

Expert Opinion of Heather Cloud, PG

White Plains Housing Authority

v.

BP Products North America Inc.,
Marianina Oil Corp., and Atlantic
Richfield Company

34 East Post Road
White Plains, Westchester County, New York

May 17, 2019





Expert Report of Heather Cloud, PG

White Plains Housing Authority v. BPPNA, MOC,
and ARCO
34 East Post Road
White Plains, Westchester County, New York

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A handwritten signature in black ink that reads "Heather Cloud". The signature is written in a cursive style and is positioned below a horizontal line.



Table of Contents

1	Introduction	1
1.1	Materials Relied On and Bases for Opinions	1
1.2	Matters Pertaining to Expert Opinion	2
1.3	Professional Experience/Qualifications and Compensation.....	2
2	Summary of Primary Opinions	4
3	Background Information.....	5
3.1	Marianina Property.....	5
3.1.1	Land Use.....	6
3.1.2	Environmental History	7
3.1.2.1	Petroleum Bulk Storage Information.....	7
3.1.2.2	NYSDEC Spills.....	8
3.1.2.3	Other Environmental Cases	9
3.1.2.4	Historical Assessment and Remediation Activities.....	10
3.2	Getty Site	11
3.2.1	Land Use.....	11
3.2.2	Environmental History	11
3.2.2.1	Petroleum Bulk Storage Information.....	11
3.2.2.2	NYSDEC Spills.....	12
3.2.2.3	Historical Assessment and Remediation Activities.....	12
3.3	White Plains Housing Authority Property	14
3.3.1	Land Use.....	14
3.3.2	Environmental History	14
3.3.2.1	Petroleum Bulk Storage Information.....	14
3.3.2.2	NYSDEC Spills.....	15
3.3.2.3	Historical Assessment and Remediation Activities.....	16
3.4	Surrounding Properties	18
3.4.1	22-24 East Post Road	18
3.4.2	41 East Post Road	18
3.4.3	42-44 East Post Road	20



3.4.4	60 East Post Road	21
4	Environmental Overview	22
4.1	Geology	22
4.2	Hydrogeology	22
4.2.1	Depth to Groundwater	22
4.2.2	Groundwater Flow	24
4.2.3	Preferential Pathways	25
4.3	Constituents of Concern	27
4.4	Soil Quality	29
4.4.1	Standards, Criteria, and Guidance Values	29
4.4.2	Historical Laboratory Analysis	29
4.4.3	Adsorbed-Phase Hydrocarbon Evaluation	31
4.4.3.1	Vadose (Unsaturated) Zone Impacts	31
4.4.3.2	Smear Zone Impacts	34
4.4.3.3	Saturated Zone Impacts	37
4.5	Groundwater Quality	39
4.5.1	Standards, Criteria, and Guidance Values	39
4.5.2	Dissolved-Phase Hydrocarbon Evaluation	39
4.6	Air Quality	55
5	Opinions	57
5.1	There is no evidence that Sinclair's and/or BP's operations at the Marianina Property prior to 1984 caused any environmental contamination at the WPHA Property	57
5.2	Groundwater flow direction is predominately to the northwest with some variation	59
5.3	Dissolved-phase plumes from the Marianina Property and the Getty Site have migrated to the WPHA Property and comingled	61
5.4	A No Further Action can be obtained from the NYSDEC without extensive soil removal from the WPHA Property	65
5.5	Contaminants on the WPHA Property do not pose an imminent and substantial endangerment to human health or the environment	68



Figures

Figure 1	Site Map
Figure 2	Local Area Map
Figure 3	Groundwater Flow Direction Frequency
Figure 4	Soil TVOC Concentrations Smear Zone
Figure 5	Dissolved-phase MTBE Plume (2016) – Marianina Property
Figure 6	Dissolved-phase MTBE Plume (2013) – Getty Site
Figure 7	Dissolved-phase Total BTEX Plume (October 2013)
Figure 8	First Environment Proposed WPHA Property Soil Excavation Zone

Tables

Table 1	Marianina Property Tank Registration Summary
Table 2	Getty Site Tank Registration Summary
Table 3	WPHA Property Tank Registration Summary
Table 4	Investigation Area Historical Depth to Groundwater Summary
Table 5	Investigation Area Vadose, Smear, and Saturated Zones Summary
Table 6	Potential Chemicals of Concern
Table 7	Historical Vadose Zone Soil Analytical Data Summary
Table 8	Historical Smear Zone Soil Analytical Data Summary
Table 9	Historical Saturated Zone Soil Analytical Data Summary
Table 10	Marianina Property Groundwater Monitoring Data Summary
Table 11	Building 33 Parking Lot Groundwater Monitoring Data Summary
Table 12	Getty Site Groundwater Monitoring Data Summary
Table 13	Building 159 Parking Lot Groundwater Monitoring Data Summary
Table 14	WPHA Recreation Area Groundwater Monitoring Data Summary
Table 15	Building 159 Groundwater Monitoring Data Summary
Table 16	Building 33 Groundwater Monitoring Data Summary



Appendices

- Appendix A Materials Relied On
- Appendix B Heather Cloud Curriculum Vitae
- Appendix C The EDR Radius Map™ Report with GeoCheck®



Acronyms

µg/kg	micrograms per kilograms	NTU	nephelometric turbidity unit
µg/L	micrograms per liter	NYS	New York State
ARC	Atlantic Richfield Company	NYSDEC	New York State Department of Environmental Conservation
AS	air sparge	P&T	pump and treat
ASTs	aboveground storage tanks	PBS	petroleum bulk storage
bgs	below ground surface	PCE	perchloroethene (perchloroethylene)
BP	BPPNA and ARC	PID	photoionization detector
BPPNA	BP Products North America Inc.	PPE	personal protective equipment
BTEX	benzene, toluene, ethylbenzene, and total xylenes	SCGs	standards, criteria, and guidance
CAMP	community air monitoring plan	SCLs	soil cleanup levels
COCs	chemicals/constituents of concern	STARS	Spill Technology and Remediation Series
CP-51	Final Commissioner Policy, CP-51	SVE	soil vapor extraction
CSM	conceptual site model	SVOC	semi-volatile organic compound
CVOCs	chlorinated volatile organic compounds	TAEE	tert-Amyl ethyl ether
DCE	dichloroethene	TAME	tert-Amyl methyl ether
DEC	Department of Environmental Conservation	TBA	tertiary butyl alcohol
DIPE	diisopropyl ether	TCE	trichloroethene (trichloroethylene)
DPHVE	dual phase high vacuum extraction	TEL	tetraethyllead
DTW	depth to water	TML	tetramethyl lead
EFR	enhanced fluid recovery	TOC	top of casing
EPA	Environmental Protection Agency	TOGS	Technical and Operational Guidance Series
ESA	environmental site assessment	UST	underground storage tank
ETBE	ethyl tert-butyl ether	VC	vinyl chloride
EVFR	enhanced vacuum fluid recovery	VOC	volatile organic compound
FID	flame ionization detector	WCHD	Westchester County Health Department
FRP	fiberglass reinforced plastic	WPHA	White Plains Housing Authority
ft	feet	WQs	water quality standards
ft/ft	feet per foot		
GES	Groundwater & Environmental Services, Inc.		
HASP	health and safety plan		
HSA	hollow stem auger		
ID	identifier or identification		
LNAPL	light non-aqueous phase liquid		
LPH	liquid phase hydrocarbons		
mg/kg	milligrams per kilograms		
mg/L	milligrams per liter		
MNA	monitored natural attenuation		
MTBE	methyl tertiary butyl ether		
NFA	no further action		



1 Introduction

I was retained by counsel for BP Products North America Inc. (BPPNA) and Atlantic Richfield Company (ARC) (collectively, BPPNA and ARC are referred to as BP) in the matter of the White Plains Housing Authority (WPHA) v. BP Products North America Inc., Marianina Oil Corp., and Atlantic Richfield, Southern District of New York (Case Number 17-cv-6250). I was retained to provide opinions regarding historical and current environmental conditions and the nature and extent, and source of environmental contamination at the former BP service station located at 34 East Post Road in White Plains, Westchester County, New York (Marianina Property) that is currently owned by Marianina Oil Corp. (Marianina), the WPHA's Winbrook apartment complex property (Winbrook Complex), including at and in the vicinity of 33 Fisher Court (Building 33), the property in between Building 33 and 159 S. Lexington Avenue (Building 159) (referred to herein as "the WPHA Recreation Area"), the Parking Lot associated with Building 33, Building 159, the Parking Lot associated with Building 159, the Prelude Building, and 135 S. Lexington Avenue (Building 135) (collectively referred to herein as "the WPHA Property"), and the former Getty gas station located at 26 East Post Road (Getty Site or Getty Site). I was further retained to evaluate and provide opinions regarding the WPHA's claims that petroleum contamination is migrating from the Marianina Property onto the WPHA Property, that BPs former operations caused petroleum contamination that is impacting the WPHA Property, and that such contamination represents a potentially imminent and substantial endangerment to human health or the environment at the WPHA Property.

The opinions expressed herein are based upon a reasonable degree of scientific certainty consistent with the standards of my profession in the field of environmental geology. I reserve the right to amend this report upon review of additional data or information, information that was not previously available, or additional documents from plaintiff as they become available.

1.1 Materials Relied On and Bases for Opinions

A list of documents reviewed and relied upon for this report and upon which my conclusions and opinions are based are included as **Appendix A**. My conclusions and opinions are further based on my general knowledge, qualifications, and professional experience as a geologist, including my knowledge of the nature, transport, degradation, investigation, and remediation of environmental contamination, and work on other contaminated sites, including but not limited to numerous sites in New York. In most instances, my conclusions and opinions rely on multiple lines of evidence, and do not necessarily depend on any one point of reference. I anticipate the preparation of exhibits to summarize and/or support my opinions consistent with this report. I reserve the right to supplement this report, and any exhibits to be used to summarize or support my opinions, as may become necessary if additional information is made available or issues are raised, including additional expert disclosures by Plaintiff.



1.2 Matters Pertaining to Expert Opinion

The list of documents included in **Appendix A** were reviewed and relied upon in the context of forming my opinions regarding the following:

1. The historical and current environmental conditions, and the nature, extent, and source of environmental contamination at the Marianina Property, the WPHA Property, and the Getty Site.
2. Groundwater flow direction and the migration of contamination onto the WPHA Property, including from the Marianina Property and the Getty Site.
3. The commingling of petroleum contamination from the Getty Site and the Marianina Property.
4. Whether BP's former operations at the Marianina Property caused petroleum contamination that is impacting the WPHA Property.
5. Whether contamination caused by BP's former operations represents a potentially imminent and substantial endangerment to human health or the environment at the WPHA Property.
6. The remedial requirements to obtain regulatory closure of the environmental impacts on the WPHA Property.

1.3 Professional Experience/Qualifications and Compensation

I hold a B.A. degree in Biology from Boston University. I am currently licensed as a Professional Geologist in the state of New York (License Number 000807-1). I have more than 18 years of experience in the field of environmental consulting, with a primary focus on site assessment and remediation of petroleum and chlorinated compounds. My professional and field expertise includes Phase I and Phase II environmental site assessments, underground storage tank (UST) studies and closures, and contaminant fate and transport modeling for retail petroleum stations, vehicle maintenance facilities, commercial facilities, and industrial locations. I also have extensive experience preparing remedial action work plans and implementing various remedial technologies related to pump-and-treat, high vacuum extraction, soil vapor extraction, air/oxygen injection, bioremediation, and chemical oxidation. Throughout my career, I have experience working in Massachusetts, Ohio, Indiana, and New York, with over 16 years in New York.

During my career at Groundwater & Environmental Services, Inc. (GES), I have either actively supported, self-performed, or independently directed over 300 projects that included the following geologic/hydrogeologic activities:

- Independently performed over 150 soil and groundwater investigations utilizing various techniques that include, but are not limited to direct push, hollow stem auger (HSA), air rotary, and sonic drilling.
- Independently performed or supervised over 50 hydrogeologic investigations that have included evaluating the transport of dissolved contaminants, collection of geotechnical soil data, slug testing, pump testing, and hydrogeological modeling.



- Independently prepared over 100 conceptual site models.
- Supported or independently directed the implementation of over 75 soil and/or groundwater remediation strategies that have included, but are not limited to the following remediation technologies: soil vapor extraction (SVE), air sparging (AS), soil excavation, liquid phase hydrocarbon (LPH) recovery utilizing mechanical and hand bailing techniques, biosparging, microbial injections, groundwater pump and treat, chemical injections, oxygen injections, and monitored natural attenuation (MNA).

My current role at GES is Senior Operations Manager for GES' Northeast Region (6 offices and 2 satellite offices in New York, Connecticut, and Massachusetts). During the first 5 years of my career at GES, I held various project support roles where I was primarily responsible for performing and supervising in-field geologic work and managing and interpreting geologic and hydrogeologic data under the direction of a project manager or senior project manager. After five (5) years of learning and executing various aspects of geology and hydrogeology, I independently managed projects throughout New York that involved: developing geologic and hydrogeologic work plans to investigate various contaminants in the soil and groundwater at retail petroleum, commercial, industrial, and manufacturing facilities; ensuring smooth execution of these work plans; providing mentoring and training to junior staff; interpreting geologic and hydrogeologic data; and, ultimately progressing a site to closure to the satisfaction of the applicable regulatory agency. In 2010, I took on an Operations Manager role overseeing office and staff management while maintaining my project management duties on major portfolios. Currently, in my role as a Northeast Senior Operations Manager, I no longer manage a portfolio of sites; however, I am responsible for overseeing our project teams and providing senior technical support and guidance on a wide variety of technically complex sites.

