDANCE VALUE) | 10 |

YELLOW SHADING INDICATES THAT THE DETECTED CONCENTRATION EXCEEDS THE GUIDANCE VALUE.

## NOTES:

1. SURVEY CONTROL WAS TAKEN FROM SITE WIDE BASE SURVEY PREPARED BY MUNOZ ENGINEERING, P.C. DATED APRIL 2007.
2. ALL ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM AS DERIVED FROM GPS.
3. HORIZONTAL COORDINATES ARE IN NYS COORDINATE SYSTEM (EAST) NAD 83 AS DERIVED FROM GPS.
4. BENCH MARK EL=12.91 X-CUT IN METAL LIGHT POLE ROUND BASE BOLT IN FRONT OF SUBJECT BUILDING ON WEST 18th STREET.
5. LOCATIONS OF FORMER GAS HOLDERS ARE BASED ON SANBORN FIRE INSURANCE MAPS, DATED 1904-1985.
6. RETACO BORING AND MONITORING WELL LOCATIONS ARE BASED ON REPORTS ISSUED BY ENVIROTRAC ON BEHALF OF RETACO BETWEEN 2001 AND 2008.
7. UST LOCATIONS ARE BASED ON A SITE SUMMARY REPORT, ISSUED BY ENVIROTRAC, DATED AUGUST 2003.
8. BUILDING INTERIOR LAYOUT BASED ON FIELD RECONNAISSANCE.
9. GROUNDWATER SAMPLES COLLECTED BY ARCADIS.

0 20' 40'
GRAPHIC SCALE

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
**REMEDIAL INVESTIGATION REPORT**
**BLOCK 715, LOT 59**

**MTBE CONCENTRATIONS IN GROUNDWATER, SEPTEMBER/OCTOBER 2008**

ARCADIS

FIGURE
**13**

# WEST 18th STREET

| MW–11 | |
|---|---|
| Date | 9/30/2008 |
| 2,4–Dimethylphenol (ug/L) | **81 D** |
| 2–Methylphenol (ug/L) | **16** |
| 4–Methylphenol (ug/L) | **14** |
| Naphthalene (ug/L) | **510 D** |
| Phenol (ug/L) | **45** |

| MW–A3 | |
|---|---|
| Date | 9/30/2008 |
| Acenaphthene (ug/L) | **58** |
| Naphthalene (ug/L) | **200 D** |
| Phenol (ug/L) | **59** |

| MW–8 | |
|---|---|
| Date | 10/1/2008 |
| 4–Methylphenol (ug/L) | **320 D** |
| Naphthalene (ug/L) | **660 D** |
| Phenol (ug/L) | **59** |

| MW–7 | |
|---|---|
| Date | 10/2/2008 |
| Naphthalene (ug/L) | **11** |

| MW–12 | |
|---|---|
| Date | 9/30/2008 |
| Naphthalene (ug/L) | **25** |
| Phenol (ug/L) | **13** |

| MW–A2 | |
|---|---|
| Date | 9/30/2008 |
| 4–Methylphenol (ug/L) | **2.2 J** |
| Naphthalene (ug/L) | **200 D** |
| Phenol (ug/L) | **16** |

| MW–B3 | |
|---|---|
| Date | 10/1/2008 |
| 2–Methylphenol (ug/L) | **1.5 J** |
| Naphthalene (ug/L) | **99 D** |
| Phenol (ug/L) | **6.7 J** |

| MW–4 | |
|---|---|
| Date | 10/1/2008 |
| Phenol (ug/L) | **3.6 J** |

| MW–1 | |
|---|---|
| Date | 10/2/2008 |
| Acenaphthene (ug/L) | **21** |
| Naphthalene (ug/L) | **18** |
| Phenol (ug/L) | **3.5 J** |

| MW–2 | |
|---|---|
| Date | 10/2/2008 |
| Phenol (ug/L) | **3.3 J** |

| MW–C3 | |
|---|---|
| Date | 9/30/2008 |
| 2–Methylphenol (ug/L) | **170** |
| 4–Methylphenol (ug/L) | **340** |
| Acenaphthene (ug/L) | **59** |
| Fluorene (ug/L) | **81** |
| Naphthalene (ug/L) | **3000 D** |
| Phenanthrene (ug/L) | **75** |
| Phenol (ug/L) | **180** |

| MW–5 | |
|---|---|
| Date | 10/2/2008 |
| Phenol (ug/L) | **3.8 J** |

| MW–3 | |
|---|---|
| Date | 10/1/2008 |
| Acenaphthene (ug/L) | **21** |
| Phenol (ug/L) | **7.9** |

| MW–B2 | |
|---|---|
| Date | 10/1/2008 |
| 2,4–Dimethylphenol (ug/L) | **51** |
| 4–Methylphenol (ug/L) | **3.9 J** |
| Naphthalene (ug/L) | **36** |
| Phenol (ug/L) | **6.4** |

| NYS Technical and Operational Guidance Class GA Standards or Guidance Values, June 1998 (µg/kg) | |
|---|---|
| 2,4–Dimethylphenol | 1 |
| 2–Methylphenol | 1 |
| 4–Methylphenol | 1 |
| Acenaphthene | 20 |
| Anthracene | 50 |
| Fluorene | 50 |
| Naphthalene | 10 |
| Phenanthrene | 50 |
| Phenol | 1 |

## LEGEND:

- PROPERTY LINE
- B–2 — RETCO SOIL BORING
- SB–2 — CON EDISON SOIL BORING
- MW–2 — SVOC CONCENTRATIONS ABOVE CLASS GA GROUNDWATER STANDARDS
- MW–5B — SVOC CONCENTRATIONS BELOW CLASS GA GROUNDWATER STANDARDS
- 180 — EXCEEDANCE OF NEW YORK STATE TECHINICAL AND OPERATION GUIDANCE CLASS GA STANDARDS OR GUIDANCE VALUES, JUNE 1998
- BUILDING COLUMN
- APPROXIMATE LOCATION OF FIVE FORMER 550–GALLON UNDERGROUND GASOLINE STORAGE TANKS
- APPROXIMATE LOCATION OF FORMER 4000–GALLON UNDERGROUND GASOLINE (DIESEL?) TANK
- APPROXIMATE LOCATION OF FORMER GAS HOLDER
- APPROXIMATE LOCATION OF BUILDING WALLS

| | |
|---|---|
| SVOCs | SEMI–VOLATILE ORGANIC COMPOUNDS |
| J | INDICATES AN ESTIMATED VALUE |
| D | COMPOUND ANALYZED AT DILUTION |
| U | INDICATES THE CONSTITUENT WAS NOT DETECTED AT THE PQL. THE PRECEDING THE U INDICATES THE PQL |
| µg/L | MICROGRAMS PER LITER |

## NOTES:

1. SURVEY CONTROL WAS TAKEN FROM SITE WIDE BASE SURVEY PREPARED BY MUNOZ ENGINEERING, P.C. DATED APRIL 2007.
2. ALL ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM AS DERIVED FROM GPS.
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4. BENCH MARK EL=12.91 X–CUT IN METAL LIGHT POLE ROUND BASE BOLT IN FRONT OF VERIZON BUILDING ON WEST 18th STREET.
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7. UST LOCATIONS ARE BASED ON A SITE SUMMARY REPORT, ISSUED BY ENVIROTRAC, DATED AUGUST 2003.
8. BUILDING INTERIOR LAYOUT BASED ON FIELD RECONNAISSANCE.
9. ALL LOCATIONS ARE APPROXIMATE.

0 20' 40'

GRAPHIC SCALE

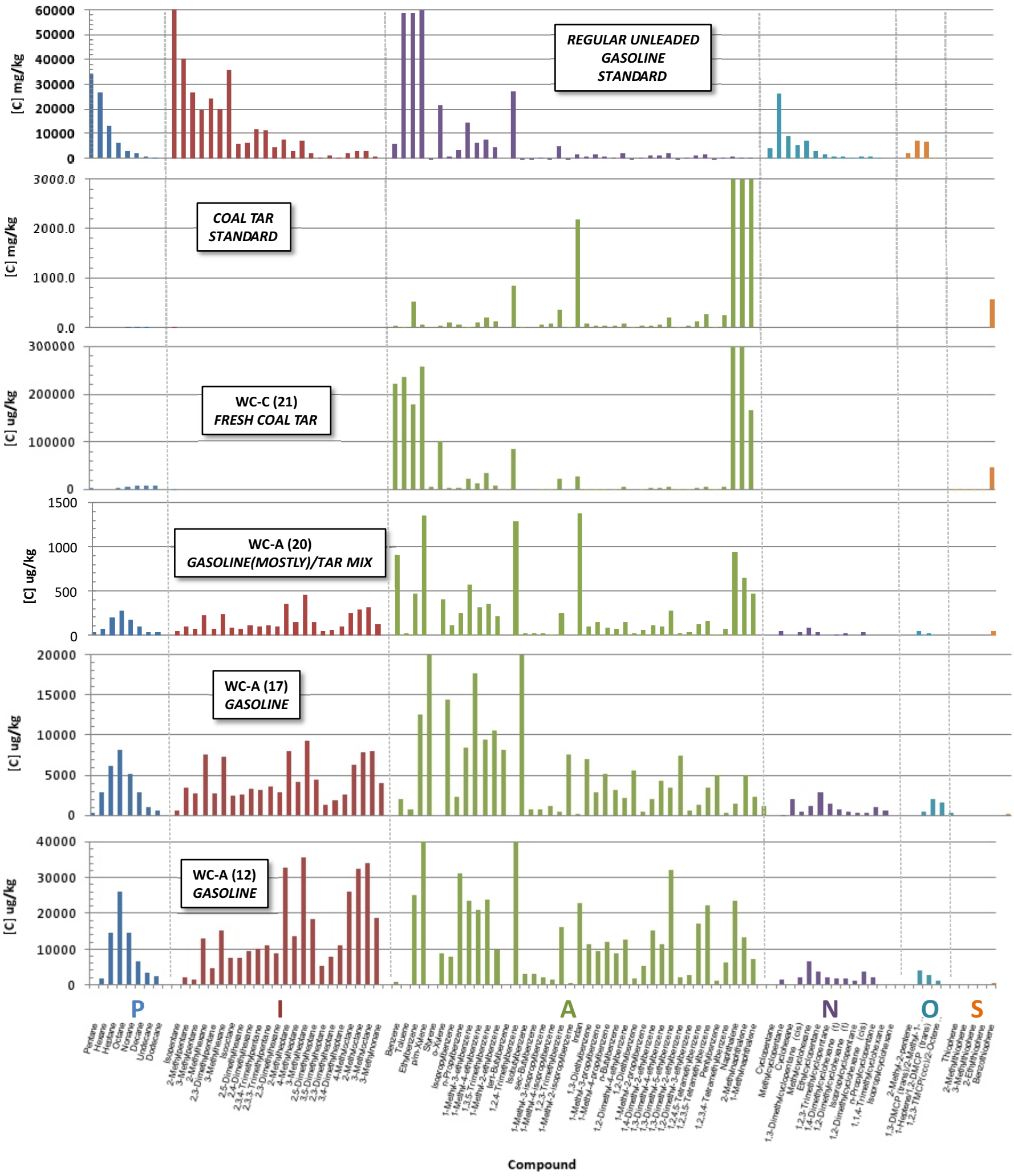
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
**REMEDIAL INVESTIGATION REPORT**
**BLOCK 715, LOT 59**

## SVOCs DETECTED IN GROUNDWATER

ARCADIS

FIGURE **14**

CITY:SYRACUSE, NY GROUP: ENVCAD DB: A. SCHILLING, N. SMITHGALL, P. LISTER LD:A.SCHILLING TR: R. ARCO LYR: ON=*OFF=REF (FRZ)
G:\ENVCAD\SYRACUSE\ACT\B0043011\100010000\AIDWG\43011C03.DWG LAYOUT: 14 SAVED: 4/14/2009 1:26 PM ACADVER: 17.0S (LMS TECH) PAGESETUP:
XREFS: IMAGES: PROJECTNAME: ---
43011X00
43011X01
PAGESETUP: #### PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 4/14/2009 2:04 PM BY: LISTER, PAUL



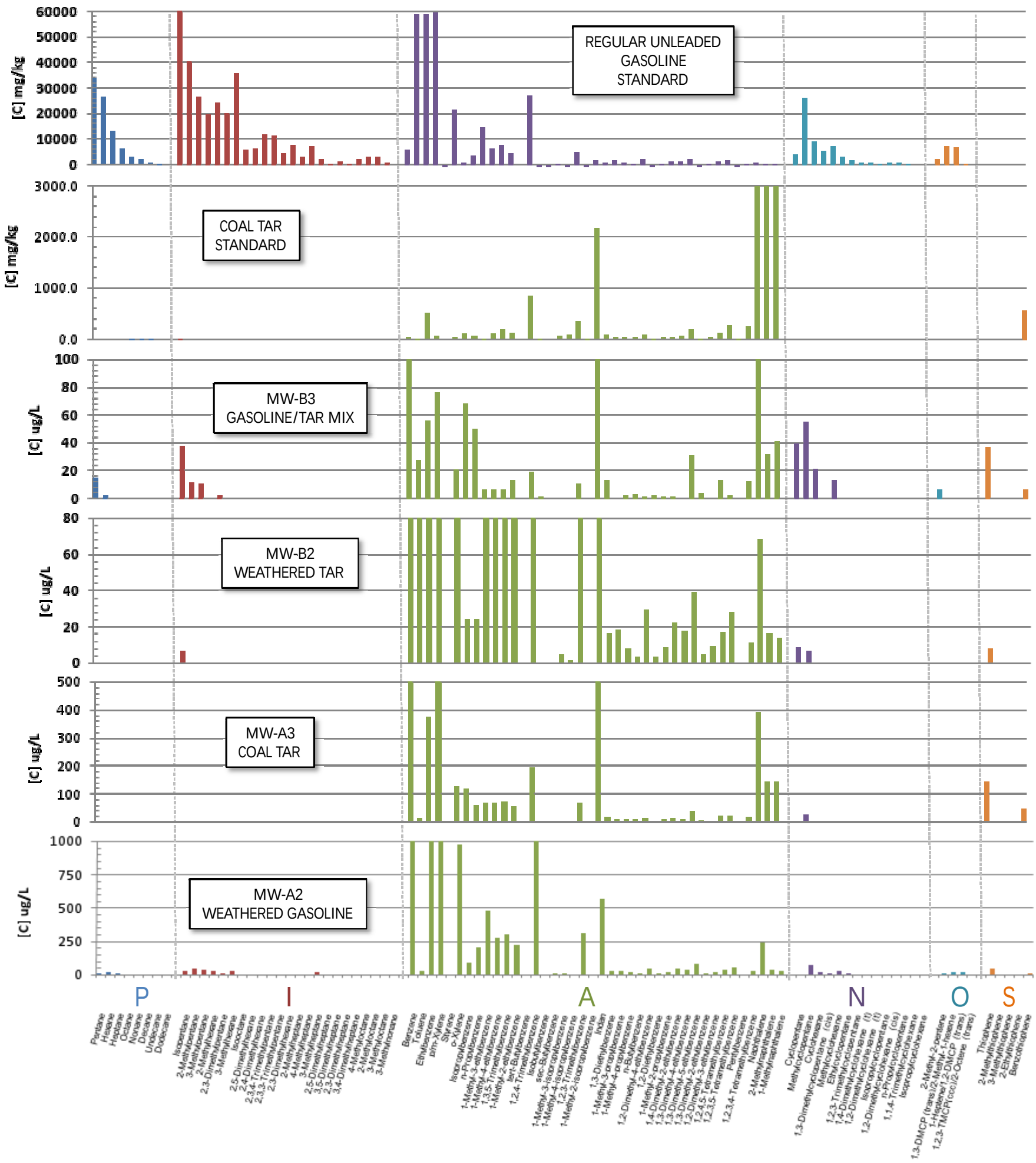

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
**REMEDIAL INVESTIGATION REPORT**
**BLOCK 715 LOT 59**

## DISTRIBUTION OF PIANOS COMPOUNDS IN SOIL

ARCADIS

FIGURE
**15**

02/03/09 SYRACUSE, NY-ENV/CAD-DJH
B0043011/0001/00003/CDR/B0043011G02.CDR




CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
**REMEDIAL INVESTIGATION REPORT**
**BLOCK 715 LOT 59**

**DISTRIBUTION OF PIANOS COMPOUNDS IN GROUNDWATER**

ARCADIS

FIGURE
**16**

02/03/09 SYRACUSE, NY-ENV/CAD-DJH
B0043011/0001/00003/CDR/B0043011G03.CDR

# APPENDICES

ARCADIS

**Appendix A**

Historical Sanborn Fire Insurance Maps

"Linking Technology with Tradition"®

# Sanborn® Map Transmittal

**Ship To:** Mike C. Ferri
Blasland, Bouck & Lee
6723 Towpath Road
Syracuse, NY 13214

**Order Date:** 2/17/2006 **Completion Date:** 2/20/2006
**Inquiry #:** 1616555.2S
**P.O. #:** NA
**Site Name:** 17th Street/10th Avenue
**Address:** 17th Street/10th Avenue
**City/State:** NEW YORK, NY 10011
**Cross Streets:**

**Customer Project:** NA
1042387ERK 315-446-2570

Based on client-supplied information, fire insurance maps for the following years were identified

1895 - 2 Maps
1904 - 2 Maps
1921 - 2 Maps
1950 - 2 Maps
1969 - 2 Maps
1975 - 2 Maps
1979 - 2 Maps
1980 - 2 Maps
1983 - 2 Maps
1985 - 2 Maps

**Limited Permission to Photocopy** Total Maps: 20

Blasland, Bouck & Lee (the client) is permitted to make up to THREE photocopies of this Sanborn Map transmittal and each fire insurance map accompanying this report solely for the limited use of its customer. No one other than the client is authorized to make copies. Upon request made directly to an EDR Account Executive, the client may be permitted to make a limited number of additional photocopies. This permission is conditioned upon compliance by the client, its customer and their agents with EDR's copyright policy; a copy of which is available upon request.

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**USER'S GUIDE**

This User's Guide provides guidelines for accessing Sanborn Map® images and for transferring them to your Word Processor.

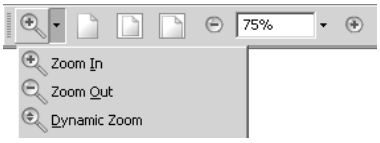
**Reading Sanborn Maps**

- Sanborn Maps document historical property use by displaying property information through words, abbreviations, and map symbols. The Sanborn Map Key provides information to help interpret the symbols and abbreviations used on Sanborn Maps. The Key is available from EDR's Web Site at: http://www.edrnet.com/reports/samples/key.pdf

**Organization of Electronic Sanborn Image File**

- Sanborn Map Report, listing years of coverage
- User's Guide
- Oldest Sanborn Map Image
- Most recent Sanborn Map Image

**Navigating the Electronic Sanborn Image File**

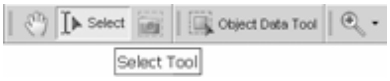



1. Open file on screen.
2. Identify TP (Target Property) on the most recent map.
3. Find TP on older printed images.
4. Using Acrobat® Reader®, zoom to 250% in order to view more clearly. (200-250% is the approximate equivalent scale of hardcopy Sanborn Maps.)
   A. On the menu bar, click "View" and then "Zoom to..."
   B. Or, use the magnifying tool and drag a box around the TP

**Printing a Sanborn Map From the Electonic File**

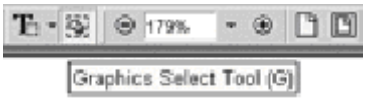
- EDR recommends printing images at 300 dpi (300 dpi prints faster than 600 dpi)
- To print only the TP area, cut and paste from Acrobat to your word processor application.

**Acrobat Versions 6 and 7**




1. Go to the menu bar
2. Click the "Select Tool"
3. Draw a box around the area selected
4. "Right click" on your mouse
5. Select "Copy Image to Clipboard"
6. Go to Word Processor such as Microsoft Word, paste and print.

**Acrobat Version 5**




1. Go to the menu bar
2. Click the "Graphics Select Tool"
3. Draw a box around the area selected
4. Go to "Menu"
5. Highlight "Edit"
6. Highlight "Copy"
7. Go to Word Processor such as Microsoft Word, paste and print.

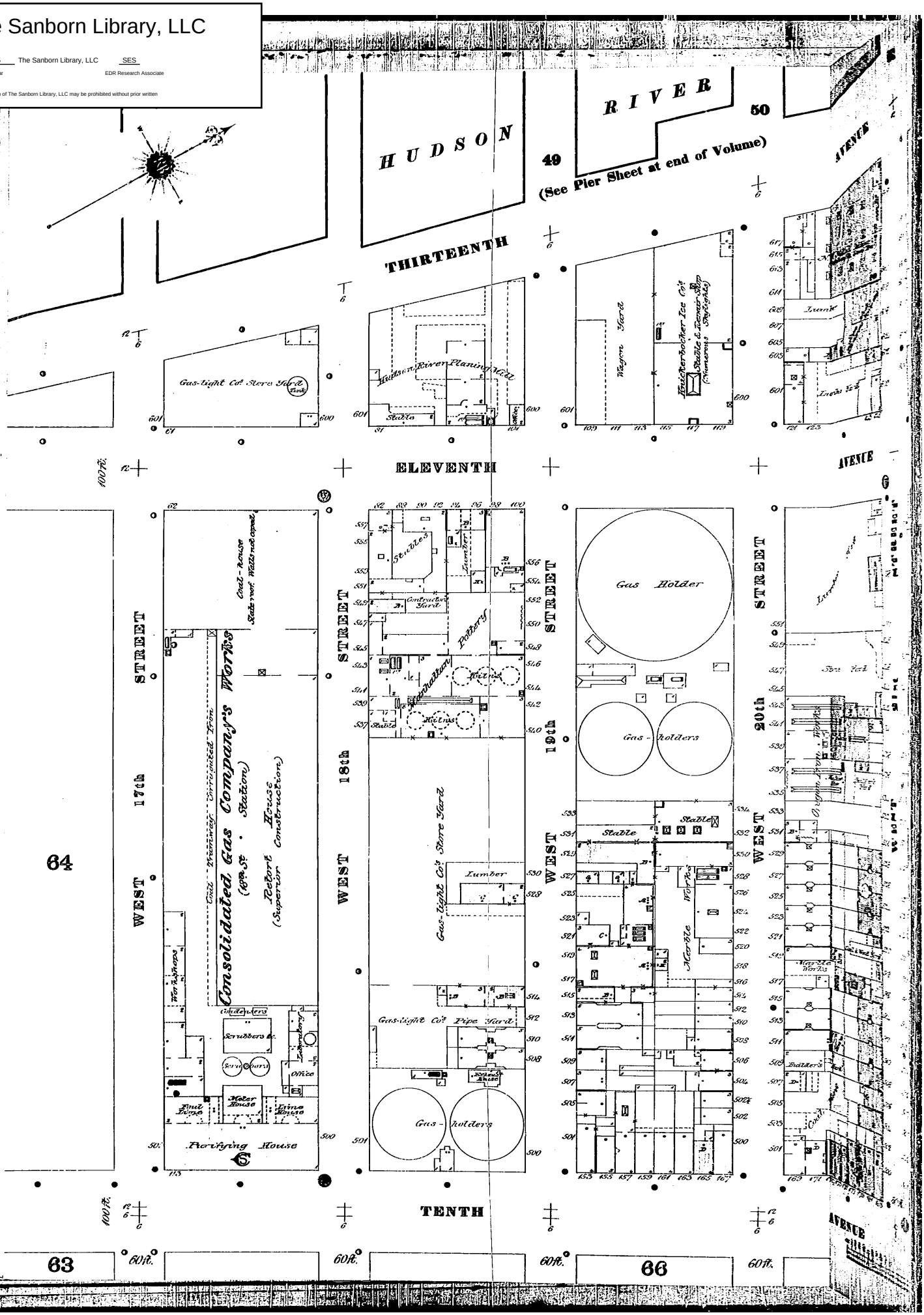
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- In cases where in excess of 6-7 map years are available, the file size typically exceeds 2MB. In these cases, you will receive multiple files, labeled as "1 of 3", "2 of 3", etc. including all available map years.
- Due to file size limitations, certain ISPs, including AOL, may occasionally delay or decline to deliver files. Please contact your ISP to identify their specific file size limitations.

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Year EDR Research Associate

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86

66

22nd

STREET

21st

STREET

CHELSEA SQUARE

AVENUE

AVENUE

20th

STREET

65

19th

STREET

NINTH

EIGHTH

18th

STREET

17th

Scale of Feet

100ft.

63

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AVENUE

THIRTEENTH AVE.

ELEVENTH AVE.

TENTH AVE.

WEST STREET

21st STREET

22nd STREET

87

Scale of Feet

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WEST 22nd

WEST 21st

CHELSEA SQUARE AVENUE

Theological Seminary of the Protestant Episcopal Church

Refectory (Stone with Tin roof)

Chapel (Gothic Style)

Dormitories

Lecture Hall

Dormitories

Library

CHELSEA SQUARE AVENUE

WEST 20th

WEST 19th

TENTH AVENUE

Boiler

Consolidated Gas Co. Holders

NINTH AVENUE

WEST 18th

Consolidated Gas Company Holders

Gas Holders

Stone Mason's Yard

Sheds Co. No. 3

WEST 17th

100 ft.

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Year EDR Research Associate

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HUDSON RIVER

54

53

43

42

MARGINAL STREET

NINETEENTH STREET WEST

TWENTIETH STREET WEST

TWENTY-FIRST STREET WEST

TWENTY-SECOND STREET WEST

TENTH AVENUE

See Volume Five.

Packing Box Factory.

Lumber Stacks, 10 to 30' high.

Lumber Stacks, 10' to 30' high.

Blue Stone Yard.

Builder's Store Yard.

Coal Yard.

Lumber Yard.

Cabinet Factory.

Contractor's Storage of Scenery.

Scenic Studio.

Lumber Shed.

Consolidated Gas Co.

American Ice Co.

Truckman.

Farrier S.

Brass Foundry S.

Marble Works.

Chilled Iron Works.

Consumers Ice Company.

Tuxedo Dairy.

Geo. R. Fuller Store House.

Glaenzer, Spies & Co. Storage.

Flour Ware House.

Stable.

Dairy Co.

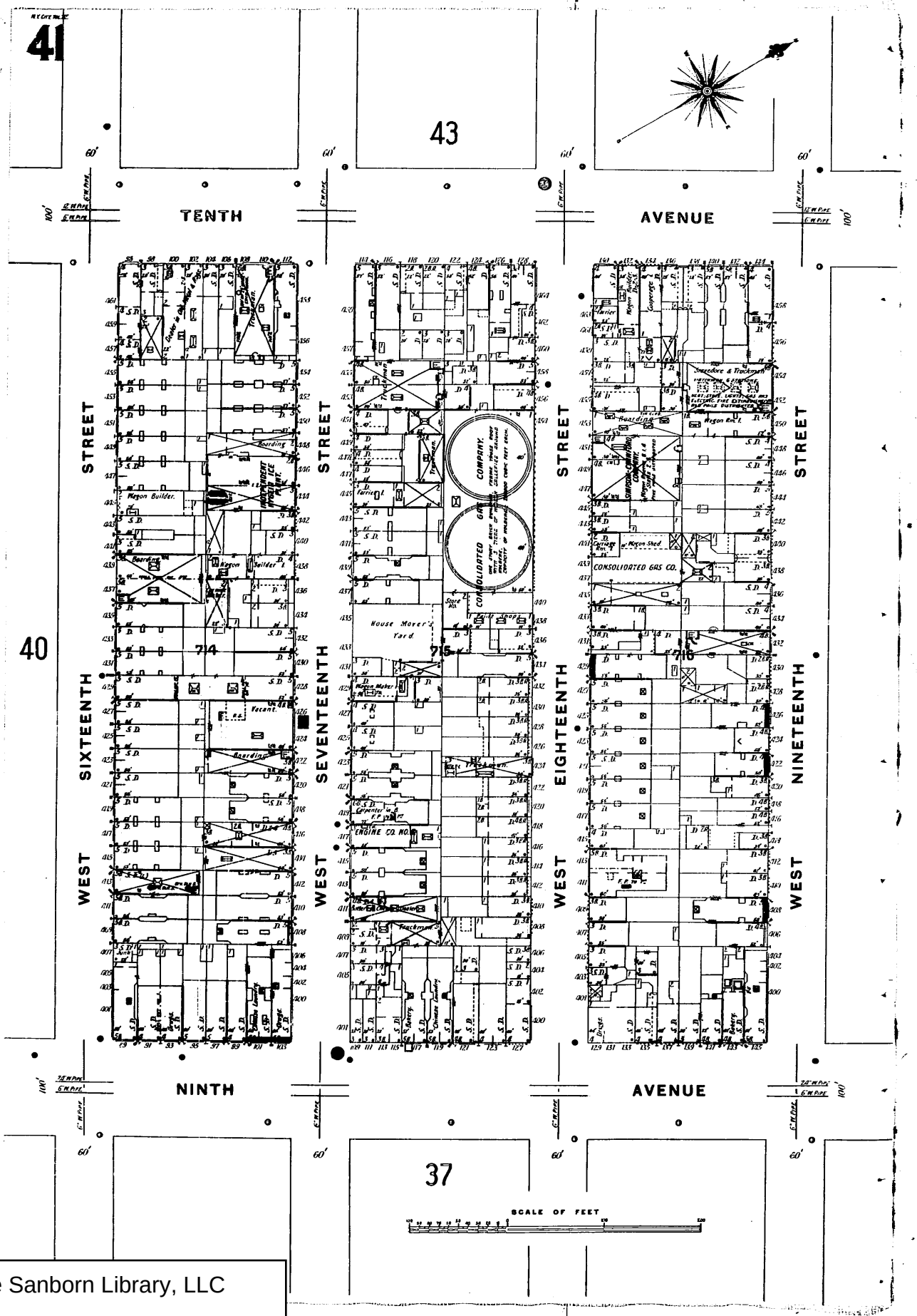
Express.

Huyler's.

Industrial Development Co.

Florist & Connector.

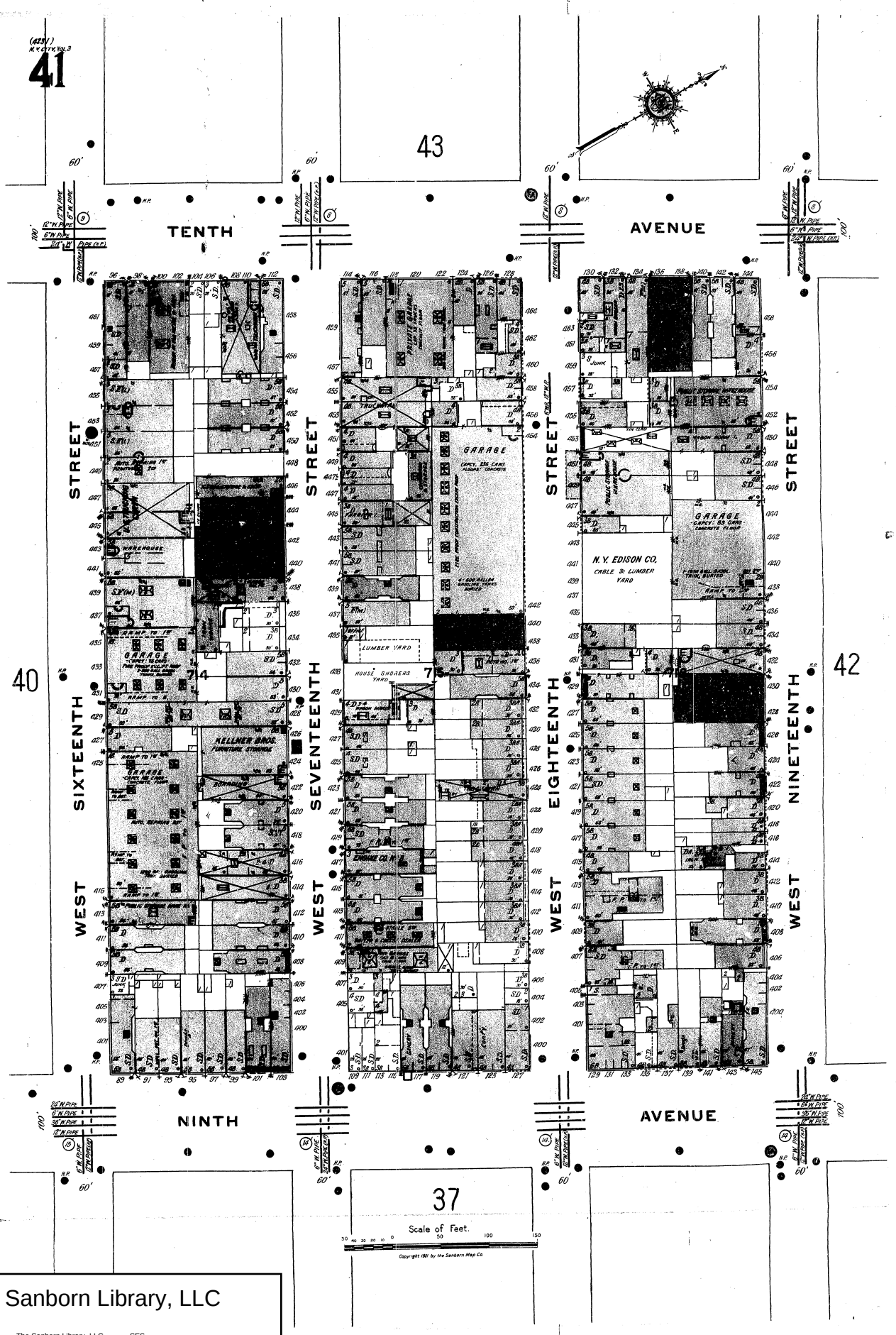
Scale of Feet




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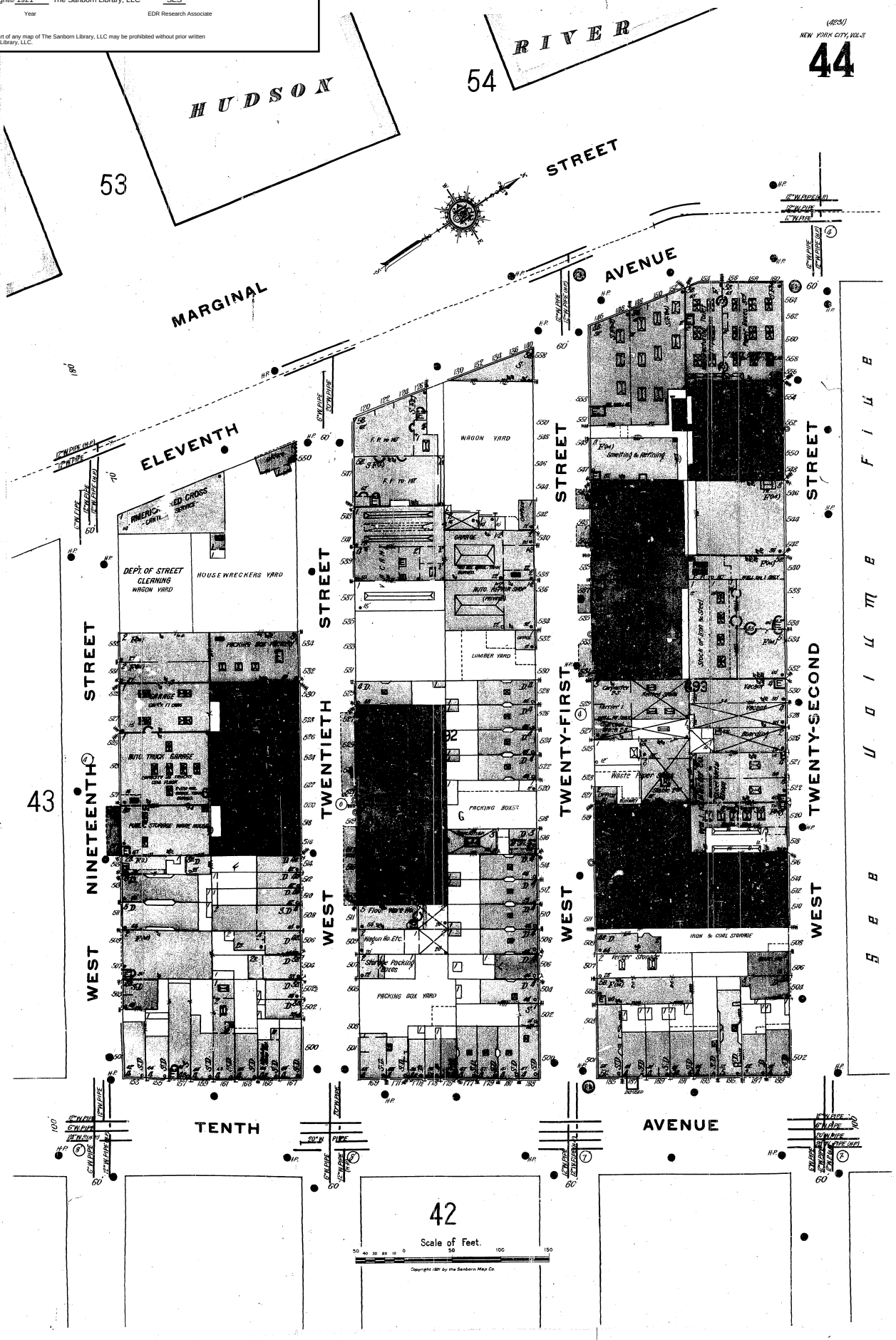
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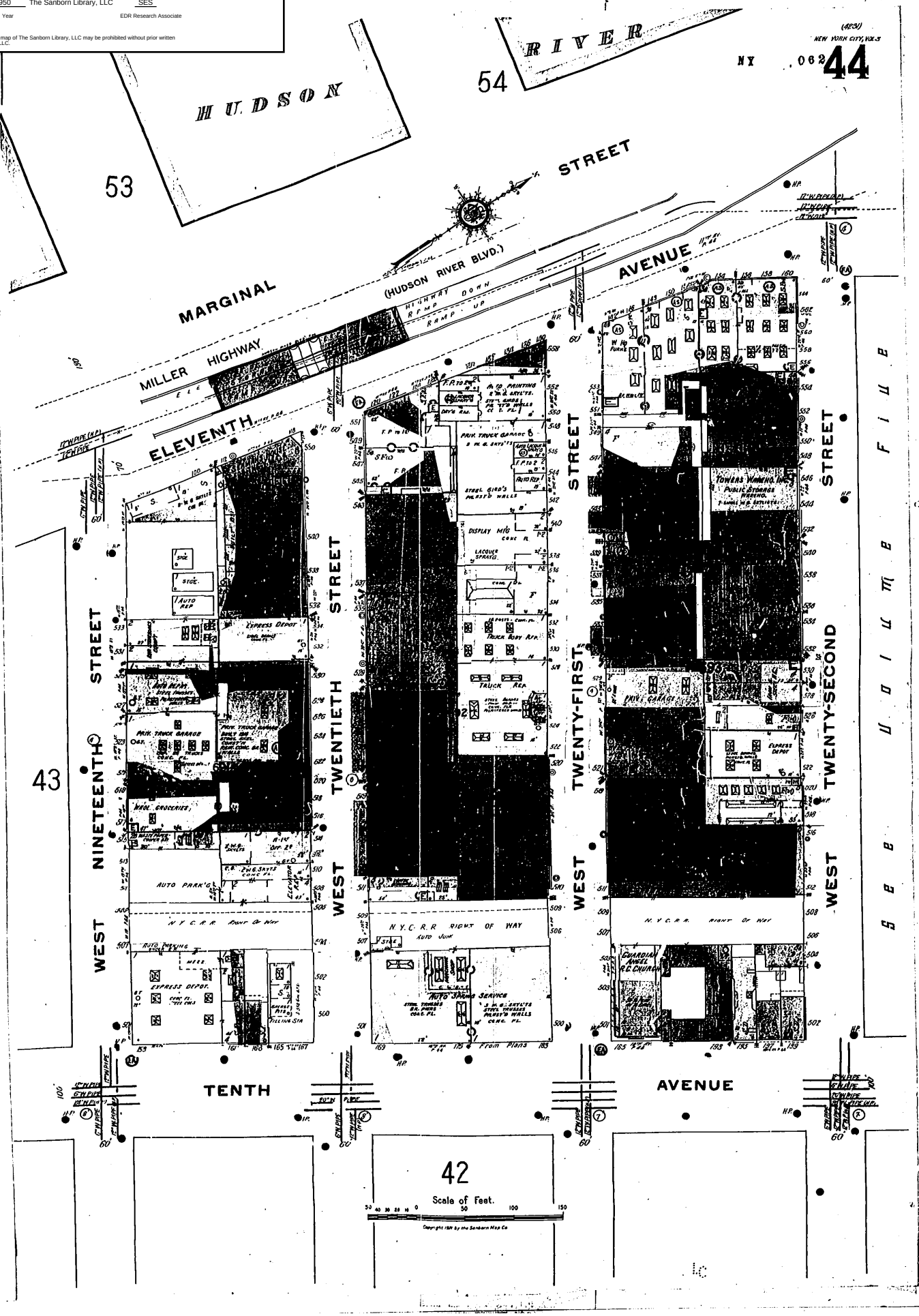


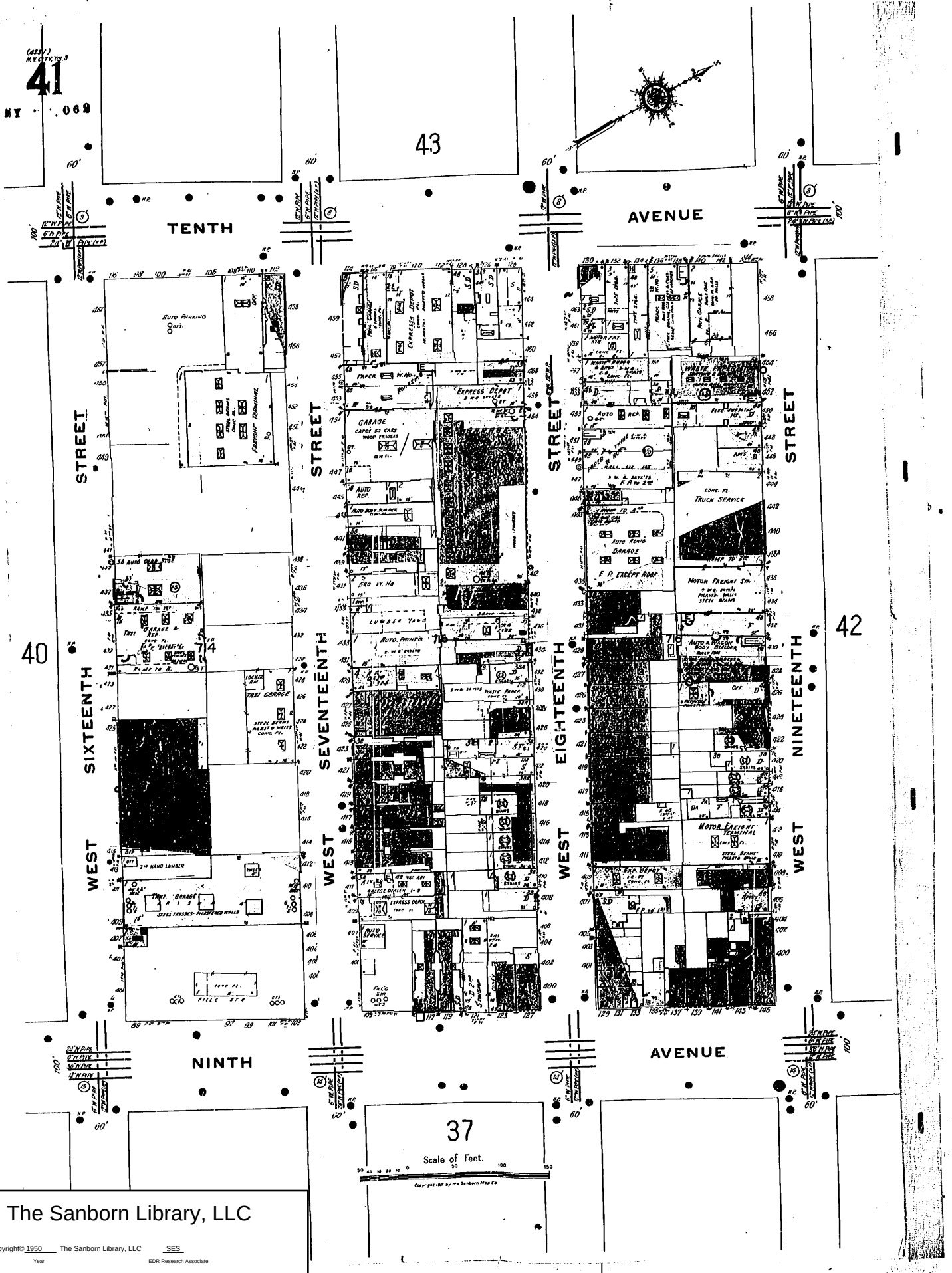
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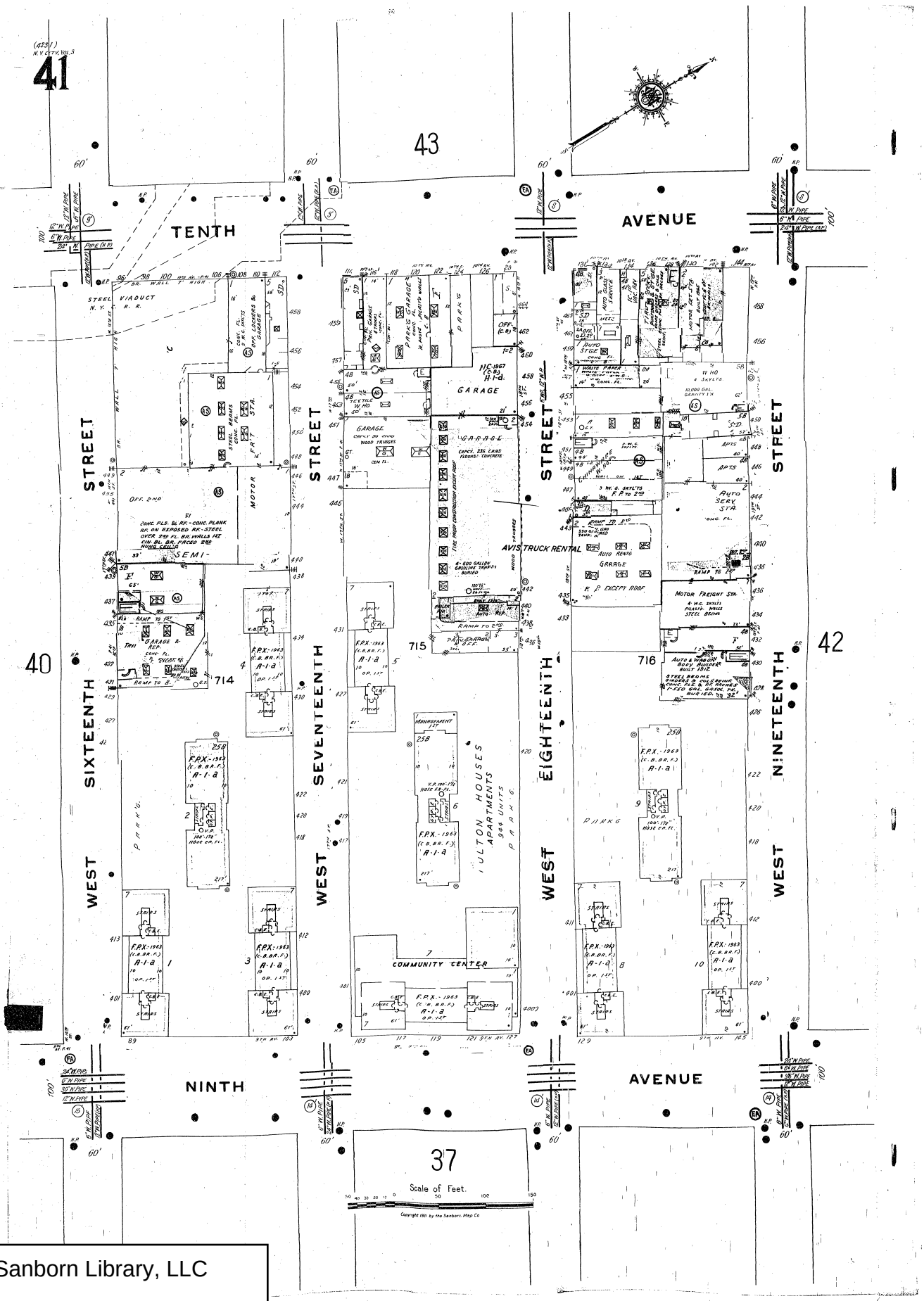