Throughout my years of working in the state of New York, I have gained extensive knowledge of New York regulations. Additionally, I have built strong working relationships with New York State Department of Environmental Conservation (NYSDEC) regulators, primarily in NYSDEC Regions 1, 2, and 3, while consulting on behalf of private clients, and directly as an environmental consultant for the NYSDEC on various state funded assessment and remediation projects, on behalf of GES. My Curriculum vitae, outlining my qualifications is included in **Appendix B**.

For my services, GES was compensated at a rate of \$145 per hour.



2 Summary of Primary Opinions

My opinions, which I render to a reasonable degree of scientific certainty, are summarized as follows:

- There is no evidence that Sinclair's and/or BP's operations at the Marianina Property prior to 1984 caused any environmental contamination at the WPHA Property.
- Groundwater flow direction is predominately to the northwest with some variation.
- Dissolved-phase plumes from the Marianina Property and the Getty Site have migrated to the WPHA Property and comingled.
- A No Further Action can be obtained from the NYSDEC without extensive soil removal from the WPHA Property.
- Contaminants on the WPHA Property do not pose an imminent and substantial endangerment to human health or the environment.

The background and support for these opinions are provided below.

3 Background Information

To fully assess the historical and current environmental conditions and the nature and extent, and source of environmental contamination at the Marianina Property and to provide opinions regarding the WPHA's claims that petroleum contamination is migrating from the Marianina Property onto the WPHA Property, that BPs former operations caused petroleum contamination that is impacting the WPHA Property, and that such contamination represents a potentially imminent and substantial endangerment to human health or the environment at the WPHA Property, environmental records from three (3) properties (the Marianina Property, the Getty Site, and the WPHA Property) were evaluated. Background information on each of the three (3) properties is outlined below in Sections 3.1, 3.2, and 3.3, respectively. Additionally, surrounding properties (22-24 East Post Road, 41 East Post Road, 42-44 East Post Road, and 60 East Post Road) were evaluated in context to the Complaint. Background information related to these surrounding properties is outlined in Section 3.4.

3.1 Marianina Property

The Marianina Property is located at 34 East Post Road (also known as NY-22) in White Plains, Westchester County, New York and is situated on the northeastern side of the intersection of East Post Road and Brookfield Street.

The surrounding area of the Marianina Property is highly developed consisting of mixed-use commercial and residential properties. Currently, the Marianina Property is a non-operational retail gasoline service station.

Properties immediately surrounding the Marianina Property include the following:

- North: A parking lot associated with the Building 33 with a multi-resident, multi-story apartment building (Building 33) beyond;
- Northwest: Brookfield Street with the WPHA Recreational Area consisting of basketball courts and a playground area associated with the WPHA Property, a parking lot associated with the Building 159, and a multi-resident, multi-story apartment building (Building 135) beyond;
- South: East Post Road with a hospital (White Plains Hospital located at 41 East Post Road) beyond;
- East: Commercial properties (vacant commercial space immediately adjacent to the Marianina Property at 42 East Post Road and White Plains Surgical Supply and One Source Homecare Pharmacy located at 44 East Post Road) with an automobile repair facility (Firestone Complete Auto Care located at 60 East Post Road) beyond; and,
- West: Brookfield Street and a vacant property that previously operated as a former Getty retail gasoline service station (26 East Post Road) with a mixed commercial and residential use 3-story building (22-24 East Post Road) beyond.

Properties immediately surrounding the Marianina Property are shown on the Site Map provided as **Figure 1** and the Local Area Map provided as **Figure 2**.

3.1.1 Land Use

Records indicate that the Marianina Property was developed as early as 1900. A dwelling was located on the southern portion of the property, and a stable and a carpenter building/shop was the located on the northern portion of the property. These buildings were in existence until at least 1930. Documents reviewed indicate that the Deed for the Marianina Property was transferred to Sinclair Refining Company in August of 1936 by The County Trust Company. The Marianina Property has operated as a retail gasoline service station since 1937 when Sinclair Refining Company constructed a gasoline service station and apparently installed USTs on the Marianina Property. ARC (and its predecessor, Sinclair Refining Company and Sinclair Oil Corp., collectively Sinclair) were the owners and/or operators of the Marianina Property from 1937 to 1969.

In 1969, ARC sold the Marianina Property to BP Oil Corporation, and in 1973, BP Oil Corporation transferred the Marianina Property to BP Oil Inc. (which subsequently became known as BPPNA). BP Oil Inc. sold the Marianina Property to Northville Gasoline Corporation (Northville) in 1983. In 1987, Marianina purchased the property from Northville, and Marianina has remained the property owner for the past 32 years.

Between at least 1937 and 2017, the Marianina Property operated intermittently as a retail gasoline service station. The ownership information since 1936 is detailed below.

- 1936-1967: Sinclair Refining Company
- 1969-1973: BP Oil Corporation
- 1973-1983: BP Oil Inc.
 - In 1978, BP Oil Inc. installed new USTs at the Marianina Property as part of site redevelopment activities.
 - The USTs installed in 1978 remained in use until 1994 when Marianina replaced them.
- 1983-1987: Northville Gasoline Corporation
- 1987-Current date: Marianina Oil Corp
 - 1987-1992: Maintained contract with Northville
 - 1992-1995: Marianina temporarily suspended/limited operations, but maintained the tanks with fuel in them.
 - 1995-2006: Marianina Property leased to Barrier Oil Corporation and operated as a CITGO
 - 2006-2017: E. Post Rd GasMart, Inc.

3.1.2 Environmental History

3.1.2.1 Petroleum Bulk Storage Information

In 1937, BP constructed a retail gasoline service station at the Marianina Property and installed USTs. Certain improvements were made to the station in and around 1955 by Sinclair, including the possible replacement of the original USTs. It is unknown whether the USTs were replaced after 1955 and before 1978. In 1978, BP performed site redevelopment activities which included the replacement of the USTs.

Based upon the available petroleum bulk storage (PBS) documentation, it appears that the USTs installed in 1978 remained in operation for approximately 16 years until the end of 1994 when Marianina undertook tank replacement activities. During the 16 years of operation, three (3) entities operated the UST system:

- 1978-1983: BP operated the UST system for approximately five (5) years. PBS records for the UST system installed in 1978 are not available.
- 1983-1987: Northville operated the UST system for approximately four (4) years. The Northville PBS registration from December of 1986 indicates that one (1) of the 6,000-gallon gasoline USTs contained leaded gasoline.
- 1987-1994: Marianina operated the UST system for approximately seven (7) years until the Marianina Property was upgraded in 1994.

During station upgrades at the Marianina Property in 1994, Marianina removed two (2) 8,000-gallon gasoline USTs and two (2) 6,000-gallon gasoline USTs on the southern portion of the Marianina Property. Following the removal of these USTs, Marianina installed three (3) 10,000-gallon gasoline USTs and one (1) 6,000-gallon diesel UST in a tank cavity on the southern portion of the Marianina Property. Based upon available documentation, the USTs installed in 1994 were taken out of service in October of 2017 after all residual fuel contained within the USTs was removed. The USTs currently remain on the property; however, Marianina is under a NYSDEC Consent Order to remove the USTs.

Based upon the available tank information, various types of gasoline were stored on the Marianina Property between 1937 and 2017. Total organic lead concentrations in regular grade gasoline peaked in 1979 in New York, and leaded grades of gasoline were phased out in New York between 1985 and 1987, with the highest lead reductions occurring between 1982 and 1985. Therefore, it can be concluded that BP and Northville both stored leaded gasoline on the Marianina Property. Additionally, it is a possibility that Marianina dispensed leaded gasoline for a short period depending on the exact timing of when leaded gasoline was completely phased out in Westchester County. Currently, the gasoline USTs at the Marianina Property contain ethanol as an additive, and prior to the use of ethanol, MTBE was utilized.

A summary of the available tank information for the Marianina Property is summarized below in **Table 1**.



Table 1: Marianina Property Tank Registration Summary

Tank ID	Capacity (gallons)	Product Stored	Construction Material	Installation Date	Removed Date	Tank Type
-	6,000	Gasoline*	Steel	1978	October 1994	UST
-	6,000	Gasoline*	Steel	1978	October 1994	UST
-	8,000	Gasoline	Steel	1978	October 1994	UST
-	8,000	Gasoline	Steel	1978	October 1994	UST
001	10,000	Gasoline/ Ethanol	Double-walled FRP	1994	In-Service	UST
002	10,000	Gasoline/ Ethanol	Double-walled FRP	1994	In-Service	UST
003	6,000	Diesel	Double-walled FRP	1994	In-Service	UST
004	10,000	Gasoline/ Ethanol	Double-walled FRP	1994	In-Service	UST

* The Northville PBS registration from December of 1986 indicates that one (1) of the 6,000-gallon gasoline USTs contained leaded gasoline.

FRP = fiberglass reinforced plastic

3.1.2.2 NYSDEC Spills

There are four (4) NYSDEC spills (Spill #94-06684, Spill #95-16188, Spill #15-09193, and Spill #16-08924) associated with the Marianina Property. Of the four (4) spills, one (1) remains open (Spill #16-08924) as of the date of this report.

- August 16, 1994: Spill #94-06684 was issued on August 16, 1994 (reported on August 17, 1994) when odors of gasoline were encountered during the excavation of three (3) test pits for the placement of new gasoline storage tanks. During the advancement of the test pits, petroleum impacted soils were encountered from grade to approximately ten (10) feet bgs, and LPH was detected at the soil-groundwater interface at approximately eight (8) feet bgs. The spill was closed on June 30, 1999 as it was assumed by the



NYSDEC that the impacts were related to Spill #97-13110 associated with the Getty Site located to the west/southwest of the Marianina Property. In February of 2007, the NYSDEC performed a file review related to Spill #94-06684 and determined that impacts detected during the excavation of the three (3) test pits was not related to Getty Site Spill #97-13110. Based upon the NYSDEC Spills Incidents Database, the spill was not reopened and it does not appear that any further investigation related to Spill #94-06684 was performed.

- March 18, 1996: Spill #95-16188 was reported following the overfilling of an on-site UST by Barrier Oil, which resulted in the discharge of approximately five (5) gallons of gasoline to the surface. As documented in the NYSDEC Spills Report, the NYSDEC noted that an unleaded petroleum surface release resulting from the overfilling of a tilted UST. Additionally, the NYSDEC noted that all five (5) gallons of spilled gasoline were recovered utilizing absorbent pads. As a result, Spill #95-16188 was closed on November 12, 1997.
- September 1, 2014: In September of 2014, during an off-site investigation being performed for Spill #97-13110 associated with the Getty Site, soil and groundwater impacts were detected along the western property boundary of the Marianina Property. Following the September 2014 investigation, additional assessment activities to evaluate the extent of impacts originating from the Marianina Property were performed in April of 2015 and in December of 2015. The results of these investigations were not submitted to the NYSDEC until December of 2016. Upon submittal of the results of the 2014 and 2015 investigations to the NYSDEC, Spill #16-08924 was assigned to the Marianina Property. A letter was sent to Marianina on December 21, 2016 from the NYSDEC stating that Marianina was considered a potential responsible party. Spill #97-13110 remains open as of the date of this report.
- December 9, 2015: Spill #15-09193 was issued due to equipment failure. As noted in the NYSDEC Spills Incidents Database, a customer noted that gas pump #7 did not shut off automatically on a couple of occasions when the vehicle fuel tank was full. As a result, the vehicle tank overflowed and a significant amount of gas pooled on the ground. Details related to the spill cleanup activities were not provided or available. Spill #15-09193 was closed on December 9, 2015.

Known historical assessment and remediation activities that have been performed at the Marianina Property in response to the above-mentioned spills took place between 2014 and 2018. A summary of these activities have been discussed below in Section 3.1.2.4.

3.1.2.3 Other Environmental Cases

EPA Civil Enforcement Case Number 02-2005-7911 was issued to the Marianina Property for failure to conduct annual line leak detector testing. The case was closed on January 20, 2005 as the Marianina Property complied with the EPA Civil Enforcement and performed an annual line leak detector test.

3.1.2.4 Historical Assessment and Remediation Activities

Investigation activities associated with the Marianina Property have been conducted since September of 2014. Assessment activities conducted on and immediately adjacent to the Marianina Property (along the western property boundary in Brookfield Street) included the following:

- Advancement of seven (7) soil borings (GB-1 through GB-7)
- Installation of five (5) temporary monitoring wells (MW-110, MW-111, GB-1 TW, GB-3 TW, and GB-4 TW). Temporary monitoring wells MW-110 and MW-111 were installed as part of a 2014 off-site investigation related to the Getty Site located to the west/southwest of the Marianina Property.

Historical remediation activities at the Marianina Property have included the removal of the UST system in August of 1994 and the excavation of approximately 1,601 tons of petroleum-impacted soils that were encountered during the UST removal activities. Following the soil excavation activities, a total of eight (8) endpoint samples were collected. Based upon the laboratory analytical results, VOC compounds including MTBE were detected; therefore, the impacts appear to be from a gasoline with MTBE additive release.

As discussed in Section 3.1.2.2, NYSDEC Spill #94-06684 was issued as a result of petroleum-impacted soils being encountered during the UST removal activities. Despite soil impacts being detected in and around the USTs, and the presence of LPH detected at the soil-groundwater interface, Spill #94-06684 was closed in June of 1999 as it was believed that the detected soil and LPH impacts were associated with impacts being investigated on the Getty Site located to the west/southwest. Between 1994, when the spill was issued, and 1999 when the spill was closed, it is unknown if any additional assessment or remediation activities took place following the UST removal and soil excavation activities to address the observed LPH and/or evaluate the extent of groundwater impacts. In the PW Grosser 1995 *Tank Closure Report*, it was concluded that further action following the UST removal was not warranted as the groundwater beneath the site was not used for public consumption.