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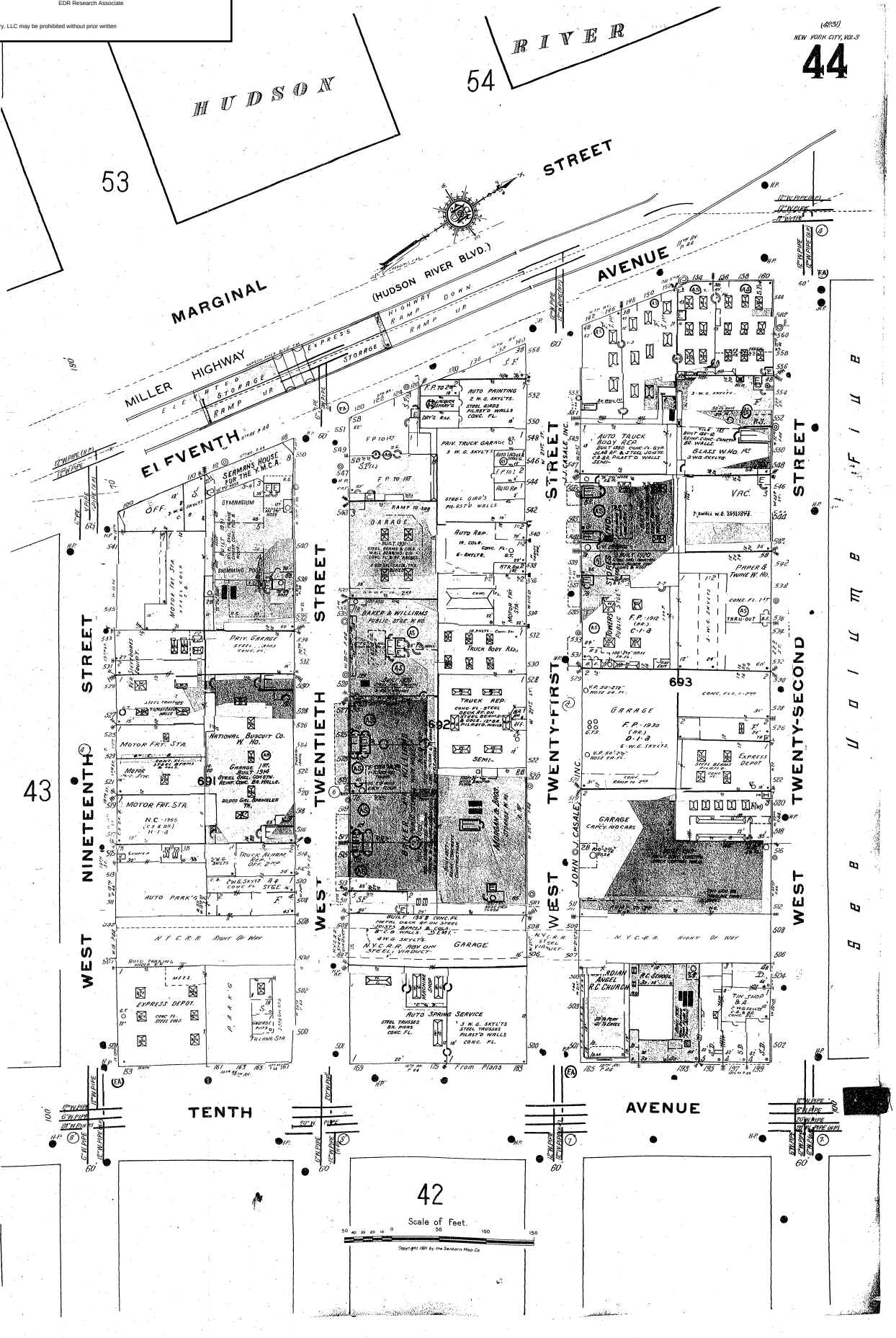
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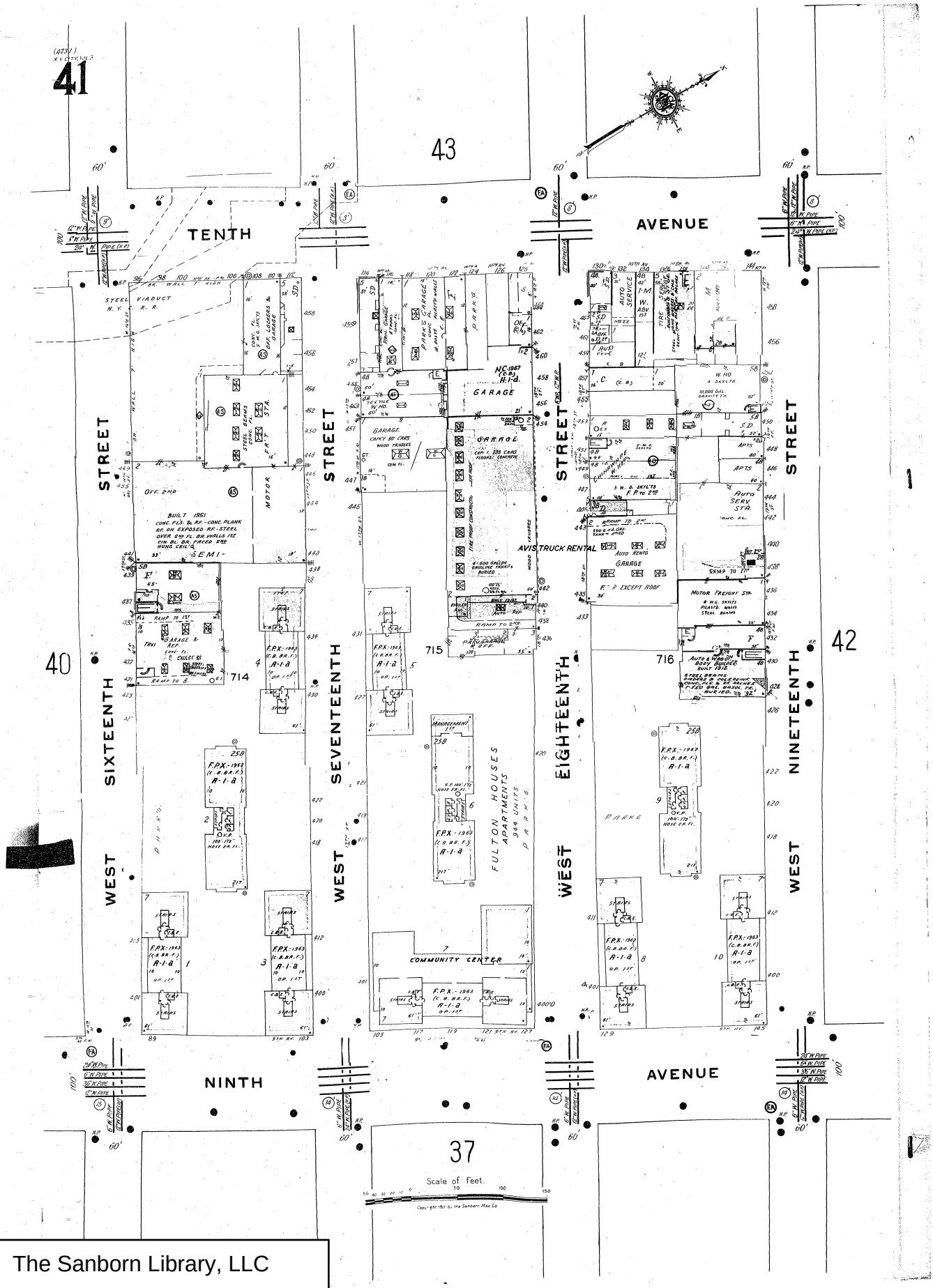
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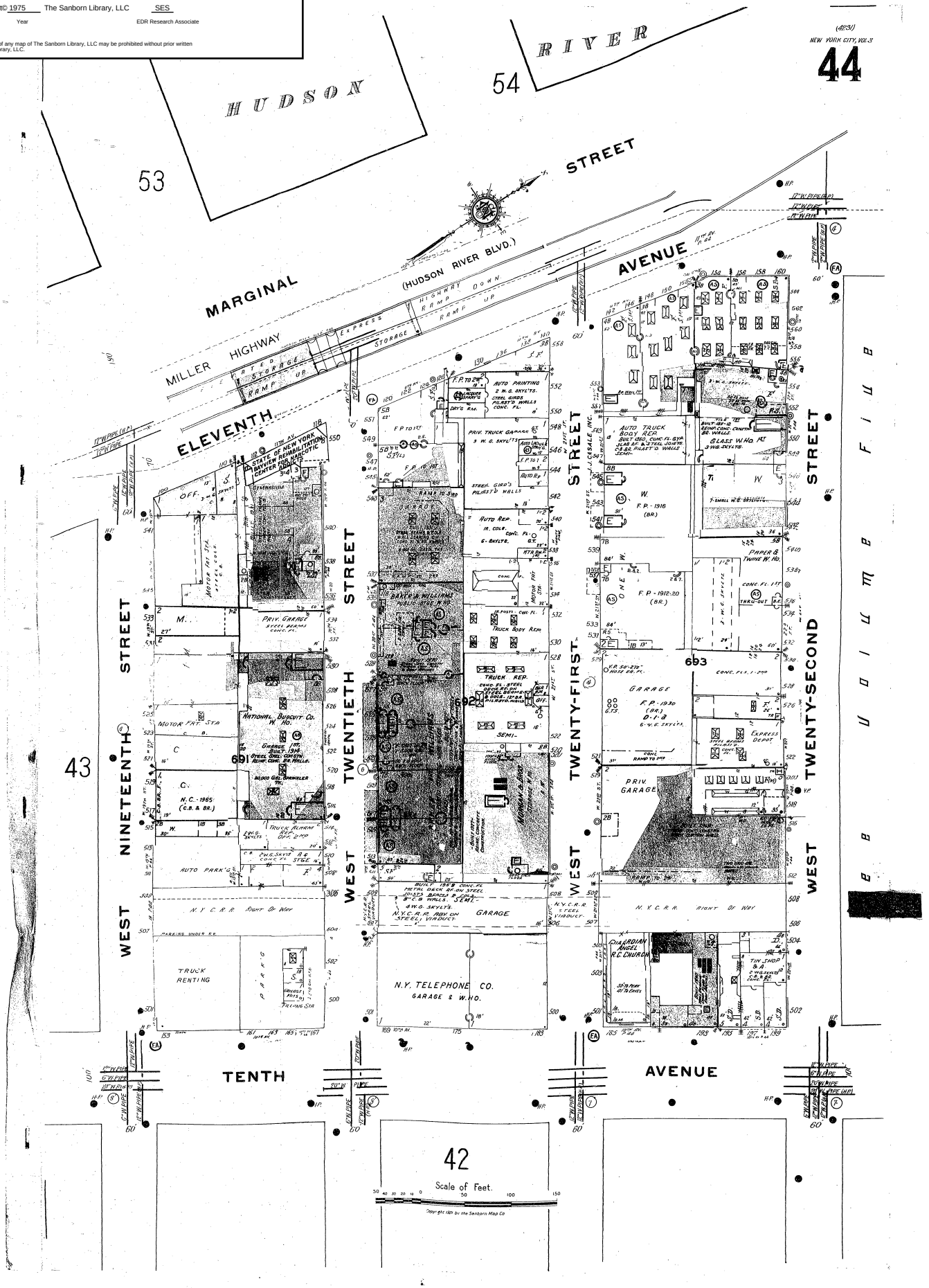
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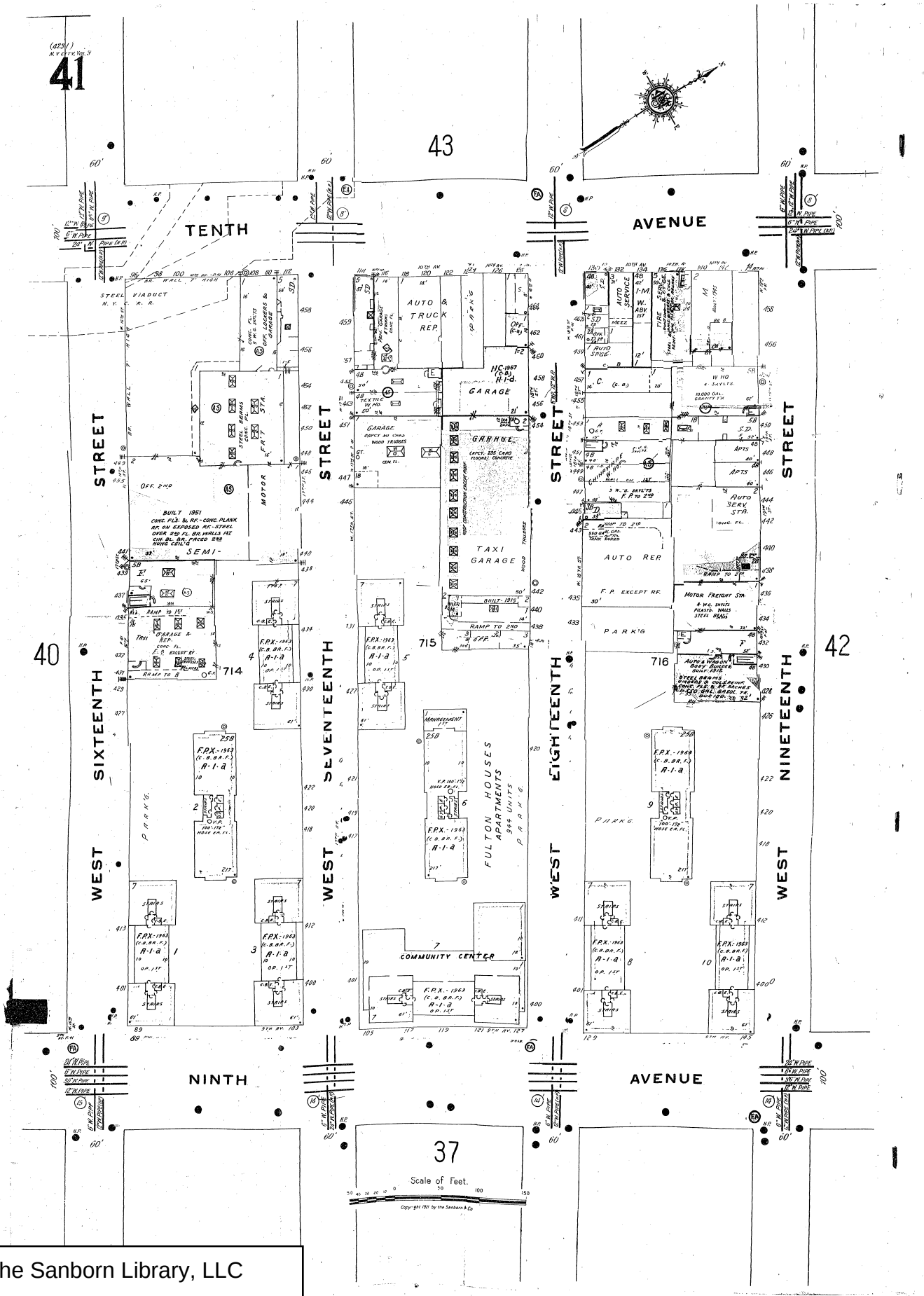
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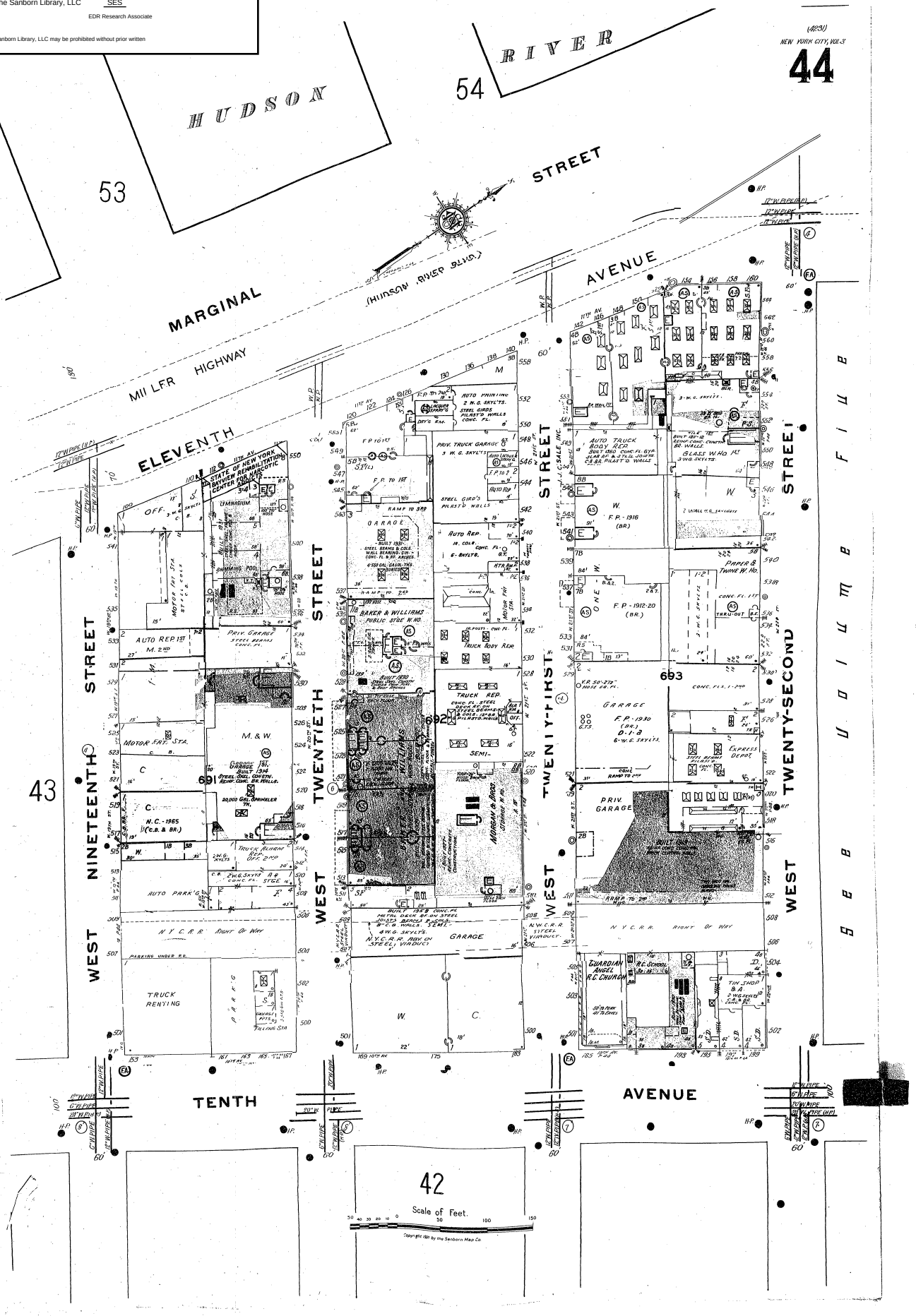
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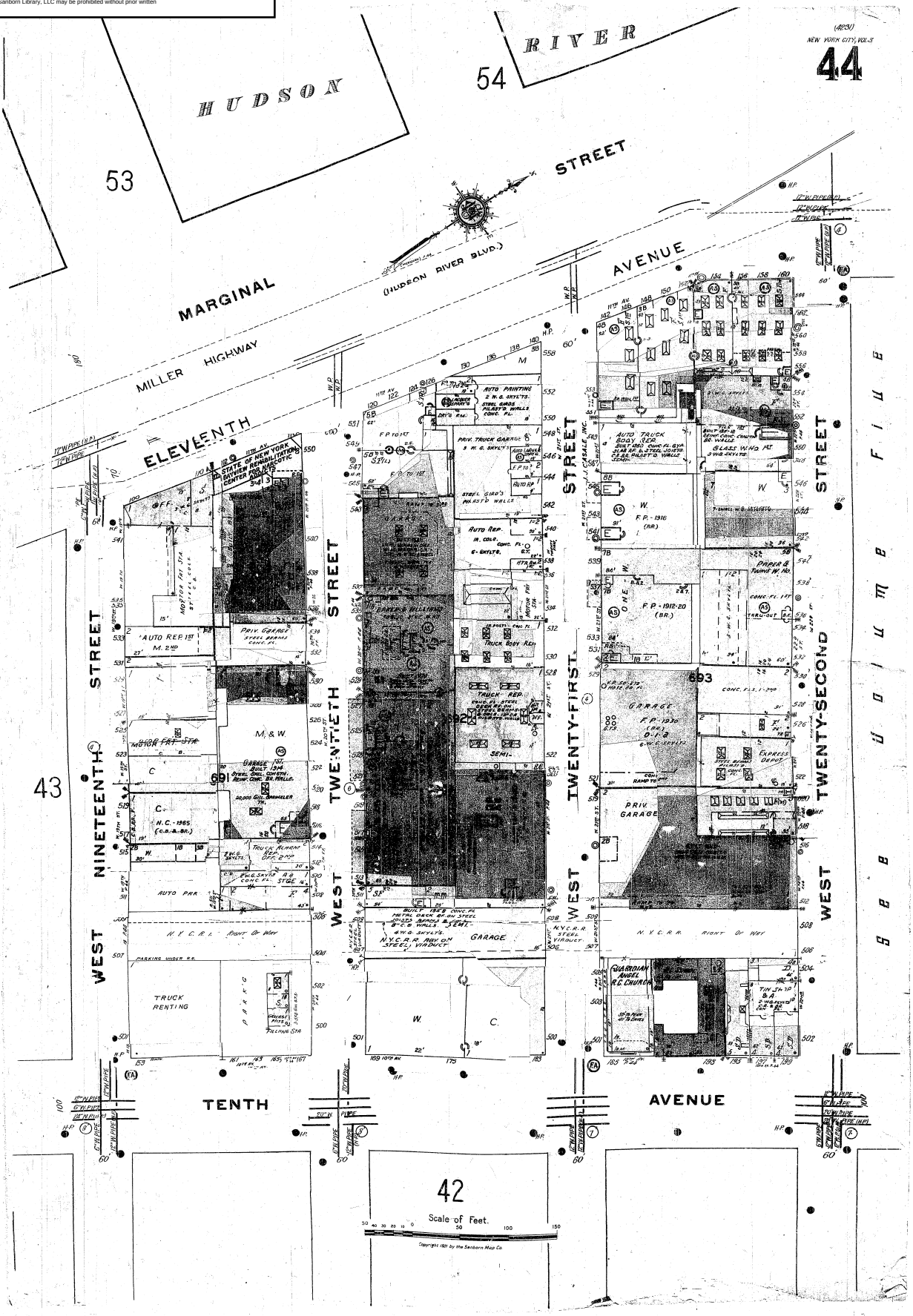


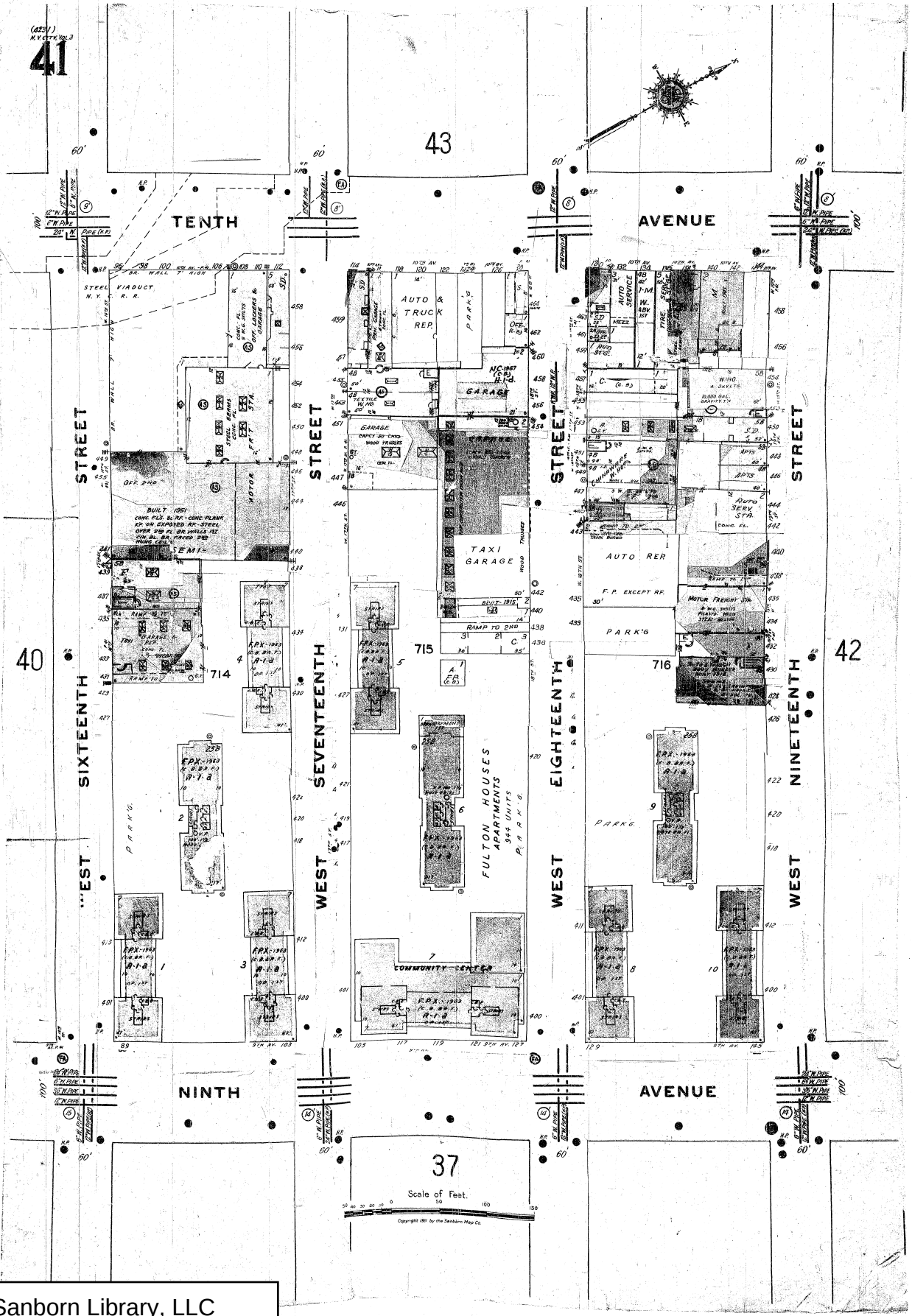
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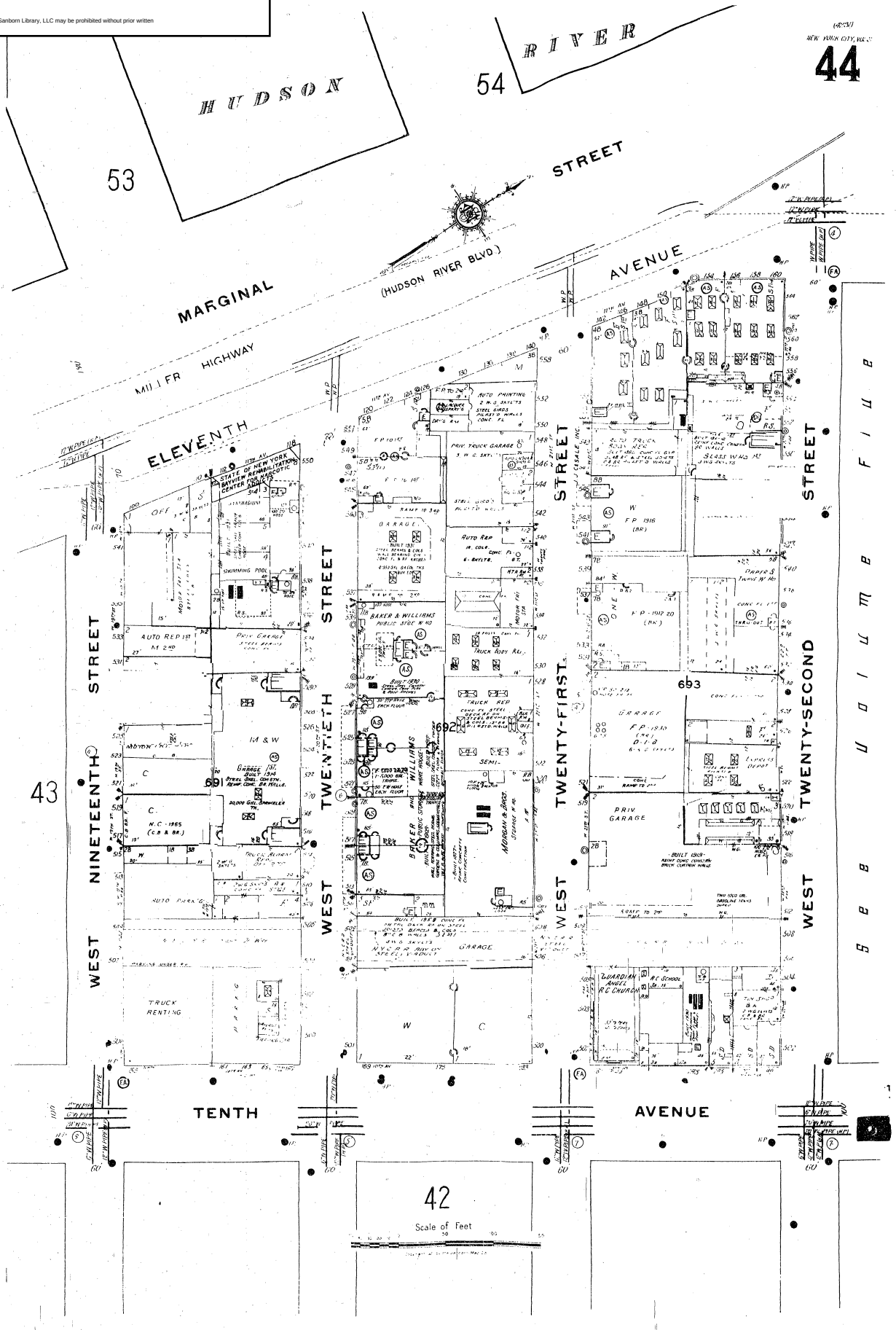
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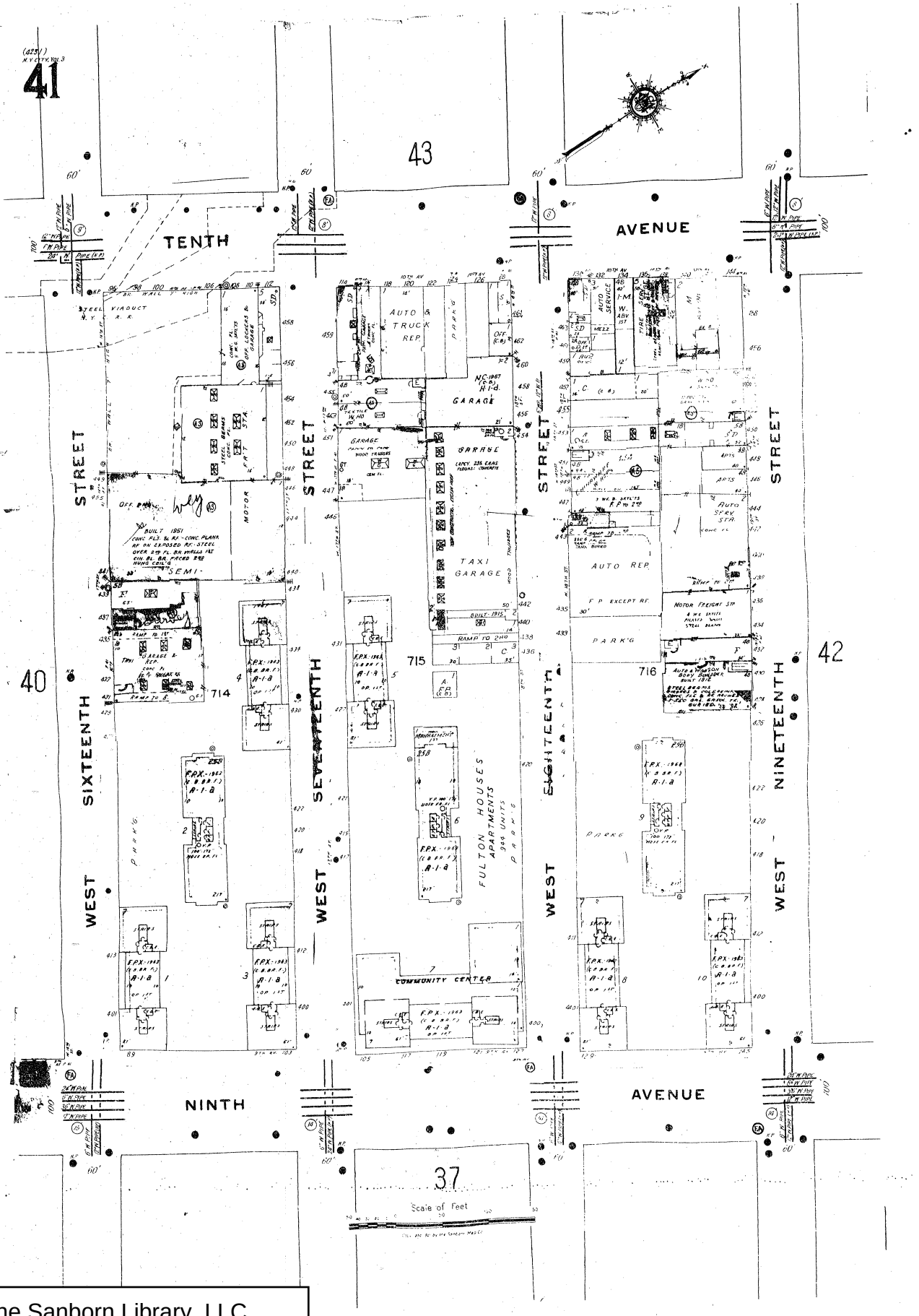
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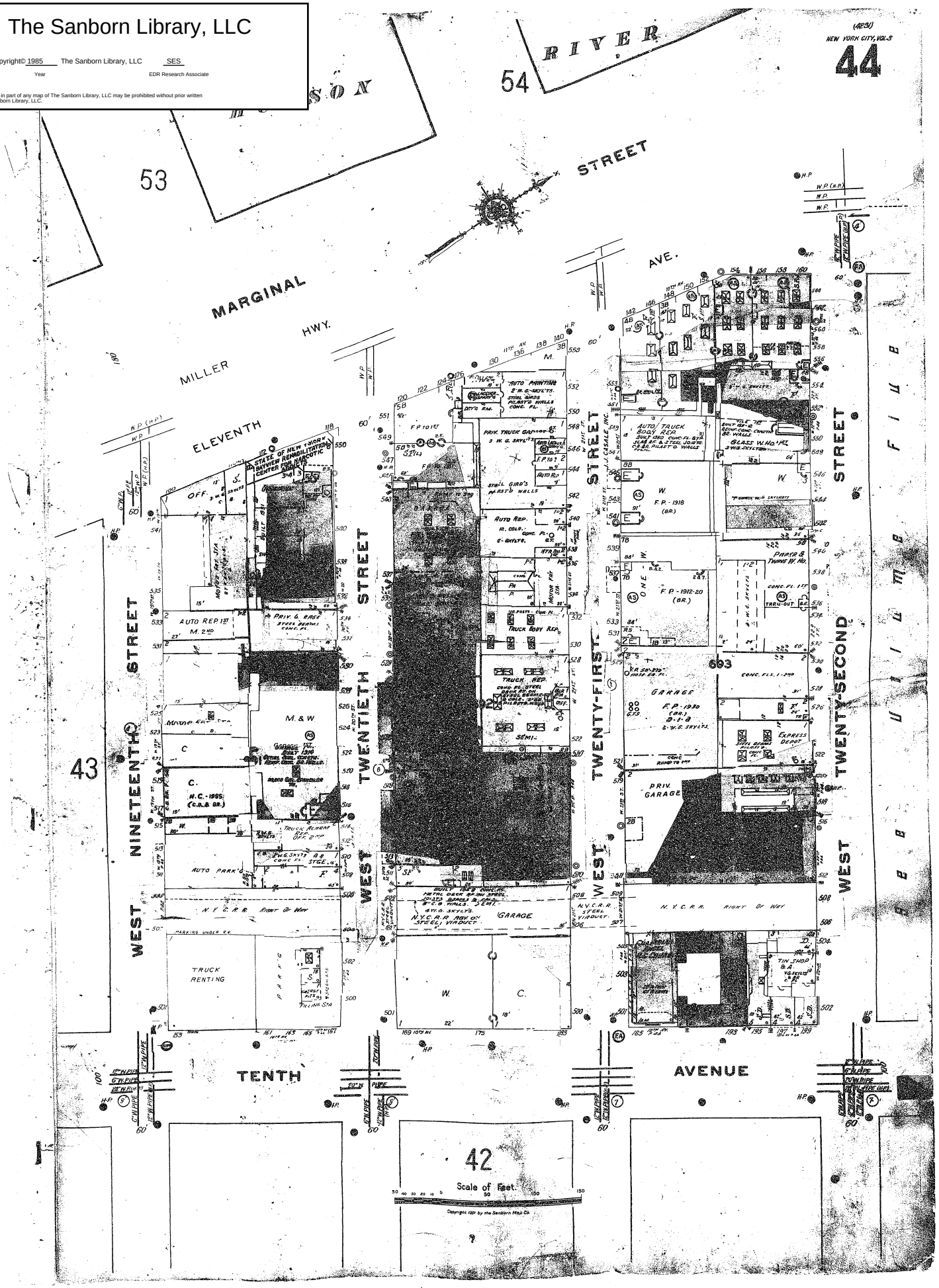
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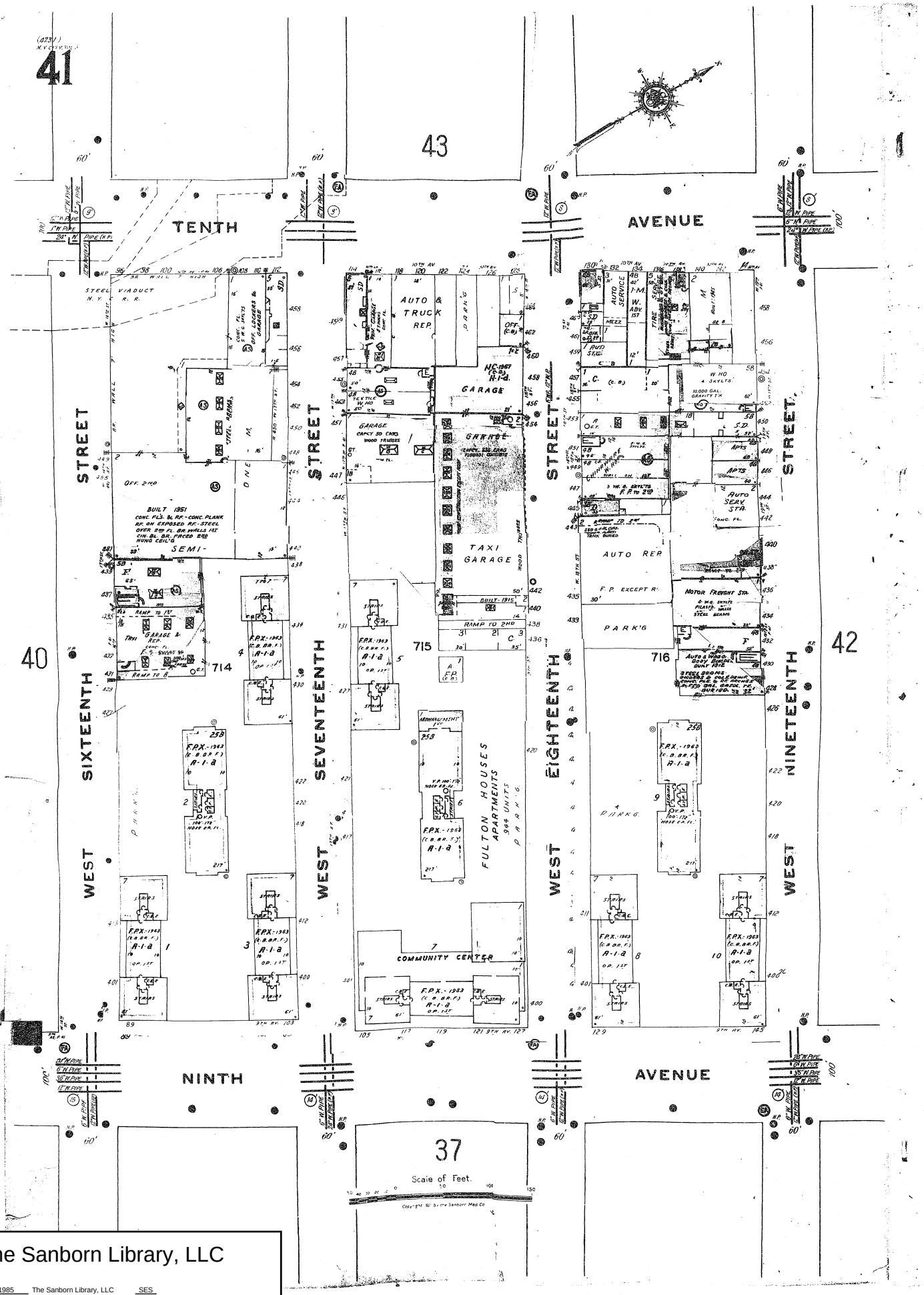
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ARCADIS

**Appendix B**

Well and Soil Boring Logs

**Date Start/Finish:** 9/5/08
**Drilling Company:** Boart Longyear
**Driller's Name:** Matt White
**Drilling Method:** Rotosonic
**Sampling Method:** 4" X 2' corebarrel
**Rig Type:** Mini-sonic

**Northing:** 696318.371
**Easting:** 629139.879
**Casing Elevation:** NA

**Borehole Depth:** 32' bgs
**Surface Elevation:** 13.12

**Descriptions By:** Craig Massaro

**Well/Boring ID:** **SB-A**

**Client:** Consolidated Edison Company of New York, Inc.

**Location:** Verizon Building
Block 715, Lot 59
New York City, New York

| DEPTH | ELEVATION | Sample Run Number | Sample/Int/Type | Recovery (feet) | PID Headspace (ppm) | Analytical Sample | Geologic Column | Stratigraphic Description | Well/Boring Construction |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | | | | |
| | | 1 | 0-2 | 2 | 28<br>16 | | | CONCRETE.<br>Brown fine to coarse SAND, some fine to coarse Gravel, trace Wood, Concrete and Schist, NVI, loose, dry, . | |
| | | 2 | 2-4 | 2 | 605<br>244 | X | | Brown fine to coarse SAND, some fine to coarse Gravel, trace Wood, Cobbles and Schist, moderate odor, loose, dry. | |
| 5 | -5 | 3 | 4-6 | 2 | 64<br>9.3 | | | Brown fine to coarse SAND, some Silt and fine to medium Gravel, trace Cobbles and Glass, faint odors, loose, moist.<br>Trace Wood, Cobbles and Schist from 3-4'. | |
| | | 4 | 6-8 | 1.4 | 41<br>100 | | | Dark brown fine to medium SAND, little Silt, and fine to coarse Gravel, medium dense, faint odors, moist. | |
| | | 5 | 8-10 | 0.7 | 159 | X | | Dark brown fine to coarse SAND, little fine to coarse Gravel, trace Wood, moderate odors, loose, moist. | Borehole backfilled with Bentonite to grade |
| 10 | -10 | 6 | 10-12 | 0.6 | 72 | | | Dark brown fine to coarse SAND, some fine to medium Gravel and Silt, trace Wood, faint odors, loose, moist. | |
| | | 7 | 12-14 | NR | NA | | | No recovery. | |
| 15 | -15 | 8 | 14-16 | 2 | 21<br>19 | | | Olive gray fine to medium SAND, little fine to coarse Gravel and Silt, trace Wood, faint odors, medium dense, wet. | |

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Infrastructure, environment, facilities

**Remarks:** NVI = No Visual Impacts and no odor, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 2 to 2.5, 8 to 8.5, 21 to 21.5, and 31.5 to 32 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total).

**Client:** Consolidated Edison Company of New York, Inc.

**Well/Boring ID:** **SB-A**

**Borehole Depth:** 32' bgs

**Site Location:**
Verizon Building
Block 715, Lot 59
New York City, New York

| DEPTH / ELEVATION | Sample Run Number | Sample/Int/Type | Recovery (feet) | PID Headspace (ppm) | Analytical Sample | Geologic Column | Stratigraphic Description | Well/Boring Construction |
|---|---|---|---|---|---|---|---|---|
| | 9 | 16-18 | NR | NA | | | No recovery. | |
| | 10 | 18-20 | NR | NA | | | No recovery.<br>Material was very competent, slow drilling rate, <1" per second, possible holder bottom. | |
| 20 -20 | 11 | 20-22 | 1.3 | 79<br>511 | X | | Olive gray fine to medium SAND, little Silt and Cobbles (Gneiss and Schist), trace Brick, some black staining from 20.8 - 21.2 only, strong odors, NVI from 21.2 - 21.3, medium dense, wet. | |
| | 12 | 22-24 | 1.8 | 204<br>17.8 | | | Olive gray fine to coarse SAND, some fine to medium Gravel and Silt, trace coarse Gravel, moderate odors, slightly cohesive, medium dense, wet.<br>Olive gray medium to coarse GRAVEL, trace coarse Gravel and Cobbles, faint odors, loose, wet. | Borehole backfilled with Bentonite to grade |
| 25 -25 | 13 | 24-26 | NR | NA | | | No Recovery. | |
| | 14 | 26-28 | NR | NA | | | No Recovery, loose GRAVEL above, possible explanation for no recovery. | |
| | 15 | 28-30 | NR | NA | | | No Recovery, loose GRAVEL above, possible explanation for no recovery. | |
| 30 -30 | 16 | 30-32 | 2 | 3.2<br>1.5 | X | | Gray brown fine to coarse GRAVEL, trace coarse Sand, NVI, very loose, wet. | |
| 35 -35 | | | | | | | | |

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Infrastructure, environment, facilities

**Remarks:** NVI = No Visual Impacts and no odor, bgs = Below Grade Surface,
NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 2 to 2.5, 8 to 8.5, 21 to 21.5, and 31.5 to 32 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total).

**Date Start/Finish:** 8/22/08
**Drilling Company:** Boart Longyear
**Driller's Name:** John Graglia
**Drilling Method:** Rotosonic
**Sampling Method:** 4" X 2' corebarrel
**Rig Type:** Mini-sonic

**Northing:** 696345.859
**Easting:** 629131.980
**Casing Elevation:** NA

**Borehole Depth:** 20.5' bgs
**Surface Elevation:** 13.26

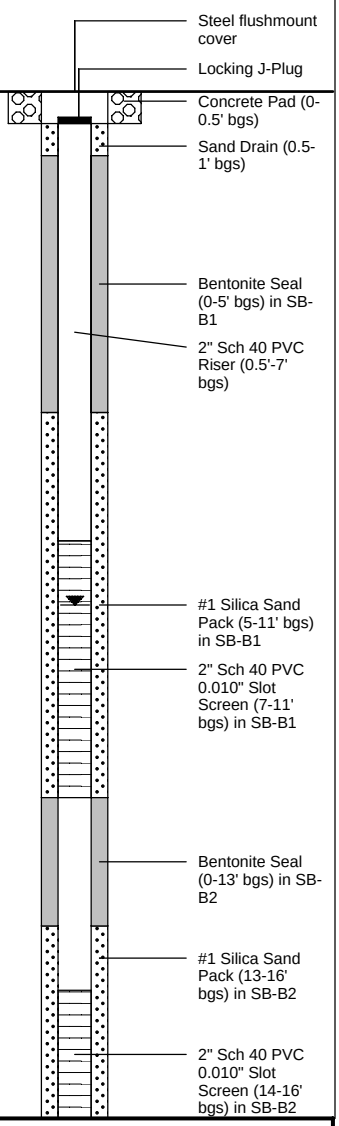
**Descriptions By:** Craig Massaro

**Well/Boring ID:** **SB-B**

**Client:** Consolidated Edison Company of New York, Inc.

**Location:** Verizon Building
Block 715, Lot 59
New York City, New York

| DEPTH / ELEVATION | Sample Run Number | Sample/Int/Type | Recovery (feet) | PID Headspace (ppm) | Analytical Sample | Geologic Column | Stratigraphic Description |
|---|---|---|---|---|---|---|---|
| 0 / 0 | 1 | 0-2 | 2 | 483<br>8463 | X | | Brown medium to coarse SAND, some fine to coarse Gravel, trace fine Sand and Schist pieces, strong odors, slight staining, loose, dry. |
| | 2 | 2-4 | 2 | 4875<br>9999 | | | |
| 5 / -5 | 3 | 4-6 | 2 | 4761<br>1523 | | | Brown fine to medium SAND, some fine to coarse Gravel, trace Schist fragments, strong odors, moist. |
| | 4 | 6-8 | NR | NA | | | No Recovery. |
| | 5 | 8-10 | 1 | 1981 | X | | Brown fine to coarse SAND, little fine to coarse Gravel, trace Silt, strong odors, loose, moist to wet. |
| 10 / -10 | 6 | 10-12 | 1.2 | 908<br>482 | | | Brown fine to coarse SAND, some medium to coarse Gravel, trace Schist pieces, strong odors, medium dense, wet. |
| | 7 | 12-14 | NR | NA | | | No Recovery. |
| 15 / -15 | 8 | 14-16 | 1 | 0.0 | | | Olive gray fine to medium SAND, little Silt and Mica flakes, NVI, medium dense, wet. |




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**Remarks:** NVI = No Visual Impacts and no odors, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 1.5 to 2, 9.5 to 10 and 19.5 to 20 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total).

Note that three separate wells were installed (SB-B1, SB-B2, and SB-B3) at different depths at SB-B to capture discreet groundwater zones.

**Client:** Consolidated Edison Company of New York, Inc.

**Well/Boring ID:** **SB-B**

**Borehole Depth:** 20.5' bgs

**Site Location:**
Verizon Building
Block 715, Lot 59
New York City, New York

| DEPTH / ELEVATION | Sample Run Number | Sample/Int/Type | Recovery (feet) | PID Headspace (ppm) | Analytical Sample | Geologic Column | Stratigraphic Description | Well/Boring Construction |
|---|---|---|---|---|---|---|---|---|
| | 9 | 16-18 | 1.8 | 0.0 | | | Olive gray fine to coarse SAND, some fine to coarse Gravel and Mica flakes, NVI, loose, wet. | Bentonite Seal (0-17' bgs) in SB-B3 |
| | 10 | 18-20 | 1.5 | 0.0 | X | | Olive gray fine to coarse GRAVEL, some medium to coarse Sand, trace Wood, NVI, loose, wet. | #1 Silica Sand Pack (17-20.5' bgs) in SB-B3 |
| 20 -20 | | | | | | | End of Boring at 20.5' bgs. | 2" Sch 40 PVC 0.010" Slot Screen (18.5-20.5' bgs) in SB-B3 |
| 25 -25 | | | | | | | | |
| 30 -30 | | | | | | | | |
| 35 -35 | | | | | | | | |

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**Remarks:** NVI = No Visual Impacts and no odors, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 1.5 to 2, 9.5 to 10 and 19.5 to 20 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total).

Note that three separate wells were installed (SB-B1, SB-B2, and SB-B3) at different depths at SB-B to capture discreet groundwater zones.

**Date Start/Finish:** 9/5/08
**Drilling Company:** Boart Longyear
**Driller's Name:** Matt White
**Drilling Method:** Rotosonic
**Sampling Method:** 4" X 2' corebarrel
**Rig Type:** Mini-sonic

**Northing:** 696374.327
**Easting:** 629126.729
**Casing Elevation:** NA

**Borehole Depth:** 42' bgs
**Surface Elevation:** 13.36

**Descriptions By:** Craig Massaro

**Well/Boring ID:** **SB-C**

**Client:** Consolidated Edison Company of New York, Inc.

**Location:** Verizon Building
Block 715, Lot 59
New York City, New York

| DEPTH / ELEVATION | Sample Run Number | Sample/Int/Type | Recovery (feet) | PID Headspace (ppm) | Analytical Sample | Geologic Column | Stratigraphic Description | Well/Boring Construction |
|---|---|---|---|---|---|---|---|---|
| 0 / 0 | | | | | | | | |
| | | | | | | | CONCRETE. | |
| | 1 | 0-2 | NR | NA | | | Brown fine to medium SAND, some fine to medium Gravel, trace Cobble at 3-5', NVI, loose, dry. | |
| | 2 | 2-4 | NR | NA | | | 0.5 to 5.0' previously logged during hand clearance. | |
| 5 / -5 | 3 | 4-6 | 2 | 4.6<br>8.8 | | | Brown fine to coarse SAND, some fine to coarse Gravel, trace Brick and Glass, NVI, loose, dry. | |
| | 4 | 6-8 | 2 | 12.6<br>4.3 | | | Brown fine to coarse SAND, some fine to coarse Gravel, trace Brick and Glass, NVI, loose,dry. | |
| | 5 | 8-10 | 2 | 749<br>861 | | | Brown fine to coarse SAND, some medium to coarse Gravel, strong odors, trace staining from 9' - 10' bgs, medium dense, loose, moist. | Borehole backfilled with Bentonite to grade |
| 10 / -10 | 6 | 10-12 | 1.1 | 850<br>3580 | | | Brown fine to coarse SAND, some fine to medium Gravel, trace coarse Gravel and Ceramic pieces, strong odors, trace staining throughout and sheen after shake test, moist. | |
| | 7 | 12-14 | 1.5 | 2732<br>3747 | X | | Brown fine to coarse SAND, some fine to medium Gravel, trace coarse Gravel and Ceramic pieces, trace staining throughout, sheen after shake test, wet at 13.8' bgs. | |
| 15 / -15 | 8 | 14-16 | NR | N | | | No recovery. | |

ARCADIS
Infrastructure, environment, facilities

**Remarks:** NVI = No Visual Impacts and no odors, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 13.5 to 14, 21.5 to 22 and 35.5 to 36 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total).

**Client:** Consolidated Edison Company of New York, Inc.

**Well/Boring ID:** SB-C

**Borehole Depth:** 42' bgs

**Site Location:**
Verizon Building
Block 715, Lot 59
New York City, New York

| DEPTH ELEVATION | Sample Run Number | Sample/Int/Type | Recovery (feet) | PID Headspace (ppm) | Analytical Sample | Geologic Column | Stratigraphic Description | Well/Boring Construction |
|---|---|---|---|---|---|---|---|---|
| | 9 | 16-18 | 2 | 2523<br>NA | | | Brown medium to coarse SAND, fine to medium Gravel, trace Clay, strong odors, slight sheen after shake test, medium dense, wet.<br>Brown fine to medium SAND, trace coarse Sand, strong odors, slight sheen after shake test, loose, wet. | |
| | 10 | 18-20 | 1.3 | 2522<br>2132 | | | Brown fine SAND, and SILT, some Clay, strong odors, strong odors, slight sheen after shake test, very dense, wet.<br>Brown fine to medium SAND, some coarse Sand, strong odors, loose, wet. | |
| 20 -20 | 11 | 20-22 | 2 | 1900<br>1980 | X | | Coarse Sand, lense from 21.8 - 22' bgs. | |
| | 12 | 22-24 | 1 | 30 | | | Reddish brown fine to medium SAND, little Silt and fine Gravel, trace Clay, faint odors, medium dense, wet. | |
| 25 -25 | 13 | 24-26 | 1 | 212 | | | Reddish brown medium to coarse SAND, little fine to medium Gravel, trace fine Sand and Silt, moderate odors, loose, wet. | |
| | 14 | 26-28 | 1 | 238 | | | Reddish brown medium to coarse SAND, trace fine Gravel, moderate odors, very loose, wet. | Borehole backfilled with Bentonite to grade |
| | 15 | 28-30 | 0.7 | 36 | | | Reddish brown fine to medium SAND, little Silt, trace fine Gravel, faint odors, very loose, wet. | |
| 30 -30 | 16 | 30-32 | 1.5 | 7.8<br>8.9 | | | Reddish brown fine to medium SAND, little Silt, trace fine Gravel, NVI, very loose, wet. | |
| | 17 | 32-34 | NR | NA | | | No recovery.<br>Measured to bottom of hole (33.5'). | |
| 35 -35 | 18 | 34-36 | 1.4 | 6.1<br>2.3 | X | | Reddish brown fine to coarse SAND, little fine to medium Gravel, trace Silt, faint odors, very loose, wet. | |

**Remarks:** NVI = No Visual Impacts and no odors, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 13.5 to 14, 21.5 to 22 and 35.5 to 36 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total).

ARCADIS
Infrastructure, environment, facilities

**Client:** Consolidated Edison Company of New York, Inc.

**Well/Boring ID:** SB-C

**Borehole Depth:** 42' bgs

**Site Location:**
Verizon Building
Block 715, Lot 59
New York City, New York

| DEPTH / ELEVATION | Sample Run Number | Sample/Int/Type | Recovery (feet) | PID Headspace (ppm) | Analytical Sample | Geologic Column | Stratigraphic Description | Well/Boring Construction |
|---|---|---|---|---|---|---|---|---|
| | 19 | 36-38 | NR | NA | | | No recovery | |
| | 20 | 38-40 | NR | NA | | | No recovery | Borehole backfilled with Bentonite to grade |
| 40 -40 | 21 | 40-42 | NR | NA | | | No recovery, with the exception of a handful of fine to coarse Gravel, NVI, wet. | |
| 45 -45 | | | | | | | | |
| 50 -50 | | | | | | | | |
| 55 -55 | | | | | | | | |

ARCADIS
Infrastructure, environment, facilities

**Remarks:** NVI = No Visual Impacts and no odors, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 13.5 to 14, 21.5 to 22 and 35.5 to 36 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total).

**Date Start/Finish:** 9/4/08
**Drilling Company:** Boart Longyear
**Driller's Name:** Matt White
**Drilling Method:** Rotosonic
**Sampling Method:** 4" X 2' corebarrel
**Rig Type:** Mini-sonic

**Northing:** 696340.325
**Easting:** 629053.258
**Casing Elevation:** NA

**Borehole Depth:** 26' bgs
**Surface Elevation:** 13.59

**Descriptions By:** Craig Massaro

**Well/Boring ID:** **SB-D**

**Client:** Consolidated Edison Company of New York, Inc.

**Location:** Verizon Building
Block 715, Lot 59
New York City, New York

| DEPTH | ELEVATION | Sample Run Number | Sample/Int/Type | Recovery (feet) | PID Headspace (ppm) | Analytical Sample | Geologic Column | Stratigraphic Description | Well/Boring Construction |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 1 | 0-2 | | 0.0<br>0.0 | | | CONCRETE. | |
| | | | | | | | | Brown fine to coarse SAND, little fine to coarse Gravel, trace Concrete, NVI, loose, dry. | |
| | | 2 | 0-4<br>2-4 | 2 | 0.0<br>0.0 | | | | |
| | | 3 | 4-6 | 1.5 | 4.6<br>12.2 | | | Conglomerate rock.<br>Brown fine to coarse SAND, little fine to coarse Gravel, NVI, loose, dry. | |
| 5 | -5 | 4 | 6-8 | 2 | 0.9<br>7.4 | | | Dark brown/olive gray fine to coarse SAND, some fine to coarse Gravel, trace Brick chunks, NVI, loose, moist at 7' bgs. | |
| | | 5 | 8-10 | 1.5 | 0.0<br>0.0 | | | Dark brown/olive gray fine to coarse SAND, some fine to coarse Gravel, trace Brick chunks, NVI, loose, moist. | Borehole backfilled with Bentonite to grade |
| 10 | -10 | 6 | 10-12 | 1.3 | 0.0<br>0.0 | X | | Dark brown/olive gray fine to coarse SAND, little fine to coarse Gravel, trace Silt, NVI, moist. | |
| | | 7 | 12-14 | NR | NA | | | No recovery. | |
| 15 | -15 | 8 | 14-16 | 1.5 | 0.0<br>0.0 | | | Olive gray medium to coarse SAND, little fine Gravel, NVI, loose, wet. | |

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Infrastructure, environment, facilities

**Remarks:** NVI = No Visual Impacts, bgs = Below Grade Surface,
NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 11.5 to 12 and 23.5 to 24 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total).

**Client:** Consolidated Edison Company of New York, Inc.

**Well/Boring ID:** **SB-D**

**Borehole Depth:** 26' bgs

**Site Location:**
Verizon Building
Block 715, Lot 59
New York City, New York

| DEPTH / ELEVATION | Sample Run Number | Sample/Int/Type | Recovery (feet) | PID Headspace (ppm) | Analytical Sample | Geologic Column | Stratigraphic Description | Well/Boring Construction |
|---|---|---|---|---|---|---|---|---|
| | 9 | 16-18 | 0.5 | 8.7 | | | Olive gray fine to coarse SAND, some Quartz and Schist rock pieces > 2", NVI, wet. | |
| | 10 | 18-20 | 0.6 | 0.0 | | | Black/gray SCHIST medium to coarse fractured pieces ranging in size from fine gravel size to 4",NVI, wet. | |
| 20 -20 | 11 | 20-22 | 1.0 | 4.8<br>10.3 | | | Olive gray fine to coarse SAND, some Gneiss and Schist rock pieces ranging in size from 2" to 4", trace Wood pieces, NVI, wet. | Borehole backfilled with Bentonite to grade |
| | 12 | 22-24 | 1.5 | 18.4<br>4.6<br>5.2 | X | | Olive gray fine to coarse SAND, some Gneiss and Schist rock pieces, NVI, loose, wet.<br>Brown fine to coarse GRAVEL, some fine to coarse Sand, trace Silt, NVI, loose, wet.<br>Brown medium to coarse SAND, trace fine Gravel, medium dense, NVI, wet. | |
| 25 -25 | 13 | 24-26 | NR | NA | | | No recovery, except for 4 pieces of Gravel ranging from fine to coarse in size, NVI, wet. | |
| 30 -30 | | | | | | | | |
| 35 -35 | | | | | | | | |

ARCADIS
Infrastructure, environment, facilities

**Remarks:** NVI = No Visual Impacts, bgs = Below Grade Surface,
NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 11.5 to 12 and 23.5 to 24 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total).

**Date Start/Finish:** 8/20/08 - 8/21/08
**Drilling Company:** Boart Longyear
**Driller's Name:** John Graglia
**Drilling Method:** Rotosonic
**Sampling Method:** 4" X 2' corebarrel
**Rig Type:** Mini-sonic

**Northing:** 696382.049
**Easting:** 629088.454
**Casing Elevation:** 12.95

**Borehole Depth:** 21' bgs
**Surface Elevation:** 13.2

**Descriptions By:** Craig Massaro

**Well/Boring ID:** **Well Cluster A**

**Client:** Consolidated Edison Company of New York, Inc.

**Location:** Verizon Building
Block 715, Lot 59
New York City, New York

| DEPTH / ELEVATION | Sample Run Number | Sample/Int/Type | Recovery (feet) | PID Headspace (ppm) | Analytical Sample | Geologic Column | Stratigraphic Description |
|---|---|---|---|---|---|---|---|
| 15 | | | | | | | |
| 0 | | | | | | | CONCRETE |
| | | | | 1.2 | | | Brown fine to coarse SAND, some medium to coarse Gravel and Brick. |
| | | | | 3.2 | | | Hand cleared with air knife and vacuum. |
| | 1 | 0-5 | 5 | 2.1 | | | |
| 10 | | | | 0.8 | | | |
| | | | | 0.6 | | | |
| 5 | 2 | 5-6 | 1 | 1.1 | | | Brown fine to coarse SAND, some medium to coarse Gravel and Brick, NVI. |
| | | | | | | | Brown fine to coarse SAND, some medium to coarse Gravel, trace Clay and Wood, soils stained from 1' - 2', moist. |
| 5 | | | | 248 | | | |
| | 3 | 6-12 | 2 | | | | |
| 10 | | | | 2042 | X | | |
| | 4 | 12-15 | NR | NA | | | NR |
| 0 | | | | | | | |
| 15 | 5 | 15-17 | 1.5 | 638<br>338 | | | Dark brown medium to coarse SAND, some fine to medium Gravel, trace coarse Gravel, loose, NVI, wet. |

Well/Boring Construction

- Steel flushmount cover
- Locking J-Plug
- Concrete Pad (0-0.5' bgs)
- Sand Drain (0.5-1' bgs)
- Bentonite Seal (0-5' bgs) in A1
- 2" Sch 40 PVC Riser (0.5'-7' bgs)
- #1 Silica Sand Pack (5-11' bgs) in SB-B1
- 2" Sch 40 PVC 0.010" Slot Screen (7-11' bgs) in A1
- Bentonite Seal (0-12.5' bgs) in A2
- #1 Silica Sand Pack (12.5-15.5' bgs) in A2
- 2" Sch 40 PVC 0.010" Slot Screen (13.5-15.5' bgs) in A2

ARCADIS
Infrastructure, environment, facilities

**Remarks:** NVI = No Visual Impacts, bgs = Below Grade Surface,
NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 11.5 to 12, 16.5 to 17 and 20 to 20.5 feet bgs and analyzed for VOCs, SVOCs, CN (amenable/total).

Note that three separate wells were installed (Well Cluster A1, A2, and A3) at different depths at Well Cluster A to capture discreet groundwater zones.

**Client:** Consolidated Edison Company of New York, Inc.

**Well/Boring ID:** **Well Cluster A**

**Borehole Depth:** 21' bgs

**Site Location:**
Verizon Building
Block 715, Lot 59
New York City, New York

| DEPTH / ELEVATION | Sample Run Number | Sample/Int/Type | Recovery (feet) | PID Headspace (ppm) | Analytical Sample | Geologic Column | Stratigraphic Description | Well/Boring Construction |
|---|---|---|---|---|---|---|---|---|
| | 5 | 15-17 | 1.5 | 683 | X | | Dark brown medium to coarse SAND, some fine to medium Gravel, trace coarse Gravel, loose, NVI, wet. | Bentonite Seal (0-16.5' bgs) in A3 |
| -5 | 6 | 17-20 | 3 | 88<br>45 | | | Olive gray fine to coarse GRAVEL, subrounded, some medium to coarse Sand and Wood, loose, wet. | #1 Silica Sand Pack (16.5-21' bgs) in A3<br>2" Sch 40 PVC 0.010" Slot Screen (17.7-19.7' bgs) in A3 |
| 20 | 7 | 20-21 | 1 | 83<br>21 | X | | Brown subangular fine to medium Gravel with pulverized Concrete, NVI, dry. | |
| | | | | | | | END OF BORING AT 21' bgs | |
| -10 | | | | | | | | |
| 25 | | | | | | | | |
| -15 | | | | | | | | |
| 30 | | | | | | | | |
| -20 | | | | | | | | |
| 35 | | | | | | | | |

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**Remarks:** NVI = No Visual Impacts, bgs = Below Grade Surface,
NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 11.5 to 12, 16.5 to 17 and 20 to 20.5 feet bgs and analyzed for VOCs, SVOCs, CN (amenable/total).

Note that three separate wells were installed (Well Cluster A1, A2, and A3) at different depths at Well Cluster A to capture discreet groundwater zones.

**Date Start/Finish:** 8/22/08
**Drilling Company:** Boart Longyear
**Driller's Name:** John Graglia
**Drilling Method:** Rotosonic
**Sampling Method:** 4" X 2' corebarrel
**Rig Type:** Mini-sonic

**Northing:** 696345.859
**Easting:** 629131.980
**Casing Elevation:** 12.89

**Borehole Depth:** 20.5' bgs
**Surface Elevation:** 13.26

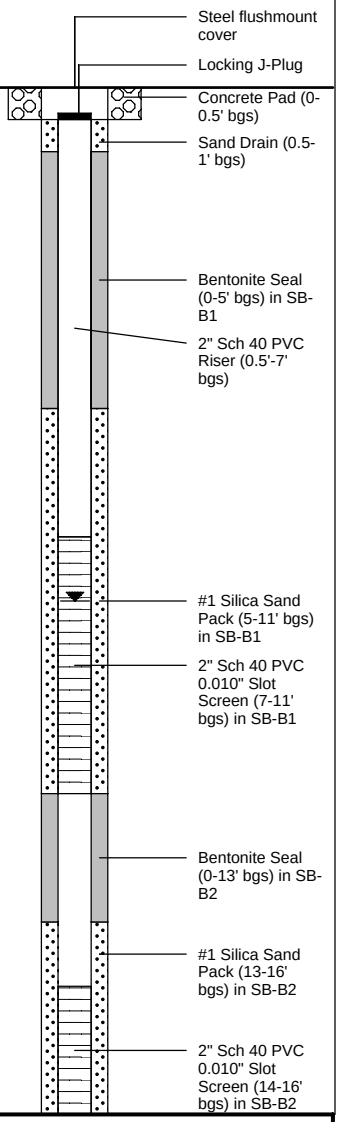
**Descriptions By:** Craig Massaro

**Well/Boring ID:** **Well Cluster B**

**Client:** Consolidated Edison Company of New York, Inc.

**Location:** Verizon Building
Block 715, Lot 59
New York City, New York

| DEPTH / ELEVATION | Sample Run Number | Sample/Int/Type | Recovery (feet) | PID Headspace (ppm) | Analytical Sample | Geologic Column | Stratigraphic Description |
|---|---|---|---|---|---|---|---|
| 15 / 0 | 1 | 0-2 | 2 | 483<br>8463 | X | | Brown medium to coarse SAND, some fine to coarse Gravel, trace fine Sand and Schist pieces, strong odors, slight staining, loose, dry. |
| 10 / 5 | 2 | 2-4 | 2 | 4875<br>9999 | | | |
| 5 / 10 | 3 | 4-6 | 2 | 4761<br>1523 | | | Brown fine to medium SAND, some fine to coarse Gravel, trace Schist fragments, strong odors, moist. |
| | 4 | 6-8 | NR | NA | | | No Recovery. |
| 5 / 0 | 5 | 8-10 | 1 | 1981 | X | | Brown fine to coarse SAND, little fine to coarse Gravel, trace Silt, strong odors, loose, moist to wet. |
| 10 / 15 | 6 | 10-12 | 1.2 | 908<br>482 | | | Brown fine to coarse SAND, some medium to coarse Gravel, trace Schist pieces, strong odors, medium dense, wet. |
| 0 | 7 | 12-14 | NR | NA | | | No Recovery. |
| 15 | 8 | 14-16 | 1 | 0.0 | | | Olive gray fine to medium SAND, little Silt and Mica flakes, NVI, medium dense, wet. |




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**Remarks:** NVI = No Visual Impacts and no odors, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 1.5 to 2, 9.5 to 10 and 19.5 to 20 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total).

Note that three separate wells were installed (SB-B1, SB-B2, and SB-B3) at different depths at SB-B to capture discreet groundwater zones.

**Client:** Consolidated Edison Company of New York, Inc.

**Well/Boring ID:** **Well Cluster B**

**Borehole Depth:** 20.5' bgs

**Site Location:**
Verizon Building
Block 715, Lot 59
New York City, New York

| DEPTH / ELEVATION | Sample Run Number | Sample/Int/Type | Recovery (feet) | PID Headspace (ppm) | Analytical Sample | Geologic Column | Stratigraphic Description | Well/Boring Construction |
|---|---|---|---|---|---|---|---|---|
| | 9 | 16-18 | 1.8 | 0.0 | | | Olive gray fine to coarse SAND, some fine to coarse Gravel and Mica flakes, NVI, loose, wet. | Bentonite Seal (0-17' bgs) in SB-B3 |
| -5 | 10 | 18-20 | 1.5 | 0.0 | X | | Olive gray fine to coarse GRAVEL, some medium to coarse Sand, trace Wood, NVI, loose, wet. | #1 Silica Sand Pack (17-20.5' bgs) in SB-B3 |
| 20 | | | | | | | End of Boring at 20.5' bgs. | 2" Sch 40 PVC 0.010" Slot Screen (18.5-20.5' bgs) in SB-B3 |
| -10 | | | | | | | | |
| 25 | | | | | | | | |
| -15 | | | | | | | | |
| 30 | | | | | | | | |
| -20 | | | | | | | | |
| 35 | | | | | | | | |

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**Remarks:** NVI = No Visual Impacts and no odors, bgs = Below Grade Surface, NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 1.5 to 2, 9.5 to 10 and 19.5 to 20 feet bgs and analyzed for VOCs, SVOCs, and CN (amenable/total).

Note that three separate wells were installed (SB-B1, SB-B2, and SB-B3) at different depths at SB-B to capture discreet groundwater zones.

**Date Start/Finish:** 8/26/08
**Drilling Company:** Boart Longyear
**Driller's Name:** Matt White
**Drilling Method:** Rotosonic
**Sampling Method:** 4" X 2' corebarrel
**Rig Type:** Mini-sonic

**Northing:** 696343.789
**Easting:** 629098.528
**Casing Elevation:** 13.05

**Borehole Depth:** 25' bgs
**Surface Elevation:** 13.34

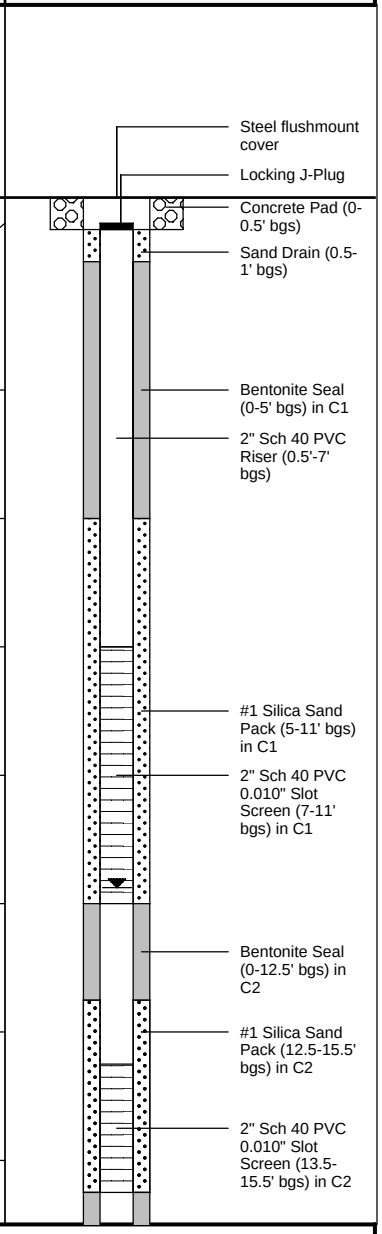
**Descriptions By:** Craig Massaro

**Well/Boring ID:** **Well Cluster C**

**Client:** Consolidated Edison Company of New York, Inc.

**Location:** Verizon Building
Block 715, Lot 59
New York City, New York

| DEPTH | ELEVATION | Sample Run Number | Sample/Int/Type | Recovery (feet) | PID Headspace (ppm) | Analytical Sample | Geologic Column | Stratigraphic Description |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | | | |
| | | 1 | 0-3 | 2.6 | 3.4<br>1.8<br>0.4 | | | CONCRETE<br>Brown medium to coarse SAND, some fine to coarse angular - subangular Gravel, trace Cobbles, NVI, loose, dry. |
| | | 2 | 3-5 | 2 | 3.5<br>2.8 | | | Brown medium to coarse SAND, some fine to medium Gravel, trace Cobbles, NVI, loose, moist. |
| 5 | -5 | 3 | 5-7 | 1.3 | 10.8<br>15.7 | | | Olive gray fine to coarse SAND, little fine to coarse Gravel, trace Schist pieces (<1"), NVI, medium dense, moist. |
| | | 4 | 7-9 | NR | NA | | | No recovery.<br>Measured borehole after pulling core barrel. 9' measurement to bottom, suggesting material was pushed out of the way, (loose soil). |
| 10 | -10 | 5 | 9-11 | 0.8 | 24.8 | X | | Olive gray fine to coarse SAND, little fine to medium Gravel, trace Schist, NVI, moist. |
| | | 6 | 11-13 | 2 | 11.8<br>17.2 | | | Olive gray fine to coarse SAND, little fine to medium Gravel, trace coarse Gravel, NVI, medium dense, wet. |
| | | 7 | 13-15 | 2 | 2.5<br>2.4 | | | Olive gray fine to coarse SAND, some fine to coarse angular Gravel, trace Schist pieces throughout, NVI, medium dense, wet. |
| 15 | -15 | 8 | 15-17 | 0.9 | NA | | | Olive gray medium to coarse SAND, some fine to medium Gravel, trace coarse angular Gravel, 1 piece of Sandstone <2", NVI, loose, wet. |




Well/Boring Construction

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**Remarks:** NVI = No Visual Impacts, bgs = Below Grade Surface,
NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 10.5 to 11 and 20.5 to 21 feet bgs and analyzed for VOCs, SVOCs, CN, (amenable/total).

Note that three separate wells were installed (Well Cluster C1, C2, and C3) at different depths at Well Cluster C to capture discreet groundwater zones.

**Client:** Consolidated Edison Company of New York, Inc.

**Well/Boring ID:** **Well Cluster C**

**Borehole Depth:** 25' bgs

**Site Location:**
Verizon Building
Block 715, Lot 59
New York City, New York

| DEPTH | ELEVATION | Sample Run Number | Sample/Int/Type | Recovery (feet) | PID Headspace (ppm) | Analytical Sample | Geologic Column | Stratigraphic Description |
|---|---|---|---|---|---|---|---|---|
| | | 8 | 15-17 | 0.9 | NA | | | Olive gray medium to coarse SAND, some fine to medium Gravel, trace coarse angular Gravel, 1 piece of Sandstone <2", NVI, loose, wet. |
| | | 9 | 17-19 | 0.9 | 0.8<br>0.6 | | | Weathered fractured SCHIST pieces, some fine to medium Sand and Silt, NVI, wet. |
| 20 | -20 | 10 | 19-21 | 1.5 | 151<br>787 | X | | Olive gray fine to medium SAND, little angular fine to coarse Gravel, trace Silts, Clays, and Wood pieces, Brick (2" piece) at 21', soils stained. |
| | | 11 | | 1.5 | 232<br>99 | | | Olive gray fine to medium SAND, trace Silt, Clay and Concrete pieces, NVI, loose, moist.<br>Resistance and evidence of concrete chunk suggests bottom of holder, however no pulverized layers of concrete observed. |
| | | 12 | | 0.6 | NA | | | Fractured cored rock, Granitic, NVI.<br>End of boring at 25 bgs. |
| 25 | -25 | | | | | | | |
| 30 | -30 | | | | | | | |
| 35 | -35 | | | | | | | |

Well/Boring Construction:
- Bentonite Seal (0-17.5' bgs) in C3
- #1 Silica Sand Pack (17.5-21' bgs) in C3
- 2" Sch 40 PVC 0.010" Slot Screen (19-21' bgs) in C3

ARCADIS
Infrastructure, environment, facilities

**Remarks:** NVI = No Visual Impacts, bgs = Below Grade Surface,
NA = Not Available/Not Applicable, NR = No Recovery

Sample collected at 10.5 to 11 and 20.5 to 21 feet bgs and analyzed for VOCs, SVOCs, CN, (amenable/total).

Note that three separate wells were installed (Well Cluster C1, C2, and C3) at different depths at Well Cluster C to capture discreet groundwater zones.

**Well, Soil Boring and Test Pit Logs from the Site Characterization Study**

Site Characterization Study Report for the Former West 18th Street Gas Works
Manhattan, New York

TRC Environmental Corporation, January 2006

**BORING No.: SB-1**

**SHEET 1 OF 1**

# BORING LOG

| JOB NAME/ CLIENT | PROJECT NO. | AREA OF SITE | |
|---|---|---|---|
| W18th St MGP SCS/Con Edison | 41318-0700-10000 | SE of Former Gas Holder #1 | |
| **ADDRESS** | | **ELEVATION/DATUM** | |
| Verizon Building on W 18th Street b/w 9th and 10th Ave | | 21.97/NAVD 88 | |
| **DRILLING CONTRACTOR** | **DRILLER** | **TRC INSPECTOR** | |
| Fenley and Nicol Environmental, Inc. | Kevin Kegel | Jessica Elliott | |
| **DRILLING RIG** | **TYPE/SIZE BIT** | **START DATE** | **END DATE** |
| Simco Earthprobe 200 | N/A | 5/14/2005 | 5/14/2005 |
| **SAMPLER TYPE** | **HAMMER WEIGHT/DROP** | **TOTAL DEPTH (feet below ground surface (ft bgs))** | **WATER LEVEL (ft bgs)** |
| 2' discrete sampler | N/A | 6.5' | N/A |

| WELL CONSTRUCTION | SAMPLES: NUMBER | SAMPLES: RECOVERY IN FEET | SAMPLES: BLOWS PER 6" | DEPTH | WATER | DESCRIPTION OF SOILS (f - fine m - medium c - coarse; lt - light dk - dark tr - trace ltl - little sl - slight) | REMARKS (PID, STAINING, ODORS, ETC.) (N/S = No Staining N/O = No odors) |
|---|---|---|---|---|---|---|---|
| | | | | 1 | | 0'-0.3': CONCRETE and rebar.<br>0.3'-2.0': Fill-Brown f to m SAND, GRAVEL, rock fragments, slag and coal fragments. | 0.3'-2': N/O, N/S<br>PID (headspace) = 3.7 ppm max. |
| | | | | 3 | | 2.0'-4.0': Fill-Lt brown very f SAND. | 2'-3': N/O, N/S<br>PID (headspace) = 2.5 ppm max.<br>3'-4': N/O, N/S<br>PID (headspace) = 3.5 ppm max. |
| | | | | 5 | | 4.0'-5.0': Fill-Brown f to m SAND.<br>Sample collected: W18STMGP-SB2-57<br>5.0'-6.0': No recovery.<br>6.0'-6.5': Hard rock. | 4'-5': N/O, N/S<br>PID (headspace) = 1.8 ppm max. |
| | | | | 7 | | E.O.B. at 6.5' bgs (Refusal due to rock at 6.0' bgs) | |
| | | | | 9 | | | |
| | | | | 11 | | | |
| | | | | 13 | | | |
| | | | | 15 | | | |
| | | | | 17 | | | |

TRC

**BORING No.: SB-2**

**SHEET 1 OF 2**

# BORING LOG

| JOB NAME/ CLIENT | PROJECT NO. | AREA OF SITE | |
|---|---|---|---|
| W18th St MGP SCS/Con Edison | 41318-0700-10000 | Inside Former Gas Holder #1 | |
| **ADDRESS** | | **ELEVATION/DATUM** | |
| Verizon Building on W 18th Street b/w 9th and 10th Ave | | 12.98/ NAVD 88 | |
| **DRILLING CONTRACTOR** | **DRILLER** | **TRC INSPECTOR** | |
| Fenley and Nicol Environmental, Inc. | Kevin Kegel | Amy Klimek | |
| **DRILLING RIG** | **TYPE/SIZE BIT** | **START DATE** | **END DATE** |
| Simco Earthprobe 200 | N/A | 5/6/2005 | 5/6/2005 |
| **SAMPLER TYPE** | **HAMMER WEIGHT/DROP** | **TOTAL DEPTH (feet below ground surface (ft bgs))** | **WATER LEVEL (ft bgs)** |
| 2' discrete sampler | N/A | 20.5' | 13' |

| WELL CONSTRUCTION | SAMPLES NUMBER | SAMPLES RECOVERY IN FEET | SAMPLES BLOWS PER 6" | DEPTH | WATER | DESCRIPTION OF SOILS (f - fine, m - medium, c - coarse; lt - light, dk - dark, tr - trace, ltl - little, sl - slight) | REMARKS (PID, STAINING, ODORS, ETC.) (N/S = No Staining, N/O = No odors) |
|---|---|---|---|---|---|---|---|
| | | | | | | 0'-0.8': CONCRETE and rebar. | |
| | | | | 1 | | 0.8'-2.0': Fill-Lt brown-gray f to c SAND, GRAVEL and rock (schist) fragments. | 0.8'-2': Strong gasoline-like odor, N/S |
| | | | | | | Sample collected: W18STMGP-SB2-11.5 | PID = 22.1 ppm max. |
| | | | | | | 2.0'-5.0': Fill-Brown f to c SAND, some gravel, rock (schist) fragments, cobbles, tr silt and brick fragments. | 2'-3': N/O, N/S |
| | | | | 3 | | | PID = 11.8 ppm max. |
| | | | | | | | 3'-4': N/O, N/S |
| | | | | | | | PID = 8.0 ppm max. |
| | | | | | | | 4'-5': N/O, N/S |
| | | | | 5 | | | PID = 5.1 ppm max. |
| | | | | | | 5.0'-5.4': Fill-Dk brown SILT, f SAND, CLAY and some gravel. | 5'-7': N/O, N/S |
| | 1 | 0.4' | | | | Sample collected: W18STMGP-SB2-57 | PID = 5.7 ppm max. |
| | | | | 7 | | 7.0'-7.4': Fill-Dk brown m SAND, some silty, gravel, cobbles and tr clay. | 7'-9': N/O, N/S |
| | 2 | 0.4' | | | | | PID = 1.0 ppm max. |
| | | | | 9 | | 9.0'-9.7': Fill-Dk brown-black SILT, f SAND, some clay, asphalt and gravel. | 9'-11': N/O, N/S |
| | 3 | 0.7' | | | | | PID = 1.0 ppm max. |
| | | | | 11 | | 11.0'-11.9': Fill-Dk brown-black SILT, f SAND, some cobbles and intermittent clay. | 11'-13': N/O, N/S |
| | 4 | 0.9' | | | | | PID = 0.1 ppm max. |
| | | | | 13 | ▼ | 13.0'-13.5': Fill-Dk brown-black SILT, f SAND, some cobbles, gravel and asphalt. | 13'-15': Petroleum odor, N/S |
| | 5 | 1.0' | | | | Sample collected: W18STMGP-SB2-1315 | PID = 0.8 ppm max. |
| | | | | | | 13.5'-14.0': Fill-Dk brown SILT, f SAND, some clay and tr m sand. | |
| | | | | 15 | | 15.0'-15.7': Fill-Dk brown SILT, f SAND and some clay. | 15'-17': MGP-related odor, N/S |
| | 6 | 0.7' | | | | | PID = 0.5 ppm max. |
| | | | | 17 | | 17.0'-17.5': Fill-Dk brown-black SILT, f SAND, some clay, cobbles, wood fibers and mica schist fragments. | 17'-19': Strong MGP-related odor, N/S |
| | 7 | 0.5' | | | | | PID = 124 ppm max. |

TRC

**BORING No.: SB-2**

**SHEET 2 OF 2**

# BORING LOG

| JOB NAME/ CLIENT | PROJECT NO. | AREA OF SITE | |
|---|---|---|---|
| W18th St MGP SCS/Con Edison | 41318-0700-10000 | Inside Former Gas Holder #1 | |
| **ADDRESS** | | **ELEVATION/DATUM** | |
| Verizon Building on W 18th Street b/w 9th and 10th Ave | | 12.98/NAVD 88 | |
| **DRILLING CONTRACTOR** | **DRILLER** | **TRC INSPECTOR** | |
| Fenley and Nicol Environmental, Inc. | Kevin Kegel | Amy Klimek | |
| **DRILLING RIG** | **TYPE/SIZE BIT** | **START DATE** | **END DATE** |
| Simco Earthprobe 200 | N/A | 5/6/2005 | 5/6/2005 |
| **SAMPLER TYPE** | **HAMMER WEIGHT/DROP** | **TOTAL DEPTH (feet below ground surface (ft bgs))** | **WATER LEVEL (ft bgs)** |
| 2' discrete sampler | N/A | 20.5' | 13' |

| WELL CONSTRUCTION | SAMPLES: NUMBER | SAMPLES: RECOVERY IN FEET | SAMPLES: BLOWS PER 6" | DEPTH | WATER | DESCRIPTION OF SOILS (f - fine m - medium c - coarse; lt - light dk - dark tr - trace ltl - little sl - slight) | REMARKS (PID, STAINING, ODORS, ETC.) (N/S = No Staining N/O = No odors) |
|---|---|---|---|---|---|---|---|
| | 8 | 0.5' | | 19 | | 19.0'-19.5': Fill-Black SILT, f SAND, some cobbles, tr clay, organic matter and wood fibers.<br>Sample collected: W18STMGP-SB2-1920.5 | 19'-21': Strong MGP-related odor, N/S<br>PID = 19.2 ppm max. |
| | | | | 21 | | E.O.B. at 20.5' bgs<br>(Refusal due to rocks. Possible bottom of Former Gas Holder #2 at 20.5' bgs) | |
| | | | | 23 | | | |
| | | | | 25 | | | |
| | | | | 27 | | | |
| | | | | 29 | | | |
| | | | | 31 | | | |
| | | | | 33 | | | |
| | | | | 35 | | | |