In July of 2017, GZA GeoEnvironmental, Inc. (GZA) submitted a proposal to Frank Codella for proposed remediation activities at the Marianina Property. Specifically, GZA proposed the excavation of approximately 800 tons of soil, the install of six (6) permanent monitoring wells, and post-remediation monitoring for approximately one (1) year. As of the date of this report, the proposed soil excavation activities have not taken place. However, as discussed above, all fuel remaining in the USTs was removed in October of 2017.



3.2 Getty Site

The Getty Site is located to the west/southwest of the Marianina Property at 26 East Post Road in White Plains, Westchester County, New York on the northwestern side of the intersection of East Post Road and Brookfield Street. The Getty Site is currently vacant, and based upon available documentation, it has generally remained vacant since the removal of the USTs in 1988.

Properties immediately surrounding the Getty Site include the following:

- North: A parking lot associated with the Building 159 and the WPHA Recreation Area consisting of basketball courts and a playground area associated with the WPHA apartment complex beyond;
- Northwest: A parking lot associated with the Building 159 and a multi-resident, multi-story apartment building (Building 159) beyond;
- South: East Post Road with a hospital (White Plains Hospital located at 41 East Post Road) beyond;
- East: Brookfield Street with the Marianina Property located at 34 East Post Road beyond; and,
- West: A mixed commercial and residential use 3-story building (22-24 East Post Road).

Properties immediately surrounding the Getty Site are shown on the Site Map provided as **Figure 1** and the Local Area Map provided as **Figure 2**.

3.2.1 Land Use

26 East Post Road operated as a retail gasoline station since at least 1930. The 1930 Sanborn Map indicates that the property was developed, with a gas station containing three (3) gasoline USTs located on the south side of the property, and a dwelling located on the northern portion of the property. In June of 1977, Wellend Bros performed site renovation activities, which included the removal of the existing UST system followed by the installation of four (4) 10,000-gallon fiberglass USTs. The UST system installed in 1977 remained in place until 1988 when they were removed from the Getty Site. Between 1988 and 1990, the property was leased to Car Leasing Associated, Inc. and was used to store rental vehicles. Between 1990 and 1994, the property remained vacant. Between January of 1994 and December of 1994, the property was leased to Frank Codella who utilized the property for parking towed vehicles, trucks, and trailers. The property was vacant starting in December 1994 and remains vacant as of the date of this report.

3.2.2 Environmental History

3.2.2.1 Petroleum Bulk Storage Information

Historical records indicate that USTs have been stored on 26 East Post Road since at least 1930, and the UST system was replaced a minimum of one (1) time in 1977. Historical UST information



for the USTs stored at 26 East Post Road between at least 1930 and 1977 are not available. All known USTs associated with 26 East Post Road were removed in 1988 and no additional USTs have been installed since that time.

A summary of the available tank information for the Getty Site is summarized below in **Table 2**.

Table 2: Getty Site Tank Registration Summary

Tank ID	Capacity (gallons)	Product Stored	Construction Material	Installation Date	Removed Date	Tank Type
In 1977, the Getty Site was redeveloped, and the UST system was removed. The exact details of the USTs removed in 1977 are unknown.						
1	10,000	Gasoline	FRP	6/1/1977	10/22/1988	UST
2	10,000	Gasoline	FRP	6/1/1977	10/22/1988	UST
3	10,000	Gasoline	FRP	6/1/1977	10/22/1988	UST
4	10,000	Gasoline	FRP	6/1/1977	10/22/1988	UST

3.2.2.2 NYSDEC Spills

There is one (1) NYSDEC spill (Spill #97-13110) associated with 26 East Post Road. Spill #97-13110 was issued on February 24, 1998 based upon soil and groundwater impacts encountered during a Phase II ESA performed by Weston, on behalf of the White Plains Urban Renewal Agency (WपुरA). Spill #97-13110 was closed on August 21, 2017.

3.2.2.3 Historical Assessment and Remediation Activities

Historical assessment and remediation activities have been performed at the Getty Site in response to the above-mentioned spill between 1997 and 2017. A summary of these activities have been discussed below.

Assessment Activities

Historical assessment activities associated with the Getty Site have been performed on the property since 1997 when Weston performed a Phase II ESA, off-site to the north on the WPHA Property since 2000, and off-site to the west on 22-24 East Post Road since 2000.

To date, assessment activities associated with the Getty Site were performed on the Getty Site and in the Building 159 Parking Lot. These assessment activities include the:

- Advancement of 16 soil borings (SB-1 through SB-7, SB-1(2010), SB-3 (2010), SB-5 (2010), and SB-6(2010), B-1, and SB-301 through SB-304)
- Installation of three (3) temporary monitoring wells (SB-1/GW-1, SB-3/GW-2, and SB-5/GW-3).

- Installation of 45 permanent monitoring and/or recovery wells (MW-1 through MW-7, GP-2/MW-8, MW-9, MW-10, GP-13/MW-11, MW-12 through MW-14, RW-1, GP-1, GP-3 through GP-12, GP-14 through GP-23, MW-101/SB-4, MW-107 through MW-109, MW-113, MW-114, and MW-201-159 through MW-203-159).

In addition to the assessment activities listed above, additional assessment activities were performed on the Marianina Property (discussed in Section 3.1.2.4) and the WPHA Property (discussed in Section 3.3.2.3).

- Marianina Property: Installation of two (2) temporary monitoring wells (MW-110 and MW-111) adjacent to the Marianina Property in the right-of-way of Brookfield Street.
- WPHA Property: Installation of five (5) monitoring wells (MW-102 through MW-106) and four (4) soil vapor points (SG-1 through SG-4) on the Building 159 property and the WPHA recreation area to assess the potential migration of soil and groundwater impacts beyond the Building 159 parking lot.

In August of 2017, Spill #97-13110 was closed, and the NYSDEC requested that monitoring wells MW-102, MW-103, MW-104, MW-105, and MW-106 as well as soil vapor points SG-1, SG-2, SG-3, and SG-4 be left in place and conveyed to the WPHA. All other monitoring wells were to be properly abandoned in accordance with NYSDEC requirements.

Remediation Activities

Historical remediation activities at the Getty Site have been conducted since 1988 in an effort to remove the source area and remediate soil and groundwater impacts that resulted from Getty's operations. The historical remediation activities conducted to date have included:

- The removal of UST system in 1988. It is unknown if soil excavation activities were performed as part of the 1988 UST system removal
- Soil excavation activities were performed between October of 2014 and June of 2015 which included the removal of approximately 5,490 tons of soil and 81,541 gallons of water.
- A dual phase high vacuum extraction (DPHVE) system was operated between 2001 and 2007;
- Periodic LPH recovery; and,
- Enhanced vapor fluid recovery (EVFR) events performed between 2007 and 2009 at select well locations.

3.3 White Plains Housing Authority Property

The WPHA Property includes the Winbrook Complex that is comprised of a five (5) apartment building multi-family residential public housing complex. The Winbrook Complex is located in White Plains, Westchester County, New York. The five (5) apartment buildings on the Winbrook Complex include:

- Building 11 located at 11 Fisher Court;
- Building 225 located at 225 Dr. Martin Luther King Jr. Blvd;
- Building 135 located at 135 S. Lexington Avenue;
- Building 159 located at 159 S. Lexington Avenue; and,
- Building 33 located at 33 Fisher Court.

The geographic relationships of WPHA Buildings 135, 159, and 33 to the Getty Site and to the Marianina Property are shown on the Site Map provided as **Figure 1**, and all five (5) of the WPHA Property buildings are depicted on the Local Area Map provided as **Figure 2**. The WPHA Property also includes the Prelude building located at the corner of Quarropas Street and S. Lexington Avenue.

3.3.1 Land Use

The WPHA Property was constructed in the late 1940's, and residents have occupied the Winbrook Complex from the 1950s through the present.

Prior to the WPHA development in the late 1940's, Brookfield Street ran from East Post Road in a northerly direction to Fisher Court. From East Post Road, Brookfield Street ran in between the Getty Site and the Marianina Property and through what is now the WPHA Recreation Area along the western side of the Buildings 33 and 11. During the development of the Winbrook Complex, Brookfield Street was cut off to terminate along the southern property boundary of the Winbrook Complex. Today, Brookfield Street remains a dead end road situated between the Getty Site and the Marianina Property.

3.3.2 Environmental History

3.3.2.1 Petroleum Bulk Storage Information

According to historical records, there have been two (2) USTs associated with the WPHA Property. Records indicate that both USTs were installed in 1950 and remain in service today.

A summary of the available tank information for the WPHA Property is summarized below in **Table 3**.



Table 3: WPHA Property Tank Registration Summary

Tank ID	Capacity (gallons)	Product Stored	Construction Material	Installation Date	Removed Date	Tank Type
001	20,000	#4 Fuel Oil	Steel	1950	In-Service	UST
002	20,000	#4 Fuel Oil	Steel	1950	In-Service	UST

Records indicate that there have been two (2) documented tank test failures associated with the WPHA fuel oil USTs. These tank test failures and associated NYSDEC Spills are summarized below in Section 3.3.2.2.

3.3.2.2 NYSDEC Spills

There are three (3) NYSDEC spills (Spill #89-04683, Spill #99-12180, and Spill #02-07150) associated with the WPHA Property.

- August 10, 1989: Spill #89-04683 was issued on August 10, 1989 as a result of a tank test failure for one (1) of the #4 fuel oil USTs. The NYSDEC noted that since the USTs were 35 years old, it may not be worth repairing the failed UST and that a tank replacement should be evaluated. Based upon the available records, it does not appear that the fuel oil UST in question was replaced. The spill was closed on July 30, 1992.
- January 21, 2000: Spill #99-12180 was issued on January 21, 2000 as a result of a #4 fuel oil release at the WPHA Property. Based upon records, Montebello Fuel Oil Company spilled approximately 700 to 900 gallons of #4 fuel oil when a fitting disconnected from the fill pipe at 33 Fisher Avenue (Building 33). The emergency response activities consisted of utilizing absorbent materials and surface (asphalt) washing. It should be noted that the initial NYSDEC Spill Report Form indicated that approximately 30 gallons of fuel oil was spilled. Based upon this information and the summary of the initial spill response measures, the spill was initially closed on January 21, 2000. However, Spill #99-12180 was reopened on March 20, 2000 once it was discovered that the quantity of #4 fuel oil spilled was actually 700 to 900 gallons and that there was evidence of petroleum contamination in the WPHA playground area. AKRF, Inc. (AKRF) stated, "It is believed that the majority of the oil seeped beneath the pavement and playground area. Once the weather warmed up, the rubberized playground surface began to bubble and additional oil staining was observed in the playground area."
- October 10, 2002: Spill #02-07150 was issued on October 10, 2002 as a result of a tank test failure involving the #4 fuel oil USTs. The NYSDEC noted that two (2) 20,000-gallon USTs were joined together, and they failed individually and collectively. Actions taken related to Spill #02-07150 are unknown. The spill was closed on November 25, 2002.

3.3.2.3 Historical Assessment and Remediation Activities

Assessment and remediation activities have been performed on the WPHA Property between 2000 and 2017. A summary of the historical assessment and remediation activities performed are summarized below.

Assessment Activities

Assessment activities were performed on the WPHA Property to evaluate the potential impacts related to the 2000 WPHA fuel oil spill, the potential migration of impacts from the Getty Site spill, and the potential migration of impacts from the Marianina Property.

- Assessment activities related to the January 2000 #4 fuel oil spill (Spill #99-12180) were performed in 2000 and included the advancement of 12 soil borings (B-1 through B-12).

During the 2000 assessment activities, a total of 25 soil samples were collected from borings B-1 through B-12 and screened with a photoionization detector (PID). It should be noted that a flame ionization detector (FID) capable of detecting semi-volatile organic compounds (SVOCs) would have been the more appropriate field screening device since it was a fuel oil release. During the field screening, low PID readings were detected which is expected since the contaminants of concern are primarily semi-volatile organics. Of the 25 soil samples collected, only four (4) samples were submitted for laboratory analysis for VOCs and/or SVOCs. It should be noted that the laboratory analysis for each of the sample locations was not consistent. SVOCs and VOCs were detected in one or more of the soil samples collected and submitted for laboratory analysis.

- Assessment activities related to the Getty Site spill included the advancement and or installation of:
 - o Five (5) monitoring wells in and around the Building 159 (MW-102 through MW-106); and,
 - o Four (4) soil gas points (SG-1 through SG-4) around the southern portion of the Building 159; and,

An additional four (4) soil borings (SB-1, SB-3, SB-5, and SB-6) and 12 monitoring wells (GP-13 through GP-16, GP-19, GP-20, MW-101, MW-107, MW-109, and MW-201-159 through MW-203-159) were installed in the Building 159 Parking Lot. The soil borings and monitoring wells associated with the Building 159 Parking Lot are summarized in Section 3.2.2.3.

- Assessment activities related to the Marianina Property included the advancement and or installation of:
 - o Advancement of 1 soil boring (TWB-1);
 - o Installation of 5 temporary monitoring wells (TWB-2 through TWB-6); and,
 - o Installation of 5 permanent monitoring wells (MW-201-33 through MW-205-33)

These assessment activities were conducted in the Building 33 Parking Lot, around Building 33 and in the Recreation Area in between Building 33 and Building 159.

Remediation Activities

Historical remediation activities on the WPHA Property have included soil excavation activities in the playground area in the vicinity of the 2000 fuel oil release and in the Building 159 Parking Lot.

During the 2000 soil excavation in the vicinity of the playground area, approximately 71.55 tons of soil was removed from the WPHA Property. Initial excavation activities were performed in April of 2000, and the excavation extended to approximately 0.5 feet bgs across the majority of the excavation area to approximately 6 feet bgs in the vicinity of B-3 and B-11. The total depth of soil excavation across the WPHA recreation area was based upon visual observations and PID readings. Following the completion of the excavation activities, a total of three (3) composite soil samples (South Composite, Center Composite, and North Composite) were collected from approximately 0.5 feet bgs to 1 feet bgs. The samples were submitted for laboratory analysis of VOCs and SVOCs. Despite non-detect PID readings and visual observations indicating clean endpoint samples, the Center Composite sample exhibited SVOC compounds that exceeded the NYSDEC SCLs by more than four (4) to five (5) times the cleanup level. As discussed herein, the use of a PID to screen fuel oil impacted soils is not appropriate which is evident by the laboratory analytical results as compared to the PID field screening and field observations.

As a result of the elevated SVOC constituents collected from the Center Composite sample, additional soil excavation activities were performed on April 29, 2000. The total area and depth of the additional excavation activities is unclear. Following the completion of the additional excavation activities, one (1) additional endpoint sample (Center Composite II) was collected from approximately 0.5 to 1 feet bgs and was submitted for laboratory analysis of VOCs and SVOCs. Based upon the results of the endpoint sampling following the April 29, 2000 excavation, VOC and SVOC constituent concentrations were below the NYSDEC SCLs.

The post-excavation sampling involved the collection of composite endpoint samples instead of the collection of discrete endpoint samples. The collection of composite samples could potentially lead to the dilution of impacted soils with non-impacted soils resulting in biased low analytical results. The collection of discrete endpoint samples is a more appropriate sampling method and would better indicate if soil impacts resulting from the 2000 fuel oil release remained post-excavation. Additionally, it should be noted that the composite samples collected following both excavations were collected at depths ranging from 0.5 to 1 feet bgs while the excavation extended to at least six (6) feet bgs in the vicinity of B-3 and B-11. Therefore, true post-excavation soil conditions were not fully evaluated. Furthermore, it cannot be determined if the 2000 excavation activities in the vicinity of the WPHA Recreation Area adequately removed the fuel oil source material or additional source material remains which could contribute to ongoing dissolved-phase impacts in the area.

3.4 Surrounding Properties

Based upon a review of historical environmental records, there are a number of surrounding properties to the east, west, and south of the Marianina Property that have identified environmental releases.

3.4.1 22-24 East Post Road

22-24 East Post Road is located to the west/southwest of the Getty Site and to the south/southwest of the Building 159 Parking Lot, the Building 159, and the WPHA Recreation Area. 22-24 East Post Road is currently utilized as a mixed commercial and residential 3-story building with commercial operations on the ground floor and residential dwellings on the second and third floors of the building.

Based upon historical environmental records, there are two (2) NYSDEC spills (Spill #11-01872 and Spill #17-00425) associated with 22-24 East Post Road. Spill #11-01872 remains open at the time of this report.

- May 19, 2011: Spill #11-01872 was issued on May 19, 2011 as a result of product discovered in monitoring well MW-14 that was installed as part of on-going soil and groundwater assessment activities associated with Getty Site Spill #97-13110. Based upon fingerprinting analysis, it was determined that the detected product was #2 fuel oil. At the request of the NYSDEC, the property owner of 22-24 East Post Road was directed to remove the 1,000-gallon fuel oil UST. The 1,000-gallon fuel oil UST was removed on February 3, 2017, and it was noted that multiple holes were discovered in the UST. In April of 2017, soils in the vicinity of the fuel oil UST were excavated. It was estimated that a 12-foot by 12-foot area was excavated to approximately 8 feet deep. Based upon the NYSDEC Spills Incidents Database, Spill #11-01872 remains open as of the date of this report.
- April 13, 2017: Spill #17-00425 was issued on April 13, 2017 as a result of impacts discovered during the removal of a 1,000-gallon fuel oil UST. Spill #17-00425 was administratively closed and referred back to Spill #11-01872.

3.4.2 41 East Post Road

41 East Post Road is currently utilized as a hospital (White Plains Hospital) and is located to the south of the Marianina Property and the Getty Site. There have been at least 19 registered tanks (USTs and aboveground storage tanks [ASTs]) containing #2 fuel oil, #6 fuel oil, and diesel associated with 41 East Post Road.

Based upon historical environmental records, there have been at least 11 NYSDEC spills (Spill #88-00316, Spill #93-03501, Spill #93-04740, Spill #94-01229, Spill #94-14693, Spill #95-06062, Spill #99-08220, Spill #02-06489, Spill #09-00120, Spill #06-13444, and Spill #11-07393)



- April 11, 1988: Spill #88-00316 was issued on April 11, 1988 as a result of a release of approximately 40 gallons of diesel fuel. The NYSDEC Spills Database noted that the loading platform was backed into causing a release from the Saddle Tank Area. The notes also indicated that some of the released diesel fuel spilled into the storm drain and that the Westchester County Health Department was completing the cleanup activities. The spill was closed on May 3, 1988.
- June 14, 1993: Spill #93-03501 was issued on June 14, 1993 as a result of impacts encountered during the removal of a #2 fuel oil tank. The spill was closed on June 18, 1996. Assessment and/or remediation activities related to Spill #93-03501 are unknown.
- July 15, 1993: Spill #93-04740 was issued on July 15, 1993 as a result of impacts encountered during the removal of a #2 fuel oil tank. The spill was closed January 6, 1994. Assessment and/or remediation activities related to Spill #93-04740 are unknown.
- April 26, 1994: Spill #94-01229 was issued on April 26, 1994 as a result of #6 fuel oil spill. The NYSDEC spills database noted that approximately 40 gallons of #6 fuel oil spilled as a result of a gauge malfunction and that the fuel oil spill was contained on the concrete surface. The spill was closed on May 5, 1994.
- February 8, 1995: Spill #94-14693 was issued on February 8, 1995 was a result of the release of approximately 50 gallons of #6 fuel oil. The NYSDEC Spills database indicated that the spill was cleaned up; however, there was no additional information regarding the cleanup efforts. The spill was closed on February 13, 1995.
- August 15, 1995: Spill #95-06062 was issued on August 15, 1995 as a result of a tank test failure of a 2,000-gallon diesel tank that was utilized for powering an emergency generator. The NYSDEC noted that the tank would be removed. The spill was closed on January 2, 2005.
- October 6, 1999: Spill #99-08220 was issued on October 6, 1999 as a result of an excavation crew encountering a strong gasoline odor. Due to the proximity of the Getty Site, it was believed that the petroleum odors were coming from Spill #97-10575 associated with 26 East Post Road; therefore, Spill #99-08220 was closed on November 19, 1999. It does not appear that any further assessment was performed to verify this assumption.
- November 14, 2001: Spill #02-06489 was issued on November 14, 2001 due to the release of less than 1 ounce of Mercury. The NYSDEC Spills database indicated that the Westchester County Health Department (WCHD) responded to the release and cleaned it up. The spill was closed on October 29, 2003.
- April 3, 2009: Spill #09-00120 was issued on April 3, 2009 due to the detection of free product in the sump pit of a UST associated with the hospital. In the NYSDEC Spills database, it was noted that leaking USTs were the suspected source of the leak. Between April and August of 2009, 74 drums of contaminated sorbents were recovered from the sump, and a total of 6,805 gallons of #6 fuel oil and contaminated water were removed

from the sump using a vacuum truck. The NYSDEC noted that the oil was leaking from the fuel oil UST for approximately 3 years (since 2006). It was also noted that impacted soils were noted beneath the UST. The assessment and remediation efforts related to Spill #09-00120 are unknown. The spill was closed on April 4, 2017.

- March 14, 2007: Spill #06-13444 was issued on March 14, 2007 due to a line leak from a failed heat exchanger. The NYSDEC Spills database noted that oil was coming out of the condensate line, and approximately 10 gallons of #6 fuel oil was released to the floor of the boiler room. Absorbent materials were utilized to clean up the spill. The spill was closed on April 5, 2007.
- September 12, 2011: Spill #11-07393 was issued on September 12, 2011 as a result of a tank test failure. It was noted in the NYSDEC Spills Database that the failure was below the product level, product was present in the tank top sump, and there was a previous spill open that documented product seeping into the basement from another UST. The spill was closed on October 31, 2011.

3.4.3 42-44 East Post Road

42-44 East Post Road is located to the East of the Marianina Property, to the south of the Building 33 Parking Lot and the Building 33, and to the southeast of the WPHA recreation area in between the Building 159 and the Building 33. 42-44 East Post Road is currently utilized for commercial purposes (vacant commercial space at 42 East Post Road and White Plains Surgical Supply and One Source Homecare Pharmacy located at 44 East Post Road).

Based upon historical environmental records, there are three (3) NYSDEC Spills (Spill #98-12506, Spill #00-11871, and Spill #00-11872) associated with 42-44 East Post Road. Two (2) of the three (3) spills involved fuel oil and the third spill involved an unknown oil. As of the date of this report, all three (3) spills are closed. A summary of the three (3) spills are outlined below.

- January 10, 1999: Spill # 98-12506 occurred on January 10, 1999 as a result of 1 quart of unknown oil discovered in a ConEdison manhole filled with approximately 50 gallons of water. The spill was closed on January 10, 1999.
- February 2, 2001: Spill #00-11871 occurred on February 2, 2001 due to a spill of approximately 25 gallons of fuel oil on the basement floor that occurred during tank filling activities. Based upon the NYSDEC Spills Report, the Fire Department responded and cleaned up the fuel oil spill with Speedi Dry. A UST Removal and Soil/Groundwater Remediation Report was submitted by National Environmental Specialists on August 5, 2005. Based on the info contained in that report, the NYSDEC issued an NFA October 11, 2005.
- February 2, 2001: Spill #00-11872 occurred on February 2, 2001 as a result of approximately 70 gallons of fuel oil spilling onto the basement floor during tank filling activities. The NYSDEC spills report noted that this spill was the same spill as 00-11871. Therefore, the spill was closed administratively on February 5, 2001 as was managed



under Spill #00-11871. It should be noted that Spill #00-11871 reported by the fire department documented 45 gallons less of spilled fuel oil as compared to the reported quantity from the fuel oil company.

3.4.4 60 East Post Road

60 East Post Road is located to the east of the Marianina Property, to the southeast of the Building 33 Parking Lot and the Building 33, and to the south of the WPHA recreation area in between the Building 33 and the WPHA Building 225. 60 East Post Road is currently utilized as an automobile repair facility (Firestone Complete Auto Care) and has operated as an auto repair facility since at least 1950.

Based upon historical environmental records, there is one (1) closed NYSDEC Spill (Spill #08-04645) and no active spills associated with 60 East Post Road. Spill #08-04645 was issued on July 23, 2008 as a result of impacted soil encountered during the removal of a hydraulic lift. Assessment and remediation efforts related to Spill #08-04645 are unknown; however, a closure report was submitted on August 12, 2008, and the spill was closed on September 26, 2008.

4 Environmental Overview

4.1 Geology

The United States Department of Agriculture's Soil Survey Geographic (SSURGO) database classifies soils immediately beneath the Investigation Area and surrounding areas as Urban Land. Urban Land is typically found in densely developed areas and is defined as areas that have been covered by pavement, concrete, building, and other structures where the original soil material is typically disturbed, filled, or otherwise destroyed prior to construction. Based upon previous subsurface assessments in the Investigation Area, urban fill consisting of asphalt, debris, crushed stone, wood, glass, and brick was encountered to depths ranging from four (4) to six (6) feet bgs. This urban fill was underlain by native soils.

According to the New York State Geological Survey (NYSGS), surficial geology beneath the urban fill for areas of White Plains are primarily comprised of unconsolidated glacial till containing mixtures of silt, clays, sand, gravel, and boulders underlain by bedrock formations. Based upon historical subsurface investigations, this is consistent with what was observed across the Investigation Area. Surficial soils across the Investigation Area are predominately non-cohesive, non-plastic, fine to course grained sands with varying amounts of silt, gravel, pebbles, and some clay. Additionally, cobbles and boulders were encountered intermittently at varying depths throughout the Investigation Area beneath the urban fill to approximate 10 feet bgs.

The total depth of exploration across the Investigation Area generally extended to depths ranging from approximately 15 to 20 feet bgs. At investigation areas that extended to less than 15 feet bgs, refusal was typically encountered. Surface bedrock exposures did not occur in the Investigation Area; however, weathered or competent bedrock was generally present at varying depths from ranging from approximately 4 to 18 feet bgs. The type of bedrock was not noted in the available boring logs.

4.2 Hydrogeology

4.2.1 Depth to Groundwater

Since 1998, at least 428 depth to water measurements have been collected across the Investigation Area from approximately 49 well locations. A Summary of the Historical Depth to Groundwater measurements across the Investigation Area are summarized in **Table 4** provided below.



Table 4: Investigation Area Historical Depth to Groundwater Summary

Investigation Area Zone	Min	Max	Average DTW	Number of Wells*	Number of Measurements
Building 159 Parking Lot	1.46 (GP-15 in 2013)	7.08 (GP-14 in 2008)	3.84	9	86 (Between 2000 and 2016)
Getty Site	3.45 (MW-10 in 2004)	11.45 (MW-4 in 2002)	7.18	25	304 (Between 1998 and 2016)
Building 159	4.81 (MW-103 in 2016)	7.80 (MW-103 and MW-104 in 2013)	6.11	3	9 (Between 2013 and 2016)
Building 33 Parking Lot	5.52 (MW-201-33 in 2015)	7.88 (MW-203-33 in 2016)	6.61	6	12 (Between 2015 and 2016)
WPHA Recreation Area	5.78 (MW-205-33 in 2015)	7.56 (MW-106 in 2013)	6.37	5	14 (Between 2013 and 2016)
Building 33	7.37 (MW-204-33 in 2016)	7.40 (MW-204-33 in 2015 and 2016)	7.39	1	3 (Between 2015 and 2016)
Marianina Property	8 (Test Pits in 1994)	8.5 (GB-1 TW in 2017)	8.25	2	2 (1994 and 2017)**

DTW = depth to water

* Only includes those wells with available DTW readings

** There is no available depth to groundwater data for temporary monitoring wells MW-110 and MW-111.

Based upon groundwater data from the historical and current groundwater monitoring well network, a summary of the Investigation Area hydrogeology is provided below

- The average depth to water across the Investigation Area is 6.15 feet below top of casing (TOC).
- Depth to water readings have ranged from 1.46 feet below TOC at GP-15 (Building 159 Parking Lot in 2013) to 11.45 feet below TOC at MW-4 (Getty Site in 2002).
- The most variable DTW readings have been measured on the Getty Site and the Building 159 parking lot. In these area, DTW has ranged from 1.46 to 11.45 feet below TOC. The variability in DTW across these areas can likely be attributable to historic remediation efforts performed (DPHVE system and EVFR events) at select wells as well as the



presence of shallow bedrock documented at select locations which could potentially be contributing to perched water conditions.