TRC

**BORING No.: SB-3**

**SHEET 1 OF 2**

# BORING LOG

| JOB NAME/ CLIENT | PROJECT NO. | AREA OF SITE |
|---|---|---|
| W18th St MGP SCS/Con Edison | 41318-0700-10000 | SE of Former Gas Holder #2 and SW of Former Gas Holder #1 |
| **ADDRESS** | | **ELEVATION/DATUM** |
| Verizon Building on W 18th Street b/w 9th and 10th Ave | | 13.60/NAVD 88 |
| **DRILLING CONTRACTOR** | **DRILLER** | **TRC INSPECTOR** |
| Fenley and Nicol Environmental, Inc. | Kevin Kegel | Amy Klimek |
| **DRILLING RIG** | **TYPE/SIZE BIT** | **START DATE** / **END DATE** |
| Simco Earthprobe 200 | N/A | 5/6/2005 / 5/6/2005 |
| **SAMPLER TYPE** | **HAMMER WEIGHT/DROP** | **TOTAL DEPTH (feet below ground surface (ft bgs))** / **WATER LEVEL (ft bgs)** |
| 2' discrete sampler | N/A | 20' / 13' |

| WELL CONSTRUCTION | SAMPLES: NUMBER | SAMPLES: RECOVERY IN FEET | SAMPLES: BLOWS PER 6" | DEPTH | WATER | DESCRIPTION OF SOILS (f - fine, m - medium, c - coarse; lt - light, dk - dark, tr - trace, ltl - little, sl - slight) | REMARKS (PID, STAINING, ODORS, ETC.) (N/S = No Staining, N/O = No odors) |
|---|---|---|---|---|---|---|---|
| | | | | | | 0'-0.8': CONCRETE and rebar. | |
| | | | | 1 | | 0.8'-1': Fill-Large (>3'x5' surface area) piece of former brick structure with mortar joints lying horizontal. | 1'-2': N/O, N/S |
| | | | | | | 1.0'-5.0': Fill-Brown f to m SAND, ltl c sand, gravel and brick chunks. | PID = 0.4 ppm max. |
| | | | | | | | 2'-3': N/O, N/S |
| | | | | 3 | | | PID = 1.0 ppm max. |
| | | | | | | | 3'-4': N/O, N/S |
| | | | | | | Sample collected: W18STMGP-SB3-33.5 | PID = 2.0 ppm max. |
| | | | | | | | 4'-5': N/O, N/S |
| | | | | 5 | | | PID = 1.6 ppm max. |
| | | | | | | 5.0'-7.8': Fill-Brown SILT, f to m SAND, c GRAVEL, some cobbles and rock rock fragments. | 5'-7': N/O, N/S |
| | 1 | 0.7' | | | | Sample collected: W18STMGP-SB3-57 | PID = 0.1 ppm max. |
| | | | | 7 | | | 7'-9': N/O, N/S |
| | 2 | 0.8' | | | | | PID = 0.2 ppm max. |
| | | | | 9 | | 9.0'-9.25': Fill-Red-brown SILT, f SAND and some cobbles. | 9'-11': N/O, N/S |
| | 3 | 1.0' | | | | 9.25'-10.0': Fill-Brown SILT and f SAND. | PID = 0.1 ppm max. |
| | | | | 11 | | 11.0'-13.0': Fill-Brown silty CLAY and ltl f sand. | 11'-13': N/O, N/S |
| | 4 | 2.0' | | | | | PID = 1.6 ppm max. |
| | | | | 13 | ▼ | 13.0'-13.8': Fill-Dk brown-gray SILT, f to m SAND and tr clay. | 13'-15': Strong gasoline-like odor, N/S |
| | 5 | 0.8' | | | | Sample collected: W18STMGP-SB3-1315 | PID = 63.0 ppm max. |
| | | | | 15 | | 15.0'-16.0': Fill-Brown GRAVEL, m SAND and tr silt. | 15'-17': N/O, N/S |
| | 6 | 1.0' | | | | | PID = 1.5 ppm max. |
| | | | | 17 | | 17.0'-18.4': Fill-Brown GRAVEL, f to c SAND, tr silt and clay. | 17'-19': N/O, N/S |
| | 7 | 1.4' | | | | | PID = 0.2 ppm max. |

TRC

**BORING No.: SB-3**

**SHEET 2 OF 2**

# BORING LOG

| JOB NAME/ CLIENT | PROJECT NO. | AREA OF SITE | |
|---|---|---|---|
| W18th St MGP SCS/Con Edison | 41318-0700-10000 | Inside Former Gas Holder #1 | |
| **ADDRESS** | | **ELEVATION/DATUM** | |
| Verizon Building on W 18th Street b/w 9th and 10th Ave | | 13.60/NAVD 88 | |
| **DRILLING CONTRACTOR** | **DRILLER** | **TRC INSPECTOR** | |
| Fenley and Nicol Environmental, Inc. | Kevin Kegel | Amy Klimek | |
| **DRILLING RIG** | **TYPE/SIZE BIT** | **START DATE** | **END DATE** |
| Simco Earthprobe 200 | N/A | 5/6/2005 | 5/6/2005 |
| **SAMPLER TYPE** | **HAMMER WEIGHT/DROP** | **TOTAL DEPTH (feet below ground surface (ft bgs))** | **WATER LEVEL (ft bgs)** |
| 2' discrete sampler | N/A | 20.5' | 13' |

| WELL CONSTRUCTION | SAMPLES: NUMBER | SAMPLES: RECOVERY IN FEET | SAMPLES: BLOWS PER 6" | DEPTH | WATER | DESCRIPTION OF SOILS (f - fine, m - medium, c - coarse; lt - light, dk - dark, tr - trace, ltl - little, sl - slight) | REMARKS (PID, STAINING, ODORS, ETC.) (N/S = No Staining, N/O = No odors) |
|---|---|---|---|---|---|---|---|
| | | | | 19 | | Sample collected: W18STMGP-SB3-1719 | |
| | 8 | 1.0' | | | | 19.0'-20.0': Fill-Brown GRAVEL, f to c SAND, tr silt and clay. | 19'-20': N/O, N/S |
| | | | | | | | PID = 2.1 ppm max. |
| | | | | | | E.O.B. at 20' bgs | |
| | | | | 21 | | | |
| | | | | 23 | | | |
| | | | | 25 | | | |
| | | | | 27 | | | |
| | | | | 29 | | | |
| | | | | 31 | | | |
| | | | | 33 | | | |
| | | | | 35 | | | |

TRC

**BORING No.: SB-4**

**SHEET 1 OF 2**

# BORING LOG

| JOB NAME/ CLIENT | PROJECT NO. | AREA OF SITE | |
|---|---|---|---|
| W18th St MGP SCS/Con Edison | 41318-0700-10000 | Inside Former Gas Holder #2 | |
| **ADDRESS** | | **ELEVATION/DATUM** | |
| Verizon Building on W 18th Street b/w 9th and 10th Ave | | 13.40/NAVD 88 | |
| **DRILLING CONTRACTOR** | **DRILLER** | **TRC INSPECTOR** | |
| Fenley and Nicol Environmental, Inc. | Kevin Kegel | Jessica Elliott | |
| **DRILLING RIG** | **TYPE/SIZE BIT** | **START DATE** | **END DATE** |
| Simco Earthprobe 200 | N/A | 5/5/2005 | 5/5/2005 |
| **SAMPLER TYPE** | **HAMMER WEIGHT/DROP** | **TOTAL DEPTH (feet below ground surface (ft bgs))** | **WATER LEVEL (ft bgs)** |
| 2' discrete sampler | N/A | 21' | 8' |

| WELL CONSTRUCTION | SAMPLES: NUMBER | SAMPLES: RECOVERY IN FEET | SAMPLES: BLOWS PER 6" | DEPTH | WATER | DESCRIPTION OF SOILS (f - fine m - medium c - coarse; lt - light dk - dark tr - trace ltl - little sl - slight) | REMARKS (PID, STAINING, ODORS, ETC.) (N/S = No Staining N/O = No odors) |
|---|---|---|---|---|---|---|---|
| | | | | | | 0'-0.8': CONCRETE and rebar. | |
| | | | | 1 | | 0.8'-2.0': Fill-Gray f SAND, some m sand, gravel, tr c sand and rock fragments. | 0.8'-2': N/O, N/S<br>PID = 3.6 ppm max. |
| | | | | 3 | | 2.0'-3.0': Fill-Lt brown f to c SAND, some silt, gravel, brick and rock fragments. | 2'-3': N/O, N/S<br>PID = 1.4 ppm max. |
| | | | | | | 3.0'-5.0': Fill-M brown SILT, f SAND, some m sand, tr c sand, gravel, rock fragments and cobbles. | 3'-4': N/O, N/S<br>PID = 1.1 ppm max.<br>4'-5': N/O, N/S<br>PID = 0.5 ppm max. |
| | | | | 5 | | Sample collected: W18STMGP-SB4-4.55.5 | 5'-6.5': N/O, N/S |
| | | | | | | 5.0'-6.5': Fill-Brown f to c SAND, some silt, gravel, rock (schist) fragments and brick fragments. | 6.5'-9': Strong gasoline-like odor, black staining, sheen |
| | 1 | 2.5' | | 7 | | 6.5'-7.5': Dk gray SILT, f SAND, some gravel, tr clay, pockets of c sand, and rock (schist) fragments. | PID = 5.7 ppm max. |
| | | | | | ▼ | Sample collected: W18STMGP-SB4-79 | |
| | | | | 9 | | 9.0'-9.5': Fill-Dk gray f to m SAND, some c sand, tr gravel and pockets of silt. | 9'-11': Sl gasoline-like odor, N/S, tr sheen |
| | 2 | 0.5' | | | | | PID = 0.9 ppm max. |
| | | | | 11 | | 11.0'-11.4': Fill-Dk gray f to c SAND, some silt and gravel. | 11'-13': Sl petroleum odor, tr black staining, tr sheen |
| | 3 | 0.4' | | | | | PID = 4.4 ppm max. |
| | | | | 13 | | 13.0'-13.5': Fill-Dk gray c SAND, some m sand, gravel, rock (schist) fragments and tr silt. | 13'-15': Petroleum odor, N/S, sheen |
| | 4 | 0.5' | | | | | PID = 30.5 ppm max. |
| | | | | 15 | | 15.0'-15.8': Fill-Gray-brown f SAND, some rock (schist) fragments, tr silt and m to c sand. | 15'-17': Sl MGP-related odor, N/S, sheen |
| | 5 | 0.8' | | | | | PID = 9.8 ppm max. |
| | | | | 17 | | 17.0'-17.7': Fill-Brown f to m SAND, SILT, some rock (schist) fragments, and tr c sand. | 17'-19': MGP-related odor, N/S, sheen |
| | 7 | 0.7' | | | | | PID = 12.9 ppm max. |

TRC

**BORING No.: SB-4**

**SHEET 2 OF 2**

# BORING LOG

| | | | |
|---|---|---|---|
| **JOB NAME/ CLIENT**<br>W18th St MGP SCS/Con Edison | **PROJECT NO.**<br>41318-0700-10000 | **AREA OF SITE**<br>Inside Former Gas Holder #2 | |
| **ADDRESS**<br>Verizon Building on W 18th Street b/w 9th and 10th Ave | | **ELEVATION/DATUM**<br>13.40/NAVD 88 | |
| **DRILLING CONTRACTOR**<br>Fenley and Nicol Environmental, Inc. | **DRILLER**<br>Kevin Kegel | **TRC INSPECTOR**<br>Jessica Elliott | |
| **DRILLING RIG**<br>Simco Earthprobe 200 | **TYPE/SIZE BIT**<br>N/A | **START DATE**<br>5/5/2005 | **END DATE**<br>5/5/2005 |
| **SAMPLER TYPE**<br>2' discrete sampler | **HAMMER WEIGHT/DROP**<br>N/A | **TOTAL DEPTH (feet below ground surface (ft bgs))**<br>21' | **WATER LEVEL (ft bgs)**<br>8' |

| WELL CONSTRUCTION | SAMPLES: NUMBER | SAMPLES: RECOVERY IN FEET | SAMPLES: BLOWS PER 6" | DEPTH | WATER | DESCRIPTION OF SOILS<br>f - fine m - medium c - coarse<br>lt - light dk - dark tr - trace ltl - little sl - slight | REMARKS<br>(PID, STAINING, ODORS, ETC.)<br>N/S = No Staining<br>N/O = No odors |
|---|---|---|---|---|---|---|---|
| | 8 | 0.6' | | 19 | | 19.0'-19.6': Fill-Black stained SILT, f to c SAND, GRAVEL, brick and rock chunks.<br><br>Sample collected: W18STMGP-SB4-1921 | 19'-21': Very strong MGP-related odor, heavy black staining, visible OLM<br><br>PID = 3,124 ppm max. |
| | | | | 21 | | E.O.B. at 21' bgs<br>(Refusal due to rocks and brick. Possible bottom of Former Gas Holder #2 at 21' bgs) | |
| | | | | 23 | | | |
| | | | | 25 | | | |
| | | | | 27 | | | |
| | | | | 29 | | | |
| | | | | 31 | | | |
| | | | | 33 | | | |
| | | | | 35 | | | |

TRC

**BORING No.: SB-5**

**SHEET 1 OF 2**

# BORING LOG

| JOB NAME/ CLIENT | PROJECT NO. | AREA OF SITE | |
|---|---|---|---|
| W18th St MGP SCS/Con Edison | 41318-0700-10000 | SW of Former Gas Holder #2 | |
| **ADDRESS** | | **ELEVATION/DATUM** | |
| Verizon Building on W 18th Street b/w 9th and 10th Ave | | 13.80/NAVD 88 | |
| **DRILLING CONTRACTOR** | **DRILLER** | **TRC INSPECTOR** | |
| Fenley and Nicol Environmental, Inc. | Scott Yanuck/Kevin Kegel | Jessica Elliott | |
| **DRILLING RIG** | **TYPE/SIZE BIT** | **START DATE** | **END DATE** |
| Geoprobe 6610DT | N/A | 5/2/2005 | 6/3/2005 |
| **SAMPLER TYPE** | **HAMMER WEIGHT/DROP** | **TOTAL DEPTH (feet below ground surface (ft bgs))** | **WATER LEVEL (ft bgs)** |
| 5' & 3' macrocore sampler | N/A | 31' | 11.5' |

| WELL CONSTRUCTION | SAMPLES: NUMBER | SAMPLES: RECOVERY IN FEET | SAMPLES: BLOWS PER 6" | DEPTH | WATER | DESCRIPTION OF SOILS (f - fine, m - medium, c - coarse; lt - light, dk - dark, tr - trace, ltl - little, sl - slight) | REMARKS (PID, STAINING, ODORS, ETC.) (N/S = No Staining, N/O = No odors) |
|---|---|---|---|---|---|---|---|
| | | | | | | 0'-0.2': CONCRETE and rebar. | |
| | | | | 1 | | 0.8'-2.0': Fill-Brown f to m SAND, some c sand, gravel, ltl silt, brick fragments and tr wood fibers. | 0.2'-2': N/O, N/S<br>PID = 1.7 ppm max. |
| | | | | 3 | | 2.0'-3.0': Fill-Brown f to c SAND, some gravel, pebbles, tr silt and brick fragments. | 2'-3': N/O, N/S<br>PID = 1.3 ppm max. |
| | | | | | | 3.0'-4.5': Fill-Brown f to c SAND, GRAVEL and brick fragments. | 3'-4': N/O, N/S<br>PID = 1.7 ppm max. |
| | | | | | | Sample collected: W18STMGP-SB5A-3.44 | 4'-5': N/O, N/S<br>PID = 3.9 ppm max. |
| | | | | 5 | | 5.0'-15.0': Drilled to 15' bgs and began sampling at 15' bgs. Soil descriptions recorded during installation of MW-5B were used for SB-5. | 5'-6.5': N/O, N/S |
| | 1 | 0.3' | | | | 5.0'-5.3': Fill-Brown SILT, f to m SAND, some c sand, ltl gravel and clay. | 5'-10': N/O, N/S<br>PID = 28.4 ppm max. |
| | | | | 7 | | | |
| | | | | 9 | | | |
| | | | | | | 10.0'-10.9': Fill-Lt to dk brown SILT, f to c SAND, GRAVEL and brick fragments. | 10'-11': Strong petroleum-like odor, sheen, N/S |
| | 2 | 1.4' | | 11 | | 10.9'-11.4': Fill-Lt brown f to c SAND and GRAVEL. | PID = 387 ppm max.<br>11'-15': Very strong petroleum-like odor, black staining, sheen<br>PID = 4,085 ppm max. |
| | | | | 13 | | | |
| | | | | 15 | | 15.0'-17.5': Wood timbers. | 15'-19': Strong petroleum-like odor, sheen black staining on wood, tr NAPL. |
| | 3 | 5.0' | | | | | PID = 198 ppm max. |
| | | | | 17 | | 17.5'-19.0': Fill-Brown-gray m to c SAND, tr f sand and gravel. | |
| | | | | | | Sample collected: W18STMGP-SB5A-1719 | |

TRC

**BORING No.: SB-5**

**SHEET 2 OF 2**

# BORING LOG

| JOB NAME/ CLIENT | PROJECT NO. | AREA OF SITE | |
|---|---|---|---|
| W18th St MGP SCS/Con Edison | 41318-0700-10000 | SW of Former Gas Holder #2 | |
| **ADDRESS** | | **ELEVATION/DATUM** | |
| Verizon Building on W 18th Street b/w 9th and 10th Ave | | 13.80/NAVD 88 | |
| **DRILLING CONTRACTOR** | **DRILLER** | **TRC INSPECTOR** | |
| Fenley and Nicol Environmental, Inc. | Scott Yanuck/Kevin Kegel | Jessica Elliott | |
| **DRILLING RIG** | **TYPE/SIZE BIT** | **START DATE** | **END DATE** |
| Geoprobe 6610DT | N/A | 5/2/2005 | 6/3/2005 |
| **SAMPLER TYPE** | **HAMMER WEIGHT/DROP** | **TOTAL DEPTH (feet below ground surface (ft bgs))** | **WATER LEVEL (ft bgs)** |
| 5' & 3' macrocore sampler | N/A | 31' | 11.5' |

| WELL CONSTRUCTION | SAMPLES: NUMBER | SAMPLES: RECOVERY IN FEET | SAMPLES: BLOWS PER 6" | DEPTH | WATER | DESCRIPTION OF SOILS (f - fine, m - medium, c - coarse; lt - light, dk - dark, tr - trace, ltl - little, sl - slight) | REMARKS (PID, STAINING, ODORS, ETC.) (N/S = No Staining, N/O = No odors) |
|---|---|---|---|---|---|---|---|
| | | | | 19 | | 19.0'-19.6': Fill-Black stained SILT, f to c SAND, GRAVEL, brick and rock chunks. | 19'-20': Tr petroleum-like odor, N/S |
| | | | | | | Sample collected: W18STMGP-SB5A-1920 | PID = 6.8 ppm max. |
| | | | | | | 20.0'-25.0': ML-Gray silty CLAY and tr f sand. | 20'-25': Very sl petroleum-like odor, N/S |
| | 4 | 5.0' | | 21 | | | PID = 8.4 ppm max. |
| | | | | 23 | | | |
| | | | | 25 | | | |
| | | | | | | 26.0'-26.5': SP-Brown c SAND, tr gravel and m sand. | 26'-29': N/O, N/S |
| | 5 | 1.5' | | 27 | | 26.5'-27.5: SM-Brown c SAND, SILT, CLAY, ltl f to m sand and tr gravel. | PID = 8.0 ppm max. |
| | | | | | | Sample collected: W18STMGP-SB5A-2628 | |
| | | | | 29 | | 29.0'-30.5': SP-Brown m SAND. | 29'-31': N/O, N/S |
| | 6 | 1.5' | | | | | PID = 5.0 ppm max. |
| | | | | 31 | | E.O.B. at 31' bgs | |
| | | | | | | (Heaving sands in casing from 12'-31' bgs. Move location over 2' and attempt new SB-5/MW-5B location) | |
| | | | | 33 | | | |
| | | | | 35 | | | |

TRC

**BORING No.: MW-5A**

**SHEET 1 OF 2**

# BORING LOG

| JOB NAME/ CLIENT | PROJECT NO. | AREA OF SITE | |
|---|---|---|---|
| W18th St MGP SCS/Con Edison | 41318-0700-10000 | SW of Former Gas Holder #2 | |
| **ADDRESS** | | **ELEVATION/DATUM** | |
| Verizon Building on W 18th Street b/w 9th and 10th Ave | | 13.84/NAVD 88 | |
| **DRILLING CONTRACTOR** | **DRILLER** | **TRC INSPECTOR** | |
| Fenley and Nicol Environmental, Inc. | Scott Yanuck | Jessica Elliott | |
| **DRILLING RIG** | **TYPE/SIZE BIT** | **START DATE** | **END DATE** |
| Geoprobe 6610DT | N/A | 5/2/2005 | 5/2/2005 |
| **SAMPLER TYPE** | **HAMMER WEIGHT/DROP** | **TOTAL DEPTH (feet below ground surface (ft bgs))** | **WATER LEVEL (ft bgs)** |
| 5' macrocore sampler | N/A | 22' | 11.5' |

| WELL CONSTRUCTION | SAMPLES: NUMBER | SAMPLES: RECOVERY IN FEET | SAMPLES: BLOWS PER 6" | DEPTH | WATER | DESCRIPTION OF SOILS (f - fine, m - medium, c - coarse; lt - light, dk - dark, tr - trace, ltl - little, sl - slight) | REMARKS (PID, STAINING, ODORS, ETC.; N/S = No Staining, N/O = No odors) |
|---|---|---|---|---|---|---|---|
| | | | | | | 0'-0.8': CONCRETE and rebar. | |
| | | | | 1 | | 0.8'-2.0': Fill-Brown SILT, f SAND, some m sand, tr c sand, gravel and cobbles. | 0.8'-2': N/O, N/S<br>PID = 1.7 ppm max. |
| | | | | | | 2.0'-4.0': Fill-Brown f to c SAND, some gravel, cobbles and tr silt. | 2'-3': N/O, N/S |
| | | | | 3 | | Sample collected: W18STMGP-SB5B-2.53 | PID = 0.9 ppm max.<br>3'-4': N/O, N/S<br>PID = 5.6 ppm max. |
| | | | | | | 4.0'-4.5': Fill-Brown f to c SAND, some gravel, cobbles, tr silt and brick fragments. | 4'-5': N/O, N/S<br>PID = 0.9 ppm max. |
| | | | | 5 | | 5.0'-5.3': Fill-Brown SILT, f to m SAND, some c sand, ltl gravel and clay. | 5'-10': N/O, N/S |
| | 1 | 0.3' | | | | | PID = 28.4 ppm max. |
| | | | | 7 | | | |
| | | | | 9 | | | |
| | | | | | | 10.0'-10.9': Fill-Lt to dk brown SILT, f to c SAND, GRAVEL and brick fragments. | 10'-11': Strong petroleum-like odor, sheen, N/S |
| | 2 | 1.4' | | 11 | | Sample collected: W18STMGP-SB5B-1011 | PID = 387 ppm max. |
| | | | | | | 10.9'-11.4': Fill-Lt brown f to c SAND and GRAVEL. | |
| | | | | | | Sample collected: W18STMGP-SB5B-1112 | 11'-15': Very strong petroleum-like odor, black staining, sheen<br>PID = 4,085 ppm max. |
| | | | | 13 | | | |
| | | | | 15 | | | 15'-20': Very strong petroleum-like odor, N/S, sheen |
| | | | | | | 15.0'-15.1': Fill-Brown-gray SILT, f SAND and tr gravel. | |
| | 3 | 0.1' | | | | | PID = 1,222 ppm max. |
| | | | | 17 | | | |

Sand
Bentonite Chips
Concete
Well Screen

TRC

**BORING No.: MW-5A**

**SHEET 2 OF 2**

# BORING LOG

| | | | |
|---|---|---|---|
| **JOB NAME/ CLIENT**<br>W18th St MGP SCS/Con Edison | **PROJECT NO.**<br>41318-0700-10000 | **AREA OF SITE**<br>SW of Former Gas Holder #2 | |
| **ADDRESS**<br>Verizon Building on W 18th Street b/w 9th and 10th Ave | | **ELEVATION/DATUM**<br>13.84/NAVD 88 | |
| **DRILLING CONTRACTOR**<br>Fenley and Nicol Environmental, Inc. | **DRILLER**<br>Scott Yanuck | **TRC INSPECTOR**<br>Jessica Elliott | |
| **DRILLING RIG**<br>Geoprobe 6610DT | **TYPE/SIZE BIT**<br>N/A | **START DATE**<br>5/2/2005 | **END DATE**<br>5/2/2005 |
| **SAMPLER TYPE**<br>5' macrocore sampler | **HAMMER WEIGHT/DROP**<br>N/A | **TOTAL DEPTH (feet below ground surface (ft bgs))**<br>22' | **WATER LEVEL (ft bgs)**<br>11.5' |

| WELL CONSTRUCTION | SAMPLES: NUMBER | SAMPLES: RECOVERY IN FEET | SAMPLES: BLOWS PER 6" | DEPTH | WATER | DESCRIPTION OF SOILS<br>f - fine m - medium c - coarse<br>lt - light dk - dark tr - trace ltl - little sl - slight | REMARKS<br>(PID, STAINING, ODORS, ETC.)<br>N/S = No Staining<br>N/O = No odors |
|---|---|---|---|---|---|---|---|
| | | | | 19 | | | 18'-22': N/O, N/S<br>PID = 1.9 ppm max. |
| | 4 | 2.0' | | 21 | | 20.0'-21.0': Fill-Brown m to c SAND, tr gravel, silt and brick and concrete fragments.<br>Sample collected: W18STMGP-SB5B-2122 | 20'-21': Sl petroleum-like odor, N/S, sheen<br>PID = 55 ppm max.<br>21'-22': Sl petroleum-like odor, N/S, tr sheen<br>PID = 12.4 ppm max. |
| | | | | 23 | | E.O.B. at 22' bgs (Refusal due to brick/concrete at 22' bgs) | |
| | | | | 25 | | | |
| | | | | 27 | | | |
| | | | | 29 | | | |
| | | | | 31 | | | |
| | | | | 33 | | | |
| | | | | 35 | | Well set at 19' bgs.<br>Screen interval from 19.0' to 9.0' bgs. | |

Sand
Bentonite Chips
Concete
Well Screen

TRC

**BORING No.: MW-5B**

**SHEET 1 OF 3**

# BORING LOG

| JOB NAME/ CLIENT | PROJECT NO. | AREA OF SITE | |
|---|---|---|---|
| W18th St MGP SCS/Con Edison | 41318-0700-10000 | SW of Former Gas Holder #2 | |
| **ADDRESS** | | **ELEVATION/DATUM** | |
| Verizon Building on W 18th Street b/w 9th and 10th Ave | | 13.80/NAVD 88 | |
| **DRILLING CONTRACTOR** | **DRILLER** | **TRC INSPECTOR** | |
| Fenley and Nicol Environmental, Inc. | Scott Yanuck | Jessica Elliott | |
| **DRILLING RIG** | **TYPE/SIZE BIT** | **START DATE** | **END DATE** |
| Geoprobe 6610DT | N/A | 6/1/2005 | 6/8/2005 |
| **SAMPLER TYPE** | **HAMMER WEIGHT/DROP** | **TOTAL DEPTH (feet below ground surface (ft bgs))** | **WATER LEVEL (ft bgs)** |
| 5' macrocore & 2' & 4' discrete sampler | N/A | 42' | 11.5' |

| WELL CONSTRUCTION | SAMPLES: NUMBER | SAMPLES: RECOVERY IN FEET | SAMPLES: BLOWS PER 6" | DEPTH | WATER | DESCRIPTION OF SOILS (f - fine m - medium c - coarse; lt - light dk - dark tr - trace ltl - little sl - slight) | REMARKS (PID, STAINING, ODORS, ETC.; N/S = No Staining N/O = No odors) |
|---|---|---|---|---|---|---|---|
| | | | | | | 0'-0.8': CONCRETE and rebar. | |
| | | | | 1 | | 0.8'-2.0': Fill-Brown SILT, f SAND, some m sand, tr c sand, gravel and cobbles. | 0.8'-2': N/O, N/S<br>PID = 1.7 ppm max. |
| | | | | | | 2.0'-4.0': Fill-Brown f to c SAND, some gravel, cobbles and tr silt. | 2'-3': N/O, N/S |
| | | | | 3 | | Sample collected: W18STMGP-SB5A-3.54 | PID = 0.9 ppm max.<br>3'-4': N/O, N/S<br>PID = 5.6 ppm max. |
| | | | | | | 4.0'-4.5': Fill-Brown f to c SAND, some gravel, cobbles, tr silt and brick fragments. | 4'-5': N/O, N/S<br>PID = 0.9 ppm max. |
| | | | | 5 | | 5.0'-5.3': Fill-Brown SILT, f to m SAND, some c sand, ltl gravel and clay. | 5'-10': N/O, N/S |
| | 1 | 0.3' | | | | | PID = 28.4 ppm max. |
| | | | | 7 | | | |
| | | | | 9 | | | |
| | | | | | | 10.0'-10.9': Fill-Lt to dk brown SILT, f to c SAND, GRAVEL and brick fragments. | 10'-11': Strong petroleum-like odor, sheen, N/S |
| | 2 | 1.4' | | 11 | | 10.9'-11.4': Fill-Lt brown f to c SAND and GRAVEL. | PID = 387 ppm max. |
| | | | | | | | 11'-15': Very strong petroleum-like odor, black staining, sheen<br>PID = 4,085 ppm max. |
| | | | | 13 | | | |
| | | | | 15 | | | 15'-19': Very strong petroleum-like odor, N/S, sheen |
| | 3 | 0.1' | | | | 15.0'-15.1': Fill-Brown-gray SILT, f SAND and tr gravel. | PID = 1,222 ppm max. |
| | | | | | | Begin sampling for MW-5B at 17' bgs (2' discrete sampler) in order to determine top of clay interval. | |
| | | | | 17 | | Sample collected: W18STMGP-SB5A-1719 | |
| | 4 | 2.0' | | | | | |

No Backfill/Hole Collapse

Concete

Well Screen

TRC

# BORING LOG

| JOB NAME/ CLIENT | PROJECT NO. | AREA OF SITE | |
|---|---|---|---|
| W18th St MGP SCS/Con Edison | 41318-0700-10000 | SW of Former Gas Holder #2 | |
| **ADDRESS** | | **ELEVATION/DATUM** | |
| Verizon Building on W 18th Street b/w 9th and 10th Ave | | 13.80/NAVD 88 | |
| **DRILLING CONTRACTOR** | **DRILLER** | **TRC INSPECTOR** | |
| Fenley and Nicol Environmental, Inc. | Scott Yanuck | Jessica Elliott | |
| **DRILLING RIG** | **TYPE/SIZE BIT** | **START DATE** | **END DATE** |
| Geoprobe 6610DT | N/A | 5/2/2005 | 5/2/2005 |
| **SAMPLER TYPE** | **HAMMER WEIGHT/DROP** | **TOTAL DEPTH (feet below ground surface (ft bgs))** | **WATER LEVEL (ft bgs)** |
| 5' macrocore & 2' & 4' discrete sampler | N/A | 42' | 11.5' |

| WELL CONSTRUCTION | SAMPLES: NUMBER | SAMPLES: RECOVERY IN FEET | SAMPLES: BLOWS PER 6" | DEPTH | WATER | DESCRIPTION OF SOILS (f - fine, m - medium, c - coarse; lt - light, dk - dark, tr - trace, ltl - little, sl - slight) | REMARKS (PID, STAINING, ODORS, ETC.; N/S = No Staining, N/O = No odors) |
|---|---|---|---|---|---|---|---|
| | | | | 19 | | 18.5'-19.0': ML-Tan silty CLAY and tr f sand. | |
| | | | | | | 19.0'-21.0': SM-Brown f to m SAND, SILT, tr clay, gravel and c sand. | 19'-21': Sheen |
| | 5 | 2.0' | | | | Sample collected: W18STMGP-SB5A-1920 | |
| | | | | 21 | | 21.0'-23.0': GW-Brown f to c SAND, GRAVEL, some silt and intervals of silty clay interval (varying thickness from approximately 0.2'-0.3'). | |
| | 6 | 2.0' | | | | | |
| | | | | 23 | | 23.0'-25.0': SW-Red-brown m to c SAND, ltl gravel and 0.25' thick interval of silty CLAY in bottom of sample (24.75'-25.0'). | |
| | 7 | 2.0' | | | | | |
| | | | | 25 | | | |
| | | | | | | 26.0'-28.0': SM-Lt brown SILT, f SAND, some clay and m to c sand and gravel. | |
| | 8 | 2.0' | | 27 | | Sample collected: W18STMGP-SB5A-2628 | |
| | | | | | | 28.0'-31.0': SM-Brown f SAND, some silt, tr m sand and c sand. | 28'-32': N/O, N/S<br>PID = 0.0 ppm max. |
| | 9 | 4.0' | | 29 | | | |
| | | | | 31 | | 31.0'-31.3': ML-Tan silty CLAY and tr f sand. | |
| | | | | | | 31.3'-36.0': SW-Brown m to c SAND and some f sand. | 32'-36': Very sl non-MGP related odor, N/S<br>PID = 0.0 ppm max. |
| | 10 | 4.0' | | 33 | | Sample collected: W18STMGP-MW5B-3436 | |
| | | | | 35 | | 36.0'-42.0': Soils were not logged, but 3.25" steel casing was advanced to 42' bgs to set monitoring well MW-5B with the screen interval below any clay intervals. | |

No Backfill/Hole Collapse
Concete
Well Screen

TRC

**BORING No.: MW-5B**

**SHEET 3 OF 3**

# BORING LOG

| JOB NAME/ CLIENT | PROJECT NO. | AREA OF SITE | |
|---|---|---|---|
| W18th St MGP SCS/Con Edison | 41318-0700-10000 | SW of Former Gas Holder #2 | |
| **ADDRESS** | | **ELEVATION/DATUM** | |
| Verizon Building on W 18th Street b/w 9th and 10th Ave | | 13.80/NAVD 88 | |
| **DRILLING CONTRACTOR** | **DRILLER** | **TRC INSPECTOR** | |
| Fenley and Nicol Environmental, Inc. | Scott Yanuck | Jessica Elliott | |
| **DRILLING RIG** | **TYPE/SIZE BIT** | **START DATE** | **END DATE** |
| Geoprobe 6610DT | N/A | 6/1/2005 | 6/8/2005 |
| **SAMPLER TYPE** | **HAMMER WEIGHT/DROP** | **TOTAL DEPTH (feet below ground surface (ft bgs))** | **WATER LEVEL (ft bgs)** |
| 5' macrocore & 2' & 4' discrete sampler | N/A | 42' | 11.5' |

| WELL CONSTRUCTION | SAMPLES: NUMBER | SAMPLES: RECOVERY IN FEET | SAMPLES: BLOWS PER 6" | DEPTH | WATER | DESCRIPTION OF SOILS (f - fine, m - medium, c - coarse; lt - light, dk - dark, tr - trace, ltl - little, sl - slight) | REMARKS (PID, STAINING, ODORS, ETC.) N/S = No Staining N/O = No odors |
|---|---|---|---|---|---|---|---|
| | | | | 37 | | | |
| | | | | 39 | | | |
| | | | | 41 | | | |
| | | | | | | E.O.B. at 42' bgs | |
| | | | | 43 | | | |
| | | | | 45 | | | |
| | | | | 47 | | | |
| | | | | 49 | | | |
| | | | | 51 | | | |
| | | | | 53 | | Well set at 42' bgs. Screen interval from 32' to 42' bgs. | No Backfill/Hole Collapse; Concete; Well Screen |

TRC

**BORING No.: SB-6**

**SHEET 1 OF 4**

# BORING LOG

| JOB NAME/ CLIENT | PROJECT NO. | AREA OF SITE | |
|---|---|---|---|
| W18th St MGP SCS/Con Edison | 41318-0700-10000 | NW of Former Gas Holder #2 | |
| **ADDRESS** | | **ELEVATION/DATUM** | |
| Verizon Building on W 18th Street b/w 9th and 10th Ave | | 13.69/NAVD 88 | |
| **DRILLING CONTRACTOR** | **DRILLER** | **TRC INSPECTOR** | |
| Fenley and Nicol Environmental, Inc. | Scott Yanuck | Jessica Elliott | |
| **DRILLING RIG** | **TYPE/SIZE BIT** | **START DATE** | **END DATE** |
| Geoprobe 6610DT | N/A | 5/12/2005 | 5/13/2005 |
| **SAMPLER TYPE** | **HAMMER WEIGHT/DROP** | **TOTAL DEPTH (feet below ground surface (ft bgs))** | **WATER LEVEL (ft bgs)** |
| 3' & 5' macrocore sampler with 31/4" steel casi | N/A | 72' | 13' |

| WELL CONSTRUCTION | SAMPLES: NUMBER | SAMPLES: RECOVERY IN FEET | SAMPLES: BLOWS PER 6" | DEPTH | WATER | DESCRIPTION OF SOILS (f - fine, m - medium, c - coarse; lt - light, dk - dark, tr - trace, ltl - little, sl - slight) | REMARKS (PID, STAINING, ODORS, ETC.) (N/S = No Staining, N/O = No odors) |
|---|---|---|---|---|---|---|---|
| | | | | | | 0'-0.3': CONCRETE and rebar. | |
| | | | | 1 | | 0.8'-2.0': Fill-Brown SILT, f SAND and tr gravel. | 0.3'-2': N/O, N/S<br>PID = 4.0 ppm max. |
| | | | | 3 | | 2.0'-5.0': Fill-Brown f SAND, some silt, gravel and brick fragments. | 2'-3': N/O, N/S<br>PID = 1.7 ppm max.<br>3'-4': N/O, N/S<br>PID = 1.4 ppm max.<br>4'-5': N/O, N/S<br>PID = 2.5 ppm max. |
| | | | | 5 | | 5.0'-6.7': Fill-Brown SILT, f SAND, tr m to c sand and gravel. | 5'-10': N/O, N/S<br>PID = 0.3 ppm max. |
| | 1 | 1.7' | | 7 | ▼ | | |
| | | | | 9 | | | |
| | | | | | | 10.0'-11.7': Fill- Brown SILT, f SAND, some m to c sand and tr gravel. | 10'-13': Sl petroleum-like odor (stronger at tip of sample), tr black staining |
| | 2 | 1.7' | | 11 | | Sample collected: W18STMGP-SB6-1012 | PID (sample sleeve) = 265 ppm max.<br>PID (sample tip) = 2,060 ppm max. |
| | | | | 13 | | 12.9'-13.0' (tip of 10'-13' sample): Brown f to c SAND, SILT and some gravel.<br>13.0'-14.4': Fill-Gray-brown SILT, f SAND and tr c sand. | 13'-16': Strong petroleum-like odor, some black staining, sheen, tr NAPL |
| | 3 | 1.4' | | | | Sample collected: W18STMGP-SB6-1315 | PID = 3,520 ppm max. |
| | | | | 15 | | | |
| | | | | | | 16.0'-16.4': Fill-Dk brown SILT, f SAND, tr m sand and rock fragments. | 16'-19': Sl petroleum-like odor, N/S |
| | 4 | 0.4 | | 17 | | | PID = 134 ppm max. |

TRC

# BORING LOG

| JOB NAME/ CLIENT | PROJECT NO. | AREA OF SITE | |
|---|---|---|---|
| W18th St MGP SCS/Con Edison | 41318-0700-10000 | NW of Former Gas Holder #2 | |
| **ADDRESS** | | **ELEVATION/DATUM** | |
| Verizon Building on W 18th Street b/w 9th and 10th Ave | | 13.69/NAVD 88 | |
| **DRILLING CONTRACTOR** | **DRILLER** | **TRC INSPECTOR** | |
| Fenley and Nicol Environmental, Inc. | Scott Yanuck | Jessica Elliott | |
| **DRILLING RIG** | **TYPE/SIZE BIT** | **START DATE** | **END DATE** |
| Geoprobe 6610DT | N/A | 5/12/2005 | 5/13/2005 |
| **SAMPLER TYPE** | **HAMMER WEIGHT/DROP** | **TOTAL DEPTH (feet below ground surface (ft bgs))** | **WATER LEVEL (ft bgs)** |
| 3' & 5' macrocore sampler with 31/4" steel ca | N/A | 72' | 13' |

| WELL CONSTRUCTION | SAMPLES: NUMBER | SAMPLES: RECOVERY IN FEET | SAMPLES: BLOWS PER 6" | DEPTH | WATER | DESCRIPTION OF SOILS (f - fine, m - medium, c - coarse; lt - light, dk - dark, tr - trace, ltl - little, sl - slight) | REMARKS (PID, STAINING, ODORS, ETC.) (N/S = No Staining, N/O = No odors) |
|---|---|---|---|---|---|---|---|
| | | | | 19 | | 0'-19.0': 3 1/4" steel casing installed to 19' bgs. Discrete sampling from 19'-72' bgs. | |
| | | | | | | 19.0'-20.9': Fill-Brown SILT, f SAND and tr m sand and gravel (2' discrete sampler). | 19'-20': N/O, N/S |
| | 5 | 0.8' | | | | | PID = 45 ppm max. |
| | | | | | | Sample collected: W18STMGP-SB6-1921 | 20'-23': N/O, N/S |
| | 6 | 2.9' | | 21 | | 20.9'-22.9': Fill-Lt brown f to c SAND, GRAVEL, rock fragments and tr brick fragments. | PID = 2.4 ppm max. |
| | | | | 23 | | 23.0'-26.1': SM-Brown-dk brown SILT, f SAND, with pockets of m to c sand and tr gravel. | 23'-27': N/O, N/S |
| | 7 | 4.0' | | | | | PID = 0.9 ppm max. |
| | | | | | | Sample collected: W18STMGP-SB6-2426 | |
| | | | | 25 | | | |
| | | | | | | 26.1'-28.2': ML-Tan silty CLAY and tr f sand. | |
| | | | | 27 | | | 27'-32': N/O, N/S |
| | 8 | 5.0' | | | | | PID = 0.0 ppm max. |
| | | | | | | 28.2'-36.0': SP-Brown f to m SAND and tr silt. | |
| | | | | 29 | | Sample collected: W18STMGP-SB6-28.530.5 | |
| | | | | 31 | | | 32'-37': N/O, N/S |
| | | | | | | | PID = 0.0 ppm max. |
| | 9 | 5.0' | | 33 | | | |
| | | | | 35 | | | |

TRC

**BORING No.: SB-6**

**SHEET 3 OF 4**

# BORING LOG

| JOB NAME/ CLIENT | PROJECT NO. | AREA OF SITE | |
|---|---|---|---|
| W18th St MGP SCS/Con Edison | 41318-0700-10000 | NW of Former Gas Holder #2 | |
| **ADDRESS** | | **ELEVATION/DATUM** | |
| Verizon Building on W 18th Street b/w 9th and 10th Ave | | 13.69/NAVD 88 | |
| **DRILLING CONTRACTOR** | **DRILLER** | **TRC INSPECTOR** | |
| Fenley and Nicol Environmental, Inc. | Scott Yanuck | Jessica Elliott | |
| **DRILLING RIG** | **TYPE/SIZE BIT** | **START DATE** | **END DATE** |
| Geoprobe 6610DT | N/A | 5/12/2005 | 5/13/2005 |
| **SAMPLER TYPE** | **HAMMER WEIGHT/DROP** | **TOTAL DEPTH (feet below ground surface (ft bgs))** | **WATER LEVEL (ft bgs)** |
| 3' & 5' macrocore sampler with 31/4" steel ca | N/A | 72' | 13' |

| WELL CONSTRUCTION | SAMPLES: NUMBER | SAMPLES: RECOVERY IN FEET | SAMPLES: BLOWS PER 6" | DEPTH | WATER | DESCRIPTION OF SOILS (f - fine, m - medium, c - coarse; lt - light, dk - dark, tr - trace, ltl - little, sl - slight) | REMARKS (PID, STAINING, ODORS, ETC.) (N/S = No Staining, N/O = No odors) |
|---|---|---|---|---|---|---|---|
| | | | | 37 | | 36.0'-36.5': SP-Brown very c SAND.<br>36.5'-38.0': SP-Brown f to m SAND. | |
| | 10 | 5.0' | | 39 | | 38.0'-40.0': ML-Tan silty CLAY and tr f sand. | |
| | | | | 41 | | 40.0'-57.0': SP-Brown f to m SAND and tr c sand. | |
| | | | | | | | 37'-42': N/O, N/S<br>PID = 0.0 ppm max. |
| | 11 | 5.0' | | 43 | | | |
| | | | | 45 | | | |
| | | | | 47 | | | 42'-47': N/O, N/S<br>PID = 0.0 ppm max. |
| | 12 | 5.0' | | 49 | | | |
| | | | | 51 | | | 47'-52': N/O, N/S<br>PID = 0.0 ppm max. |
| | 13 | 5.0' | | 53 | | | |

TRC

**BORING No.: SB-6**

**SHEET 4 OF 4**

# BORING LOG

| JOB NAME/ CLIENT | PROJECT NO. | AREA OF SITE | |
|---|---|---|---|
| W18th St MGP SCS/Con Edison | 41318-0700-10000 | NW of Former Gas Holder #2 | |
| **ADDRESS** | | **ELEVATION/DATUM** | |
| Verizon Building on W 18th Street b/w 9th and 10th Ave | | 13.69/NAVD 88 | |
| **DRILLING CONTRACTOR** | **DRILLER** | **TRC INSPECTOR** | |
| Fenley and Nicol Environmental, Inc. | Scott Yanuck | Jessica Elliott | |
| **DRILLING RIG** | **TYPE/SIZE BIT** | **START DATE** | **END DATE** |
| Geoprobe 6610DT | N/A | 5/12/2005 | 5/13/2005 |
| **SAMPLER TYPE** | **HAMMER WEIGHT/DROP** | **TOTAL DEPTH (feet below ground surface (ft bgs))** | **WATER LEVEL (ft bgs)** |
| 3' & 5' macrocore sampler with 31/4" steel ca | N/A | 72' | 13' |

| WELL CONSTRUCTION | SAMPLES: NUMBER | SAMPLES: RECOVERY IN FEET | SAMPLES: BLOWS PER 6" | DEPTH | WATER | DESCRIPTION OF SOILS (f - fine, m - medium, c - coarse; lt - light, dk - dark, tr - trace, ltl - little, sl - slight) | REMARKS (PID, STAINING, ODORS, ETC.; N/S = No Staining, N/O = No odors) |
|---|---|---|---|---|---|---|---|
| | | | | 55 | | | |
| | | | | 57 | | 57.0'-66.7': SW-Brown f to m SAND and some c sand. | 57'-62': N/O, N/S |
| | 14 | 5.0' | | | | | PID = 0.0 ppm max. |
| | | | | 59 | | | |
| | | | | 61 | | | |
| | | | | | | | 62'-67': N/O, N/S |
| | 15 | 5.0' | | 63 | | | PID = 0.0 ppm max. |
| | | | | 65 | | | |
| | | | | 67 | | 66.7'-67.0': GC-Brown f to very c SAND and GRAVEL. | |
| | | | | | | 67.0'-71.75': GP-Brown m to very c SAND, GRAVEL and tr f sand. | 67'-72': N/O, N/S |
| | 16 | 5.0' | | | | | PID = 0.0 ppm max. |
| | | | | 69 | | | |
| | | | | 71 | | Sample collected: W18STMGP-SB6-7072 | |
| | | | | | | 71.75'-72.0': Refusal-Schist fragments in spoon. | |

E.O.B. at 72' bgs (Refusal due to hard rock).

TRC

**TRC Environmental Corp.**

## TEST PIT LOG

Sheet 1 Of 1

| Project No. | Client | Test Pit No. | |
|---|---|---|---|
| 41318 | Con Edison | TP-1 | |
| Location | | Elevation & Datum | |
| Verizon Building on W 18th Street | | 13.70 NAVD '88 | |
| | | TRC Inspector | |
| | | Jessica Elliott | |
| Contractor | | Date Started/Completed | Completion Status |
| Fenley and Nicol Environmental | | 4/27/2005 | 4/27/2005-Backfilled |
| Excavator | | Total Depth (ftbg) | Water Level (ftbg) Obs. Stab. |
| Manual Excavation | | 4.2' | N/A |
| Sampler Type | | | |
| Grab | | | |

| DEPTH ( FT BGS) | WATER | SAMPLE DESCRIPTION | REMARKS (PID/DID, ETC) |
|---|---|---|---|
| 0.0' | | CONCRETE and rebar (0.0'-0.3') | |
| 1.0' | | Intact red brick wall encountered along eastern wall of SB-6 and western wall of TP-1 (Western ring wall of Former Gas Holder #2). Brick wall running N-S and approximately 20" wide. excavated along eastern side of wall (interior). | rick v N/O, N/S PID = 1.4 ppm max. |
| 2.0' | | 1.0'-4.2': Brown-dark brown f to c SAND, GRAVEL, COBBLES, brick fragments and large rock (schist) fragments and chunks. | N/O, N/S PID = 1.1 ppm max. |
| 3.0' | | | N/O, N/S PID = 1.1 ppm max. |
| 4.0' | | | N/O, N/S |
| | | E.O.T.P. at 4.2' bgs (2.0' x 2.0') | PID=1.0 ppm max. |
| 5.0' | | | |

**TRC Environmental Corp.**

## TEST PIT LOG

Sheet 1 Of 1

| | | | |
|---|---|---|---|
| **Project No.** | **Client** | **Test Pit No.** | |
| **41318** | **Con Edison** | **TP-1B** | |
| **Location** | | **Elevation & Datum** | |
| | | **13.24 NAVD '88** | |
| **Verizon Building on W 18th Street** | | **TRC Inspector** | |
| | | **Jessica Elliott** | |
| **Contractor** | | **Date Started/Completed** | **Completion Status** |
| | | **5/4/2005** | **5/4/2005-Backfilled** |
| **Fenley and Nicol Environmental** | | **Total Depth (ftbg)** | **Water Level (ftbg)** |
| **Excavator** | | | **Obs. Stab.** |
| | | **3'** | **N/A** |
| **Manual Excavation** | | | |
| **Sampler Type** | | | |
| **Grab** | | | |

| DEPTH ( FT BGS) | WATER | SAMPLE DESCRIPTION | REMARKS (PID/DID, ETC) |
|---|---|---|---|
| 0.0' | | CONCRETE and rebar (0.0'-0.7') | |
| | | 0.7'-2.0': Fill-Brown SILT, f to c SAND, GRAVEL, some cobbles, brick and rock fragments. | Gasoline-like odor, N/S PID = 667 ppm max. |
| | | Sample collected: W18STMGP-TP1B-1.01.5 | |
| 1.0' | | 1.0': Intact red brick wall (western ring wall of Former Gas Holder #1). Brick wall running N-S and approximately 18" wide. Excavated along eastern side of wall (holder interior). | |
| | | excavated along eastern side of wall (interior). | |
| 2.0' | | 2.0'-3.0': Brown SILT, f SAND, ltl m to c sand, gravel, brick fragments, wood timbers and rock (schist) fragments. | Gasoline-like odor, black staining on wood timbers PID = 78.2 ppm max. |
| 3.0' | | 3.0': Large boulders; unable to excavate deeper. | Gasoline-like odor, N/S PID = 46.0 ppm max. |
| | | E.O.T.P. at 3' bgs (7.5' x 2.0') | |
| 4.0' | | | |

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**Appendix C**

Groundwater Sampling and Development Logs

**ARCADIS**

## Water-Level Measurement Form

Project No.: B0043011.1.3 Field Personnel: Craig Massaro
Site Location: Verizon Building 438 West 18th St. Date: 9-29-08
Instrument Model: Solinst Interface Probe. Instrument Serial No.:

| Well Number | Time | W.L. Measurements TD (feet) | DTW (feet) | DTP (feet) | Comments Well Locked | Lock Condition | Other Comments |
|---|---|---|---|---|---|---|---|
| MW-2 | 1140 | 13.20 | 11.47 | — | No | — | 4" |
| MW-1 | 1141 | 15.10 | 11.40 | — | No | — | 4" |
| MW-10 | | | | | | | |
| MW-7 | 1144 | 13.44 | 12.23 | — | No | — | 4" |
| MW-4 | 1146 | 14.35 | 12.60 | — | No | — | 4" |
| MW-5 | 1150 | 14.10 | 13.32 | — | No | — | 4" Mod. odors, debris on probe |
| MW-3 | 1148 | 14.70 | 12.91 | — | No | — | 4" |
| MW-12 | 1157 | 18.85 | 12.96 | — | No | | 1.5" Faint odor, debris on probe No cap (plug) |
| MW-8 | 1152 | 17.00 | 12.05 | — | No | — | 4" Faint odors, debris on probe |
| MW-11 | 1202 | 18.30 | 11.64 | — | No | — | 1.5" " " |
| MW-9 | 1205 | NR | 13.75 | 13.73 | No | — | 4" |
| MW-13 | Destroyed | | — | — | — | — | — |
| Well Cluster A1 | 1218 | 11.14 | Dry | — | No | — | — |
| Well Cluster A2 | 1220 | 15.02 | 11.27 | — | | | |
| Well Cluster A3 | 1222 | 19.25 | 11.30 | — | | | |
| Well Cluster C1 | 1223 | 10.60 | Dry | — | No | — | 2" sed on probe |
| Well Cluster C2 | 1225 | 15.55 | 11.44 | — | No | — | 2" |
| Well Cluster C3 | 1228 | 21.38 | 11.38 | — | No | — | 2" |
| SB-B1 | 1230 | 11.35 | Dry | — | No | — | 2" |
| SB-B2 | 1232 | 15.32 | 13.38 | — | No | — | 2" |
| SB-B3 | 1235 | 20.18 | 13.20 | — | No | — | 2" |
| MW-5A | 1214 | 18.88 | 14.28 | — | No | — | 2" |
| MW-5B | 1211 | 41.2 | 14.20 | — | No | No | 2" |
| MW-6 | Abandoned | | — | — | — | — | — |
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W.L. Water Level
TD Total Depth
DTW Depth To Water
DTP Depth To Product

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Infrastructure, environment, facilities

# Low-Flow Groundwater Sampling Log

Project: West 18th St MGP
Project Number: B0043011.13
Site Location: Manhattan, NY
Well ID: MW-1
Date: 10-2-08
Sampled By: C. Massaro / G. William
Sampling Time: 1125
Recorded By: " "
Weather: 60 °F
Coded Replicate No.:

Instrument Identification
Water Quality Meter(s): YSI 600 XL
Serial #:

Casing Material: PVC
Purge Method: 2" Bladder Pump
Casing Diameter: 4"
Screen Interval (ft bmp): Top unknown Bottom unknown
Sounded Depth (ft bmp): 15.10
Pump Intake Depth (ft bmp): 1400 1400
Depth to Water (ft bmp): 11.42
Purge Time: Start 1100 Finish

Field Parameter Measurements During Purging

| Time | Minutes Elasped | Flow Rate (mL/min) | Volume Purged | Temp (°C) | pH (s.u.) | Conductivity (umhos or mS/cm) 1) | ORP (mV) | DO (mg/L) | Turbidity (NTU) | Depth to Water (ft bmp) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1105 | 5 | 300 | | 20.10 | 7.15 | 2.68 | -326.2 | 0.26 | 30 | 13.00 |
| 1110 | 10 | " | | 20.15 | 7.17 | 2.68 | -333.1 | 0.23 | 45 | 13.50 |
| 1115 | 15 | " | | 20.19 | 7.18 | 2.68 | -322.1 | 0.21 | 50 | 13.55 |
| 1120 | 20 | " | | 20.21 | 7.18 | 2.69 | -326.8 | 0.29 | 50 | 13.55 |
| | | | | | | | | | | |
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Collected Sample Condition
Color: yellow/brn
Odor: mod.
Appearance:

| Parameter | Container | No. | Preservative |
|---|---|---|---|
| VOCs | VOAs | 2 | HCl |
| SVOCs | Ambers | 2 | None |
| CN Total | Plastic | 1 | NaOH |

PID Reading: 0.3 ppm

Comments:

1) Circle one unit type

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Infrastructure, environment, facilities

# Low-Flow Groundwater Sampling Log

Project: West 18th St MGP
Project Number: B0043011.1.3
Site Location: Manhattan, NY Verizon
Well ID: MW-2
Date: 10-2-08
Sampled By: CJM / GW
Sampling Time:
Recorded By: " "
Weather:
Coded Replicate No.:

Instrument Identification
Water Quality Meter(s): YSI 600XL
Serial #:

Casing Material: PVC
Purge Method: Peristaltic
Casing Diameter: 2"
Screen Interval (ft bmp): Top Unknown Bottom unknown
Sounded Depth (ft bmp): 13.20
Pump Intake Depth (ft bmp): 12.5-13.00 12.5-13.00
Depth to Water (ft bmp): 11.60
Purge Time: Start 1356 Finish

Field Parameter Measurements During Purging

| Time | Minutes Elasped | Flow Rate (mL/min) | Volume Purged | Temp (°C) | pH (s.u.) | Conductivity (umhos or mS/cm) 1) | ORP (mV) | DO (mg/L) | Turbidity (NTU) | Depth to Water (ft bmp) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1401 | 5 | 225 | | 20.81 | 6.83 | 2.65 | -49.6 | 1.36 | 650 | 12.20 |
| 1406 | 10 | 225 | | 20.67 | 6.80 | 2.54 | -55.2 | 1.21 | 310 | 12.48 |
| 1411 | 15 | 225 | | 20.57 | 6.78 | 2.50 | -58.2 | 1.27 | 190 | 12.80 |
| 1416 | 20 | 225 | | 20.57 | 6.76 | 2.51 | -60.1 | 1.27 | 160 | 13.00 |
| 1417 | Dry | - Allowing | to recover. | | | | | | | |
| 1554 | | | | | | | | | | 11.74 |
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Collected Sample Condition
Color: Brown
Odor: Moderate
Appearance:

| Parameter | Container | No. | Preservative |
|---|---|---|---|
| VOCs | VOAs | 2 | HCl |
| SVOCs | Ambers | 2 | None |
| CN Total | Plastic | 1 | NaOH |

PID Reading:

Comments: Not enough $H_2O$ to pump with bladder, so used peristaltic.

1) Circle one unit type

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# Low-Flow Groundwater Sampling Log

Project: West 18th Street MGP
Project Number: B0043011.1.3
Site Location: Verizon Building
Well ID: MW-3
Date: 10-1-08
Sampled By: CJM / GW
Sampling Time: 1420
Recorded By: " "
Weather: 70° sunny
Coded Replicate No.:

Instrument Identification
Water Quality Meter(s): YSI 600XL
Serial #:

Casing Material: PVC
Purge Method: 2" Bladder
Casing Diameter: 4
Screen Interval (ft bmp): Top unknown Bottom unknown
Sounded Depth (ft bmp): 14.70
Pump Intake Depth (ft bmp): 14.5 14.5
Depth to Water (ft bmp): 13.02
Purge Time: Start 1355 Finish

Field Parameter Measurements During Purging

| Time | Minutes Elasped | Flow Rate (mL/min) | Volume Purged | Temp (°C) | pH (s.u.) | Conductivity (umhos or mS/cm) 1) | ORP (mV) | DO (mg/L) | Turbidity (NTU) | Depth to Water (ft bmp) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1400 | 5 | 450 | | 20.44 | 6.59 | 1.67 | -121.5 | 1.90 | 110 | 13.02 |
| 1405 | 10 | 450 | | 20.34 | 6.55 | 1.60 | -126.2 | 1.61 | 18 | 13.02 |
| 1410 | 15 | 450 | | 20.33 | 6.54 | 1.58 | -126.5 | 1.58 | 12 | 13.02 |
| 1415 | 20 | 450 | | 20.40 | 6.53 | 1.57 | -126.9 | 1.55 | 9.8 | 13.02 |
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Collected Sample Condition
Color: yellow/brn
Odor: ~~Odor~~ Moderate
Appearance:

| Parameter | Container | No. | Preservative |
|---|---|---|---|
| VOCs | 2 VOAs | 2 | HCl |
| SVOCs | 2 Ambers | 2 | None |
| CN Total | 1 Plastic | 1 | NaOH |

PID Reading: 2.6

Comments:

1) Circle one unit type

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# Low-Flow Groundwater Sampling Log

Project: West 18th Street MGP
Project Number: B0043011.1.3
Site Location: Verizon Building Manhattan Well ID: MW-4
Date: 10-1-08
Sampled By: CJM, GW
Sampling Time: 1300
Recorded By: " "
Weather: 70° sunny
Coded Replicate No.:

Instrument Identification
Water Quality Meter(s): YSI 600XL
Serial #:

Casing Material: PVC
Purge Method: 2" Bladder
Casing Diameter: 4
Screen Interval (ft bmp): Top Unknown Bottom Unknown
Sounded Depth (ft bmp): 14.35
Pump Intake Depth (ft bmp): 14
Depth to Water (ft bmp): 12.42
Purge Time: Start 1230 Finish

Field Parameter Measurements During Purging

| Time | Minutes Elasped | Flow Rate (mL/min) | Volume Purged | Temp (°C) | pH (s.u.) | Conductivity (umhos or mS/cm) 1) | ORP (mV) | DO (mg/L) | Turbidity (NTU) | Depth to Water (ft bmp) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1235 | 5 | 300 | | 19.27 | 6.62 | 1.91 | -113.4 | 2.01 | 400 | 12.42 |
| 1240 | 10 | 300 | | 19.07 | 6.65 | 1.15 | -124.2 | 2.38 | 110 | 12.42 |
| 1245 | 15 | 300 | | 18.68 | 6.65 | 1.13 | -128.7 | 1.76 | 60 | 12.42 |
| 1250 | 20 | 300 | | 18.62 | 6.66 | 1.12 | -132.7 | 1.74 | 36 | 12.42 |
| 1255 | 25 | 300 | | 18.60 | 6.68 | 1.11 | -131.8 | 1.69 | 27 | 12.42 |
| | | | | | | | | | | |
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Collected Sample Condition: Color Yellowish/Brown Odor Moderate Appearance

| Parameter | Container | No. | Preservative |
|---|---|---|---|
| VOCs | VOAs | 2 | HCL |
| SVOCs | Ambers | 2 | None |
| CN Total | Plastic | 1 | NaOH |

PID Reading: 0.4

Comments:

1) Circle one unit type

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# Low-Flow Groundwater Sampling Log

Project: West 18th St MGP
Project Number: B0043011.1.3
Site Location: Verizon Building
Well ID: MW-5
Date: 10-2-08
Sampled By: CTM/GW
Sampling Time: ____
Recorded By: " "
Weather: 70° sunny
Coded Replicate No.: ____

Instrument Identification
Water Quality Meter(s): YSI 600XL
Serial #: ____

Casing Material: PVC
Purge Method: Peristaltic
Casing Diameter: 4"
Screen Interval (ft bmp): Top Unknown Bottom Unknown
Sounded Depth (ft bmp): 14.10
Pump Intake Depth (ft bmp): ____
Depth to Water (ft bmp): 13.35
Purge Time: Start 1435 Finish ____

Field Parameter Measurements During Purging

| Time | Minutes Elasped | Flow Rate (mL/min) | Volume Purged | Temp (°C) | pH (s.u.) | Conductivity (umhos or mS/cm) [1] | ORP (mV) | DO (mg/L) | Turbidity (NTU) | Depth to Water (ft bmp) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1440 | 5 | 225 | | 20.56 | 6.73 | 2.19 | -77.9 | 0.59 | >999 | 13.88 |
| 1445 | 10 | 225 | | 21.49 | 6.74 | 2.22 | -91.9 | 0.88 | >999 | 13.88 |
| 1450 | 15 | 225 | | 21.60 | 6.74 | 2.22 | -92.3 | 0.92 | 7999 | 13.88 |
| 1455 | 20 | 225 | | 21.63 | 6.74 | 2.23 | -92.0 | 0.99 | 800 | 13.88 |
| 1500 | 25 | 225 | | 21.65 | 6.74 | 2.23 | -91.4 | 1.04 | 550 | 13.88 |
| 1505 | 30 | 225 | | 21.67 | 6.73 | 2.22 | -88.7 | 1.10 | 160 | 13.88 |
| 1510 | 35 | 225 | | 21.75 | 6.73 | 2.22 | -88.3 | 1.12 | 45 | 13.88 |
| | | | | | | | | | | |
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Collected Sample Condition
Color: Brn/blk
Odor: mod-strong
Appearance: sl sheen

| Parameter | Container | No. | Preservative |
|---|---|---|---|
| VOCs | VOAs | 2 | HCL |
| SVOCs | Ambers | 1 | None |
| CN Total | Plastic | 1 | NaOH |

PID Reading: 0.7

Comments: Not enough H2O to pump with 2" Bladder.

1) Circle one unit type

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# Low-Flow Groundwater Sampling Log

Project: B0043011.1.3
Project Number: West 18TH St MGP
Site Location: Manhattan, NY Verizon
Well ID: MW-5A
Date: 10-2-08
Sampled By: C. Massaro / G. Williams
Sampling Time: 1310
Recorded By: " "
Weather: SSY
Coded Replicate No.:

Instrument Identification
Water Quality Meter(s): YSI 600XL
Serial #:

Casing Material: PVC
Purge Method: 2" Bladder
Casing Diameter: 2
Screen Interval (ft bmp): Top 9 Bottom 19
Sounded Depth (ft bmp): 18.88
Pump Intake Depth (ft bmp):
Depth to Water (ft bmp): 14.39
Purge Time: Start 1230 Finish

Field Parameter Measurements During Purging

| Time | Minutes Elasped | Flow Rate (mL/min) | Volume Purged | Temp (°C) | pH (s.u.) | Conductivity (umhos or mS/cm) 1) | ORP (mV) | DO (mg/L) | Turbidity (NTU) | Depth to Water (ft bmp) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1235 | 5 | 150 | | 19.98 | 7.10 | 1.79 | -338.2 | 0.50 | 450 | 15.65 |
| 1240 | 10 | 150 | | 20.01 | 7.07 | 1.77 | -338.7 | 0.45 | 270 | 15.77 |
| 1245 | 15 | 150 | | 19.95 | 7.08 | 1.76 | -335.7 | 0.46 | 150 | 15.95 |
| 1250 | 20 | 150 | | 19.93 | 7.10 | 1.75 | -333.8 | 0.45 | 95 | 16.15 |
| 1255 | 25 | 150 | | 19.91 | 7.12 | 1.75 | -333.4 | 0.45 | 80 | 16.22 |
| 1300 | 30 | 150 | | 19.95 | 7.15 | 1.74 | -332.8 | 0.41 | 60 | 16.30 |
| 1305 | 35 | 150 | | 19.95 | 7.18 | 1.73 | -333.6 | 0.38 | 50 | 16.41 |
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Collected Sample Condition
Color: brn/blk
Odor: Moderate
Appearance:

| Parameter | Container | No. | Preservative |
|---|---|---|---|
| VOCs | VOAs | 2 | HCl |
| SVOCs | Ambers | 1 x 1 Liter | None |
| CAI Total | Plastic | 1 | NaOH |

PID Reading: 0.3

Comments:

1) Circle one unit type

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# Low-Flow Groundwater Sampling Log

Project: B0043011.1.3
Project Number: West 18th St MGP
Site Location: Manhattan, NY
Verizon Well ID: MW-5B
Date: 10-2-08
Sampled By: C. Messam, G. Williams
Sampling Time: 1100
Recorded By: " "
Weather: 55 F
Coded Replicate No.:

Instrument Identification
Water Quality Meter(s): YSI 600XL, YSI 550 DO
Serial #:

Casing Material: PVC
Purge Method: 2" Bladder
Casing Diameter: 2
Screen Interval (ft bmp): Top 32 Bottom 42
Sounded Depth (ft bmp): 41.2
Pump Intake Depth (ft bmp): 37 37
Depth to Water (ft bmp): ~~14.39~~ 14.31 CM
Purge Time: Start 1018 Finish

Field Parameter Measurements During Purging

| Time | Minutes Elasped | Flow Rate (mL/min) | Volume Purged | Temp (°C) | pH (s.u.) | Conductivity (umhos or mS/cm) 1) | ORP (mV) | DO (mg/L) | Turbidity (NTU) | Depth to Water (ft bmp) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1023 | 5 | 450 | | 18.48 | 6.97 | 0.202 | 251.7 | 2.03 | 145 | 14.30 |
| 1028 | 10 | " | | 17.85 | 6.91 | 0.18 | 92.8 | 1.58 | 110 | 14.30 |
| 1033 | 15 | " | | 17.84 | 6.92 | 0.18 | 73.4 | 1.45 | 90 | 14.30 |
| 1038 | 20 | " | | 18.07 | 6.97 | 0.19 | 38.9 | 1.77 | 60 | 14.30 |
| 1043 | 25 | " | | 18.12 | 6.99 | 0.19 | 23.2 | 1.64 | 45 | 14.30 |
| 1048 | 30 | " | | 18.13 | 7.04 | 0.19 | 6.5 | 1.63 | 38 | 14.30 |
| 1053 | 35 | " | | 18.17 | 7.07 | 0.19 | 2.0 | 1.63 | 30 | 14.30 |
| 1058 | 40 | " | | 18.19 | 7.08 | 0.19 | 1.8 | 1.67 | 34 | 14.30 |
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Collected Sample Condition
Color: yellow/brn
Odor: mod
Appearance:

| Parameter | Container | No. | Preservative |
|---|---|---|---|
| VOCs | VOAs | 2 | HCl |
| SVOCs | Ambers | 2 | None |
| CN Total | Plastic | 1 | NaOH |

PID Reading: 0.3

Comments: DO charge is high on 600XL, so using 550 DO

1) Circle one unit type

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# Low-Flow Groundwater Sampling Log

Project: West 187th St Gas Works
Project Number: B00430[illegible]1.1.3
Site Location: Verizon Building
Well ID: MW-7
Date: 10-1-08 / 10-2-08
Sampled By: CJM / GW
Sampling Time: 1645
Recorded By: " "
Weather: 70° sunny
Coded Replicate No.:

Instrument Identification
Water Quality Meter(s):
Serial #:

Casing Material: PVC
Purge Method: Peristaltic
Casing Diameter: 4"
Screen Interval (ft bmp): Top: Bottom:
Sounded Depth (ft bmp): 13.50 **
Pump Intake Depth (ft bmp):
Depth to Water (ft bmp): 12.32
Purge Time: Start * 1630 Finish:

Field Parameter Measurements During Purging

| Time | Minutes Elasped | Flow Rate (mL/min) | Volume Purged | Temp (°C) | pH (s.u.) | Conductivity (umhos or mS/cm) 1) | ORP (mV) | DO (mg/L) | Turbidity (NTU) | Depth to Water (ft bmp) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1635 | No $H_2O$ quality parameters collected - $H_2O$ too | | | | | | | | | |
| | turbid from yesterdays hand augering. | | | | | | | | | |
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Collected Sample Condition
Color ~~yellow/brn~~ CM Odor ~~mod~~ CM Appearance

| Parameter | Container | No. | Preservative |
|---|---|---|---|
| VOCs | VOAs | 2 | HCl |
| SVOCs | Ambers | 1 | None |
| CN total | Plastic | 1 | NaOH |

PID Reading:

Comments: Not sufficient amount of $H_2O$ to sample with a bladder pump.
* $H_2O$ not pumping with Peristaltic pump - Dave Finnerty removed 2 augers full of sediment; will attempt to sample

1) Circle one unit type: ~~to~~ micromhos

** TD on 10-2-08 14.40 - after Dave hand augered sediment

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# Low-Flow Groundwater Sampling Log

Project: West 18th Street MGP
Project Number: B0043011.1.3
Site Location: Verizon Building Manhattan
Well ID: MW-8
Date: 10-1-08
Sampled By: CJM / GW
Sampling Time: 1550
Recorded By: " "
Weather: 70° sunny
Coded Replicate No.:

Instrument Identification
Water Quality Meter(s): YSI 600XL
Serial #:

Casing Material: PVC
Purge Method: 2" Bladder
Casing Diameter: 4"
Screen Interval (ft bmp): Top Unknown Bottom Unknown
Sounded Depth (ft bmp): 17.00
Pump Intake Depth (ft bmp):
Depth to Water (ft bmp): 12.00
Purge Time: Start 1525 Finish

Field Parameter Measurements During Purging

| Time | Minutes Elasped | Flow Rate (mL/min) | Volume Purged | Temp (°C) | pH (s.u.) | Conductivity (umhos or mS/cm) 1) | ORP (mV) | DO (mg/L) | Turbidity (NTU) | Depth to Water (ft bmp) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1530 | 5 | 225 | | 20.97 | 6.17 | 5.75 | -112.3 | 0.58 | 23 | 12.61 |
| 1535 | 10 | " | | 20.97 | 6.08 | 5.74 | -117.9 | 0.36 | 26 | 12.99 |
| 1540 | 15 | " | | 20.99 | 6.03 | 5.73 | -121.8 | 0.26 | 28 | 13.45 |
| 1545 | 20 | " | | 21.03 | 5.99 | 5.71 | -127.8 | 0.20 | 20 | 13.95 |
| | | | | | | | | | | |
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Collected Sample Condition: Color yellow/brn Odor Strong Appearance

| Parameter | Container | No. | Preservative |
|---|---|---|---|
| VOCs | VOAs | 2 | HCL |
| SVOCs | Ambers | 2 | None |
| CN - Total | Plastic | 1 | NaOH |

PID Reading:

Comments:

1) Circle one unit type

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# Low-Flow Groundwater Sampling Log

Project: West 18th St MGP
Project Number: B0043011.1.3
Site Location: Manhattan, NY Verizon
Well ID: MW-10
Date: 10-2-08
Sampled By: CJM / GW
Sampling Time: 1220
Recorded By: " "
Weather: 70°
Coded Replicate No.:

Instrument Identification
Water Quality Meter(s):
Serial #:

Casing Material: PVC
Casing Diameter: 4"
Sounded Depth (ft bmp): 15.00
Depth to Water (ft bmp): 11.11
Purge Method:
Screen Interval (ft bmp): Top unknown Bottom unknown
Pump Intake Depth (ft bmp): 14 14
Purge Time: Start 1150 Finish:

Field Parameter Measurements During Purging

| Time | Minutes Elasped | Flow Rate (mL/min) | Volume Purged | Temp (°C) | pH (s.u.) | Conductivity (umhos or mS/cm) 1) | ORP (mV) | DO (mg/L) | Turbidity (NTU) | Depth to Water (ft bmp) |
|---|---|---|---|---|---|---|---|---|---|---|
| ~~1155~~ | ~~5~~ | CM | | ~~20.51~~ | ~~8.00~~ | ~~0.01~~ | ~~11.9~~ | ~~8.14~~ | CM | ~~11.37~~ cms |
| ~~1155~~ | ~~5~~ | CM | | ~~20.51~~ | CM | | | | | ~~11.37~~ cms |
| 1155 | 5 | 250 | | 20.06 | 6.54 | 5.41 | -48.2 | 1.30 | 160 | 11.37 |
| 1200 | 10 | 200 | | 20.04 | 6.56 | 5.49 | -54.4 | 1.28 | 110 | 11.91 |
| 1205 | 15 | 200 | | 20.15 | 6.57 | 5.54 | -59.9 | 1.38 | 55 | 12.35 |
| 1210 | 20 | 200 | | 20.25 | 6.58 | 5.55 | -61.5 | 1.25 | 55 | 12.40 |
| 1215 | 25 | 200 | | 20.25 | 6.58 | 5.56 | -61.6 | 1.25 | 55 | 12.42 |
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Collected Sample Condition
Color: Yellow/brn
Odor: moderate
Appearance:

| Parameter | Container | No. | Preservative |
|---|---|---|---|
| VOCs | VOAs | 2 | HCL |
| SVOCs | Ambers | cmz 1 | None |
| CN Total | Plastic | 1 | NaOH |

PID Reading: 0.5

Comments:

1) Circle one unit type

ARCADIS
Infrastructure, environment, facilities

# Low-Flow Groundwater Sampling Log

Project: West 18th St Gas Works
Project Number: B0043011.1.3
Site Location: Verizon Building, Manhattan
Well ID: MW-11
Date: 9-30-08
Sampled By: C. Massaro
Sampling Time: 1645
Recorded By: C. Massaro
Weather: 70°
Coded Replicate No.:

Instrument Identification
Water Quality Meter(s):
Serial #:

Casing Material: PVC
Purge Method: ~~Bladder~~ ~~0.75~~ QM Peristaltic
Casing Diameter: 1.5"
Screen Interval (ft bmp): Top unknown Bottom unknown
Sounded Depth (ft bmp): 18.30
Pump Intake Depth (ft bmp): 16 16
Depth to Water (ft bmp): 11.69
Purge Time: Start 1615 Finish

Field Parameter Measurements During Purging

| Time | Minutes Elasped | Flow Rate (mL/min) | Volume Purged | Temp (°C) | pH (s.u.) | Conductivity (umhos or mS/cm) 1) | ORP (mV) | DO (mg/L) | Turbidity (NTU) | Depth to Water (ft bmp) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1620 | 5 | 500 | | 19.58 | 6.51 | 5.79 | -163.2 | 3.96 | 38 | 12.45 |
| 1625 | 10 | 11 | | 19.44 | 6.49 | 5.76 | -187.8 | 3.46 | 24 | 12.45 |
| 1630 | 15 | 500 | | 19.41 | 6.49 | 5.70 | -172.8 | 2.32 | 21 | 12.58 |
| 1635 | 20 | 500 | | 19.43 | 6.48 | 5.69 | -169.6 | 2.08 | 18 | 12.60 |
| 1640 | 25 | 500 | | 19.38 | 6.48 | 5.64 | -169.7 | 2.01 | 12 | 12.63 |
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Collected Sample Condition
Color: clear
Odor: strong
Appearance:

| Parameter | Container | No. | Preservative |
|---|---|---|---|
| VOCs | VOAs | 2 | HCL |
| SVOCs | Ambers | 2 | None |
| CN Total/Amenable | Plastic | 2 | NaOH |

PID Reading:

Comments:

1) Circle one unit type

ARCADIS
Infrastructure, environment, facilities

# Low-Flow Groundwater Sampling Log

| | | | |
|---|---|---|---|
| Project | West 18th St MGP | | |
| Project Number | B0043011.1.3 | Site Location | Verizon Building, Manhattan Well ID MW-12 |
| Date | 9-30-08 | Sampled By | C. Massaro, G. Williams |
| Sampling Time | 1735 | Recorded By | " " |
| Weather | 70° | Coded Replicate No. | |

Instrument Identification

Water Quality Meter(s): YSI 600XL  Serial #:

| | | | | | |
|---|---|---|---|---|---|
| Casing Material | PVC | Purge Method | Peristaltic Pump | | |
| Casing Diameter | 2 | Screen Interval (ft bmp) | Top Unknown | Bottom Unknown | |
| Sounded Depth (ft bmp) | 18.85 | Pump Intake Depth (ft bmp) | 16 | 16 | |
| Depth to Water (ft bmp) | 13.02 | Purge Time | Start 1705 | Finish | |

Field Parameter Measurements During Purging

| Time | Minutes Elasped | Flow Rate (mL/min) | Volume Purged | Temp (°C) | pH (s.u.) | Conductivity (umhos or mS/cm) 1) | ORP (mV) | DO (mg/L) | Turbidity (NTU) | Depth to Water (ft bmp) |
|---|---|---|---|---|---|---|---|---|---|---|
| 5:10 | 5 | 500 | | 19.74 | 6.67 | 2847 | -23.3 | 4.63 | | |
| 5:15 | 10 | 500 | | 18.98 | 6.51 | 2.127 | -145.5 | 2.20 | 17 | 13.65 |
| 5:20 | 15 | 500 | | 18.96 | 6.50 | 2.13 | -150.4 | 1.88 | 9.7 | 13.64 |
| 5:25 | 20 | 500 | | 18.96 | 6.49 | 2.15 | -153.6 | 1.78 | 7.7 | 13.64 |
| 5:30 | 25 | 500 | | 18.92 | 6.48 | 2.17 | -156.2 | 1.68 | 6.2 | 13.64 |
| 5:35 | | | | | | | | | | |
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Collected Sample Condition  Color: Lt brn/blk  Odor: strong  Appearance: sheen

| Parameter | Container | No. | Preservative |
|---|---|---|---|
| VOCs | VOAs | 2 | HCL |
| SVOCs | Ambers | 2 | None |
| CN Total/Amenable | Plastic | 2 | NaOH |

PID Reading:

Comments:

1) Circle one unit type

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Infrastructure, environment, facilities

# Low-Flow Groundwater Sampling Log

Project: West 18th Street Gas Works
Project Number: B0043011.1.3
Site Location: Verizon Building Manhattan
Well ID: Well Cluster A2
Date: 9-30-08
Sampled By: C. Massaro / G. Williams
Sampling Time: 1145
Recorded By: C. Massaro
Weather: 70° party cloudy
Coded Replicate No.:

Instrument Identification
Water Quality Meter(s): YSI 600XL
Serial #:

Casing Material: PVC
Purge Method: Bladder 2"
Casing Diameter: 2"
Screen Interval (ft bmp): Top 13.50 Bottom 15.50
Sounded Depth (ft bmp): 15.02
Pump Intake Depth (ft bmp): 14.50
Depth to Water (ft bmp): 11.32
Purge Time: Start Finish

Field Parameter Measurements During Purging

| Time | Minutes Elasped | Flow Rate (mL/min) | Volume Purged | Temp (°C) | pH (s.u.) | Conductivity (~~umhos or~~ mS/cm) [1] | ORP (mV) | DO (mg/L) | Turbidity (NTU) | Depth to Water (ft bmp) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1110 | | 100 | | 20.15 | 7.45 | 2.96 | -22.2 | 2.90 | 888 | 13.18 |
| 1115 | | " | | 20.24 | 7.47 | 2.97 | -230 | 2.24 | 885 | 14.5 |
| 1120 | | " | | 20.85 | 7.45 | 2.97 | -120 | 1.94 | 900 | 14.5 |
| 1125 | | " | | 21.03 | 7.47 | 3.02 | -126 | 1.87 | 880 | 14.5 |
| 1130 | | " | | 21.06 | 7.48 | 3.02 | -128 | 1.78 | 950 | 14.5 |
| 1135 | | " | | 21.17 | 7.48 | 3.01 | -128 | 1.68 | 750 | 14.5 |
| 1140 | | " | | 21.24 | 7.47 | 3.01 | -124 | 1.86 | 680 | 14.5 |
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Collected Sample Condition
Color: Brown/gray
Odor: Moderate
Appearance:

| Parameter | Container | No. | Preservative |
|---|---|---|---|
| VOCs | Cmbz VOAs & Ambers | 2 | HCL |
| SVOCs | & gl plastic | ~~cmbz~~ 2 | None |
| CN Total/~~Amenable~~ | | ~~cmbz~~ 1 | NaOH |

PID Reading: 43.72

Comments: * purge rate = recovery rate

1) Circle one unit type

ARCADIS
Infrastructure, environment, facilities

# Low-Flow Groundwater Sampling Log

Project: West 18th Street Gas Works
Project Number: B00430 11.1.3
Site Location: Verizon Building Manhattan
Well ID: Well Cluster A3
Date: 9-30-08
Sampled By: C. Massaro, G. Williams
Sampling Time: 1130
Recorded By: C. Massaro
Weather: 70° F
Coded Replicate No.:

Instrument Identification
Water Quality Meter(s): YSI 600XL
Serial #:

Casing Material: PVC
Purge Method: Bladder 2"
Casing Diameter: 2"
Screen Interval (ft bmp): Top 17.70 Bottom 19.70
Sounded Depth (ft bmp): 19.25
Pump Intake Depth (ft bmp): 18.5
Depth to Water (ft bmp): 11.40
Purge Time: Start 1105 Finish 1135

Field Parameter Measurements During Purging

| Time | Minutes Elasped | Flow Rate (mL/min) | Volume Purged | Temp (°C) | pH (s.u.) | Conductivity (umhos or mS/cm) 1) | ORP (mV) | DO (mg/L) | Turbidity (NTU) | Depth to Water (ft bmp) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1110 | 5 | 500 | 1 Gal | 19.00 | 6.66 | 3.208 | -244.0 | 2.96 | 220 | 11.40 |
| 1115 | 10 | 500 | | 18.80 | 6.66 | 3.290 | -253.2 | 2.29 | 160 | 11.40 |
| 1120 | 15 | 500 | | 18.81 | 6.67 | 3.288 | -273.2 | 2.00 | 80 | 11.40 |
| 1125 | 20 | 500 | | 18.78 | 6.68 | 3.290 | -278.2 | 1.80 | 50 | 11.40 |
| 1130 | 25 | 500 | | 18.75 | 6.69 | 3.285 | -281.3 | 1.76 | 23 | 11.40 |
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Collected Sample Condition
Color: cloudy
Odor: moderate
Appearance: Lt brown/gray

| Parameter | Container | No. | Preservative |
|---|---|---|---|
| VOCs | VOA's | 3 2 | HCL |
| SVOCs | Ambers | 2 | None |
| CN, Total, Amenable | plastic | 2 | NaOH |

PID Reading: 23.8

Comments:

1) Circle one unit type

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# Low-Flow Groundwater Sampling Log

Project: West 18th St. MGP
Project Number: B0043011.1.3
Site Location: Verizon Building
Well ID: SB-B2
Date: 10-1-08
Sampled By: CJM, BW
Sampling Time: 1145
Recorded By: " "
Weather: 70° sunny
Coded Replicate No.:

Instrument Identification
Water Quality Meter(s): YSI 600XL
Serial #:

Casing Material: PVC
Purge Method:
Casing Diameter: 2
Screen Interval (ft bmp) Top: Bottom:
Sounded Depth (ft bmp): 15.32
Pump Intake Depth (ft bmp): 14.5 14.5
Depth to Water (ft bmp): 13.23
Purge Time Start: 1100 Finish:

Field Parameter Measurements During Purging

| Time | Minutes Elasped | Flow Rate (mL/min) | Volume Purged | Temp (°C) | pH (s.u.) | Conductivity (umhos or mS/cm) 1) | ORP (mV) | DO (mg/L) | Turbidity (NTU) | Depth to Water (ft bmp) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1105 | 5 | 100 | | 19.78 | 6.91 | 2.12 | -131.5 | 7.58 | 7999. | 14.5 |
| 1110 | 10 | " | | 19.98 | 6.93 | 2.12 | -121.8 | 7.03 | " | " |
| 1115 | 15 | " | | 20.30 | 6.94 | 2.10 | -103.5 | 6.29 | " | 14.5 |
| 1120 | 20 | " | | 21.33 | 6.96 | 2.13 | -90.0 | 5.26 | " | 14.5 |
| 1125 | 25 | " | | 21.70 | 6.99 | 2.14 | -81.5 | 5.19 | " | 14.5 |
| 1130 | 30 | " | | 21.46 | 7.00 | 2.12 | -95.8 | 4.77 | " | " |
| 1135 | 35 | " | | 21.51 | 7.01 | 2.11 | -90.2 | 4.75 | " | " |
| 1140 | 40 | " | | 21.58 | 7.03 | 2.10 | -89.9 | 4.75 | " | " |
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Collected Sample Condition
Color: Odor: Appearance:

| Parameter | Container | No. | Preservative |
|---|---|---|---|
| VOCs | VOAs | 2 | HCL |
| SVOCs | Amber | ~~1~~ 2 | None |
| CN Total | Plastic | 1 | NaOH |

PID Reading: 44.8

Comments: 100mL/min flow rate is = to recovery rate * having trouble keeping bladder full because of slow recovery, so air is present causing higher DO values.

1) Circle one unit type

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Infrastructure, environment, facilities

# Low-Flow Groundwater Sampling Log

Project: B0043011.1.3
Project Number: West 18th St MGP
Site Location: Verizon Building, Manhattan
Well ID: SB-B3
Date: 10-1-08
Sampled By: C. Massaro / G. Williams
Sampling Time: 1110
Recorded By: " "
Weather: 70° sunny
Coded Replicate No.: Dup-02

Instrument Identification
Water Quality Meter(s): YSI 600XL
Serial #:

Casing Material: PVC
Purge Method: 2" Bladder
Casing Diameter: 2
Screen Interval (ft bmp): Top ____ Bottom ____
Sounded Depth (ft bmp): 20.18
Pump Intake Depth (ft bmp): 19 / 19
Depth to Water (ft bmp): 13.48
Purge Time: Start 1038 Finish ____

Field Parameter Measurements During Purging

| Time | Minutes Elasped | Flow Rate (mL/min) | Volume Purged | Temp (°C) | pH (s.u.) | Conductivity (umhos or mS/cm) [1] | ORP (mV) | DO (mg/L) | Turbidity (NTU) | Depth to Water (ft bmp) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1048 | 10 | 450 | | 18.11 | 6.85 | 1.46 | -148.4 | 2.77 | 160 | 13.60 |
| 1053 | 15 | " | | 18.01 | 6.82 | 1.49 | -152.3 | 2.09 | 55 | 13.60 |
| 1058 | 20 | " | | 17.96 | 6.81 | 1.49 | -152.7 | 1.80 | 39 | 13.60 |
| 1103 | 25 | " | | 17.96 | 6.79 | 1.50 | -151.6 | 1.76 | 21 | 13.60 |
| 1108 | 30 | " | | 17.98 | 6.78 | 1.51 | -151.1 | 1.70 | 18 | 13.60 |
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Collected Sample Condition
Color: Faint CLR Lt brn/yellow Odor: moderate Appearance: ____

| Parameter | Container | No. | Preservative |
|---|---|---|---|
| VOC's | VOAs | 2 | HCl |
| SVOC's | Ambers | 2 | None |
| Total CN | Plastic | 1 | NaOH |

PID Reading: 24.5

Comments: ____

1) Circle one unit type

ARCADIS
Infrastructure, environment, facilities

# Low-Flow Groundwater Sampling Log

Project: West 18th Street Gas Works
Project Number: B0043011.1.3
Site Location: Verizon Building
Well ID: Well Cluster C2
Date: 9-30-08
Sampled By: C. Massaro
Sampling Time: 1355
Recorded By: C. Massaro
Weather: 70° sunny
Coded Replicate No.:

Instrument Identification
Water Quality Meter(s): YSI 600XL
Serial #:

Casing Material: PVC
Purge Method:
Casing Diameter: 2
Screen Interval (ft bmp): Top: Bottom:
Sounded Depth (ft bmp):
Pump Intake Depth (ft bmp):
Depth to Water (ft bmp): 11.87
Purge Time: Start 1325 Finish:

Field Parameter Measurements During Purging

| Time | Minutes Elasped | Flow Rate (mL/min) | Volume Purged | Temp (°C) | pH (s.u.) | Conductivity (umhos or mS/cm) 1) | ORP (mV) | DO (mg/L) | Turbidity (NTU) | Depth to Water (ft bmp) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1330 | 5 | ~100 | | 22.18 | 7.62 | 1.65 | -94.7 | 2.46 | 290 | 11.89 |
| 1335 | 10 | 11 | | 20.98 | 7.55 | 1.32 | -101.7 | 2.41 | 180 | 14.50 |
| 1340 | 15 | 11 | | 21.11 | 7.54 | 1.31 | -101.0 | 2.13 | 210 | 14.50 |
| 1345 | 20 | 11 | | 21.35 | 7.54 | 1.29 | -99.1 | 2.00 | 190 | 14.50 |
| 1350 | 25 | 11 | | 21.42 | 7.54 | 1.28 | -96.8 | 2.18 | 160 | 14.50 |
| | | | | | | | | | | |
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Collected Sample Condition: Color: Odor: Appearance:

| Parameter | Container | No. | Preservative |
|---|---|---|---|
| VOCs | VOAs | 2 | HCL |
| SVOCs | Ambers | 1 | None |
| CN Total/Amenable | Plastic | 1 | NaOH |

PID Reading: 1.2

Comments: * ~100 mL/min drew down $H_2O$ level to pump intake.