- Depth to groundwater data for the Marianina Property is limited; however, based upon the 1994 tank removal activities, groundwater was approximately 8 feet bgs. In 2017, depth to groundwater was measured at approximately 8.5 feet bgs at GB-1 TW.

Based upon the historical depth to water information, the vadose, smear and saturated zones are defined in **Table 5** below.

Table 5: Investigation Area Vadose, Smear, and Saturated Zones Summary

Investigation Area Zone	Vadose Zone (feet bgs)	Smear Zone (feet bgs)	Saturated Zone (feet bgs)
Building 159 Parking Lot	0-1.5	1.5-7	>7
Getty Site	0-3.5	3.5-11	>11
Building 159	0-5	5-8	>8
Building 33 Parking Lot	0-5.5	5.5-8	>8
WPHA Recreation Area	0-5.5	5.5-7.5	>7.5
Building 33	0-7	7-7.5	>7.5
Marianina Property	0-5.5	5.5-8.5	>8.5

4.2.2 Groundwater Flow

Historical groundwater elevation data from 1998 through 2016 were reviewed to determine groundwater flow directionality and hydraulic gradient in the vicinity of the Investigation Area. To aid in the evaluation of predominate groundwater flow directionality over time, the Groundwater Spatio-Temporal Data Analysis Tool (GWSDAT) was utilized. Wells or sampling events without documented TOC Elevation data (not surveyed) were not included in the evaluation.

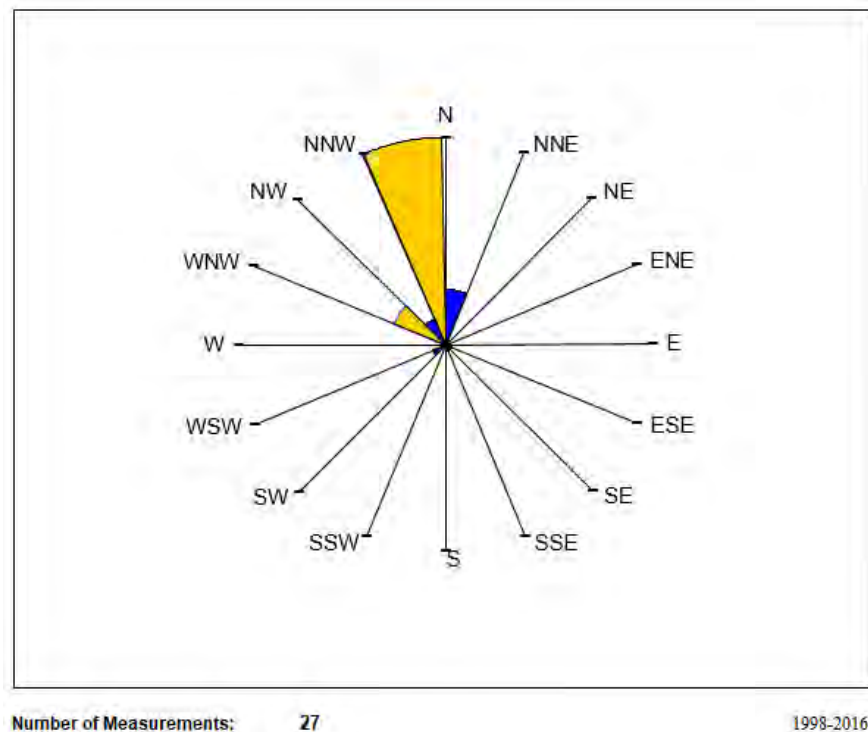
Based upon an evaluation of 27 data sets collected between 1998 and 2016, the predominate groundwater flow direction across the Investigation Area is northwesterly with some fluctuations to the northeast, southwest, and southeast. Groundwater flow direction prominence since 1998 within the Investigation Area includes:

- 77.8% northwesterly flow direction with an average hydraulic gradient of 0.057 feet per foot (ft/ft)
- 14.8% northeasterly flow direction with an average hydraulic gradient of 0.080 ft/ft
- 3.7% southwesterly flow direction with an average hydraulic gradient of 0.034 ft/ft
- 3.7% southeasterly flow direction with an average hydraulic gradient of 0.048 ft/ft

Figure 3 provided below summarizes the predominate groundwater flow direction frequency over time.

Figure 3 – Groundwater Flow Direction Frequency

Marianina Property, Getty Site, WPHA Property
White Plains, Westchester County, New York



4.2.3 Preferential Pathways

Within the Investigation Area, a number of preferential pathways potentially contributing to the variation in groundwater flow and the migration of dissolved-phase impacts were identified. These preferential pathways include subsurface utilities, bedrock with potential fractures, and man-made alterations to the local landscape.

Subsurface Utilities

A number of subsurface utilities have been documented throughout the Investigation Area. All identified utilities that traverse the Investigation Area have been included on the Site Map provided as **Figure 1** and the Local Area Map provided as **Figure 2**. Based upon the location of the utilities and the anticipated depths of these utilities in relation to depth to groundwater, it is likely that some of these utilities are acting as preferential pathways contributing to the migration of dissolved-phase impacts.

As noted in historical reports, the majority of the utilities servicing the Winbrook Complex enter the WPHA Property through 33 Fisher Court (Building 33) and are piped underground to the other buildings associated with the Winbrook Complex. Documented utilities that traverse the

Investigation Area between WPHA Buildings 33 and 159 include electric, gas, telephone, water and an underground steam line. In January of 2014, First Environment, Inc. (First Environment) noted in a letter to the NYSDEC that multiple conduits (water line, east/west steam conduit, gas, electric, telephone, and additional steam conduits) are in the water table, and that these utilities are “all potential pathways for the chemicals of concern”. These conduits have been summarized below.

- Subsurface conduits housing electric, gas and telephone lines run from Building 33 located to the northeast of the WPHA Recreation Area to the Building 159 located to the west/southwest of the WPHA Recreation Area.
- Between 1900 and 1911, a 4-inch water pipe was noted running through Brookfield Street from south to north from East Post Road. As of 1930, an additional 14-inch water pipe was noted running through Brookfield Street parallel to the 4-inch water pipe. Based upon geophysical documentation from various subsurface investigations performed throughout the WPHA Recreation Area, a water line servicing the Building 159 branches off of the water main, runs in a westerly direction across the WPHA Recreation Area basketball courts, and enters Building 159 along the eastern side of the building.
- A heating plant adjacent to Building 33 serves all buildings associated with the Winbrook Complex. The heating plant distributes steam underground to radiators in the apartments utilizing two (2) 20,000-gallon fuel oil USTs that are located under the parking near the heating plant building. To deliver heat to Building 159, subsurface steam pipes run from Building 33 across the WPHA Recreation Area in between the playground and the basketball courts to the eastern side of Building 159. Additional steam lines were noted on the northeastern side of Building 159 that travel across a portion of the WPHA Recreation Area playground.

It was noted in the April 14, 2015 *Report of Severe Physical and Structural Distress* prepared by WMW Architects that there are major leaks in the underground steam lines feeding the buildings of the Winbrook Complex and that the underground steam line should be excavated and replaced.

- A subsurface sewer pipe was detected running northeast (from the 159 S. Lexington parking lot) through the basketball courts. The location of this sewer pipe is not included on the Site Map and Local Area Map provided as **Figures 1** and **2**, respectively as its approximate location was not verified.

Additional subsurface utilities noted in the Investigation Area include:

- Stormwater catch basins located in the Building 159 Parking Lot with associated stormwater lines traveling to the northwest of the parking lot; and,
- A trench drain and drain manhole located on the eastern side of the Getty Site.

Bedrock

During the various soil assessments performed across the Investigation Area, weathered and/or competent bedrock was encountered between 4 and 15 feet bgs and refusal was encountered at depths ranging from 8 to 15 feet bgs. Depending on the permeability of the competent bedrock encountered at the site, a perched water table may have developed in the vicinity of the Getty Site and the Building 159 Parking Lot which could be contributing to the shallow depth to groundwater and drastic groundwater fluctuations in these areas.

Bedrock contains solution cavities and fractures, which transmit water. While fractures have not been specifically documented during the various soil assessments in the Investigation Area, the potential for fractured bedrock exists, and these fractures may act as preferential pathways contributing to the migration of dissolved-phase impacts.

Man-Made Alterations

As documented in the April 14, 2015 *Report of Severe Physical and Structural Distress* prepared by WMW Architects, the WPHA Property was built over a running underground stream, and the buildings associated with the Winbrook Complex were built on pile foundations to accommodate for this. The underground stream could be acting as a preferential pathway for groundwater and contributing to the migration of dissolved-phase impacts. The exact location of the underground stream is unknown.

It was also noted in the April 14, 2015 WMW Architects report that groundwater infiltration is a consistent problem at several of the buildings, especially 11 Fisher Court. All buildings have a pumping system to move water out of buildings, and that the current systems require constant maintenance and should be replaced.

4.3 Constituents of Concern

When evaluating the nature and extent of potential sources of contamination, historical land use and historically stored chemicals for the area of concern and surrounding properties should be evaluated to aid in the proper identification of contributing source area(s). **Table 6** provided below outlines potential constituents of concern for each property in the Investigation Area based upon their historical land use and chemicals historically stored on each property.

Marianina Property

The Marianina Property has stored gasoline since at least 1937. Based upon the timing and available tank documentation, it is likely that various grades of gasoline containing lead, MTBE, and ethanol have been used at the Marianina Property. Additionally, it has been documented that diesel has been stored on the Marianina Property.

Getty Site

The Getty Site stored gasoline since at least 1930 and operated as an active station until 1988 when the USTs were removed. Based upon the timing and available tank documentation, it is likely that various grades of gasoline containing lead and MTBE have been used at the Getty Site.



WPHA Property

The WPHA Property has stored #4 fuel oil for heating purposes since at least 1950 when two (2) 20,000-gallon fuel oil steel USTs were installed.

Other Surrounding Properties:

The other surrounding properties (22-24 East Post Road, 42-44 East Post Road, and the White Plains Hospital) historically stored various grades of fuel oil (#2, #4, and #6 fuel oils). The White Plains Hospital has stored diesel fuel and 60 East Post Road has operated as an auto repair facility.

Table 6: Potential Chemicals of Concern
Investigation Area and Surrounding Properties

Chemicals Stored	VOCs CP-51 List	VOCs Full List*	SVOCs CP-51 List	Lead	MTBE	Ethanol	Other Oxygenates**
Marianina Property							
Leaded Gasoline	X			X			
Gasoline (MTBE)	X				X		X
Gasoline (Ethanol)	X					X	
Diesel	X		X				
Getty Site							
Leaded Gasoline	X			X			
Gasoline (MTBE)	X				X		X
WPHA Property							
#4 Fuel Oil	X		X				
Other Surrounding Properties (22-24 East Post Road, 42-44 East Post Road, and the White Plains Hospital)							
Fuel Oil (#2, #4, and #6 fuel oils)	X		X				
Diesel	X		X				
Auto Repair Facility		X	X				

* Inclusive of CVOCs

** diisopropyl ether (DIPE), tert-Amyl ethyl ether (TAE), ethyl tert-butyl ether (ETBE), tert-Amyl methyl ether (TAME), and tertiary butyl alcohol (TBA)

4.4 Soil Quality

The quality of soil across the Investigation Area is based upon the available historical soil analytical data collected during the various soil investigations discussed in Sections 3.1.2.4, 3.2.2.3, and 3.3.2.3. In many cases, only one (1) soil sample was submitted for laboratory analysis from each soil boring location; therefore, the evaluation is based upon limited data for select hydrogeological zones (vadose, smear, and saturated zones).

4.4.1 Standards, Criteria, and Guidance Values

The primary NYSDEC Standards, Criteria, and Guidance (SCGs) applicable to the Investigation Area are the Soil Cleanup Levels (SCLs) established in NYSDEC Policy CP-51: Soil Cleanup Guidance. In October of 2010, the NYSDEC CP-51 Soil Cleanup Guidance replaced Technical and Administrative Guidance Memorandum (TAGM) 4046: Determination of Soil Cleanup Objectives and Cleanup Levels (January 24, 1994); the Petroleum Site Inactivation and Closure Memorandum (February 23, 1998); and Sections III and IV of Spill Technology and Remediation Series (STARS) #1 (August 1992).

4.4.2 Historical Laboratory Analysis

Marianina Property

Soil investigations to evaluate the nature and extent of impacts on and adjacent to (along the western property boundary in the right-of-way) the Marianina Property were performed between 2014 and 2017.