1) Circle one unit type

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Infrastructure, environment, facilities

# Low-Flow Groundwater Sampling Log

Project: WEST 18TH ST GAS WORKS
Project Number: B0045011.0001.0003
Site Location: HUDSON BLDG NYC
Well ID: WBL CLUSTER C-3
Date: 9-30-08
Sampled By: G.W C.M
Sampling Time: 1330
Recorded By: GW / CM
Weather: 70° Sunny
Coded Replicate No.:

Instrument Identification
Water Quality Meter(s): YSI 600XL
Serial #:

Casing Material: PVC
Casing Diameter: 2"
Sounded Depth (ft bmp):
Depth to Water (ft bmp): 12.45
Purge Method: Bladder 2"
Screen Interval (ft bmp) Top: Bottom:
Pump Intake Depth (ft bmp):
Purge Time Start: 1255 Finish:

Field Parameter Measurements During Purging

| Time | Minutes Elasped | Flow Rate (mL/min) | Volume Purged | Temp (°C) | pH (s.u.) | Conductivity (umhos or mS/cm) 1) | ORP (mV) | DO (mg/L) | Turbidity (NTU) | Depth to Water (ft bmp) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1300 | 5 | 300 | | 19.28 | 8.01 | 1.32 | -136.5 | 4.69 | 330 | 15.10 |
| 1305 | 10 | " | | 18.95 | 7.99 | 1.32 | -143.2 | 3.30 | 320 | 15.10 |
| 1310 | 15 | " | | 19.60 | 7.97 | 1.34 | -143.0 | 3.26 | 190 | 15.10 |
| 1315 | 20 | " | | 19.16 | 7.93 | 1.48 | -144.1 | 3.12 | 120 | 15.30 |
| 1320 | 25 | " | | 18.73 | 7.86 | 1.49 | -147.2 | 2.53 | 70 | 15.55 |
| 1325 | 30 | " | | 18.66 | 7.83 | 1.51 | -149.1 | 2.30 | 40 | 15.59 |
| 1330 | 35 | " | | 18.68 | 7.80 | 1.53 | -149.8 | 2.28 | 50 | 15.69 |
| | | | | | | | | | | |
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Collected Sample Condition: Color slightly cloudy Odor moderate Appearance faint cloudy

| Parameter | Container | No. | Preservative |
|---|---|---|---|
| VOCs | 3 VOAs | 2 | HCL |
| SVOCs | 3 Ambers | 2 | None |
| CN Total, Amenable | 3 Plastic | 2 | NaOH |

PID Reading: 4.1 ppm

Comments:

1) Circle one unit type

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## INSTRUMENT CALIBRATION FORM

Project: CON ED W 18TH ST
Project No.: B0043011.0001.00003
Site Location: W - 18TH ST MANHATTAN
Date: 9-30-08
Time:
Prepared by: G.W.

| | | | |
|---|---|---|---|
| ☐ Ph Cond Tempmeter<br>Model Oakton 300 Services<br>Serial 121686 | ☐ Turbidity Meter<br>Model 2020 Lamotte<br>Serial 3597-3502 | ☐ D.O. Meter<br>Model #55/25 FT<br>Serial 00H0611 | ☐ ORP Meter<br>Model 00702-70<br>Serial 55386 |
| ☐ Multiprobe<br>Model YSI 600 XL<br>Serial 02J0183A1 | ☐ Turbidity Meter<br>Model 2020 Lamotte<br>Serial | ☐ D.O. Meter<br>Model<br>Serial | ☐ ORP Meter<br>Model<br>Serial |
| ☐ PID<br>Model Photovac 2020<br>Serial ED HF 358 | ☐ PID<br>Model Photovac 2020<br>Serial | ☐ pH Cond Temp<br>Model Oakton 300 Series<br>Serial 197765 | ✓ Rental (2)<br>Model 600 XL<br>Serial PIDE7127<br>600 XL<br>PIDE 02651 |

***Check appropriate box for equipment calibrated. If two similar items are calibrated, please note two checks under calibration successful***

| Parameter PID (ppmv) | Value | Calibration Successful |
|---|---|---|
| Zero | ✓ | ✓ |
| Span | 100 | ✓ |

| Parameter D.O. | Calibration Successful |
|---|---|
| 100% Saturated Air | YES |
| Barometer Adjustment | YES |
| Elevation Adjustment | NO |

| ph (si Units) | Value | Calibration Successful |
|---|---|---|
| 4.00 | ✓ | YES |
| 7.00 | ✓ | YES |
| 10.00 | | |

| * ORP (Mv) | Calibration Successful |
|---|---|
| Hydroquinone (240) (Black) | |
| Zobel Solution (237) (yellow) | YES |
| Temperature Based Chart Calibration | |
| * Adjusted | |

| Conductivity (umhos) | Value | Calibration Successful |
|---|---|---|
| 84 umhos | | |
| 1413 uhmos | ✓ | YES |
| Other | | |

*** No adjustment on some meters just a probe check, others are adjustable**

| Turbidity (NTU) NO | Value | Calibration Successful |
|---|---|---|
| 1.0 NTU | | |
| 10 NTU | | |
| 40 NTU | | |
| Other | | |

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# INSTRUMENT CALIBRATION FORM

Project: CON ED W 18TH ST
Project No.: B0043011.0001.00003
Site Location: W 18TH ST, NYC
Date: 10-1-08
Time:
Prepared by: GKW

| | | | |
|---|---|---|---|
| ☐ Ph Cond Tempmeter<br>Model Oakton 300 Services<br>Serial 121686 | ☐ Turbidity Meter<br>Model 2020 Lamotte<br>Serial 3597-3502 | ☐ D.O. Meter<br>Model #55/25 FT<br>Serial 00H0611 | ☐ ORP Meter<br>Model 00702-70<br>Serial 55386 |
| ☐ Multiprobe<br>Model YSI 600 XL<br>Serial 02J0183A1 | ☐ Turbidity Meter<br>Model 2020 Lamotte<br>Serial | ☐ D.O. Meter<br>Model<br>Serial | ☐ ORP Meter<br>Model<br>Serial |
| ☐ PID<br>Model Photovac 2020<br>Serial ED HF 358 | ☐ PID<br>Model Photovac 2020<br>Serial | ☐ pH Cond Temp<br>Model Oakton 300 Series<br>Serial 197765 | ☑ (2) Rental<br>Model 600 XL<br>Serial PDIE 7127<br>600 XL<br>PDIE 02651 |

***Check appropriate box for equipment calibrated. If two similar items are calibrated, please note two checks under calibration successful***

| Parameter PID (ppmv) | Value | Calibration Successful |
|---|---|---|
| Zero | ✓ | YES |
| Span | ✓ | YES |

| Parameter D.O. | Calibration Successful |
|---|---|
| 100% Saturated Air | ✓ YES |
| Barometer Adjustment | YES |
| Elevation Adjustment | WD |

| ph (si Units) | Value | Calibration Successful |
|---|---|---|
| 4.00 | ✓ | YES |
| 7.00 | ✓ | YES |
| 10.00 | | |

| * ORP (Mv) | Calibration Successful |
|---|---|
| Hydroquinone (240) (Black) | |
| Zobel Solution (237) (yellow) | YES |
| Temperature Based Chart Calibration | |
| * Adjusted | |

| Conductivity (umhos) | Value | Calibration Successful |
|---|---|---|
| 84 umhos | | |
| 1413 uhmos | ✓ | YES |
| Other | | |

*** No adjustment on some meters just a probe check, others are adjustable**

| Turbidity (NTU) | Value | Calibration Successful |
|---|---|---|
| WD | | |
| 1.0 NTU | | |
| 10 NTU | | |
| 40 NTU | | |
| Other | | |

ARCADIS

# INSTRUMENT CALIBRATION FORM

Project: Con Ed W 18TH St
Project No.: B0043011.0001.00003
Site Location: W 18th St NYC
Date: 10-2-20
Time:
Prepared by: G. W.

| | | | |
|---|---|---|---|
| ☐ Ph Cond Tempmeter<br>Model Oakton 300 Services<br>Serial 121686 | ☐ Turbidity Meter<br>Model 2020 Lamotte<br>Serial 3597-3502 | ☐ D.O. Meter<br>Model #55/25 FT<br>Serial 00H0611 | ☐ ORP Meter<br>Model 00702-70<br>Serial 55386 |
| ☐ Multiprobe<br>Model YSI 600 XL<br>Serial 02J0183A1 | ☐ Turbidity Meter<br>Model 2020 Lamotte<br>Serial | ☐ D.O. Meter<br>Model<br>Serial | ☐ ORP Meter<br>Model<br>Serial |
| ☐ PID<br>Model Photovac 2020<br>Serial ED HF 358 | ☐ PID<br>Model Photovac 2020<br>Serial | ☐ pH Cond Temp<br>Model Oakton 300 Series<br>Serial 197765 | ☑ Rental<br>(2) Model 600 XL<br>Serial PDME7127 600Y PID E02651 |

***Check appropriate box for equipment calibrated. If two similar items are calibrated, please note two checks under calibration successful***

| Parameter PID (ppmv) | Value | Calibration Successful |
|---|---|---|
| Zero | ✓ | YES |
| Span | ✓ | YES |

| Parameter D.O. | Calibration Successful |
|---|---|
| 100% Saturated Air | YES |
| Barometer Adjustment | YES |
| Elevation Adjustment | |

| ph (si Units) | Value | Calibration Successful |
|---|---|---|
| 4.00 | ✓ | YES |
| 7.00 | ✓ | |
| 10.00 | | |

| * ORP (Mv) | Calibration Successful |
|---|---|
| Hydroquinone (240) (Black) | |
| Zobel Solution (237) (yellow) | YES |
| Temperature Based Chart Calibration | |
| * Adjusted | |

| Conductivity (umhos) | Value | Calibration Successful |
|---|---|---|
| 84 umhos | | |
| 1413 uhmos | ✓ | YES |
| Other | | |

*** No adjustment on some meters just a probe check, others are adjustable**

| Turbidity (NTU) | Value | Calibration Successful |
|---|---|---|
| NTU | | |
| 1.0 NTU | | |
| 10 NTU | | |
| 40 NTU | | |
| Other | | |

# ARCADIS

## Site Activities Tailgate Safety Briefing Sign-in Log

| | | | |
|---|---|---|---|
| **Project Number:** | B0043011.0004.00003 | **Project Name:** | CONEO W 18TH ST |
| **Date:** | 9-3, 10-1-2-2008 | **Time:** | |
| **Briefing Conducted by:** | GARY WILLIAMS | **Signature:** | |
| **Company:** | ARCADIS | | |

This sign-in log documents the tailgate briefing conducted in accordance with the HASP. Personnel who perform work operations on Site are required to attend each briefing and to acknowledge receipt of each briefing, daily.

**TOPICS COVERED (check all those covered):**

- ☒ General PPE Usage
- ☐ Hearing Conservation
- ☐ Respiratory Protection
- ☐ Personal Hygiene
- ☐ Exposure Guidelines
- ☒ Decon Procedures
- ☐ Emergency Procedures (include route to hospital)
- ☐ Confined Space
- ☒ Slips, Trips, Falls
- ☐ Heat Stress
- ☐ Thermal Stresses
- ☐ Site Control
- ☐ Work Zones
- ☐ Lockout/Tagout
- ☐ Excavation Safety
- ☐ Confined Space
- ☒ Traffic Safety
- ☐ Changes to the HASP
- ☐ Initial Review of Hazard Evaluation
- ☐ Other (specify):
- ☐ Other (specify):

**Personnel Sign-in List**

| | Printed Name | Signature | Company Name |
|---|---|---|---|
| | Craig Massaro | | ARCADIS |
| 10-1-08 | GARY WILLIAMS | | ARCADIS |
| | Craig Massaro | | " |
| 10-2-08 | GARY H. WILLIAMS | | ARCADIS |
| | Craig Massaro | | " |
| | | | |
| | | | |
| | | | |
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| | | | |
| | | | |

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**Appendix D**

Forensic Evaluation

ARCADIS
11000 Regency Parkway
West Tower Suite 205
Cary
North Carolina 27518-8518
Tel 919.469.1952
Fax 919.469.5676

**MEMO**

To:
File

Copies:
Craig Massaro
Terry Taylor

From:
Ted Sauer

Date:
January 14, 2009

ARCADIS Project No.:
B0043011

Subject:
Forensic Evaluation to Differentiate Petroleum Product Volatile Hydrocarbons (e.g., BTEX) From Those of Coal Tar in Soils and Groundwater at the ConEdison Former West 18th Street MGP Site (Verizon Property) in New York, New York

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## Introduction

In previous investigations of groundwater and soils at the Con Edison Former West 18th Street Manufactured Gas Plant (MGP) Site (i.e., Verizon property) in New York, New York, the volatile hydrocarbons benzene, toluene, ethyl benzene and xylenes (BTEX) and other hydrocarbons were determined to be present and in some samples exceed MCL criteria in soil and groundwater within the property boundaries. The source of the hydrocarbons has been unknown but allegedly associated with MGP wastes found in some soils at the Site even though there were historic and present uses of the Site that would suggest other sources that include petroleum.

As a result, to determine potential sources of the hydrocarbons in groundwater at the Site, groundwater and soil samples were collected in 2008 and analyzed for a suite of volatile hydrocarbons that would compositionally characterize types of hydrocarbon material (e.g., gasoline, coal tar) contributing to the presence of hydrocarbons and BTEX exceedances in Site soil and groundwater. This suite of volatile hydrocarbons is collectively called PIANOS compounds, and represent over 100 paraffin (P), isoparaffin (I), aromatic (A), naphthenic (N), olefin (O) and sulfur heterocyclic (S) hydrocarbons (Table 1). This suite of volatile hydrocarbons has been found to be essential in determining sources of hydrocarbons of concern such as BTEX in environmental samples (Stout et al. 2002; Sauer and Costa 2003).

## Sampling and Analysis

In August 2008, seven (and 1 duplicate) soil samples were collected at four areas at the Site (Figure 1) to characterize potential sources of hydrocarbons in both soils and groundwater. Two soil samples [SB-C(14) and SB-C(22)] were collected at SB-C, near the doorway of the building facing 18th Street (between the two former gas holders); three samples [WC-A(12), WC-A(17) and WC-A(20)] at Well Cluster A, west of

SB-C (under the former west gas holder); one sample [SB-B(10)] at SB-B, south of SB-C, near the former 550-gallon gasoline USTs (under the former east gas holder); and one sample [WC-C(21)] at Well Cluster C, in the center of the property (between the two former gas holders). The samples were collected at different subsurface depths in each area from 10 to 22 ft bgs. The inventory of soil samples collected at the Site is provided in Table 1.

In September/October 2008, eight (and 1 duplicate) groundwater samples were collected in the same four areas sampled for soils and in another are near the former 4000-gallon UST. Two groundwater samples (MW-8 and MW-9) were collected near SB-C, two samples (MW-A2 and MW-A3) at the Well Cluster A area, two samples (MW-B2 and MW-B3) at SB-B, and two samples (MW-C2 and MW-C3) at Well Cluster C. Also, one groundwater sample (MW-4) was collected in the area of the former 4000-gallon gasoline UST south of SB-B near the east boundary (under the former east gas holder).

Both the soil and groundwater samples from the Site were analyzed for nearly 100 volatile hydrocarbon compounds in the gasoline range listed in Table 1. In addition, three gasoline standards that represent the 3 major types of gasolines available on the market, Regular (87 octane rating), Plus (89), and Super (91), were also analyzed for PIANOS compounds. The target compounds, collectively called PIANOS, included eight paraffin compounds (*n*-alkanes) from pentane through dodecane; 23 isoparaffin compounds (branched alkanes); 35 aromatic compounds that included BTEX, $C_3$- $C_4$-, and $C_5$-benzenes, and the 2-ring naphthalenes; 12 naphthene compounds (saturated cyclic compounds), 13 olefin compounds (alkenes), five thiophene compounds and benzothiophene (sulfur cyclic compounds), and gasoline additives that include tertiary butyl alcohol (TBA), methyl tertiary butyl ether (MTBE), and dis-isopropyl ether (DIPE), and other compounds.

These target analytes were determined by EPA Method 8260 modified to include calibration solutions of this more robust list of volatile compounds, stricter quality control objectives, longer gas chromatographic column, and longer chromatography temperature program as presented in the published literature, Uhler et al. (2003) and Sauer and Costa (2003). These modifications to this purge and trap, gas chromatography/mass spectrometer (GC/MS) method were necessary to successfully separate and quantify these compounds. Also, Total Petroleum Hydrocarbon – Diesel Range Organics (TPH-DRO) analysis was performed by modified Method 8015 on the samples, and the gas chromatogram (i.e., GC fingerprint) from the analysis was used to help identify the type of petroleum in the samples. These GC fingerprints are provided in the appendix of this memo.

Selected diagnostic aromatic compounds and groups of compounds were used in double ratio plots. The concentration of a group of higher-molecular-weight mono-aromatic compounds (HMW aromatics) that included compounds listed after indan/indene in the aromatic fraction of the PIANO composition in Table 1 was calculated for each sample. This group of $C_4$- and $C_5$- aromatic compounds, eluting after the n-alkane decane in the analysis, represents the volatile hydrocarbons that would be most resistant to the effects of

weathering (e.g., evaporation, dissolution, biodegradation) of an organic product exposed to the environment.

**Overall Hydrocarbon Compositional Characteristics of Site Samples**

Compositional histograms of PIANOS compounds (Figures 2A and 2B) were generated for the soil and groundwater samples from the Site and for a representative gasoline standard and a coal tar NAPL (from another site). These compositional histograms show the relative contributions of the individual hydrocarbons and hydrocarbon groups (P, I, A, N, O and S) to the overall PIANOS composition in the samples. The relative percent of the major hydrocarbon groups in the soil and groundwater samples containing gasoline and/or coal tar l are summarized in Table 2.

Evident from the PIANOS histograms of the gasoline standard and coal tar NAPL in Figures 2A and 2B, the compositional characteristics of the two products are quite contrasting. Coal tar contains almost exclusively aromatic compounds with relatively trace amounts of the thiophenes and high molecular weight *n*-alkanes, whereas the petroleum product is represented by all the PIANOS groups. Isoparaffin, naphthene, and olefin compounds are absent from coal tars. Also in coal tar, the volatile aromatic group has a much higher proportion of the 2-ring aromatic naphthalenes than that of petroleum. As evident in Figure, the distinguishing features of the two product types are also evident in the soil and groundwater samples that contain either one of the products.

These PIANOS compositional histograms which help to show the predominant product type in a sample are complemented by the GC fingerprints from the TPH (TPH-DRO type) analysis. In Table 2, the results of the evaluation of the GC fingerprints of the samples are provided. The volatile hydrocarbon portion of coal tar falls within the gasoline range of GC fingerprints and as a result determining the contribution of either product is difficult when there is a mixture of the two type products. One feature of a GC fingerprint that allows for determining the presence of gasoline only in the sample is the absence of significant peaks after the gasoline signature which is approximately 20 minutes (C14) on the GC fingerprint. If there are not many significantly large peaks after 20 minutes on the GC fingerprint, then the product is gasoline. Peaks after 20 minutes would represent other petroleum products, coal tar or some other organic material. A comparison of the GC fingerprints of soil sample WC-A(12), which contains gasoline only, and soil sample WC-A(20), which contains a mix of gasoline and coal tar, illustrates this feature (see appendix for the GC fingerprints).

**Differentiation of Gasoline and Coal Tar Products Using Diagnostic Ratio Relationships**

Identifying the source of particular hydrocarbons-of-concern, such as BTEX, in the environment where coal tar and petroleum products are candidate sources requires a number of considerations. One consideration is the overall composition of hydrocarbons. If there are negligible amounts of P, I, N, and O compounds in the environmental sample, the source of hydrocarbons would probably be coal tar products.

If, on the other hand, the environmental sample contained the full suite of PIANOS compounds, the source of the hydrocarbons would be, at a minimum, a petroleum product. However, since both petroleum products and coal tar contain aromatics, the presence of the non-aromatic compounds does not limit the hydrocarbon source to petroleum products since aromatics from the coal tar could be present with the aromatics from the petroleum product. Compounds such as indene and some of the thiophenes have been used to suggest the presence of coal tar in environmental samples, but the presence of these compounds does not indicate the relative amount of coal tar in environmental samples contaminated with a mix of coal tar and petroleum.

Another consideration in source identification is the effects of weathering (evaporation, dissolution and biodegradation) on the composition of the products. Depending on the relative influence of particular weathering processes, the change in composition of a product would be variable and identifying a particular source less predictable. The vapor pressures and solubilities of these PIANOS groups are different, and therefore, loss of particular hydrocarbons from weathering in the environment would vary depending on the type and extent of exposure (Stout et al., 2002). Overall product compositions (compositional fingerprints) would look different over time depending on the extent of weathering.

Still another consideration is the transport of product from one matrix to matrix (i.e., soil or NAPL to groundwater). Due to different solubilities of individual hydrocarbons in a product, the composition of the material will change when the product moves from the soil/NAPL matrix to the groundwater matrix. The more soluble compounds of the product will be relatively enhanced in groundwater compared to the NAPL or contaminated soil (Sauer and Costa, 2003). Aromatics would be relatively enhanced compared to the other hydrocarbon groups in groundwater when contaminated soil or NAPL are in contact with groundwater. The effects of solubilities would especially be an issue when comparing compositions of petroleum products with coal tar in groundwater. The composition of gasoline in groundwater compared to same gasoline in soil would be enhanced with aromatics relative to the other non-aromatics such that the hydrocarbon composition in the groundwater would look like there was a contribution of coal tar in the groundwater, and would lead to a misidentification of the product or products in the groundwater.

The effects of weathering and the differences in physical properties of individual hydrocarbons that influence changes in hydrocarbon compositions of an original hydrocarbon source material when moving from matrix to another require consideration when identifying useful diagnostic compounds for use in differentiating hydrocarbon sources. As a result, identification of sources of petroleum products exposed to the environment requires comparison of particular analytes or groups of analytes that have similar physical/biodegradation properties (Burris et al., 2006; Sauer and Costa, 2003; Stout et al., 2002). This is especially important when comparing compositions of petroleum and coal tars in groundwater to those in soils. In evaluating petroleum product and coal tar data in samples from the Site, diagnostic ratios of individual and groups of compounds were found to be useful in determining the relative contributions of petroleum product and coal tar in environmental samples.

One useful diagnostic ratio is the ratio of the PAH naphthalenes and the high molecular weight mono-aromatics (HMW Aromatics – defined above). The naphthalenes and HMW Aromatics are the most weathering-resistant compounds of the PIANOS compounds, and have distinguishing features for coal tar and petroleum products. In Figure 3, the ratio of naphthalenes and HMW Aromatics are graphed versus the percent ratio of the aromatics and total PIANOS for the soil samples. This figure shows the relationship of gasoline and coal tar where coal tar naphthalenes are five to 10 times higher in coal tar-containing than in petroleum-containing soils. Almost every soil sample has either the coal tar or gasoline compositional signature. One soil sample, WC-A(20) has a mix of coal tar and gasoline evident by its position in Figure 3.

Coal tar contains almost exclusively aromatics, and in Figure 3, the diagnostic ratio of percent aromatics versus total PIANOS shows coal tar NAPL and coal tar-containing soil samples positioned to the far right of the graph with values close to 100%. In contrast, the gasoline standards are positioned to the left of center reflecting the presence of the non-aromatic hydrocarbons in gasoline. This compositional feature for fresh gasolines (gasoline standards) becomes affected, however, by exposure to the environment and the processes of weathering. The effect of weathering is illustrated by the gasoline-containing soil samples in Figure 3 where the non-aromatic hydrocarbons are preferentially lost when compared to the aromatic hydrocarbons such that the relative aromatic content of the gasoline-containing soils increases. The non-aromatic compound classes (PINOS) are mostly represented by low-molecular-weight hydrocarbons with carbons less than the 10 which is different from the aromatics which are mostly represented by higher-molecular-weight aromatics with carbons greater than 10. The lower-molecular-weight, non-aromatic hydrocarbons are more susceptible to weathering than the higher-molecular-weight aromatics and therefore the relative amount of aromatics increases with weathering. As a result, the use of this percent aromatic to total PIANOS ratio is limited in determining the relative contribution of coal tar and gasoline in a mixture of the two products because of the effects of weathering on the non-aromatic fraction of gasolines.

In addition, the change in relative aromatic content in gasolines released to the environment also occurs when gasoline-containing soils or NAPL are in contact with groundwater. In Figure 4, the groundwater samples from the Site are included with the soil samples. At locations where gasoline is present in soils, the aromatic fraction (ratio of percent aromatics versus total PIANOS) in the groundwater samples is higher that of the corresponding soil samples. This is evident in Table 2 when comparing the percent values of the PIANOS groups in the groundwater and soil at the same location. This enhancement of the aromatic fraction in the groundwater samples is due mostly to the generally higher solubilities of the aromatic hydrocarbons compared to those of the non-aromatic compounds. As pointed before, the higher aromatic percents in groundwater may be misinterpreted as groundwater containing coal tar when in fact that is not the case.

A diagnostic ratio that clearly shows the relative contribution of gasoline or coal tar in both soils and groundwater is the ratio of 1,2,3,4-tetramethyl benzene to1,2,4,5-tetramethyl benzene. These two

compounds have very similar solubilities and because of their relatively higher molecular weight compared to the other aromatics they are less susceptible to weathering. So any significant change in the ratio would reflect a difference in composition due to source not from the effects of weathering. This ratio of the two C4-benzenes is paired with the percent naphthalenes and HMW Aromatics, and in Figure 5 shows the distinct difference in composition of samples containing gasoline from those containing coal tar. The diagnostic pair also shows the compositions of mixes of the two products. Soil and groundwater samples containing gasoline are grouped with the gasoline standards in the figure, in the same way that the soil and groundwater samples containing coal tar are grouped with the coal tar NAPL and coal tar in soil samples. In between the areas of the two source materials in the figure are the samples that contain a mix of gasoline and coal tar.

Another parameter that helps to differentiate gasoline hydrocarbons from coal tar hydrocarbons is the sulfur-containing compounds. Although sulfur-containing compounds vary in petroleum products depending on refining conditions and source oil, the relative amount of sulfur cyclic hydrocarbons in volatile hydrocarbon compositions (i.e., PIANOS) is relatively higher in coal tar than in gasoline. Gasolines rarely contain detectable thiophenes and relatively small amount of benzothiophene (see Table 1), whereas fresh coal tar will usually contain many of these sulfur compounds at relative amounts around 5 percent or greater depending on the extent of weathering of the coal tar. Benzothiophene is the most weathering resistant volatile sulfur cyclic compound and will often be present in samples containing either gasoline or coal tar. The relative amount of sulfur cyclic compounds is a potential distinguishing feature for coal tar and gasoline differentiation as illustrated in Figure 6.

**Source Identification of Hydrocarbons in Site Soils and Groundwater**

Although it would be desired to use the diagnostic ratios, especially the ratios used in the double ratio plot in Figure 5, to estimate the relative contribution of each product in samples that contain a mixture of the two source products, there is not sufficient data from either this study or the published literature to allow one at this time to make this estimate. However, the selected diagnostic ratios in addition to the other compositional information from the PIANO and TPH analyses provide multiple lines of evidence to differentiate hydrocarbons of gasoline from those of coal tar in both soil and groundwater. The results of the hydrocarbon compositional characterization in identifying sources of hydrocarbons in soil and groundwater samples from the Site are summarized in Figure 7 and discussed below:

- The soils and groundwater in the SB-C area including MW-8 have the compositional signature of gasoline. The PIANOS compositions of the soil samples SB-C(14) and SB-C(22) and groundwater samples MW-8 and MW-9 that represent this area are consistent with that of gasoline standards. There appears to be no evidence of coal tar in any of these samples.

- In the area of Well Cluster C, which is in the middle of the Site between the two gas historic holders of the former MGP facility, both soils and groundwater have the compositional signature of a coal tar

product. The PIANOS compositions of the Well Cluster C soil samples WC-C(21) and groundwater samples MW-C2 and MW-C3, with well screen intervals of 13.5 to 15.5 ft bgs and 19 to 21 ft bgs, respectively, are generally consistent with the represent coal tar NAPL and coal tar-containing soils collected at another former MGP site. The slight deviation of the MW-C2 groundwater composition compared to the other Well Cluster groundwater sample is probably due to low concentrations and non-detects of the PIANOS compounds.

- In the area of Well Cluster A, most soil and groundwater contain predominately gasoline but in some samples coal tar is also present. The shallow soil samples, WC-A(12) and WC-A(17), and the shallow groundwater sample, MW-A2 with a well screen interval of 13.5 to 15.5 ft bgs, have the gasoline signature with low or negligible evidence of coal tar. The deepest soil sample WC-A(20) has a mixture of gasoline and coal tar. The deep groundwater sample, MW-A3 with a well screen interval of 17.5 to 19.5 ft bgs, looks to contain mostly coal tar hydrocarbons, but the apparent absence of the non-aromatic (PINO) compounds, which would indicate coal tar, may be due to the high analyte detection limits due to diluting of the sample prior to analysis.

- In the SB-B area, the shallow soils and groundwater have a gasoline signature, whereas the deeper groundwater has a mix of gasoline and coal tar. This area is closest to the former 550 gallon USTs at the Site. The soils at SB-B are only represented by one shallow soil sample SB-B(10). A deeper soil sample was not analyzed for PIANOS. The shallow groundwater sample, MW-B2 with a well screen interval of 14 to 16 ft bgs, looks to have a similar hydrocarbon composition as that of MW-A2 (Well Cluster A area) which contained gasoline. The shallow groundwater samples of the two areas were collected at approximately the same well screen interval. The deeper groundwater sample MW-B3 of the SB-B area, which was collected in the well screen interval of 18.5 and 20.5 ft bgs, has a composition that indicates a mixture of gasoline and coal tar. The deep groundwater sample MW-A3 of the Well Cluster A area also has a mixture of gasoline and coal tar.

- In the area of the former 4000-gallon UST, one groundwater sample MW-4 was collected at well depth14.35 ft (well screen interval unknown). The PIANOS concentrations in this sample are very low with all almost all the PIANOS made up of benzene and indan. The PIANO composition indicates gasoline with some coal tar but the low PIANOS concentration makes the assessment inconclusive.

- MTBE, a gasoline additive, is present at varying concentrations in all groundwater samples and in some soil samples. However, MTBE is not present in the soil samples at SB-C where gasoline only is present. The absence of MTBE may be due water-washing of the chemical from the gasoline hydrocarbons because its high solubility or may be due to that the spilled gasoline pre- or post-dates the use of the chemical in the gasoline. TBA, another gasoline additive, is also present in the shallow groundwater samples but not in the soil samples. The concentrations of this chemical are especially high in the SB-B groundwater samples for, at the moment, an unknown reason.

## Summary

In this study, compositional characteristics of the PIANOS hydrocarbons in Site soil and groundwater samples are compared with each other and standard gasoline and coal tar NAPL samples to identify and differentiate the source of hydrocarbons in soils and groundwater at the Site. From multiple lines of evidence that include PIANOS compositional characterization, diagnostic ratio relationships of selected aromatic and heterocyclic compounds, and TPH GC fingerprint evaluation, the results of these interpretative analyses are summarized here and in Figure 7.

- There are areas of the Site where gasoline and coal tar are exclusively present. In the SB-C area that includes MW-8, shallow (14 ft bgs) and deep (22 ft bgs) soils and groundwater (unknown well screen intervals) contain only gasoline. In the area of Well Cluster C, only coal tar product is present in soils (only deep, 21 ft bgs representation) and shallow (13.5 to 15.5 ft bgs interval) and deep (19 to 21 ft bgs interval) groundwater.

- In other areas (Well Cluster A, SB-B), gasoline is the only or predominate product in shallow soils and groundwater (<16 ft bgs) with a mixture of gasoline and coal tar product present in the deeper (around 20 ft bgs) soils and groundwater.

- The gasoline additives, MTBE and TBA, are present in all shallow and most deep groundwater samples but only in a small number of shallow soil samples at the Site. The presence of these additives is indicative of gasoline contamination.

## References

Sauer, T.C and H.J. Costa. 2003. Fingerprinting of fuel oil and coal tar NAPL volatile hydrocarbons in groundwater. *Environmental Forensics* 4:319-329.

Stout, S.A., A.D. Uhler, K.J. McCarthy, and S. Emsbo-Mattingly. 2002. Chemical fingerprinting of hydrocarbons. *In: Introduction to Environmental Forensics*, eds. B.L Murphy and R.D. Morrison. London: Academic Press, pp. 137-260.

Uhler, R.M., E.M. Healey, K.J. McCarthy, A.D. Uhler, and S.A. Stout. 2003. Molecular Fingerprinting of Gasoline by a Modified EPA 8260 Gas Chromatography-Mass Spectrometry Method. *Intern. J. Environ. Anal. Chem.* 83 (1): 1-20.

**Table 1. PIANO Results and GC Fingerprint Evaluation For Soil and Groundwater Samples Collected From ConEd W. 18th Street Former MGP Site, New York**

| Sample Name | y in Water | MW-A2 GW | MW-A3 GW | WC-A(12) Soil | WC-A (17) Soil | WC-A (20) soil | MW-C2 GW | MW-C3 GW | WC-C (21) Soil | MW-B3 GW | DUP-02 GW (MW-B3) | MW-B2 GW | SB-B (10) Soil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab Sample ID | | 0810015-01 | 0810015-02 | 0808111-01 | 0808111-02 | 0808111-03 | 0810015-03 | 0810015-04 | 0808162-01 | 0810015-06 | 0810015-09 | 0810015-07 | 0808111-04 |
| Date Collected | | 9/30/2008 | 9/30/2008 | 8/20/2008 | 8/21/2008 | 8/21/2008 | 9/30/2008 | 9/30/2008 | 0808162-01 | 10/1/2008 | 9/30/2008 | 10/1/2008 | 8/21/2008 |
| Reporting Limit | | 20 | 100 | 425 | 93.8 | 94 | 2 | 40 | 6120 | 20 | 100 | 20 | 390 |
| Result Units | mg/L | µg/L | µg/L | µg/Kg | µg/Kg | µg/Kg | µg/L | µg/L | ug/kg | µg/L | µg/L | µg/L | ug/kg |
| **Aromatics** | | | | | | | | | | | | | |
| Benzene | 1790 | 4040 | 13300 | 872 | 1970 | 913 | 39.1 | 3520 | 222000 | 4380 | 4240 | 917 | 340 |
| Toluene | 535 | 27.9 | 12.5 | 191 | 654 | 25.8 | 2.91 | 1860 | 236000 | 28 | 33 | 123 | 4790 |
| Ethylbenzene | 161 | 1450 | 373 | 25100 | 12600 | 474 | 1.41 | 1060 | 178000 | 56.9 | 49.5 | 150 | 19300 |
| p/m-Xylene | 151 | 3420 | 498 | 45100 | 47400 | 1360 | 3.05 | 1340 | 257000 | 77 | 76 | 948 | 67400 |
| Styrene | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 22 | 4340 | 0 | 0 | 0 | 0 |
| o-Xylene | 171 | 974 | 124 | 8910 | 14500 | 408 | 1.17 | 593 | 101000 | 21.5 | 22.5 | 427 | 16900 |
| Isopropylbenzene | 65 | 90.9 | 117 | 7860 | 2290 | 115 | 0.61 | 28 | 3460 | 68.7 | 64.5 | 23.8 | 3270 |
| n-Propylbenzene | 51 | 203 | 59 | 31100 | 8490 | 262 | 0 | 6.4 | 2690 | 50.3 | 35.5 | 24.2 | 14300 |
| 1-Methyl-3-ethylbenzene | 83 | 479 | 67 | 23400 | 17800 | 580 | 0.26 | 54.8 | 21500 | 6.5 | 0 | 242 | 33600 |
| 1-Methyl-4-ethylbenzene | 93 | 277 | 65.5 | 20800 | 9450 | 325 | 0 | 36.2 | 12000 | 6.7 | 0 | 97.5 | 21800 |
| 1,3,5-Trimethylbenzene | 48 | 306 | 70.5 | 23800 | 10600 | 362 | 0.19 | 81.6 | 34000 | 6.4 | 0 | 134 | 25400 |
| 1-Methyl-2-ethylbenzene | 74 | 228 | 53 | 9870 | 8070 | 214 | 0.29 | 23 | 6940 | 13.6 | 11 | 113 | 11400 |
| tert-Butylbenzene | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 68.3 |
| 1,2,4-Trimethylbenzene | 52 | 1290 | 193 | 110000 | 38100 | 1300 | 0.68 | 237 | 85700 | 19.4 | 19.5 | 513 | 84900 |
| Isobutylbenzene | 10 | 5.3 | 0 | 3040 | 743 | 23.4 | 0 | 0 | 0 | 1.3 | 0 | 0 | 1490 |
| sec-Butylbenzene | 18 | 6.8 | 0 | 2960 | 723 | 24.4 | 0 | 0 | 0 | 0 | 0 | 0 | 1500 |
| 1-Methyl-3-isopropylbenzene | 43 | 9.9 | 0 | 2000 | 1060 | 27.2 | 0 | 0 | 948 | 0 | 0 | 4.8 | 2420 |
| 1-Methyl-4-isopropylbenzene | 23 | 4.3 | 0 | 1520 | 437 | 13.6 | 0 | 0 | 673 | 0 | 0 | 1.6 | 1110 |
| 1,2,3-Trimethylbenzene | 75 | 315 | 66 | 16300 | 7500 | 255 | 0.49 | 70.2 | 21000 | 10.9 | 11 | 153 | 21500 |
| 1-Methyl-2-isopropylbenzene | 48 | 1.8 | 0 | 461 | 115 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 263 |
| Indan | | 569 | 2590 | 22800 | 7040 | 1390 | 36.2 | 594 | 27600 | 1060 | 933 | 311 | 15100 |
| Indene | | 23 | 38.9 | 1870 | 581 | 49 | 2 | 195 | 40100 | 46.5 | 36 | 15.9 | 1920 |
| 1,3-Diethylbenzene | | 27.7 | 16.5 | 11400 | 2860 | 101 | 0 | 0 | 1250 | 13.3 | 10 | 16.1 | 8500 |
| 1-Methyl-3-propylbenzene | 9.1 | 32.7 | 10 | 9480 | 5150 | 151 | 0 | 0 | 1680 | 0 | 0 | 17.9 | 12700 |
| 1-Methyl-4-propylbenzene | 10 | 20.7 | 8 | 12000 | 3120 | 96.1 | 0 | 0 | 1220 | 2.2 | 0 | 7.7 | 7750 |
| n-Butylbenzene | 12 | 13.6 | 6.5 | 8730 | 2120 | 71.7 | 0 | 0 | 1320 | 3.1 | 0 | 3.4 | 5460 |
| 1,2-Dimethyl-4-ethylbenzene | 13 | 47.6 | 14 | 12800 | 5510 | 157 | 0 | 6.4 | 4980 | 1.4 | 0 | 29.4 | 16800 |
| 1,2-Diethylbenzene | 23 | 6.6 | 0 | 1940 | 472 | 20.6 | 0 | 0 | 0 | 2.9 | 0 | 3.2 | 1380 |
| 1-Methyl-2-propylbenzene | 13 | 17.2 | 6.5 | 5270 | 2010 | 58.1 | 0 | 0 | 703 | 1.7 | 0 | 8.2 | 5630 |
| 1,4-Dimethyl-2-ethylbenzene | 15 | 43.3 | 11.5 | 15100 | 4230 | 114 | 0 | 3.2 | 2380 | 1.6 | 0 | 22.3 | 13000 |
| 1,3-Dimethyl-4-ethylbenzene | | 33.2 | 8 | 11400 | 3450 | 98.5 | 0 | 3 | 2420 | 0 | 0 | 17.7 | 10600 |
| 1,3-Dimethyl-5-ethylbenzene | 12 | 77.9 | 39.5 | 32000 | 7440 | 277 | 0.29 | 7 | 4680 | 30.9 | 23.5 | 39.3 | 22200 |
| 1,3-Dimethyl-2-ethylbenzene | 20 | 8.9 | 5 | 2190 | 532 | 21.1 | 0 | 0 | 550 | 4.2 | 0 | 4.4 | 1680 |
| 1,2-Dimethyl-3-ethylbenzene | 17 | 16.5 | 0 | 2890 | 1330 | 38.9 | 0 | 0 | 1040 | 0 | 0 | 9.1 | 4490 |
| 1,2,4,5-Tetramethylbenzene | 3.5 | 35.8 | 20 | 17000 | 3460 | 129 | 0.2 | 5.8 | 3760 | 13.9 | 12.5 | 16.8 | 10900 |
| 1,2,3,5-Tetramethylbenzene | | 57.3 | 21.5 | 22100 | 4930 | 166 | 0 | 8.2 | 6450 | 2.2 | 0 | 27.8 | 16300 |
| Pentylbenzene | 3.4 | 0 | 0 | 1220 | 226 | 15.0 | 0 | 0 | 673 | 0 | 0 | 0 | 1460 |
| 1,2,3,4-Tetramethylbenzene | | 26 | 17.5 | 6240 | 1340 | 78.8 | 0.23 | 8.2 | 4830 | 12.8 | 10.5 | 10.9 | 4980 |
| 1-t-Butyl-3,5-Dimethylbenzene | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1,3,5-Triethylbenzene | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Naphthalene | | 239 | 392 | 23400 | 4990 | 947 | 3.66 | 3340 | 1140000 | 127 | 106 | 68.4 | 18000 |
| 1,2,4-Triethylbenzene | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hexylbenzene | | 0 | 0 | 433 | 81.6 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 804 |
| 2-Methylnaphthalene | | 34.8 | 142 | 13200 | 2210 | 659 | 0.74 | 216 | 302000 | 32.5 | 31 | 16.4 | 18300 |
| 1-Methylnaphthalene | | 26.7 | 142 | 7090 | 1180 | 468 | 0.93 | 170 | 167000 | 41 | 36 | 13.7 | 8930 |

**Table 1. PIANO Results and GC Fingerprint Evaluation For Soil and Groundwater Samples Collected From ConEd W. 18th Street Former MGP Site, New York**

| Sample Name | y in Water | MW-A2 GW | MW-A3 GW | WC-A(12) Soil | WC-A (17) Soil | WC-A (20) soil | MW-C2 GW | MW-C3 GW | WC-C (21) Soil | MW-B3 GW | DUP-02 GW (MW-B3) | MW-B2 GW | SB-B (10) Soil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lab Sample ID** | | 0810015-01 | 0810015-02 | 0808111-01 | 0808111-02 | 0808111-03 | 0810015-03 | 0810015-04 | 0808162-01 | 0810015-06 | 0810015-09 | 0810015-07 | 0808111-04 |
| **Date Collected** | | 9/30/2008 | 9/30/2008 | 8/20/2008 | 8/21/2008 | 8/21/2008 | 9/30/2008 | 9/30/2008 | 0808162-01 | 10/1/2008 | 9/30/2008 | 10/1/2008 | 8/21/2008 |
| **Reporting Limit** | | 20 | 100 | 425 | 93.8 | 94 | 2 | 40 | 6120 | 20 | 100 | 20 | 390 |
| **Result Units** | mg/L | µg/L | µg/L | µg/Kg | µg/Kg | µg/Kg | µg/L | µg/L | ug/kg | µg/L | µg/L | µg/L | ug/kg |
| **Paraffins** | | | | | | | | | | | | | |
| Pentane | 48 | 13.5 | 0 | 234 | 320 | 41.3 | 0 | 0 | 2200 | 14.9 | 0 | 0 | 0 |
| Hexane | 13 | 23.2 | 0 | 1900 | 2920 | 82.5 | 0 | 0 | 0 | 2.8 | 0 | 0 | 178 |
| Heptane | 3 | 14.9 | 0 | 14600 | 6150 | 206 | 0 | 0 | 0 | 0 | 0 | 0 | 4070 |
| Octane | 0.66 | 4.7 | 0 | 26000 | 8140 | 288 | 0 | 0 | 2290 | 0 | 0 | 0 | 9670 |
| Nonane | 0.17 | 0 | 0 | 14400 | 5160 | 176 | 0 | 0 | 4130 | 0 | 0 | 0 | 8320 |
| Decane | 0.052 | 0 | 0 | 6700 | 2810 | 97.1 | 0 | 0 | 7680 | 0 | 0 | 0 | 7960 |
| Undecane | 0.044 | 0 | 0 | 3280 | 1060 | 40.8 | 0 | 0 | 6760 | 0 | 0 | 0 | 7260 |
| Dodecane | 0.003 | 0 | 0 | 2320 | 565 | 36.1 | 0 | 0 | 6210 | 0 | 0 | 0 | 6260 |
| Tridecane | | 0 | 0 | 868 | 183 | 11.2 | 0 | 0 | 3940 | 0 | 0 | 0 | 4380 |
| Tetradecane | | 0 | 0 | 437 | 66.2 | 0.0 | 0 | 0 | 2750 | 0 | 0 | 0 | 2260 |
| Pentadecane | | 0 | 0 | 236 | 39.9 | 0 | 0 | 0 | 2450 | 0 | 0 | 0 | 1280 |
| **Isoparaffins** | | | | | | | | | | | | | |
| Isopentane | 48 | 31.8 | 0 | 219 | 602 | 45.5 | 0 | 0 | 1010 | 37.6 | 43.5 | 6.2 | 0 |
| 2,2-Dimethylbutane | | 0 | 0 | 0 | 134 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2,3-Dimethylbutane | 21 | 8.2 | 0 | 293 | 598 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2-Methylpentane | 16 | 45.9 | 0 | 2010 | 3380 | 102 | 0 | 0 | 0 | 11.8 | 0 | 0 | 99.5 |
| 3-Methylpentane | 18 | 38.2 | 0 | 1550 | 2750 | 74.6 | 0 | 0 | 0 | 11.3 | 0 | 0 | 87.8 |
| 2,2-Dimethylpentane | | 0 | 0 | 231 | 235 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2,4-Dimethylpentane | 5.5 | 0 | 0 | 1220 | 1130 | 33.8 | 0 | 0 | 0 | 0 | 0 | 0 | 295 |
| 2,2,3-Trimethylbutane | | 0 | 0 | 74.3 | 67.6 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3,3-Dimethylpentane | 5.9 | 0 | 0 | 439 | 307 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 68.3 |
| 2-Methylhexane | 2.5 | 27.8 | 0 | 13100 | 7600 | 233 | 0 | 0 | 0 | 0 | 0 | 0 | 2770 |
| 2,3-Dimethylpentane | 5.3 | 16.5 | 0 | 4820 | 2710 | 82.0 | 0 | 0 | 0 | 2.6 | 0 | 0 | 1820 |
| 3-Methylhexane | 2.6 | 33.1 | 0 | 15200 | 7350 | 248 | 0 | 0 | 0 | 0 | 0 | 0 | 3390 |
| 3-Ethylpentane | | 3.4 | 0 | 1620 | 702 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 361 |
| Isooctane | | 5.1 | 0 | 7400 | 2460 | 90.5 | 0 | 0 | 0 | 0 | 0 | 0 | 7560 |
| 2,2-Dimethylhexane | | 0 | 0 | 962 | 341 | 10.8 | 0 | 0 | 0 | 0 | 0 | 0 | 224 |
| 2,5-Dimethylhexane | | 0 | 0 | 7600 | 2520 | 82.5 | 0 | 0 | 0 | 0 | 0 | 0 | 2720 |
| 2,4-Dimethylhexane | 1.3 | 4 | 0 | 9410 | 3300 | 117 | 0 | 0 | 0 | 0 | 0 | 0 | 3520 |
| 2,2,3-Trimethylpentane | | 0 | 0 | 1050 | 350 | 6.56 | 0 | 0 | 0 | 0 | 0 | 0 | 585 |
| 2,3,4-Trimethylpentane | | 4.2 | 0 | 9990 | 3180 | 105 | 0 | 0 | 0 | 0 | 0 | 0 | 8220 |
| 2,3,3-Trimethylpentane | | 7.4 | 0 | 11000 | 3530 | 117 | 0 | 0 | 0 | 0 | 0 | 0 | 7180 |
| 2,3-Dimethylhexane | 0.94 | 0 | 0 | 8840 | 2810 | 96.6 | 0 | 0 | 0 | 0 | 0 | 0 | 3900 |
| 2-Methylheptane | 0.86 | 8 | 0 | 32600 | 7990 | 354 | 0 | 0 | 0 | 0 | 0 | 0 | 10100 |
| 4-Methylheptane | 0.84 | 0 | 0 | 13600 | 4190 | 157 | 0 | 0 | 0 | 0 | 0 | 0 | 3900 |
| 3-Methylheptane | 0.79 | 18.8 | 0 | 35600 | 9270 | 466 | 0 | 0 | 0 | 0 | 0 | 0 | 10300 |
| 3-Ethylhexane | | 0 | 0 | 6240 | 1730 | 77.8 | 0 | 0 | 0 | 0 | 0 | 0 | 1800 |
| 2,5-Dimethylheptane | | 0 | 0 | 18300 | 4480 | 155 | 0 | 0 | 0 | 0 | 0 | 0 | 4720 |
| 3,5-Dimethylheptane | | 0 | 0 | 5370 | 1300 | 45.5 | 0 | 0 | 0 | 0 | 0 | 0 | 1300 |
| 3,3-Dimethylheptane | | 0 | 0 | 1550 | 400 | 8.44 | 0 | 0 | 0 | 0 | 0 | 0 | 306 |
| 2,3-Dimethylheptane | 0.25 | 0 | 0 | 7930 | 1840 | 63.8 | 0 | 0 | 0 | 0 | 0 | 0 | 2390 |
| 3,4-Dimethylheptane | | 0 | 0 | 11100 | 2640 | 98.0 | 0 | 0 | 0 | 0 | 0 | 0 | 2640 |
| 4-Methyloctane | | 0 | 0 | 26100 | 6230 | 251 | 0 | 0 | 0 | 0 | 0 | 0 | 6640 |
| 2-Methyloctane | 0.22 | 0 | 0 | 32400 | 7860 | 292 | 0 | 0 | 0 | 0 | 0 | 0 | 9480 |

**Table 1. PIANO Results and GC Fingerprint Evaluation For Soil and Groundwater Samples Collected From ConEd W. 18th Street Former MGP Site, New York**

| Sample Name | y in Water | MW-A2 GW | MW-A3 GW | WC-A(12) Soil | WC-A (17) Soil | WC-A (20) soil | MW-C2 GW | MW-C3 GW | WC-C (21) Soil | MW-B3 GW | DUP-02 GW (MW-B3) | MW-B2 GW | SB-B (10) Soil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab Sample ID | | 0810015-01 | 0810015-02 | 0808111-01 | 0808111-02 | 0808111-03 | 0810015-03 | 0810015-04 | 0808162-01 | 0810015-06 | 0810015-09 | 0810015-07 | 0808111-04 |
| Date Collected | | 9/30/2008 | 9/30/2008 | 8/20/2008 | 8/21/2008 | 8/21/2008 | 9/30/2008 | 9/30/2008 | 0808162-01 | 10/1/2008 | 9/30/2008 | 10/1/2008 | 8/21/2008 |
| Reporting Limit | | 20 | 100 | 425 | 93.8 | 94 | 2 | 40 | 6120 | 20 | 100 | 20 | 390 |
| Result Units | mg/L | µg/L | µg/L | µg/Kg | µg/Kg | µg/Kg | µg/L | µg/L | ug/kg | µg/L | µg/L | µg/L | ug/kg |
| **Isoparaffins (Cont.)** | | | | | | | | | | | | | |
| 3-Methyloctane | 0.21 | 0 | 0 | 33900 | 7980 | 315 | 0 | 0 | 0 | 0 | 0 | 0 | 9370 |
| 3,3-Diethylpentane | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3,3-Dimethyloctane | | 0 | 0 | 879 | 200 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2-Methylnonane | | 0 | 0 | 18900 | 4050 | 167 | 0 | 0 | 0 | 0 | 0 | 0 | 8110 |
| 3-Methylnonane | | 0 | 0 | 18700 | 3950 | 131 | 0 | 0 | 0 | 0 | 0 | 0 | 6090 |
| **Naphthenes** | | | | | | | | | | | | | |
| Cyclopentane | 161 | 4.1 | 0 | 0 | 69.4 | 0.0 | 0 | 0 | 0 | 39.1 | 22 | 8.4 | 0 |
| Methylcyclopentane | 42 | 70.5 | 25 | 1600 | 2130 | 51.1 | 0 | 0 | 0 | 55.4 | 50.5 | 6.8 | 271 |
| Cyclohexane | 67 | 17.6 | 0 | 469 | 449 | 0.0 | 0 | 0 | 0 | 22.1 | 0 | 0 | 113 |
| 1,1-Dimethylcyclopentane | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1,3-Dimethylcyclopentane (cis) | | 12.2 | 0 | 2360 | 1270 | 36.6 | 0 | 0 | 0 | 0 | 0 | 0 | 704 |
| Methylcyclohexane | 14 | 32.8 | 0 | 6710 | 2900 | 86.7 | 0 | 0 | 0 | 13.2 | 0 | 0 | 2450 |
| Ethylcyclopentane | 9.6 | 8.8 | 0 | 3660 | 1490 | 44.5 | 0 | 0 | 0 | 0 | 0 | 0 | 1380 |
| 1,2,3-Trimethylcyclopentane (ctc) | | 0 | 0 | 2090 | 794 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 880 |
| 1,4-Dimethylcyclohexane (trans) | | 0 | 0 | 2060 | 552 | 17.8 | 0 | 0 | 0 | 0 | 0 | 0 | 689 |
| 1,2-Dimethylcyclohexane (trans) | 6 | 0 | 0 | 1850 | 348 | 23.4 | 0 | 0 | 0 | 0 | 0 | 0 | 747 |
| Isopropylcyclopentane | | 0 | 0 | 1250 | 377 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 597 |
| 1,2-Dimethylcyclohexane (cis) | 6 | 0 | 0 | 3790 | 1070 | 32.4 | 0 | 0 | 0 | 0 | 0 | 0 | 1650 |
| n-Propylcyclopentane | | 0 | 0 | 2380 | 678 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 1270 |
| 1,1,4-Trimethylcyclohexane | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Isopropylcyclohexane | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Isobutylcyclohexane | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Olefins** | | | | | | | | | | | | | |
| 3-Methyl-1-butene | 130 | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1-Pentene | 150 | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2-Methyl-1-butene | | 0 | 0 | 0 | 30.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2-Pentene (trans) | 205 | 0 | 0 | 0 | 31.4 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2-Methyl-1,3-butadiene | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2-Pentene (cis) | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4-Methyl-1-pentene | | 0 | 0 | 0 | 18.3 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1-Hexene | 50 | 0 | 0 | 0 | 29.6 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2-Hexene (trans) | 89 | 0 | 0 | 61.6 | 218 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2-Methyl-2-pentene | 79 | 5.8 | 0 | 225 | 401 | 0.0 | 0 | 0 | 0 | 7 | 0 | 0 | 50.7 |
| 2-Hexene (cis) | | 0 | 0 | 0 | 145 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1,3-DMCP (trans)/2-Methyl-1-hexene | | 18.8 | 0 | 3890 | 2060 | 45.5 | 0 | 0 | 0 | 0 | 0 | 0 | 1220 |
| 1-Heptene/1,2-DMCP (trans) | | 10.7 | 0 | 2650 | 1640 | 26.7 | 0 | 0 | 0 | 0 | 0 | 0 | 757 |
| 3-Heptene (trans) | 31 | 0 | 0 | 236 | 438 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 304 |
| 3-Heptene (cis) | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2-Heptene (trans) | | 0 | 0 | 138 | 340 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 158 |
| 2-Heptene (cis) | | 0 | 0 | 178 | 327 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1-Octene | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1,2,3-TMCP(ccc)/2-Octene (trans) | | 0 | 0 | 1200 | 353 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 523 |
| 2-Octene (cis) | | 0 | 0 | 0 | 237 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 449 |

**Table 1. PIANO Results and GC Fingerprint Evaluation For Soil and Groundwater Samples Collected From ConEd W. 18th Street Former MGP Site, New York**

| Sample Name | y in Water | MW-A2 GW | MW-A3 GW | WC-A(12) Soil | WC-A (17) Soil | WC-A (20) soil | MW-C2 GW | MW-C3 GW | WC-C (21) Soil | MW-B3 GW | DUP-02 GW (MW-B3) | MW-B2 GW | SB-B (10) Soil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab Sample ID | | 0810015-01 | 0810015-02 | 0808111-01 | 0808111-02 | 0808111-03 | 0810015-03 | 0810015-04 | 0808162-01 | 0810015-06 | 0810015-09 | 0810015-07 | 0808111-04 |
| Date Collected | | 9/30/2008 | 9/30/2008 | 8/20/2008 | 8/21/2008 | 8/21/2008 | 9/30/2008 | 9/30/2008 | 0808162-01 | 10/1/2008 | 9/30/2008 | 10/1/2008 | 8/21/2008 |
| Reporting Limit | | 20 | 100 | 425 | 93.8 | 94 | 2 | 40 | 6120 | 20 | 100 | 20 | 390 |
| Result Units | mg/L | µg/L | µg/L | µg/Kg | µg/Kg | µg/Kg | µg/L | µg/L | ug/kg | µg/L | µg/L | µg/L | ug/kg |
| **Olefins (Cont.)** | | | | | | | | | | | | | |
| 1-Nonene | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3030 | 0 | 0 | 0 | 0 |
| 3-Nonene (trans) | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3-Nonene (cis) | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2-Nonene | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1-Decene | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | | 0 | 0 | 0 | 0 |
| **Sulfur Heterocyclics** | | | | | | | | | 6670 | | | | |
| Thiophene | | 46.9 | 142 | 0 | 0.0 | 0.0 | 1.04 | 35.6 | 1650 | 37.1 | 33 | 8.1 | 0 |
| 2-Methylthiophene | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 12.2 | 1070 | 0 | 0 | 0 | 0 |
| 3-Methylthiophene | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 10.2 | 887 | 0 | 0 | 0 | 0 |
| 2-Ethylthiophene | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 6 | 795 | 0 | 0 | 0 | 0 |
| Benzothiophene | | 10.4 | 48 | 546 | 128 | 48.8 | 0 | 200 | 46600 | 6.6 | 0 | 0 | 1180 |
| **Gasoline Additives** | | | | | | | | | | | | | |
| Tertiary butanol | | 254 | 0 | 0 | 0 | 0 | 28.9 | 0 | 0 | 4270 | 4680 | 4270 | 0 |
| MTBE | 52100 | 106 | 110 | 0 | 17.4 | 0.0 | 24.1 | 32 | 0 | 72 | 65 | 27.8 | 0 |
| Diisopropyl Ether (DIPE) | | 0 | 0 | 0 | 0.0 | 0.0 | 0.87 | 0 | 0 | 10.3 | 0 | 14 | 0 |
| Ethyl Tertiary Butyl Ether (ETBE) | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1,2-Dichloroethane | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TAME | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1,2-Dibromoethane | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MMT | | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Analyte Ratios** | | | | | | | | | | | | | |
| 1,4-dimethyl-2-ethyl bz/1,2-dimethyl-4-ethyl bz | | 0.91 | 0.82 | 1.18 | 0.77 | 0.73 | - | 0.50 | 0.48 | 1.14 | - | 0.76 | 0.77 |
| ethyl bz/ o-xylene | | 1.49 | 3.01 | 2.82 | 0.87 | 1.16 | 1.21 | 1.79 | 1.76 | 2.65 | 2.20 | 0.35 | 1.14 |
| indan/1,3-Dimethyl-5-ethylbz | | 7.30 | 65.57 | 0.71 | 0.95 | 5.02 | 124.83 | 84.86 | 5.90 | 34.30 | 39.70 | 7.91 | 0.68 |
| 1,3-dimethyl-5-ethylbz/1-methyl-2-propylbz | | 4.53 | 6.08 | 6.07 | 3.70 | 4.77 | - | - | 6.66 | 18.18 | - | 4.79 | 3.94 |
| 1,2,3,4-tetramethylbz/1,2,4,5-tetramethylbx | | 0.73 | 0.88 | 0.37 | 0.39 | 0.61 | 1.15 | 1.41 | 1.28 | 0.92 | 0.84 | 0.65 | 0.46 |
| **Misc Parameters** | | | | | | | | | | | | | |
| Sum Aromatics (No Naphthlenes) | | 14,186 | 17,812 | 528,277 | 237,804 | 9,666 | 89 | 9,763 | 1,292,887 | 5,944 | 5,588 | 4,433 | 493,405 |
| sum PIANO minus Aromatics | | 490 | 25 | 467,970 | 155,976 | 5,370 | 0 | 0 | 42,450 | 218 | 116 | 21 | 185,797 |
| Aromatics/Non-Aromatics | | 29.0 | 712.5 | 1.1 | 1.5 | 1.8 | - | - | 30.5 | 27.3 | 48.2 | 207.1 | 2.7 |
| Total PIANO (no S or Ns) | | 14,676 | 17,837 | 996,247 | 393,780 | 15,036 | 89 | 9,763 | 1,335,337 | 6,162 | 5,704 | 4,454 | 679,203 |
| Sum Aromatics (No Naphthlenes)/Total | | 97% | 100% | 53% | 60% | 64% | 100% | 100% | 97% | 96% | 98% | 100% | 73% |
| Paraffins | | 0.38% | 0.00% | 7.12% | 6.96% | 6.49% | 0.00% | 0.00% | 2.77% | 0.29% | 0.00% | 0.00% | 7.59% |
| Isoparaffins | | 1.71% | 0.00% | 36.14% | 27.97% | 26.69% | 0.00% | 0.00% | 0.07% | 1.02% | 0.76% | 0.14% | 17.63% |
| Aromatics (no Ns) | | 96.29% | 98.81% | 53.00% | 60.37% | 64.08% | 98.85% | 97.37% | 93.26% | 95.79% | 97.40% | 99.34% | 72.52% |
| Naphthenes | | 0.99% | 0.14% | 2.83% | 3.08% | 1.94% | 0.00% | 0.00% | 0.00% | 2.09% | 1.26% | 0.34% | 1.58% |
| Olefins | | 0.24% | 0.00% | 0.86% | 1.59% | 0.48% | 0.00% | 0.00% | 0.22% | 0.11% | 0.00% | 0.00% | 0.51% |
| Sulfur | | 0.39% | 1.05% | 0.05% | 0.03% | 0.32% | 1.15% | 2.63% | 3.68% | 0.70% | 0.58% | 0.18% | 0.17% |
| Percent Isoparaffins+Naphthenes | | 2.70% | 0.14% | 38.97% | 31.05% | 28.63% | 0.00% | 0.00% | 0.07% | 3.11% | 2.02% | 0.48% | 19.21% |
| Total PIANO +S (no Ns) | | 14,733 | 18,027 | 996,793 | 393,908 | 15,085 | 90 | 10,027 | 1,386,339 | 6,205 | 5,737 | 4,463 | 680,383 |
| Naphthalenes | | 301 | 676 | 43,690 | 8,380 | 2,074 | 5 | 3,726 | 1,609,000 | 201 | 173 | 99 | 45,230 |
| Percent Sulfur/(Aromatics+Sulfur) | | 0.4% | 1.1% | 0.1% | 0.1% | 0.5% | 1.2% | 2.6% | 3.8% | 0.7% | 0.6% | 0.2% | 0.2% |
| Percent Ns/(Aromatics+Ns) | | 2% | 4% | 8% | 3% | 18% | 6% | 28% | 55% | 3% | 3% | 2% | 8% |

**Table 1. PIANO Results and GC Fingerprint Evaluation For Soil and Groundwater Samples Collected From ConEd W. 18th Street Former MGP Site, New York**

| Sample Name | y in Water | MW-A2 GW | MW-A3 GW | WC-A(12) Soil | WC-A (17) Soil | WC-A (20) soil | MW-C2 GW | MW-C3 GW | WC-C (21) Soil | MW-B3 GW | DUP-02 GW (MW-B3) | MW-B2 GW | SB-B (10) Soil |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lab Sample ID** | | **0810015-01** | **0810015-02** | **0808111-01** | **0808111-02** | **0808111-03** | **0810015-03** | **0810015-04** | **0808162-01** | **0810015-06** | **0810015-09** | **0810015-07** | **0808111-04** |
| **Date Collected** | | **9/30/2008** | **9/30/2008** | **8/20/2008** | **8/21/2008** | **8/21/2008** | **9/30/2008** | **9/30/2008** | **0808162-01** | **10/1/2008** | **9/30/2008** | **10/1/2008** | **8/21/2008** |
| **Reporting Limit** | | **20** | **100** | **425** | **93.8** | **94** | **2** | **40** | **6120** | **20** | **100** | **20** | **390** |
| **Result Units** | **mg/L** | **µg/L** | **µg/L** | **µg/Kg** | **µg/Kg** | **µg/Kg** | **µg/L** | **µg/L** | **ug/kg** | **µg/L** | **µg/L** | **µg/L** | **ug/kg** |
| **Misc Parameters (Cont.)** | | | | | | | | | | | | | |
| Percent P+I+N | | 3% | 0% | 46% | 38% | 35% | 0% | 0% | 3% | 3% | 2% | 0% | 27% |
| Percent A+S | | 97% | 100% | 53% | 60% | 64% | 100% | 100% | 97% | 96% | 98% | 100% | 73% |
| Percent Ns/Aromatics (no Ns) | | 2.1 | 3.8 | 8.3 | 3.5 | 21.5 | 6.0 | 38.2 | 124.5 | 3.4 | 3.1 | 2.2 | 9.2 |
| Percent Ns/(Ns+HMW Aromatic above Indane | | 39.3% | 78.6% | 20.4% | 14.9% | 57.3% | 88.1% | 98.9% | 97.7% | 69.0% | 75.4% | 29.6% | 23.8% |
| | | | | | | | | | | | | | |
| C10-C28 DRO mg/L or mg/kg | | 5.0 | 8.2 | 613 | 202 | 96.5 | 1.4 | 10.9 | 15300 | 2.8 | 3.0 | 2.4 | 918 |
| | | | | | | | | | | | | | |
| **TPH GC Fingerprint Evaluation** | | Few well resolved peaks but with more peaks in C10 to C12 than coal tar. Negligible peaks after C13 (19 min). Weathered gasoline | Similar to Well Cluster C3 | Gasoline | Gasoline | Mix, mostly gasoline | Few, small peaks in gasoline range (same size peaks as C13 to C20) and small peaks from C13 to C20. Weathered coal tar | Few, large, well resolved peaks with empty space (C10-C12) in gasoline range (<C13), and many, small peaks past C13 to C20 -- Coal Tar Fingerprint | Coal tar only fresh with relatively high BTEX | Few well resolved peaks with empty spacing in gasoline range (<C13), and many smaller peaks from C13 to C20 | Duplicate of SB-B3 | Similar to Well Cluster A2 | Gasoline |

**Table 1. PIANO Results and GC Fingerprint Evaluation For Soil and Groundwater Samples Collected From ConEd W. 18th Street Former MGP Site, New York**

| Sample Name | MW-8 GW | MW-9 GW | SB-C (14) Soil | Dup-01 Soil [SB-C(14)] | SB-C (22) Soil | MW-4 GW | Coal Tar NAPL | Coal Tar in Soil | Coal Tar in Soil | Regular | Plus | Super |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab Sample ID | 0810015-10 | 0810015-05 | 0809049-01 | 0809049-03 | 0809049-02 | 0810015-08 | | | | 0809077-03 | 0809077-04 | 0809077-05 |
| Date Collected | 10/1/2008 | 10/1/2008 | 09/08/2008 | 09/08/2008 | 09/08/2008 | 10/1/2008 | 2008 | 2008 | 2008 | 09/09/2008 | 09/09/2008 | 09/09/2008 |
| Reporting Limit | 100 | | 933 | 786 | 1050 | 5 | 10.6 | 425 | 743 | 93.1 | 92.2 | 98.1 |
| Result Units | µg/L | Analysis | ug/kg | ug/kg | ug/kg | µg/L | mg/kg oil | ug/kg | ug/kg | mg/kg oil | mg/kg oil | mg/kg oil |
| **Aromatics** | | | | | | | | | | | | |
| Benzene | 3080 | | 1120 | 1370 | 1880 | 688 | 23.0 | 1220 | 3970 | 6010 | 5610 | 5780 |
| Toluene | 4520 | | 38600 | 43400 | 47100 | 2.75 | 2.85 | 440 | 1390 | 58500 | 68000 | 64200 |
| Ethylbenzene | 2480 | | 69800 | 73400 | 252000 | 0 | 523 | 28700 | 44500 | 58500 | 12600 | 12600 |
| p/m-Xylene | 11000 | | 296000 | 303000 | 980000 | 6.3 | 49.7 | 12600 | 20100 | 59600 | 59100 | 57400 |
| Styrene | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 193 | 17.7 | 0.0 | 0.0 |
| o-Xylene | 4570 | | 93900 | 99400 | 302000 | 1.25 | 31.2 | 11200 | 15200 | 21700 | 20600 | 19400 |
| Isopropylbenzene | 147 | | 12500 | 12100 | 43500 | 20.3 | 93.0 | 3760 | 7450 | 849 | 666 | 550 |
| n-Propylbenzene | 337 | | 43300 | 44200 | 153000 | 11.8 | 45.6 | 959 | 1600 | 3500 | 2920 | 2800 |
| 1-Methyl-3-ethylbenzene | 1800 | | 150000 | 151000 | 443000 | 0 | 4.38 | 8960 | 15300 | 14800 | 11400 | 12200 |
| 1-Methyl-4-ethylbenzene | 776 | | 70000 | 69500 | 218000 | 0 | 91.6 | 9290 | 15800 | 6420 | 5480 | 5100 |
| 1,3,5-Trimethylbenzene | 1040 | | 82000 | 81800 | 235000 | 0.8 | 178 | 4420 | 9820 | 7720 | 6700 | 6290 |
| 1-Methyl-2-ethylbenzene | 852 | | 52200 | 51200 | 154000 | 3.95 | 112 | 3370 | 4820 | 4620 | 3800 | 3400 |
| tert-Butylbenzene | 0 | | 163 | 161 | 305 | 0 | 0.0 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| 1,2,4-Trimethylbenzene | 3820 | | 301000 | 298000 | 783000 | 1 | 833 | 18700 | 29100 | 26900 | 21000 | 20400 |
| Isobutylbenzene | 17 | | 4430 | 4480 | 18600 | 0 | 3.48 | 59.5 | 123 | 220 | 171 | 178 |
| sec-Butylbenzene | 19 | | 4210 | 4040 | 16500 | 0 | 0.0 | 0 | 0 | 204 | 153 | 157 |
| 1-Methyl-3-isopropylbenzene | 41 | | 8040 | 7500 | 28000 | 0 | 44.4 | 1860 | 4530 | 418 | 288 | 256 |
| 1-Methyl-4-isopropylbenzene | 11.5 | | 2870 | 2600 | 7890 | 0 | 62.9 | 5890 | 2550 | 151 | 95.9 | 80.0 |
| 1,2,3-Trimethylbenzene | 1130 | | 61200 | 58700 | 158000 | 1.4 | 350 | 7510 | 13100 | 5020 | 3970 | 3320 |
| 1-Methyl-2-isopropylbenzene | 0 | | 653 | 613 | 1750 | 0 | 5.22 | 63.8 | 85.5 | 29.3 | 20.3 | 17.7 |
| Indan | 931 | | 37400 | 36300 | 96600 | 283 | 2180 | 64500 | 128000 | 2040 | 1700 | 1970 |
| Indene | 112 | | 1910 | 13900 | 5120 | 10.9 | | | | | | |
| 1,3-Diethylbenzene | 126 | | 21000 | 19900 | 53600 | 3.35 | 64.8 | 3470 | 5270 | 824 | 660 | 728 |
| 1-Methyl-3-propylbenzene | 190 | | 39300 | 38200 | 126000 | 0 | 20.2 | 627 | 1210 | 2020 | 1540 | 1660 |
| 1-Methyl-4-propylbenzene | 91 | | 21100 | 20100 | 69000 | 0.5 | 30.7 | 946 | 1380 | 969 | 746 | 801 |
| n-Butylbenzene | 58 | | 14600 | 14300 | 50200 | 0.8 | 20.2 | 572 | 799 | 618 | 494 | 537 |
| 1,2-Dimethyl-4-ethylbenzene | 306 | | 47200 | 44100 | 126000 | 0 | 71.5 | 2720 | 3610 | 2440 | 1890 | 1980 |
| 1,2-Diethylbenzene | 26.5 | | 3680 | 3370 | 10100 | 0.65 | 5.96 | 159 | 201 | 152 | 109 | 113 |
| 1-Methyl-2-propylbenzene | 87 | | 15200 | 14100 | 49000 | 0 | 17.2 | 380 | 613 | 664 | 475 | 490 |
| 1,4-Dimethyl-2-ethylbenzene | 234 | | 34300 | 31700 | 89400 | 0 | 33.5 | 1280 | 1740 | 1560 | 1180 | 1210 |
| 1,3-Dimethyl-4-ethylbenzene | 188 | | 28400 | 26300 | 77800 | 0 | 54.4 | 1500 | 1800 | 1290 | 988 | 1000 |
| 1,3-Dimethyl-5-ethylbenzene | 384 | | 55200 | 51900 | 137000 | 6.8 | 196 | 6540 | 9610 | 2310 | 1770 | 1820 |
| 1,3-Dimethyl-2-ethylbenzene | 34 | | 3620 | 4160 | 10200 | 1.1 | 14.4 | 353 | 509 | 165 | 118 | 116 |
| 1,2-Dimethyl-3-ethylbenzene | 91 | | 11700 | 10400 | 29000 | 0 | 37.1 | 825 | 1190 | 452 | 340 | 350 |
| 1,2,4,5-Tetramethylbenzene | 200 | | 27400 | 24500 | 63700 | 3.65 | 118 | 1620 | 2920 | 1180 | 902 | 918 |
| 1,2,3,5-Tetramethylbenzene | 335 | | 42400 | 38200 | 103000 | 0.55 | 248 | 4060 | 6480 | 1830 | 1400 | 1360 |
| Pentylbenzene | 13.5 | | 3130 | 3010 | 7250 | 0 | 9.76 | 121 | 223 | 69.4 | 62.7 | 79.5 |
| 1,2,3,4-Tetramethylbenzene | 108 | | 11700 | 8900 | 26000 | 3 | 225 | 3800 | 5460 | 396 | 420 | 331 |
| 1-t-Butyl-3,5-Dimethylbenzene | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| 1,3,5-Triethylbenzene | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| Naphthalene | 772 | | 39400 | 35700 | 87500 | 4.85 | 16300 | 476000 | 1160000 | 821 | 793 | 1090 |
| 1,2,4-Triethylbenzene | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| Hexylbenzene | 0 | | 1460 | 1420 | 2630 | 0 | 11.2 | 70.1 | 208 | 23.3 | 0.0 | 25.5 |
| 2-Methylnaphthalene | 168 | | 30600 | 26400 | 40800 | 8.25 | 6240 | 170000 | 467000 | 504 | 515 | 664 |
| 1-Methylnaphthalene | 91 | | 14200 | 12200 | 16600 | 10.6 | 5500 | 175000 | 522000 | 254 | 251 | 305 |

**Table 1. PIANO Results and GC Fingerprint Evaluation For Soil and Groundwater Samples Collected From ConEd W. 18th Street Former MGP Site, New York**

| Sample Name | MW-8 GW | MW-9 GW | SB-C (14) Soil | Dup-01 Soil [SB-C(14)] | SB-C (22) Soil | MW-4 GW | Coal Tar NAPL | Coal Tar in Soil | Coal Tar in Soil | Regular | Plus | Super |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab Sample ID | 0810015-10 | 0810015-05 | 0809049-01 | 0809049-03 | 0809049-02 | 0810015-08 | | | | 0809077-03 | 0809077-04 | 0809077-05 |
| Date Collected | 10/1/2008 | 10/1/2008 | 09/08/2008 | 09/08/2008 | 09/08/2008 | 10/1/2008 | 2008 | 2008 | 2008 | 09/09/2008 | 09/09/2008 | 09/09/2008 |
| Reporting Limit | 100 | | 933 | 786 | 1050 | 5 | 10.6 | 425 | 743 | 93.1 | 92.2 | 98.1 |
| Result Units | µg/L | Analysis | ug/kg | ug/kg | ug/kg | µg/L | mg/kg oil | ug/kg | ug/kg | mg/kg oil | mg/kg oil | mg/kg oil |
| **Paraffins** | | | | | | | | | | | | |
| Pentane | 512 | | 956 | 484 | 93000 | 9.4 | 0.0 | 0 | 0 | 33800 | 24600 | 23900 |
| Hexane | 226 | | 6100 | 7130 | 270000 | 1.75 | 0.0 | 0 | 0 | 26400 | 20600 | 13000 |
| Heptane | 120 | | 31800 | 35500 | 422000 | 0 | 0.0 | 0 | 0 | 12900 | 11000 | 7910 |
| Octane | 38 | | 36600 | 34600 | 242000 | 0 | 0.0 | 0 | 0 | 5960 | 4860 | 3440 |
| Nonane | 0 | | 27800 | 30100 | 126000 | 0 | 4.06 | 0 | 156 | 2770 | 1840 | 1260 |
| Decane | 32 | | 24200 | 25100 | 88600 | 0 | 9.81 | 130 | 349 | 1780 | 1280 | 1260 |
| Undecane | 47.5 | | 16500 | 16400 | 47700 | 0 | 5.96 | 223 | 535 | 514 | 419 | 508 |
| Dodecane | 71.5 | | 13100 | 12800 | 33900 | 0 | 0.0 | 0 | 197 | 128 | 124 | 151 |
| Tridecane | 0 | | 6850 | 6120 | 14100 | 0 | 0.0 | 0 | 0 | 120 | 130 | 141 |
| Tetradecane | 0 | | 2760 | 1830 | 2580 | 0 | 0.0 | 0 | 0 | 72.2 | 90.9 | 27.5 |
| Pentadecane | 0 | | 1230 | 888 | 363 | 0 | 0.0 | 0 | 0 | 0 | 0 | 0 |
| **Isoparaffins** | | | | | | | | | | | | |
| Isopentane | 914 | | 928 | 417 | 171000 | 27.8 | 3.48 | 274 | 145 | 88300 | 78300 | 89600 |
| 2,2-Dimethylbutane | 35.5 | | 242 | 267 | 7900 | 0 | 0.0 | 0 | 0 | 1590 | 2670 | 3450 |
| 2,3-Dimethylbutane | 97.5 | | 709 | 947 | 45600 | 2.65 | 0.0 | 0 | 0 | 12300 | 14500 | 19000 |
| 2-Methylpentane | 416 | | 4950 | 5280 | 248000 | 6.75 | 0.0 | 0 | 0 | 40500 | 36800 | 31000 |
| 3-Methylpentane | 283 | | 4020 | 4550 | 176000 | 6.15 | 0.0 | 0 | 0 | 27000 | 24200 | 20800 |
| 2,2-Dimethylpentane | 0 | | 513 | 613 | 8970 | 0 | 0.0 | 0 | 0 | 1440 | 1180 | 700 |
| 2,4-Dimethylpentane | 41.5 | | 3940 | 4620 | 60800 | 0 | 0.0 | 0 | 0 | 18300 | 19400 | 20000 |
| 2,2,3-Trimethylbutane | 0 | | 168 | 208 | 3590 | 0 | 0.0 | 0 | 0 | 425 | 500 | 649 |
| 3,3-Dimethylpentane | 0 | | 784 | 904 | 9230 | 0 | 0.0 | 0 | 0 | 1340 | 1110 | 662 |
| 2-Methylhexane | 139 | | 23100 | 26500 | 256000 | 0 | 0.0 | 0 | 0 | 20000 | 17500 | 15500 |
| 2,3-Dimethylpentane | 98 | | 12900 | 15100 | 175000 | 0 | 0.0 | 0 | 0 | 24400 | 26100 | 28800 |
| 3-Methylhexane | 153 | | 26000 | 29800 | 274000 | 0 | 0.0 | 0 | 0 | 20200 | 17600 | 15000 |
| 3-Ethylpentane | 13 | | 2550 | 2900 | 22400 | 0 | 0.0 | 0 | 0 | 1800 | 1590 | 1200 |
| Isooctane | 81.5 | | 29000 | 33500 | 263000 | 0 | 0.0 | 0 | 0 | 36100 | 57300 | 109000 |
| 2,2-Dimethylhexane | 0 | | 1570 | 1780 | 12900 | 0 | 0.0 | 0 | 0 | 93.1 | 92.2 | 98.1 |
| 2,5-Dimethylhexane | 15 | | 12200 | 13800 | 93700 | 0 | 0.0 | 0 | 0 | 5820 | 8010 | 12000 |
| 2,4-Dimethylhexane | 19.5 | | 14700 | 16800 | 97000 | 0 | 0.0 | 0 | 0 | 6310 | 7510 | 9400 |
| 2,2,3-Trimethylpentane | 0 | | 2100 | 2380 | 17200 | 0 | 0.0 | 0 | 0 | 1400 | 2470 | 4980 |
| 2,3,4-Trimethylpentane | 47.5 | | 25200 | 28300 | 180000 | 0 | 0.0 | 0 | 0 | 12100 | 22000 | 45900 |
| 2,3,3-Trimethylpentane | 57 | | 22300 | 25000 | 172000 | 0 | 0.0 | 0 | 0 | 11600 | 22500 | 49500 |
| 2,3-Dimethylhexane | 19.5 | | 13700 | 15100 | 82500 | 0 | 0.0 | 0 | 0 | 4770 | 6340 | 8970 |
| 2-Methylheptane | 45.5 | | 37300 | 42200 | 201000 | 0 | 0.0 | 0 | 0 | 7860 | 6880 | 5930 |
| 4-Methylheptane | 0 | | 14700 | 16600 | 78300 | 0 | 0.0 | 0 | 0 | 3060 | 2650 | 2220 |
| 3-Methylheptane | 93 | | 36800 | 41500 | 212000 | 0 | 0.0 | 0 | 0 | 7360 | 6740 | 5700 |
| 3-Ethylhexane | 0 | | 6150 | 7260 | 36400 | 0 | 0.0 | 0 | 0 | 1300 | 0.0 | 874 |
| 2,5-Dimethylheptane | 0 | | 14600 | 14600 | 66500 | 0 | 0.0 | 0 | 0 | 2250 | 1900 | 1710 |
| 3,5-Dimethylheptane | 0 | | 3890 | 3710 | 18200 | 0 | 0.0 | 0 | 0 | 614 | 474 | 399 |
| 3,3-Dimethylheptane | 0 | | 1320 | 1360 | 8850 | 0 | 0.0 | 0 | 0 | 254 | 153 | 94.2 |
| 2,3-Dimethylheptane | 0 | | 7340 | 8170 | 35700 | 0 | 0.0 | 0 | 0 | 1350 | 1080 | 801 |
| 3,4-Dimethylheptane | 0 | | 4390 | 4200 | 14600 | 0 | 0.0 | 0 | 0 | 645 | 992 | 830 |
| 4-Methyloctane | 0 | | 20200 | 22800 | 89600 | 0 | 0.0 | 0 | 0 | 2310 | 1910 | 1560 |
| 2-Methyloctane | 0 | | 28500 | 28600 | 105000 | 0 | 0.0 | 0 | 0 | 3090 | 2300 | 2160 |

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| Sample Name | MW-8 GW | MW-9 GW | SB-C (14) Soil | Dup-01 Soil [SB-C(14)] | SB-C (22) Soil | MW-4 GW | Coal Tar NAPL | Coal Tar in Soil | Coal Tar in Soil | Regular | Plus | Super |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab Sample ID | 0810015-10 | 0810015-05 | 0809049-01 | 0809049-03 | 0809049-02 | 0810015-08 | | | | 0809077-03 | 0809077-04 | 0809077-05 |
| Date Collected | 10/1/2008 | 10/1/2008 | 09/08/2008 | 09/08/2008 | 09/08/2008 | 10/1/2008 | 2008 | 2008 | 2008 | 09/09/2008 | 09/09/2008 | 09/09/2008 |
| Reporting Limit | 100 | | 933 | 786 | 1050 | 5 | 10.6 | 425 | 743 | 93.1 | 92.2 | 98.1 |
| Result Units | µg/L | Analysis | ug/kg | ug/kg | ug/kg | µg/L | mg/kg oil | ug/kg | ug/kg | mg/kg oil | mg/kg oil | mg/kg oil |
| **Isoparaffins (Cont.)** | | | | | | | | | | | | |
| 3-Methyloctane | 28.5 | | 27300 | 30100 | 107000 | 0 | 0.0 | 0 | 0 | 3230 | 2480 | 2140 |
| 3,3-Diethylpentane | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| 3,3-Dimethyloctane | 0 | | 979 | 1030 | 4910 | 0 | 0.0 | 0 | 0 | 101 | 40.6 | 23.6 |
| 2-Methylnonane | 0 | | 23100 | 24500 | 82800 | 0 | 0.0 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| 3-Methylnonane | 13 | | 17600 | 18700 | 55600 | 0 | 0.0 | 0 | 0 | 1090 | 760 | 743 |
| **Naphthenes** | | | | | | | | | | | | |
| Cyclopentane | 225 | | 0 | 78.6 | 14800 | 18.1 | 0.0 | 0 | 0 | 3920 | 3780 | 3120 |
| Methylcyclopentane | 556 | | 5240 | 6140 | 155000 | 24.6 | 0.0 | 0 | 0 | 25800 | 21400 | 17900 |
| Cyclohexane | 174 | | 1860 | 2210 | 46600 | 9.2 | 0.0 | 0 | 0 | 8810 | 7800 | 5990 |
| 1,1-Dimethylcyclopentane | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 644 | 559 | 390 |
| 1,3-Dimethylcyclopentane (cis) | 68.5 | | 5290 | 6310 | 50800 | 0 | 0.0 | 0 | 0 | 5340 | 4790 | 4340 |
| Methylcyclohexane | 178 | | 16100 | 18300 | 185000 | 5.2 | 0.0 | 0 | 0 | 7120 | 5980 | 5660 |
| Ethylcyclopentane | 38.5 | | 6800 | 8100 | 43900 | 0 | 0.0 | 0 | 0 | 2850 | 2570 | 2690 |
| 1,2,3-Trimethylcyclopentane (ctc) | 0 | | 3890 | 4560 | 24600 | 0 | 0.0 | 0 | 0 | 1680 | 1030 | 767 |
| 1,4-Dimethylcyclohexane (trans) | 0 | | 3150 | 3100 | 11800 | 0 | 0.0 | 0 | 0 | 758 | 738 | 677 |
| 1,2-Dimethylcyclohexane (trans) | 0 | | 3520 | 2180 | 15600 | 0 | 0.0 | 0 | 0 | 1050 | 681 | 558 |
| Isopropylcyclopentane | 0 | | 1710 | 1610 | 5790 | 0 | 0.0 | 0 | 0 | 338 | 296 | 277 |
| 1,2-Dimethylcyclohexane (cis) | 0 | | 6450 | 5340 | 20600 | 0 | 0.0 | 0 | 0 | 678 | 501 | 509 |
| n-Propylcyclopentane | 0 | | 3550 | 3640 | 13700 | 0 | 0.0 | 0 | 0 | 617 | 517 | 542 |
| 1,1,4-Trimethylcyclohexane | 0 | | 2060 | 1960 | 5880 | 0 | 0.0 | 0 | 0 | 294 | 238 | 0.0 |
| Isopropylcyclohexane | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| Isobutylcyclohexane | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| **Olefins** | | | | | | | | | | | | |
| 3-Methyl-1-butene | 0 | | 0 | 0 | 926 | 0 | 0.0 | 0 | 0 | 570 | 587 | 571 |
| 1-Pentene | 32.5 | | 0 | 0 | 4110 | 0 | 0.0 | 0 | 0 | 1500 | 1570 | 1300 |
| 2-Methyl-1-butene | 64.5 | | 0 | 0 | 7700 | 0 | 0.0 | 0 | 0 | 4330 | 4140 | 3630 |
| 2-Pentene (trans) | 249 | | 0 | 0 | 15800 | 0 | 0.0 | 0 | 0 | 4210 | 4490 | 3770 |
| 2-Methyl-1,3-butadiene | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 159 | 126 | 81.4 |
| 2-Pentene (cis) | 139 | | 0 | 0 | 7420 | 0 | 0.0 | 0 | 0 | 2290 | 2370 | 2020 |
| 4-Methyl-1-pentene | 0 | | 0 | 0 | 3170 | 0 | 0.0 | 0 | 0 | 278 | 345 | 313 |
| 1-Hexene | 0 | | 0 | 0 | 7050 | 0 | 0.0 | 0 | 0 | 568 | 638 | 566 |
| 2-Hexene (trans) | 84.5 | | 933 | 1070 | 23600 | 0 | 0.0 | 0 | 0 | 1620 | 2850 | 3450 |
| 2-Methyl-2-pentene | 123 | | 1500 | 1770 | 40200 | 2.1 | 0.0 | 0 | 0 | 2100 | 6150 | 7340 |
| 2-Hexene (cis) | 82 | | 630 | 727 | 15900 | 0 | 0.0 | 0 | 0 | 1010 | 1420 | 1510 |
| 1,3-DMCP (trans)/2-Methyl-1-hexene | 86 | | 8890 | 11000 | 81700 | 0 | 0.0 | 0 | 0 | 7400 | 6160 | 5890 |
| 1-Heptene/1,2-DMCP (trans) | 60.5 | | 5290 | 6440 | 83800 | 0 | 0.0 | 0 | 0 | 6660 | 4850 | 3700 |
| 3-Heptene (trans) | 0 | | 2960 | 3240 | 15300 | 0 | 0.0 | 0 | 0 | 390 | 411 | 405 |
| 3-Heptene (cis) | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| 2-Heptene (trans) | 0 | | 1910 | 2210 | 14000 | 0 | 0.0 | 0 | 0 | 362 | 356 | 348 |
| 2-Heptene (cis) | 0 | | 2280 | 2660 | 14800 | 0 | 0.0 | 0 | 0 | 272 | 273 | 0.0 |
| 1-Octene | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| 1,2,3-TMCP(ccc)/2-Octene (trans) | 0 | | 1600 | 1580 | 4540 | 0 | 0.0 | 0 | 0 | 318 | 259 | 247 |
| 2-Octene (cis) | 0 | | 2100 | 2080 | 7010 | 0 | 0.0 | 0 | 0 | 60.5 | 135 | 164 |