- The 2014 investigation was performed as part of on-going delineation efforts at the Getty Site. During the 2014 investigation, soil samples were submitted for analysis of VOCs CP-51 list (including MTBE) and total lead. In addition to this analysis, SVOCs STARS List and ethanol should have been included in the analytes list to account for the diesel fuel that has been stored on the Marianina Property since 1994. Additionally, organic lead including tetraethyllead (TEL) and tetramethyl lead (TML) should have been analyzed instead of total lead to differentiate between leaded gasoline and background (naturally occurring and imported fill) lead concentrations.
- During the 2017 investigation, seven (7) soil borings were advanced across the Marianina Property, and soil samples collected were screened with a PID. It should be noted that an FID capable of detecting SVOCs should have also been utilized during the field screening activities to account for semi-volatile compounds that are found in diesel fuel. While continuous soil samples were collected from each of the soil borings, only soils samples collected from three (3) of the locations were submitted for laboratory analysis. The laboratory analysis included VOCs STARS list (including MTBE), SVOCs STARS list, and total lead. The analysis selected was appropriate; however, organic lead including TEL and TML should have been analyzed instead of total lead to differentiate between leaded gasoline and background (naturally occurring and imported fill) lead concentrations.

Getty Site

Multiple soil investigations to evaluate the nature and extent of impacts on the Getty Site were performed between 1997 and 2017. During these investigations, samples were only submitted for NYSDEC Listed VOCs (STARS or CP-51 list). In order to properly assess impacts downgradient of the Getty Site, organic lead including TEL and TML should have been included as the Getty Site likely housed leaded gasoline during its operations prior to the mid to late 1980's.

WPHA Property

Laboratory analysis for soil investigations on the WPHA Property (Building 33 Parking Lot, Building 33, Building 159 Parking Lot, Building 159, and the WPHA Recreation Area between Building 33 and Building 159) have not been consistent and have not included all appropriate laboratory analytical methods consistent with the potential chemicals of concern (COCs) identified in the Investigation Area. The following analysis should have been performed to fully evaluate the nature, extent, and potential contributing source of soil impacts on the WPHA Property:

WPHA Fuel Oil Spill:

- To investigate the WPHA fuel oil Spill, 12 soil borings were advanced across the spill area and a total of 25 soil samples were collected from borings B-1 through B-12, and all samples collected were screened with a PID. It should be noted that an FID capable of detecting SVOCs would have been the more appropriate field screening device since the spill was fuel oil in nature. During the field screening, low PID readings were detected which is expected since it was a fuel oil release and there are only low levels of volatile compounds in fuel oil.
- Of the 25 soil samples collected, only four (4) samples collected from B-3, B-10, and B-11 were submitted for laboratory analysis. It is unclear how the four (4) samples submitted for analysis were selected as some samples not selected for analysis had higher PID readings than those selected. The laboratory analytical methods for the samples selected were not consistent and included a variation of analysis for VOCs, SVOCs, and total lead.
 - o B-3 (2-3') was submitted for VOCs STARS list and total lead
 - o B-3 (4-5') was submitted for SVOCs STARS list only
 - o B-10 (3-4') and B-11 (4-5') were submitted for VOCs STARS list and SVOCs STARS list

At a minimum, VOCs STARS List and SVOCs STARS List should have been the laboratory analysis for all soil samples collected in conjunction with the WPHA fuel oil spill.

Evaluation of Impacts Migrating from the Marianina Property to the WPHA Property:

- Investigations to evaluate the potential for impacts migrating from the Marianina Property to the WPHA Property (specifically the Building 33 Parking Lot, Building 33, and the WPHA Recreation Area Building 33 and Building 159) were performed in April of 2015 and December of 2015. During these investigations, samples were only submitted for VOCs [Final Commissioner Policy, CP-51 (CP-51) list or Full list] and total lead. At a minimum,

all soil sampling performed to evaluate the potential migration of impacts from the Marianina Property should have also included SVOCs STARS list to account for diesel that was stored on the Marianina Property and fuel oil that is stored on the WPHA Property. Additionally, organic lead, including TEL and TML instead of total lead should have been included in the analysis list to differentiate between leaded gasoline and background (naturally occurring and imported fill) lead concentrations.

Evaluation of Impacts Migrating from the Getty Site to the WPHA Property:

- Multiple investigations to evaluate the potential for impacts migrating from the Getty Site to the WPHA Property (specifically Building 159 Parking Lot, Building 159, and the WPHA Recreation Area between Building 33 and Building 159) were performed between 2000 and 2016. During these investigations, samples were only submitted for VOCs (CP-51 or Full lists) and total lead. At a minimum, all soil sampling performed to evaluate the potential migration of impacts from the Getty Site should have also included organic lead including TEL and TML as the Getty Site likely housed leaded gasoline during its operations prior to the mid to late 1980's.

4.4.3 Adsorbed-Phase Hydrocarbon Evaluation

4.4.3.1 Vadose (Unsaturated) Zone Impacts

Based upon historical groundwater fluctuation data across the Investigation Area, the vadose zone thickness varies considerably. The vadose zone ranges from 1.5 feet in thickness in the vicinity of the Building 159 Parking Lot (0-1.5 feet bgs) to 7 feet in thickness in the vicinity of Building 33 (0-7 feet bgs). The approximate vadose zone depths across the Investigation Area are listed below in order of thinnest to thickest.

- Building 159 Parking Lot: 0-1.5 feet bgs
- Getty Site: 0-3.5 feet bgs
- Building 159: 0-5 feet bgs
- Building 33 Parking Lot, WPHA Recreation Area, and the Marianina Property: 0-5.5 feet bgs
- Building 33: 0-7 feet bgs

Table 7 provided below outlines vadose zone soil impacts detected across the Investigation Area.



Table 7: Historical Vadose Zone Soil Analytical Data Summary

	Benzene	MTBE	Total VOCs	CVOCs	SVOCs	Total Lead
Data Sets*	11	8	10	1	10	3
Detections	3	1	7	1 [^]	9	3
Detections Over SCLs**	1	0	2	0	2	1
Max Concentration (mg/kg)	0.0847	0.0209	130.8	0.0186	58.09	84.4
Sample ID for Max Concentration Investigation	B-11 (4-5')	SB-4 (1997) (2-4')	GB-3 TW (4-8')	GP-8 (3-6')	Center Composite (0.5')	B-3 (2-3')
Area Location of Max Concentration Year Max Concentration Detected	WPHA Rec Area	Getty Site	Marianina Property	Getty Site	WPHA Rec Area	WPHA Rec Area
Year Max Concentration Detected	2000	1997	2017	2000	2000	2000

CVOC = chlorinated volatile organic compounds

* The data set count includes split samples. In instances where samples were split, the data count is two (2) for each split sampling location.

** One (1) or more individual VOC, CVOC, or SVOC compounds were detected above the NYSDEC SCLs

[^] One (1) or more samples were collected over two (2) hydrogeological zones (vadose and smear)

The collection and analysis of vadose zone soil samples is important, as impacts detected within the vadose zone are a key indicator of source areas. Based upon a review of available soil analytical data, vadose zone soil analytical data is limited across the Investigation Area. Out of the 115 soil samples collected from the Investigation Area that were submitted for laboratory analysis, only 10% (12 samples total) were collected in the vadose zone and 4% (5 samples total) were collected from zones that span both the vadose and smear zones.

Since laboratory analytical data collected from the vadose zone is limited, PID data collected from the vadose zone across the Investigation Area were also evaluated to help in determining source areas.

Marianina Property

During subsurface investigations associated with the Marianina Property performed in 2014 and 2017, vadose zone soil samples were not submitted for laboratory analysis. Therefore, the vadose zone evaluation for the Marianina Property is based solely on the available PID data. Boring logs with PID readings were not available for temporary monitoring wells MW-110 and MW-111; therefore, PID data are limited to the seven (7) borings advanced on the Marianina Property. PID



readings suggest that a shallow VOC source area within the vadose zone (0-4 feet bgs) exists in the vicinity of the dispenser islands and product piping at boring location GB-4. However, without laboratory analytical data, this cannot be confirmed.

While there were no vadose zone samples collected, two (2) soil samples spanning both the vadose and smear zones (GB-3 TW and GB-6) were collected and submitted for laboratory analysis. Based upon the laboratory analytical results, only VOC constituents at one (1) of the boring locations exceeded the NYSDEC SCLs.

- VOC constituents above the NYSDEC SCLs were detected at one (1) boring location (GB-3 TW). While there were VOC detections above the NYSDEC SCLs at GB-3 TW; it cannot be determined with any certainty whether these impacts are unsaturated impacts or impacts from the smear zone.
- SVOC constituents were detected at one (1) of the boring locations (GB-3 TW); however, all constituents were below the NYSDEC SCLs.
- Total lead was detected at both of the sample locations; however, concentrations were below the NYSDEC SCLs. Based upon the fact that the vadose zone and portions of the smear zone of the Investigation Area is primarily comprised of non-native fill material, the low level lead detections are likely a result of background lead concentrations and not a leaded gasoline release.

The available analytical data suggest that the impacts detected in the samples spanning the vadose zone and upper parts of the smear zone are related to an unleaded gasoline release from the dispensers, product piping, and/or surface spills (housekeeping issues).

Getty Site

Limited vadose zone laboratory analytical data for the Getty Site is available. A total of one (1) vadose samples and three (3) samples spanning the vadose and smear zones were collected and submitted for laboratory analysis. Based upon the available laboratory analytical data, none of the vadose or vadose/smear zone samples collected exhibit concentrations of VOCs, SVOCs, or total lead above the NYSDEC SCLs.

Additionally, PID data for the vadose zone are limited. During soil investigations associated with the Getty Site, the screening of soils with a PID primarily began at five (5) feet bgs which is within the smear zone.

WPHA Property

Based upon the laboratory analytical data for samples collected from the vadose zone of the WPHA Property, it appears that there is a distinct source area for VOCs and SVOCs within the WPHA Recreation Area (vicinity of B-3, B-11, and the Center Composite Sampling). SVOC and select VOC compounds, including benzene, are found in fuel oil; therefore, the SVOC and VOC vadose zone impacts in the vicinity of the WPHA Recreation Area can be attributable to the 2000 fuel oil release. While portions of the WPHA Recreation Area were excavated, post-excavation sampling involved the collection of composite endpoint samples over a large area. As discussed



above in Section 3.3.2.3, composite sampling can lead to the dilution of impacted soils with non-impacted soils resulting in biased low analytical results. Additionally, the composite samples collected following both excavations were collected at depths ranging from 0.5 to 1 feet bgs while the excavation extended to at least six (6) feet bgs in the vicinity of B-3 and B-11. Therefore, true post-excavation soil conditions were not fully evaluated. Furthermore, it cannot be determined if the 2000 excavation activities in the vicinity of the WPHA Recreation Area adequately removed the fuel oil source material or additional source material remains which could contribute to ongoing dissolved-phase impacts in the area.

Lastly, total lead concentrations above the NYSDEC SCLs were detected in the vadose zone within the WPHA Recreation Area. Based upon the fact that the majority of the vadose zone of the Investigation Area is primarily comprised of non-native urban fill material, it is likely that these lead concentrations above the NYSDEC SCLs can be attributable to background lead concentrations and not an active release.

4.4.3.2 Smear Zone Impacts

Based upon historical groundwater fluctuation data, the smear zone has been defined as 1.5 to 11 feet bgs in the vicinity of the Getty Site and the Building 159 Parking Lot and generally 5.5 to 8.5 feet bgs in the vicinity of the Marianina Property, Building 159, Building 33, and the WPHA Recreation Area between Building 33 and Building 159. The presence of impacts within the smear zone is an indicator of a local release (impacts traveled through the vadose zone to the smear zone locally) or the migration of constituents at the soil-groundwater interface along the groundwater flow direction or along preferential pathways.

Table 8 provided below outlines smear zone soil impacts detected across the Investigation Area.



Table 8: Historical Smear Zone Soil Analytical Data Summary

	Benzene	MTBE	Total VOCs	CVOCs	SVOCs	Total Lead
Data Sets*	68	61	68	1	3	9
Detections	16 [^]	3 [^]	57 [^]	1 [^]	2 [^]	2 [^]
Detections Over SCLs**	11	0	35	0	0	0
Max Concentration (mg/kg)	7.89	0.0062	1,036	0.0186	1.509	9.39
Sample ID for Max Concentration	GP-6 (9.5)	SB-2 (1997) (4-6')	SB-5 (3')	GP-8 (3-6')	MW-109 (2-4.5)	GB-6 (4-8)
Investigation Area Location of Max Concentration	Getty Site	Getty Site	WPHA 159 Parking Lot	Getty Site	Building 159 Parking Lot	Marianina Property
Year Max Concentration Detected	1999	1997	2010	NA	2014	2017

NA = Not Applicable

* The data set count includes split samples. In instances where samples were split, the data count is two (2) for each split sampling location.

** One (1) or more individual VOC, CVOC, or SVOC compounds were detected above the NYSDEC SCLs

[^] One (1) or more samples were collected over two (2) hydrogeological zones (vadose and smear or smear and saturated)

Out of the 115 soil samples collected from the Investigation Area that were submitted for laboratory analysis, a total of 68 samples were collected within or spanning the smear zone. Across the Investigation Area, the smear zone samples were submitted for laboratory analysis of VOCs (NYSDEC List or Full List), SVOCs, and/or Total Lead. A summary of smear zone impacts for the Marianina Property, the WPHA Property, and the Getty Site are provided below.

Marianina Property

During subsurface investigations associated with the Marianina Property, a limited number of smear zones samples were collected and submitted for laboratory analysis to date. In total, four (4) samples were collected from the smear zone. Two (2) of these samples were split samples; therefore, the Marianina Property smear zone evaluation includes a total of six (6) data sets.

Based upon the smear zone laboratory analytical results, only VOC constituents exceeded the NYSDEC SCLs. SVOC constituents and total lead were below the NYSDEC SCLs at all locations.

- VOC constituents above the NYSDEC SCLs were detected at three (3) locations [GB-3 TW, MW-110 with both split samples, and MW-111 with only one (1) split sample]. Based upon an evaluation of PID readings where laboratory analytical data was not available,

smear zone impacts appear to be also present at GB-1 TW, GB-2, GB-4, GB-5, and GB-7. A map depicting VOC smear zone soil impacts across the Marianina Property as it relates to the Investigation Area has been attached as **Figure 4**.