**Table 1. PIANO Results and GC Fingerprint Evaluation For Soil and Groundwater Samples Collected From ConEd W. 18th Street Former MGP Site, New York**

| Sample Name | MW-8 GW | MW-9 GW | SB-C (14) Soil | Dup-01 Soil [SB-C(14)] | SB-C (22) Soil | MW-4 GW | Coal Tar NAPL | Coal Tar in Soil | Coal Tar in Soil | Regular | Plus | Super |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab Sample ID | 0810015-10 | 0810015-05 | 0809049-01 | 0809049-03 | 0809049-02 | 0810015-08 | | | | 0809077-03 | 0809077-04 | 0809077-05 |
| Date Collected | 10/1/2008 | 10/1/2008 | 09/08/2008 | 09/08/2008 | 09/08/2008 | 10/1/2008 | 2008 | 2008 | 2008 | 09/09/2008 | 09/09/2008 | 09/09/2008 |
| Reporting Limit | 100 | | 933 | 786 | 1050 | 5 | 10.6 | 425 | 743 | 93.1 | 92.2 | 98.1 |
| Result Units | µg/L | Analysis | ug/kg | ug/kg | ug/kg | µg/L | mg/kg oil | ug/kg | ug/kg | mg/kg oil | mg/kg oil | mg/kg oil |
| **Olefins (Cont.)** | | | | | | | | | | | | |
| 1-Nonene | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0 | 0 | 0 |
| 3-Nonene (trans) | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| 3-Nonene (cis) | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| 2-Nonene | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| 1-Decene | 0 | | 5200 | 6780 | 15600 | 0 | 0.0 | 0 | 0 | 0.0 | 0.0 | 0.0 |
| **Sulfur Heterocyclics** | | | | | | | | | | | | |
| Thiophene | 0 | | 0 | 0 | 0 | 7.25 | 0.0 | 0 | 0 | | | |
| 2-Methylthiophene | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | | | |
| 3-Methylthiophene | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | | | |
| 2-Ethylthiophene | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 119 | | | |
| Benzothiophene | 74.5 | | 2320 | 1990 | 5090 | 0 | 583 | 17000 | 44300 | | | |
| **Gasoline Additives** | | | | | | | | | | | | |
| Tertiary butanol | 0 | | 0 | 0 | 0 | 862 | 0.0 | 0 | 0 | | | |
| MTBE | 33 | | 0 | 0 | 0 | 13.2 | 0.0 | 0 | 0 | | | |
| Diisopropyl Ether (DIPE) | 0 | | 0 | 0 | 0 | 3.75 | 0.0 | 0 | 0 | | | |
| Ethyl Tertiary Butyl Ether (ETBE) | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | | | |
| 1,2-Dichloroethane | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | | | |
| TAME | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | | | |
| 1,2-Dibromoethane | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | | | |
| MMT | 0 | | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | | | |
| **Analyte Ratios** | | | | | | | **mg/kg** | | | | | |
| 1,4-dimethyl-2-ethyl bz/1,2-dimethyl-4-ethyl bz | 0.76 | | 0.73 | 0.72 | 0.71 | - | 0.47 | 0.47 | 0.48 | 0.64 | 0.62 | 0.61 |
| ethyl bz/ o-xylene | 0.54 | | 0.74 | 0.74 | 0.83 | 0.00 | 16.76 | 2.56 | 2.93 | 2.70 | 0.61 | 0.65 |
| indan/1,3-Dimethyl-5-ethylbz | 2.42 | | 0.68 | 0.70 | 0.71 | 41.62 | 11.12 | 9.86 | 13.32 | 0.88 | 0.96 | 1.08 |
| 1,3-dimethyl-5-ethylbz/1-methyl-2-propylbz | 4.41 | | 3.63 | 3.68 | 2.80 | - | 11.40 | 17.21 | 15.68 | 3.48 | 3.73 | 3.71 |
| 1,2,3,4-tetramethylbz/1,2,4,5-tetramethylbx | 0.54 | | 0.43 | 0.36 | 0.41 | 0.82 | 1.91 | 2.35 | 1.87 | 0.34 | 0.47 | 0.36 |
| **Misc Parameters** | | | | | | | | | | | | |
| Sum Aromatics (No Naphthlenes) | 39,156 | | 1,712,686 | 1,711,224 | 4,975,125 | 1,052 | 5,811 | 212,545 | 360,855 | 294,182 | 237,369 | 229,618 |
| sum PIANO minus Aromatics | 5,819 | | 706,552 | 768,134 | 5,790,189 | 114 | 23 | 627 | 1,382 | 548,743 | 548,986 | 641,717 |
| Aromatics/Non-Aromatics | 6.7 | | 2.4 | 2.2 | 0.9 | 9.3 | 249.3 | 339.0 | 261.1 | 0.5 | 0.4 | 0.4 |
| Total PIANO (no S or Ns) | 44,974 | | 2,419,238 | 2,479,358 | 10,765,314 | 1,166 | 5,835 | 213,172 | 362,237 | 842,925 | 786,355 | 871,335 |
| Sum Aromatics (No Naphthlenes)/Total | 87% | | 71% | 69% | 46% | 90% | 100% | 100% | 100% | 35% | 30% | 26% |
| Paraffins | 2.32% | | 6.93% | 6.89% | 12.44% | 0.95% | 0.31% | 0.15% | 0.30% | 10.02% | 8.26% | 5.92% |
| Isoparaffins | 5.79% | | 18.41% | 19.91% | 32.43% | 3.70% | 0.05% | 0.12% | 0.04% | 43.93% | 50.36% | 58.69% |
| Aromatics (no Ns) | 86.92% | | 70.73% | 68.96% | 46.19% | 89.69% | 90.55% | 92.34% | 88.74% | 34.90% | 30.19% | 26.35% |
| Naphthenes | 2.75% | | 2.46% | 2.56% | 5.52% | 4.87% | 0.00% | 0.00% | 0.00% | 7.11% | 6.47% | 4.98% |
| Olefins | 2.04% | | 1.37% | 1.59% | 3.37% | 0.18% | 0.00% | 0.00% | 0.00% | 4.05% | 4.72% | 4.05% |
| Sulfur | 0.17% | | 0.10% | 0.08% | 0.05% | 0.62% | 9.08% | 7.39% | 10.92% | | | |
| Percent Isoparaffins+Naphthenes | 8.55% | | 20.87% | 22.47% | 37.95% | 8.56% | 0.05% | 0.12% | 0.04% | 51.04% | 56.83% | 63.67% |
| Total PIANO +S (no Ns) | 45,049 | | 2,421,558 | 2,481,348 | 10,770,404 | 1,173 | 6,418 | 230,172 | 406,656 | 842,925 | 786,355 | 871,335 |
| Naphthalenes | 1,031 | | 84,200 | 74,300 | 144,900 | 24 | 28,040 | 821,000 | 2,149,000 | 1,579 | 1,559 | 2,059 |
| Percent Sulfur/(Aromatics+Sulfur) | 0.2% | | 0.1% | 0.1% | 0.1% | 0.7% | 9.1% | 7.4% | 11.0% | 0.0% | 0.0% | 0.0% |
| Percent Ns/(Aromatics+Ns) | 3% | | 5% | 4% | 3% | 2% | 83% | 79% | 86% | 1% | 1% | 1% |

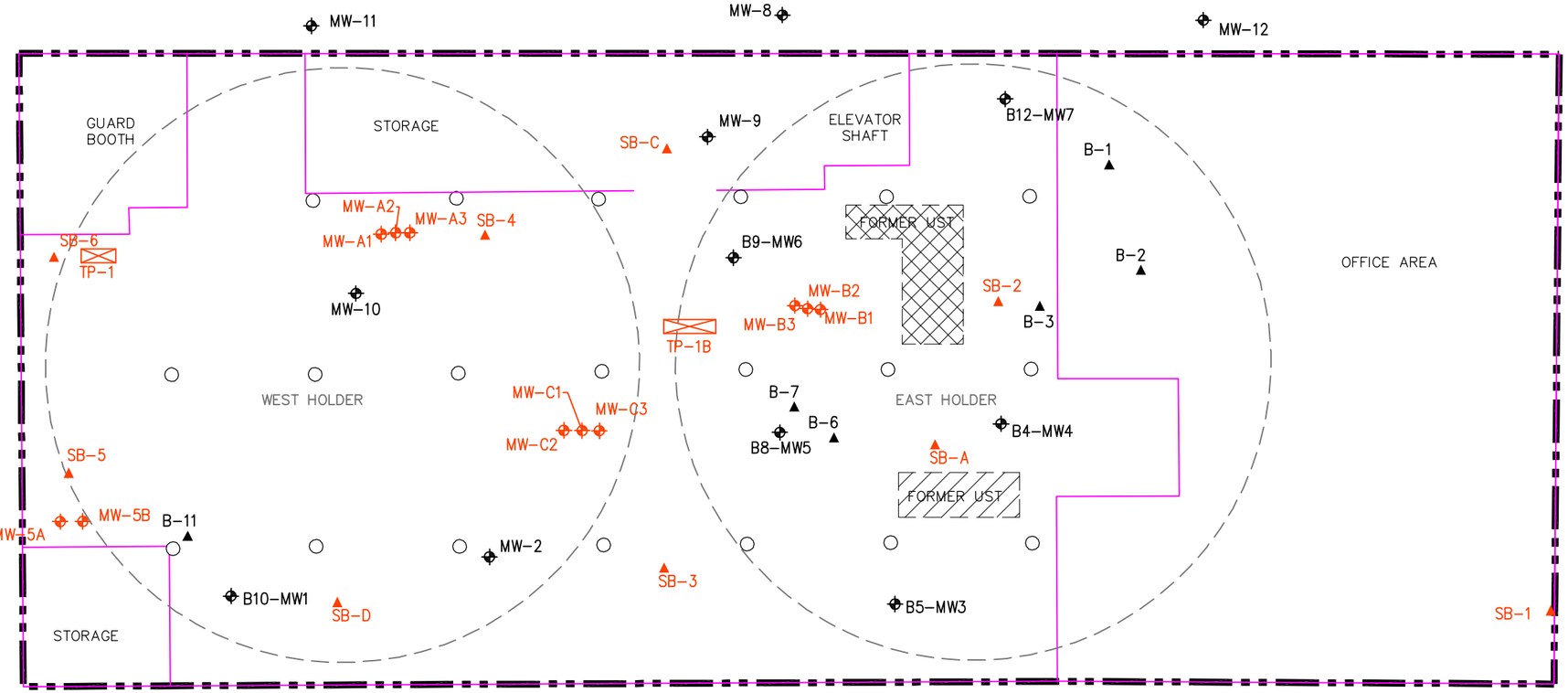
**Table 1. PIANO Results and GC Fingerprint Evaluation For Soil and Groundwater Samples Collected From ConEd W. 18th Street Former MGP Site, New York**

| Sample Name | MW-8 GW | MW-9 GW | SB-C (14) Soil | Dup-01 Soil [SB-C(14)] | SB-C (22) Soil | MW-4 GW | Coal Tar NAPL | Coal Tar in Soil | Coal Tar in Soil | Regular | Plus | Super |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lab Sample ID** | **0810015-10** | **0810015-05** | **0809049-01** | **0809049-03** | **0809049-02** | **0810015-08** | | | | **0809077-03** | **0809077-04** | **0809077-05** |
| **Date Collected** | **10/1/2008** | **10/1/2008** | **09/08/2008** | **09/08/2008** | **09/08/2008** | **10/1/2008** | **2008** | **2008** | **2008** | **09/09/2008** | **09/09/2008** | **09/09/2008** |
| **Reporting Limit** | **100** | | **933** | **786** | **1050** | **5** | **10.6** | **425** | **743** | **93.1** | **92.2** | **98.1** |
| **Result Units** | **µg/L** | **Analysis** | **ug/kg** | **ug/kg** | **ug/kg** | **µg/L** | **mg/kg oil** | **ug/kg** | **ug/kg** | **mg/kg oil** | **mg/kg oil** | **mg/kg oil** |
| **Misc Parameters (Cont.)** | | | | | | | | | | | | |
| Percent P+I+N | 11% | | 28% | 29% | 50% | 10% | 0% | 0% | 0% | 61.1% | 65.1% | 69.6% |
| Percent A+S | 87% | | 71% | 69% | 46% | 90% | 100% | 100% | 100% | 35% | 30% | 26% |
| Percent Ns/Aromatics (no Ns) | 2.6 | | 4.9 | 4.3 | 2.9 | 2.3 | 482.5 | 386.3 | 595.5 | 0.5 | 0.7 | 0.9 |
| Percent Ns/(Ns+HMW Aromatic above Indane | 29.4% | . | 18.1% | 17.3% | 12.3% | 53.7% | 96.0% | 96.6% | 98.0% | 8.5% | 10.6% | 13.2% |
| | | | | | | | | | | | | |
| C10-C28 DRO mg/L or mg/kg | 141.0 | 132 | 1260 | 1780 | 3420 | 0.9 | 3420 | 3420 | 3420 | | | |
| | | | | | | | | | | | | |
| **TPH GC Fingerprint Evaluation** | Same as MW-9. Many large, not well resolved peaks end abruptly just after C13. Negligible peaks after C13 -- Gasoline Fingerprint | Same as MW-8 | Gasoline only | Gasoline only | Gasoline only | Similar to SB-B3 | Weathered tar | Fresh tar | Fresh tar | Gasoline Product | Gasoline Product | Gasoline Product |

**Table 2. PIANOS Results and TPH Fingerprint Interpretation of Soil and Groundwater Samples Collected at ConEd West 18th Street Former MGP Site, New York**

| Sample Location | Percent | | | | | | TPH Fingerprint Interpretation |
|---|---|---|---|---|---|---|---|
| | Paraffins (P) | Isoparafins (I) | Aromatics (A) | Naphthenes (N) | Olefins (O) | Sulfur (S) | |
| SB-C Area | | | | | | | |
| *Soil* | | | | | | | |
| SB-C (14) | 6.9 (6.9) | 18.4 (20.2) | 70.7 (68.8) | 2.5 (2.6) | 1.4 (1.6) | 0.1 (0.1) | Gasoline Only |
| SB-C (22) | 12.5 | 32.5 | 46.2 | 5.5 | 3.4 | 0.05 | Gasoline Only |
| *Groundwater* | | | | | | | |
| MW-8 | 2.3 | 5.8 | 86.9 | 2.8 | 2.1 | 0.17 | Gasoline Only, negligible peaks after C13 |
| MW-9 | 0 | 0 | 0 | 0 | 0 | 0 | Same as MW-8 |
| Well Cluster A Area | | | | | | | |
| *Soil* | | | | | | | |
| WC-A (12) | 7.1 | 36.1 | 53 | 2.8 | 0.9 | 0.05 | Gasoline |
| WC-A (17) | 7 | 28 | 60.4 | 3.1 | 1.6 | 0.03 | Gasoline |
| WC-A (20) | 6.5 | 26.7 | 64.1 | 1.9 | 0.5 | 0.32 | Mix, mostly gasoline |
| *Groundwater* | | | | | | | |
| MW-A2 | 0.4 | 1.7 | 96.3 | 1 | 0.24 | 0.4 | Weathered gasoline |
| MW-A3 | 0 | 0 | 98.8 | 0.14 | 0 | 1.1 | Similar to MW-C3 |
| SB-B Area | | | | | | | |
| *Soil* | | | | | | | |
| SB-B (10) | 7.6 | 17.7 | 72.4 | 1.6 | 0.5 | 0.17 | Gasoline |
| *Groundwater* | | | | | | | |
| MW-B2 | 0 | 0.14 | 99.3 | 0.34 | 0 | 0.18 | Similar to MW-A2 |
| MW-B3 | 0.3(0.0) | 1.0 (0.8) | 95.8 (97.4) | 2.1 (1.3) | 0.11 (0.0) | 0.7 (0.6) | Mix |
| Well Cluster C Area | | | | | | | |
| *Soil* | | | | | | | |
| WC-C (21) | 2.9 | 0.08 | 93.1 | 0 | 0.2 | 3.8 | Fresh coal tar |
| *Groundwater* | | | | | | | |
| MW-C2 (low conc) | 0 | 0 | 98.8 | 0 | 0 | 1.2 | Weathered coal tar |
| MW-C3 | 0 | 0 | 97.3 | 0 | 0 | 2.7 | Coal tar |
| UST (4000 gal.) Area | | | | | | | |
| *Groundwater* | | | | | | | |
| MW-4 (low conc) | 1 | 3.7 | 89.6 | 4.9 | 0.2 | 0.6 | Similar to MW-B3 |
| Gasoline Standards | | | | | | | |
| Regular | 10.0 | 43.9 | 34.9 | 7.1 | 4.1 | Not Analyzed | - |
| Plus | 8.3 | 50.4 | 30.2 | 6.5 | 4.7 | Not Analyzed | - |
| Super | 5.9 | 58.7 | 26.4 | 4.9 | 4.1 | Not Analyzed | - |
| Coal Tar in Soil (from another location) | | | | | | | |
| NAPL | 0.3 | 0.1 | 90.6 | 0.0 | 0.0 | 9.1 | - |

# WEST 18th STREET




## LEGEND:

- PROPERTY LINE
- B-1 — SOIL BORING (RETACO)
- MW-1 — MONITORING WELL (RETACO)
- TP-2S — TEST PIT (CON EDISON)
- MW-A1 / SB-C — MONITORING WELL/SOIL BORING LOCATION (CON EDISON)
- BUILDING COLUMN
- APPROXIMATE LOCATION OF FIVE FORMER 550-GALLON UNDERGROUND GASOLINE STORAGE TANKS
- APPROXIMATE LOCATION OF FORMER 4000-GALLON UNDERGROUND GASOLINE (DIESEL) TANK
- APPROXIMATE LOCATION OF FORMER GAS HOLDERS
- APPROXIMATE LOCATION OF BUILDING WALLS

## NOTES:

1. SURVEY CONTROL WAS TAKEN FROM SITE WIDE BASE SURVEY PREPARED BY MUNOZ ENGINEERING, P.C. DATED APRIL 2007.
2. ALL ELEVATIONS REFER TO NAVD 88 VERTICAL DATUM AS DERIVED FROM GPS.
3. HORIZONTAL COORDINATES ARE IN NYS COORDINATE SYSTEM (EAST) NAD 83 AS DERIVED FROM GPS.
4. BENCH MARK EL=12.91 X-CUT IN METAL LIGHT POLE ROUND BASE BOLT IN FRONT OF VERIZON BUILDING ON WEST 18th STREET.
5. LOCATIONS OF FORMER GAS HOLDERS ARE BASED ON SANBORN FIRE INSURANCE MAPS, DATED 1904-1985.
6. RETACO BORING AND MONITORING WELL LOCATIONS ARE BASED ON REPORTS ISSUED BY ENVIROTRAC ON BEHALF OF RETACO BETWEEN 2001 AND 2008.
7. UST LOCATIONS ARE BASED ON A SITE SUMMARY REPORT, ISSUED BY ENVIROTRAC, DATED AUGUST 2003.
8. BUILDING INTERIOR LAYOUT BASED ON FIELD RECONNAISSANCE.

0 20' 40'

GRAPHIC SCALE

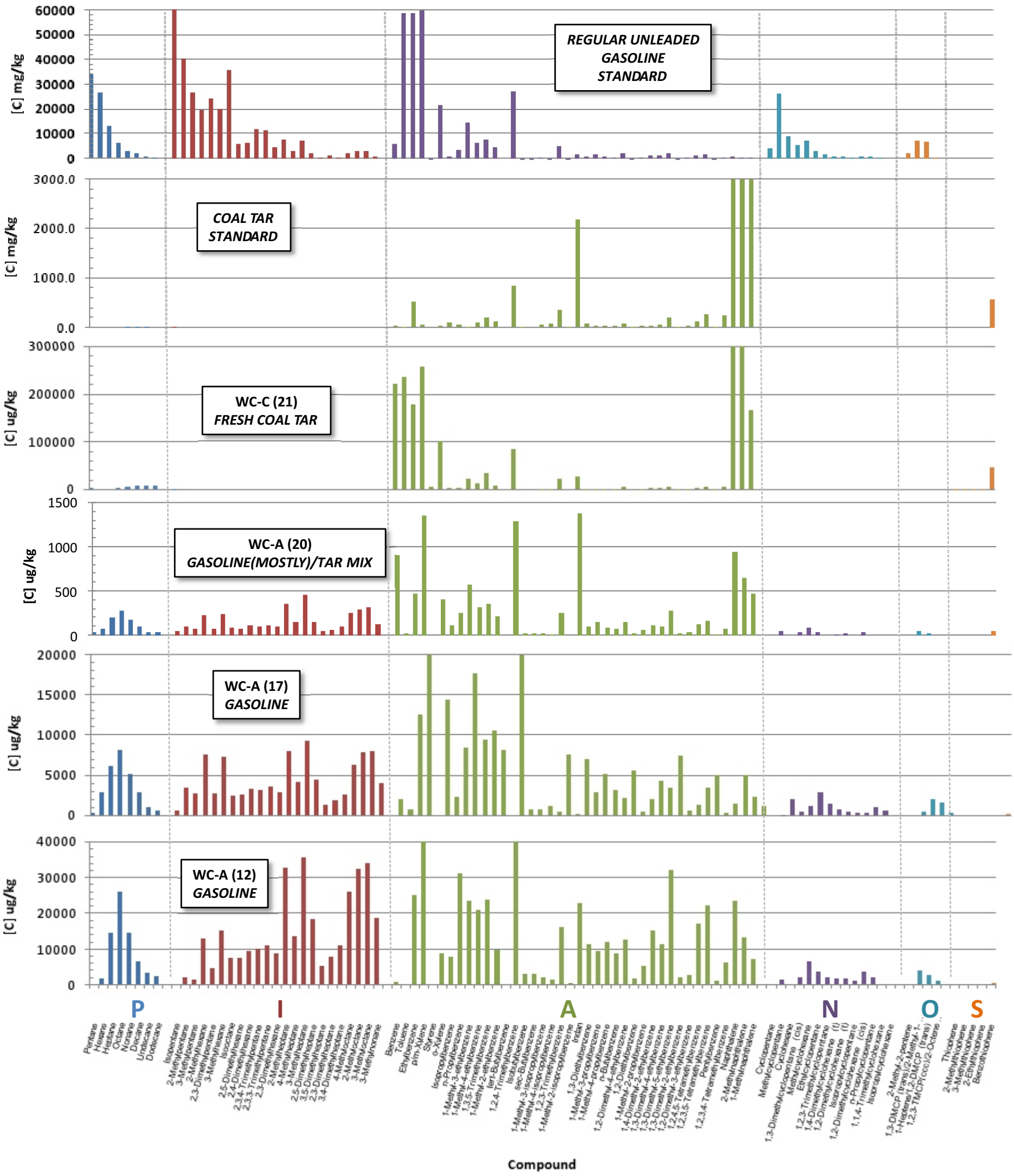
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
**BLOCK 715 LOT 59**
**FORENSIC EVALUATION**

**SAMPLE LOCATION MAP**

ARCADIS

FIGURE **1**


CITY:SYRACUSE,NY GROUP: ENVCAD DB: A. SCHILLING, N. SMITHGALL, P. LISTER LD:A.SCHILLING TR: R. ARCO LYR: ON=*;OFF=REF*;(FRZ)
G:\ENVCAD\SYRACUSE\ACTIB0043011\000100004\DWG\43011B04.DWG LAYOUT: 1 SAVED: 5/4/2009 3:26 PM ACADVER: 17.0S (LMS TECH) PAGESETUP: ---
XREFS: IMAGES: PROJECTNAME: ---
43011XBL
43011X01



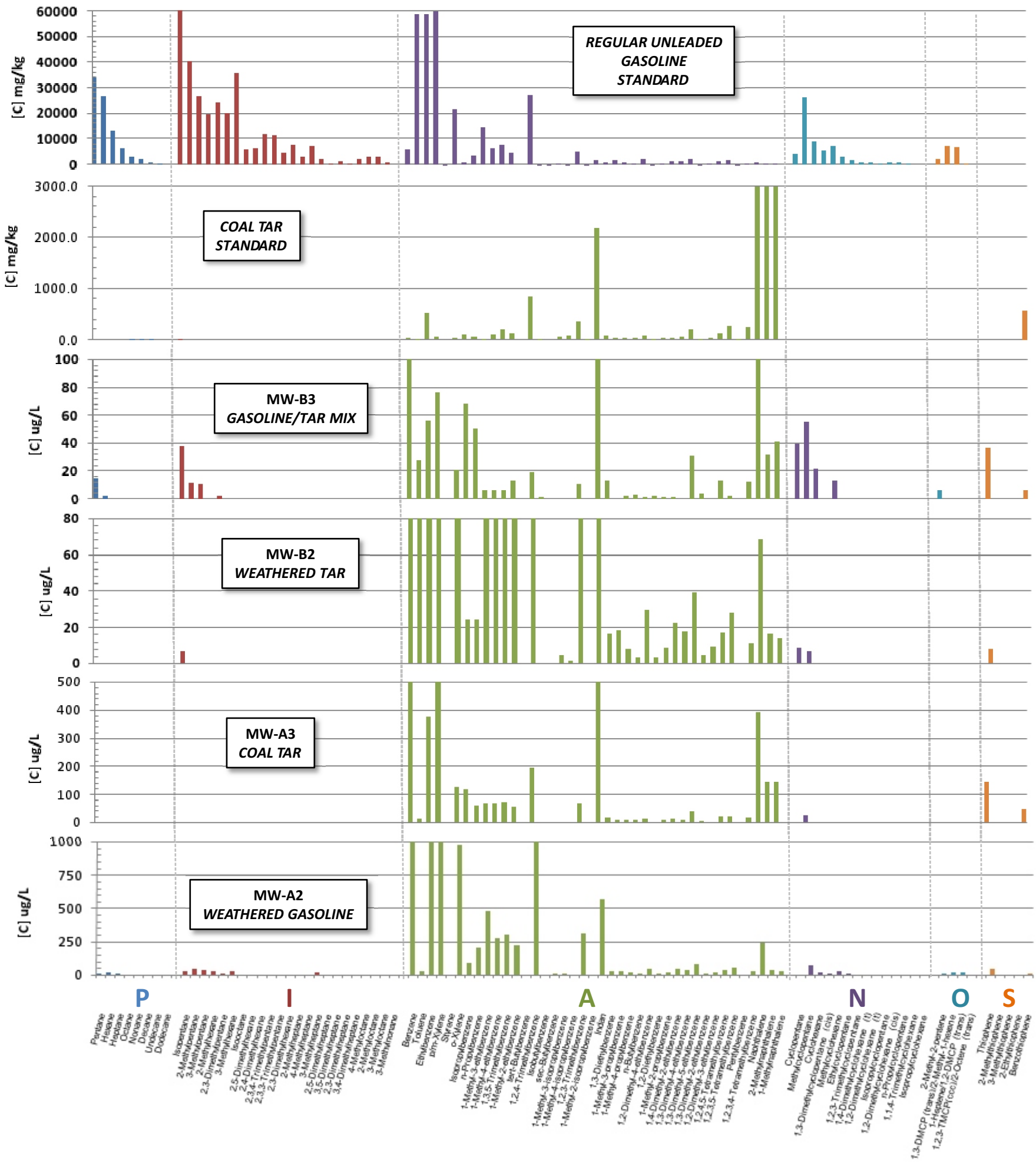

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
**BLOCK 715 LOT 59**
**FORENSIC EVALUATION**

# DISTRIBUTION OF PIANOS COMPOUNDS IN SOIL

ARCADIS

FIGURE
**2A**

05/04/09 SYRACUSE, NY-ENV/CAD-DHOWES
B0043011/0001/00004/CDR/B0043011G02.CDR




CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
WEST 18TH STREET FORMER GAS WORKS
**BLOCK 715 LOT 59**
**FORENSIC EVALUATION**

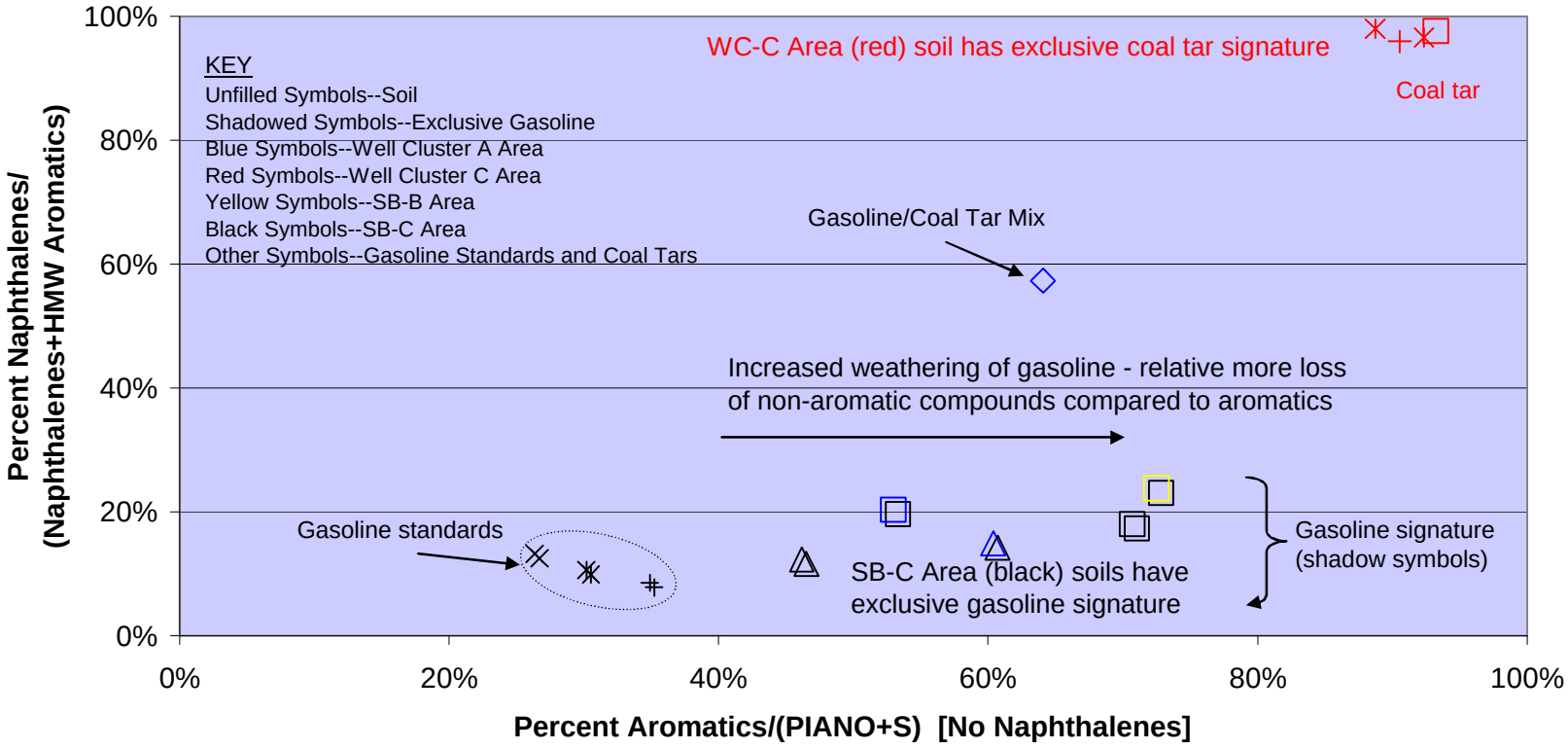
**DISTRIBUTION OF PIANOS COMPOUNDS IN GROUNDWATER**

ARCADIS

FIGURE
**2B**

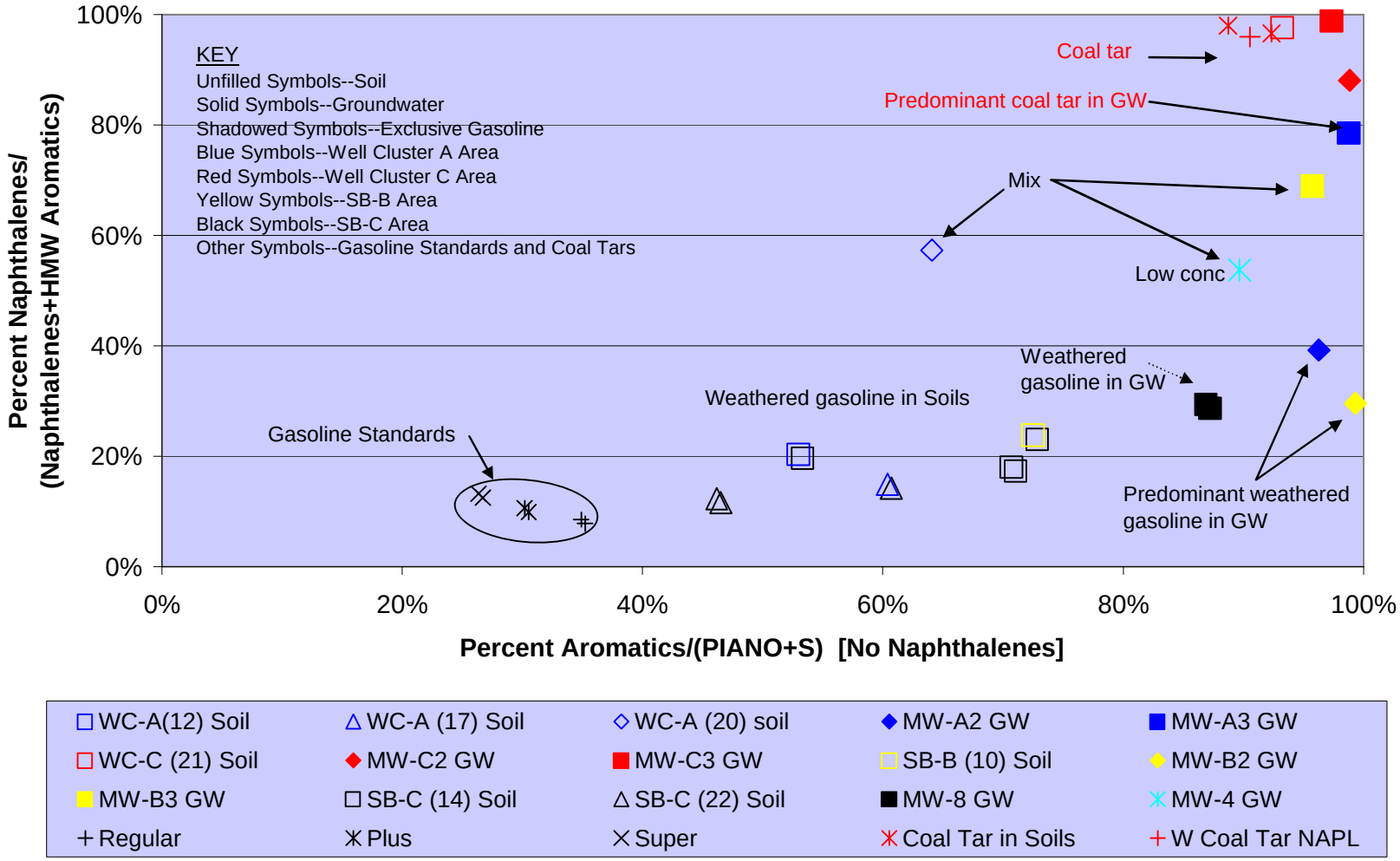
05/04/09 SYRACUSE, NY-ENV/CAD-DJH
B0043011/0001/00004/CDR/B0043011G03.CDR

# Figure 3. ConEd W. 18th Street Former MGP (Verizon) Facility
# Soils PIANO Double Ratio Plots

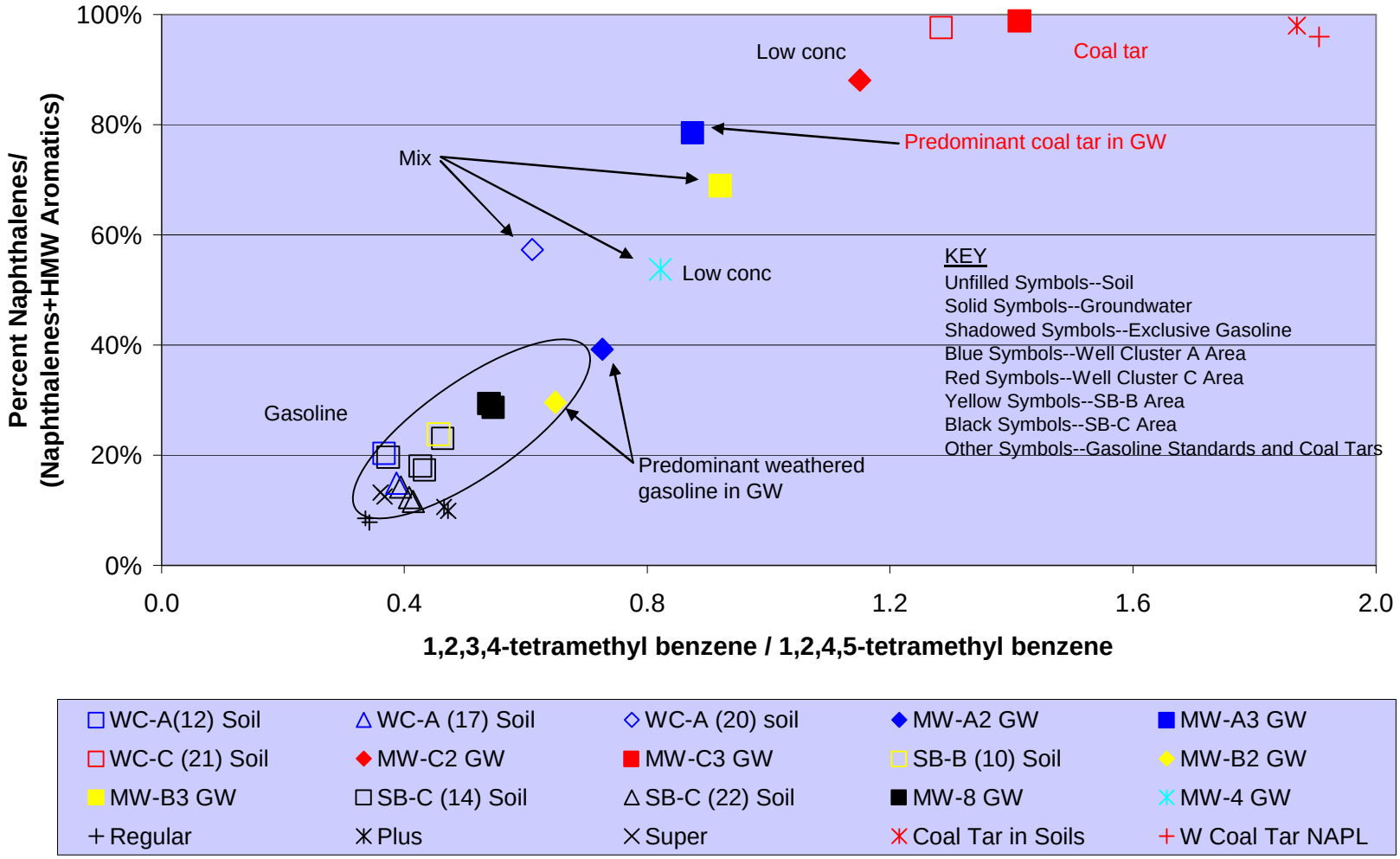



| | | | | | |
|---|---|---|---|---|---|
| □ WC-A(12) Soil | △ WC-A (17) Soil | ◇ WC-A (20) soil | □ WC-C (21) Soil | □ SB-B (10) Soil | □ SB-C (14) Soil |
| △ SB-C (22) Soil | + Regular | ✳ Plus | × Super | ✳ Coal Tar Soil | + W Coal Tar NAPL |

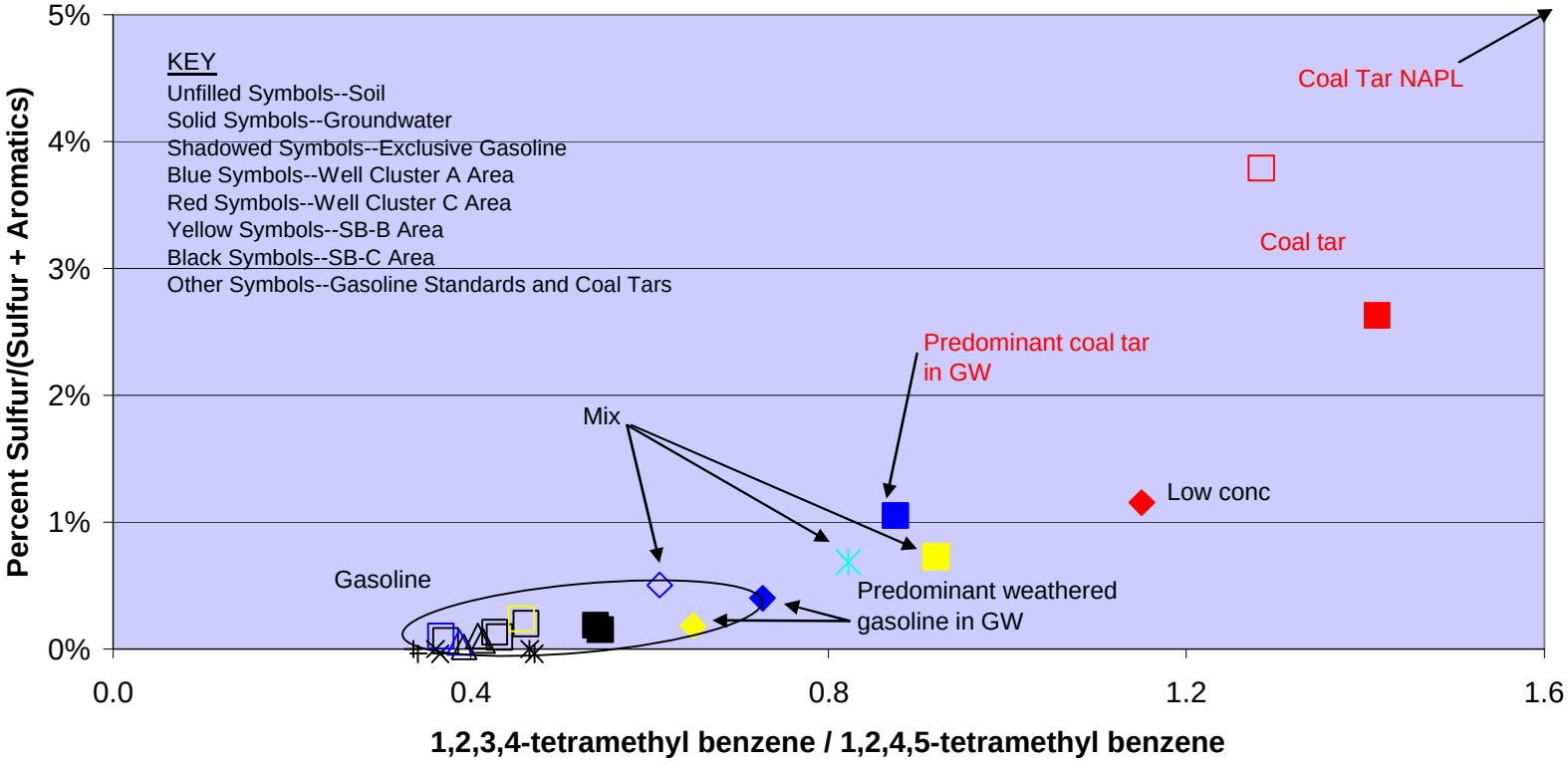
# Figure 4. ConEd W. 18th Street Former MGP (Verizon) Facility
# Soils and Groundwater PIANO Double Ratio Plots



# Figure 5. ConEd W. 18th Street Former MGP (Verizon) Facility Soils and Groundwater PIANO Double Ratio Plots



# Figure 6. ConEd W. 18th Street Former MGP (Verizon) Facility
# Soils and Groundwater PIANO Double Ratio Plots




| | | | | |
|---|---|---|---|---|
| WC-A(12) Soil | WC-A (17) Soil | WC-A (20) soil | MW-A2 GW | MW-A3 GW |
| WC-C (21) Soil | MW-C2 GW | MW-C3 GW | SB-B (10) Soil | MW-B2 GW |
| MW-B3 GW | SB-C (14) Soil | SB-C (22) Soil | MW-8 GW | MW-4 GW |
| Regular | Plus | Super | Coal Tar in Soils | W Coal Tar NAPL |

ARCADIS

**ELECTRONIC ATTACHMENTS**
**(Provided on CD)**

1. EDR Radius Report
2. Site Characterization Report
3. Transducer Data Files
4. Laboratory Analytical Reports
5. Data Usability Summary Reports