- SVOC constituents were detected at one (1) of the boring locations (GB-3 TW). As discussed in the Vadose Zone discussion, GB-3 TW spans both the vadose and smear zones, and all SVOC constituents were below the NYSDEC SCLs.
- Total lead was detected at sample intervals from two (2) boring locations (GB-3 TW and GB-6 which span both the vadose and smear zones); however, concentrations were below the NYSDEC SCLs at both locations. As discussed in the Vadose Zone discussion, it is likely that these low level lead detections are a result of background lead concentrations and not a leaded gasoline release.

The available laboratory analytical data and PID readings suggest that VOC smear zone soil impacts are present across the Marianina Property from the UST field located on the southern Portion of the property extending past the northern and western property boundaries. On the Marianina Property, the highest smear zone impacts are present in the vicinity of and downgradient of the UST field (GB-7, GB-5, and MW-110) and in the vicinity of and downgradient of the dispensers and product piping (GB-4, GB-3 TW, and GB-1 TW). Therefore, the data indicate there are multiple sources on the Marianina Property related to unleaded gasoline releases from the dispensers and/or product piping (also identified in the Vadose Zone evaluation) and the UST field.

Getty Site

During subsurface investigations associated with the Getty Site, a total of 48 smear zone samples (45 samples within the smear zone and 3 samples spanning both the vadose and smear zones) were collected and submitted for laboratory analysis. VOCs were the only constituents evaluated in the smear zone across the Getty Site.

VOC constituents above the NYSDEC SCLs were detected at 22 of the 48 sample locations. The available laboratory analytical data and PID readings suggest that VOC smear zone soil impacts span the majority of the Getty Site footprint and extend past the northern property boundary. The highest smear zone impacts were detected in the northern portion of the property in the vicinity of and downgradient of the former UST field. Additionally, elevated smear zone impacts were detected adjacent to and in the vicinity of the former dispenser islands. Therefore, the data indicate there are multiple sources on the Getty Site related to gasoline releases from the former UST field and the former dispensers and/or product piping. The Getty Site soil samples were not submitted for lead analysis; therefore, it cannot be determined if the gasoline releases is from leaded gasoline or unleaded gasoline.

WPHA Property

During subsurface investigations associated with the WPHA Property (Building 33 Parking Lot, Building 33, Building 159 Parking Lot, Building 159, and the WPHA Recreation Area), a total of 26 smear zones samples were collected and submitted for laboratory analysis to date. NYSDEC

VOC Lists are the primary laboratory analysis performed across the WPHA Property with only one (1) sample submitted for SVOCs, and seven (7) samples submitted for total lead. Based upon the laboratory analytical results, only VOC constituents exceeded the NYSDEC SCLs. SVOC constituents and total lead were below the NYSDEC SCLs at all locations.

- VOC constituents above the NYSDEC SCLs were detected at seven (7) locations in the vicinity of the Building 159 Parking Lot [GP-13 (5-7'), GP-15 (4-7'), SB-4/MW-101 (7'), SB-5 (3'), MW-107 (4-5), MW-107 (5-6), and G22-SW (6')] and three (3) locations in the vicinity of the Building 33 Parking Lot [TWB-2 (6-6.5), SB-201 (6.0-6.5)/MW-201-33, SB-203 (7-7.5)/MW-203-33]. All VOC constituents in the smear zone of the WPHA Recreation Area and the Building 159 were below the NYSDEC SCLs. Smear zone samples were not collected in the vicinity of Building 33. A map depicting the smear zone impacts downgradient of the Marianina Property in the Building 33 Parking Lot is attached as **Figure 4**.
- SVOC analysis was limited on the WPHA Property to one (1) sample location [MW-109 (2-4.5)]. SVOC constituents were detected; however, all constituents were below the NYSDEC SCLs. Based upon the location of MW-109 (downgradient of 22-24 East Post Road), it is possible that the SVOC constituents detected are a result of the fuel oil release at 22-24 East Post Road.
- Total lead analysis was limited to five (5) sample locations within the limits of the Building 33 Parking Lot and two (2) sample location within the WPHA Recreation Area. All total lead concentrations were below the laboratory detection limits.

Based upon the available laboratory analytical data and PID readings, VOC smear zone soil impacts are primarily limited to the Building 33 Parking Lot and the Building 159 Parking Lot. Based upon the available smear zone data for the Marianina Property, the VOC smear zone impacts detected in the Building 33 Parking Lot likely resulted from an unleaded gasoline release from the Marianina Property, and the VOC smear zone impacts detected in the Building 159 Parking Lot likely resulted from a gasoline release from the Getty Site.

Smear zone soil samples were not submitted for laboratory analysis during the 2000 fuel oil release investigation and following the 2000 soil excavation activities; therefore, the potential for smear zone impacts from the 2000 fuel oil release exists.

4.4.3.3 Saturated Zone Impacts

Based upon historical groundwater fluctuation data, the saturated zone has been defined as greater than 7 feet bgs in the vicinity of the Building 159 Parking Lot, greater than 7.5 feet bgs in the vicinity of the Building 33 and the WPHA Recreation Area, greater than 8 feet bgs in the vicinity of the Building 159, the Building 33 Parking Lot, and the Marianina Property, and greater than 11 feet bgs in the vicinity of the Getty Site.

Table 9 provided below outlines saturated zone soil impacts detected across the Investigation Area.



Table 9: Historical Saturated Zone Soil Analytical Data Summary

	Benzene	MTBE	Total VOCs	CVOCs	SVOCs	Total Lead
Data Sets*	32	32	32	0	1	9
Detections	2	1	15 [^]	NA	1	2
Detections Over SCLs**	1	0	10	NA	0	0
Max Concentration (mg/kg)	0.18	0.0015	103.5	NA	1.8	5.8
Well ID for Max Concentration	G-15 Side (8')	SB-204 (11.0-11.5)/ MW-204-33	SB-304 (11-12')	NA	GB-7 (8-12)	SB-202 (15.0-15.5)/ MW-202-33
Investigation Area Location of Max Concentration	159 Parking Lot	Building 33	Getty	NA	Marianina Property	Building 33 Parking Lot
Year Max Concentration Detected	2014	2015	2017	NA	2017	2015

NA = Not Applicable

* The data set count includes split samples. In instances where samples were split, the data count is two (2) for each split sampling location.

** One (1) or more individual VOC, CVOC, or SVOC compounds were detected above the NYSDEC SCLs

[^] One (1) or more samples were collected over two (2) hydrogeological zones (vadose and smear or smear and saturated)

Out of the 115 soil samples collected from the Investigation Area that were submitted for laboratory analysis, a total of 32 samples were collected within or spanning the saturated zone. The saturated zone samples collected across the Investigation Area were submitted for laboratory analysis of primarily VOCs (NYSDEC list or Full list) with only nine (9) samples being submitted for total lead, and only one (1) sample being submitted for SVOCs.

Based upon the laboratory analytical results, only VOC constituents exceeded the NYSDEC SCLs in the saturated soil samples collected. At 11 of the 32 sample locations, one (1) or more VOC constituent concentrations exceeded the NYSDEC SCLs. The VOC constituent exceedances in the saturated zone were primarily present in the vicinity of the Getty Site and the Building 159 Parking Lot (82% of samples collected) with fewer exceedances on the Marianina Property (limited to GB-7 located to the east of the UST field) and the WPHA Recreation area (limited to TWB-5 located adjacent to the WPHA Recreation Area along the western side of the eastern most basketball court). Due to the nature of petroleum compounds, it is likely that some of these observed saturated exceedances were a result of smearing impacts downward in the borehole during soil sampling activities.

All SVOC constituent concentrations and total lead concentrations in the saturated soils were below the NYSDEC SCLs.

4.5 Groundwater Quality

4.5.1 Standards, Criteria, and Guidance Values

The primary NYSDEC Water Quality Standards (WQSs) applicable to the Investigation Area are New York State (NYS) regulation 6 *New York Codes, Rules and Regulations* (NYCRR) Part 703. In the absence of established water quality standards outlined in NYS regulation 6 NYCRR Part 703, derived guidance values are provided in the Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 which was established in 1993 and revised in 1998. In the November 29, 2016 First Environment *Remedial Investigation Report* for the Building 33, First Environment stated that no standard exists for MTBE. It should be noted that the NYSDEC does have an established WQS of 10 micrograms per liter ($\mu\text{g/L}$) for MTBE.

4.5.2 Dissolved-Phase Hydrocarbon Evaluation

Marianina Property

Dissolved-phase impacts potentially originating from the Marianina Property were first recognized following a subsurface investigation performed on the WPHA Property in October of 2013 and confirmed in 2014 when two (2) temporary monitoring wells (MW-110 and MW-111) were installed in the right-of-way of Brookfield Street along the western property boundary of the Marianina Property. Groundwater investigations on the Marianina Property itself have been limited in nature. Only one (1) groundwater sample (GB-1 TW) has been collected to date.

There have been a total of five (5) groundwater analytical data sets collected over two (2) sampling events (September of 2014 and January of 2017) involving the three (3) well locations at the Marianina Property. Groundwater analysis for the above-referenced sampling events included VOCs CP-51 list and MTBE. Historical groundwater monitoring data for the Marianina Property are summarized in **Table 10**.



Table 10: Marianina Property Groundwater Monitoring Data Summary

	Benzene	MTBE	TOTAL BTEX	VOCs	CVOCs	Total Lead
Data Sets	5	5	5	5	0	0
Detections	4	1	5	5	NA	NA
Detections Over WQSS*	4	1	5	5	NA	NA
Max Concentration (µg/L)**	1,400	18	15,010	21,180	NA	NA
Sample ID for Max Concentration	MW-111	MW-111	MW-110	MW-110	NA	NA
Year Max Concentration Detected	2014	2014	2014	2014	NA	NA

NA = Not Analyzed

* For Total BTEX, VOCs, and CVOCs, one (1) or more individual BTEX or VOC concentrations were detected above the NYSDEC WQSS

** All compound concentrations are in µg/L.

Based upon the available groundwater analytical data, various VOC compounds and MTBE were detected above the NYSDEC WQSS at the Marianina Property.

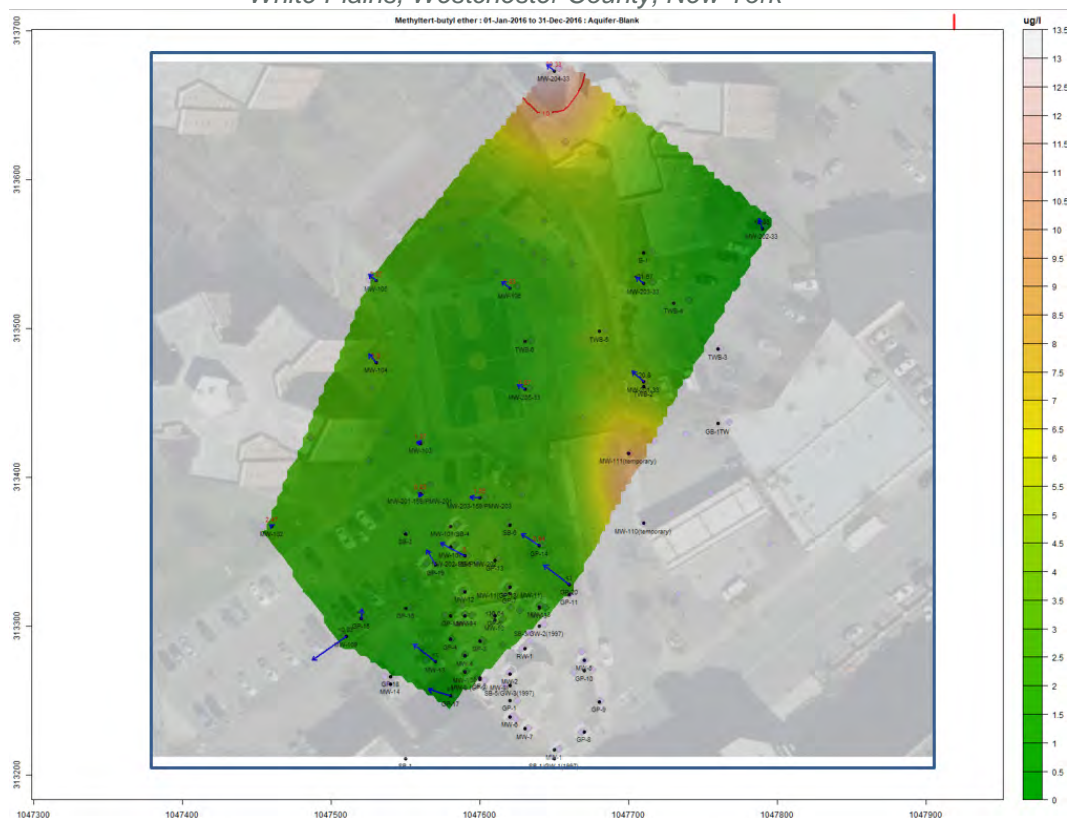
- Dissolved-phase benzene concentrations above the NYSDEC WQSS were detected at two (2) of the three (3) sampling points. The highest benzene detections were encountered at temporary monitoring well MW-111 at a concentration of 1,400 µg/L.
- The highest total BTEX and total VOC concentrations were encountered at temporary monitoring well MW-110 at concentrations of 15,010 µg/L and 21,180 µg/L, respectively.
- Based upon the total BTEX analyte make-up at the three (3) groundwater monitoring wells, it appears that there are multiple sources contributing to the dissolved-phase impacts detected on or adjacent to the Marianina Property.
 - o Ethylbenzene and total xylenes make up 100% of the total BTEX compounds at temporary well GB-1 TW indicating that dissolved-phase impacts at this location are historic in nature.
 - o Ethylbenzene and total xylenes make up 97% of the total BTEX compounds at temporary well MW-110 indicating that dissolved-phase impacts at this location are historic in nature.
 - o Benzene makes up 67% of the total BTEX concentration at temporary well MW-111 indicating that dissolved-phase impacts at this location are more recent in nature.

The degradation rate of BTEX compounds can vary significantly depending on specific subsurface conditions; therefore, the date of these releases cannot be determined by just evaluating the BTEX constituent ratios.

- MTBE was detected above the NYSDEC WQSs at one (1) sample location (MW-111) at a concentration of 18 µg/L. The presence of MTBE at MW-111 indicates that there was a release of gasoline containing MTBE additives at the Marianina Property. While MTBE was below the laboratory detection limits at MW-110, the laboratory detection limits were elevated and above the NYSDEC WQS. Therefore, with lower detection limits, MTBE may have been detected. A map showing the 2016 MTBE plume is provided below as **Figure 5**. While the dissolved-phase MTBE concentrations are below the NYSDEC WQSs, the map provides evidence of an MTBE release originating on the Marianina Property.

Figure 5 – Dissolved-phase MTBE Plume (2016)

*Marianina Property and WPHA Property
White Plains, Westchester County, New York*



- Lead, SVOC, and ethanol analyses were not performed on any of the groundwater samples collected in association with the Marianina Property. In order to fully evaluate the nature of the dissolved-phase impacts at the Marianina Property, SVOCs STARS List, organic lead including TEL and TML, and ethanol should have been included in the



analytes to account for all of the historical and current products stored at the Marianina Property.

To evaluate the extent of the dissolved-phase plume detected on the Marianina Property, additional groundwater investigations were performed between 2015 and 2016 in the Parking Lot of Building 33. Dissolved-phase investigations included the collection of groundwater from six (6) wells (temporary monitoring wells TWB-2, TWB-3, and TWB-4 and monitoring wells MW-201-33, MW-202-33, and MW-203-33). There have been a total of 15 groundwater analytical data sets collected over 4 sampling events from the above-referenced temporary and permanent well locations. Groundwater analysis for the above referenced sampling events included VOCs CP-51 List, MTBE, and total lead during all of the sampling events and VOCs Full List during two (2) sampling events at three (3) well locations. The historical groundwater monitoring data for the Building 33 Parking Lot are summarized in **Table 11**.

Table 11: Building 33 Parking Lot Groundwater Monitoring Data Summary

	Benzene	MTBE	TOTAL BTEX	VOCs	CVOCs	Total Lead
Data Sets	15	15	15	15	6	8
Detections	4	1	12	12	2	7
Detections Over WQs*	3	0	11	11	2	1
Max Concentration (µg/L)**	59.0	47	4,530	8,725	294	51.0
Sample ID for Max Concentration	MW-201-33	MW-204-33	TWB-2	TWB-2	MW-201-33	TWB-3
Year Max Concentration Detected	2015	2015	2015	2015	2015	2015

NA = Not Analyzed

* For Total BTEX, VOCs, and CVOCs, one (1) or more individual BTEX or VOC concentrations were detected above the NYSDEC WQs

** All compound concentrations are in µg/L.

Based upon the available groundwater analytical data, various VOC compounds including CVOCs and lead were detected above the NYSDEC WQs in the Building 33 Parking Lot.

- Dissolved-phase benzene concentrations above the NYSDEC WQs were detected at two (2) of the six (6) sampling points. The highest benzene detections were encountered at monitoring well MW-201-33 at a concentration of 59 µg/L.
- The highest total BTEX and total VOC concentrations were encountered at temporary monitoring well TWB-2 at concentrations of 4,530 µg/L and 8,725 µg/L, respectively. Permanent monitoring well MW-201-33 was later installed in the general vicinity of TWB-2. Based upon the TWB-2 and MW-201-33 dissolved-phase data, trends at this location have been generally decreasing with some seasonal fluctuations in concentrations.

- Ethylbenzene and total xylenes make up 98.4% to 100% of the total BTEX compounds at all six (6) well locations which indicates that the dissolved-phase impacts in the Building 33 Parking Lot are historic in nature and are likely associated with the dissolved-phase impacts detected at GB-1 TW and MW-110 on the Marianina Property.
- Total Lead was detected above the NYSDEC WQs at one (1) location (TWB-3) in April of 2015 at a concentration of 51 µg/L; however, it should be noted that the proper low-flow sampling technique for metals was not performed when collecting samples from TWB-3. Additionally, it does not appear that the samples were field or laboratory filtered prior to analysis. Therefore, the total lead detections at TWB-3 are not truly representative of dissolved-phase lead. TWB-3 was a temporary monitoring well, so additional sampling employing the correct sampling technique for metals could not be performed.

The wells sampled in April of 2015 for lead were analyzed for total lead. Total lead is not the appropriate analysis to determine if there was a potential release from leaded gasoline. Rather, organic lead including TEL and TML should have been analyzed as these are the main lead compounds found in leaded gasoline.

During the sampling of MW-201-33 through MW-203-33 in December of 2015, proper low flow sampling techniques were utilized, and the lead laboratory analysis included organic lead compounds including TEL and TML. Based upon the laboratory analytical results of the additional lead sampling, all lead compounds were below the laboratory detection limits. Therefore, there is no evidence that the release on the Marianina Property or immediately downgradient of the Marianina Property on the WPHA Property is a result of a leaded gasoline release.

- MTBE was below the NYSDEC WQs at all well locations. Because of the movement and disposition characteristics of MTBE in groundwater, the absence of MTBE does not rule out the possibility that the dissolved-phase impacts are a result of gasoline with MTBE additives. Since MTBE dissolves easily in water and does not "cling" to soil very well, an MTBE release at the Marianina Property that is historic in nature (prior to or in 2004 when MTBE was banned in New York) could have already migrated off of the property.
- SVOC and ethanol analyses were not performed on any of the groundwater samples collected. In order to fully evaluate the nature of the dissolved-phase impacts migrating from the Marianina Property, SVOCs STARS List and ethanol should have been included in the laboratory analysis list to account for all of the historical and current products stored at the Marianina Property.

Getty Site

Dissolved-phase impacts at the Getty Site were first identified in 1997 during a Phase II ESA when groundwater was collected from three (3) temporary monitoring wells (SB-1/GW-1, SB-3/GW-2, and SB-5/GW-3). Between 1997 and 2016, various groundwater investigations were performed to evaluate the nature and extent of dissolved-phase impacts on the Getty Site and



dissolved-phase impacts migrating from the Getty Site to the Building 159 Parking Lot located to the north.

Based upon the available historical documentation, there have been a minimum of 549 groundwater analytical data sets collected from at least 45 locations across the Getty Site and the Building 159 Parking Lot.

- Getty Site: 32 locations:
 - o 30 wells: SB-1/GW-1, SB-3/GW-2, SB-5/GW-3, MW-1 through MW-7, MW-8 [also referred to as GP-2/MW-8], MW-9, MW-10, MW-11 [also referred to as GP-13/MW-11], MW-12, RW-1, GP-1, GP-3, GP-4, GP-6 through GP-12, GP-20, MW-108, MW-113, and MW-114
 - o 2 excavation locations: Ex Water N, and Ex Water N-1
- Building 159 Parking Lot: 13 locations
 - o 9 wells: GP-14, GP-15, GP-19, MW-101/SB-4, MW-107, MW-109, MW-201-159, MW-202-159, MW-203-159,
 - o 4 soil borings: SB-1, SB-3, SB-5, SB-6

The historical groundwater monitoring data for the Getty Site are summarized in **Table 12**.

Table 12: Getty Site Groundwater Monitoring Data Summary

	Benzene	MTBE	Total BTEX	VOCs	CVOCs	Total Lead
Data Sets	339	427	340	340	4***	0
Detections	124	65	139	142	2	NA
Detections Over WQSS*	116	19	124	125	0	NA
Max Concentration (µg/L)**	3,280	204	17,020	24,256.5	8.6	NA
Sample ID for Max Concentration	MW-2	MW-12	MW-2	MW-2	MW-1	NA
Year Max Concentration Detected	1998	2002	1998	1998	1998	NA

NA = Not Analyzed

* For Total BTEX, VOCs, and CVOCs, one (1) or more individual BTEX or VOC concentrations were detected above the NYSDEC WQSS

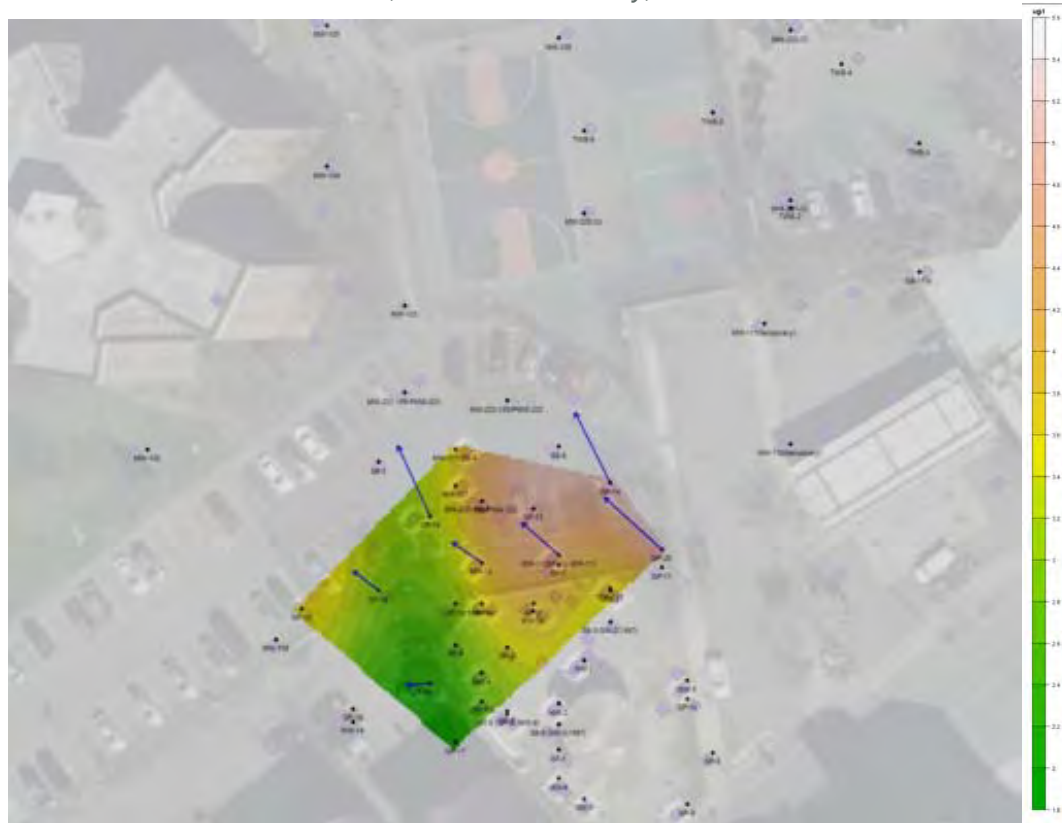
** All compound concentrations are in µg/L.

*** Only CVOC analysis was Methylene Chloride which is a chlorinated methane. The CVOC analysis did not include chlorinated ethylenes such as perchloroethene/perchloroethylene (PCE), trichloroethene/trichloroethylene (TCE), dichloroethene (DCE), and vinyl chloride (VC)

Groundwater analysis for the Getty Site primarily consisted of BTEX and MTBE. However, there were approximately 23 data sets that included additional VOC analysis. Based upon the available groundwater analytical data, various VOC compounds and MTBE were detected above the NYSDEC WQSs at the Getty Site.

- Dissolved-phase benzene concentrations above the NYSDEC WQSs were detected approximately 116 times at 27 of the 32 sample locations. The highest benzene detections were encountered at monitoring well MW-2 at a concentration of 3,280 µg/L.
- The highest total BTEX and total VOC concentrations were encountered at monitoring well MW-2 at concentrations of 17,020 µg/L and 24,257 µg/L, respectively.
- Based upon the total BTEX analyte make-up during the initial investigations performed between 1997 and 2000, ethylbenzene and total xylenes were the predominate BTEX compounds detected with benzene being the third largest compound being detected.
 - o Ethylbenzene and total xylenes made up an average of 59.7% of the total BTEX concentrations.
 - o Benzene made up an average of 31.4% of the total BTEX concentrations
- MTBE was detected above the NYSDEC WQSs at 11 sample locations with a maximum concentration of 204 µg/L at MW-12 in 2001. The presence of MTBE at these wells indicates that there was a release of gasoline containing MTBE additives at the Getty Site. A map showing the MTBE plume on the Getty Site in 2013 has been provided as **Figure 6** below. While the dissolved-phase MTBE concentration are below the NYSDEC WQS, it demonstrates the presence of MTBE and supports the conclusion that gasoline with MTBE additives were released.

Figure 6 – Dissolved-phase MTBE Plume (2013)
Getty Site
White Plains, Westchester County, New York



- Lead analyses was not performed on any of the groundwater samples collected. In order to fully evaluate the nature of the dissolved-phase impacts at the Getty Site, Lead (TEL and TML) should have been included in the laboratory analysis to account for all of the historical products stored at the Getty Site.
- SVOC analyses was not performed on any of the groundwater samples collected. In order to fully evaluate the nature of the dissolved-phase impacts migrating from the Marianina Property, SVOCs STARS List should have been included in the laboratory analysis list to account for all of the historical and current products stored at the .
- CVOC analysis was limited to Methylene Chloride. Methylene Chloride (also known as Dichloromethane) is widely used as a paint stripper and a degreaser; however, it is also a common laboratory contaminant. Therefore, it cannot be determined if there was a release from the former auto repair facility associated with the Getty Site.



To evaluate the potential migration of dissolved-phase impacts to the Building 159 Parking Lot from the Getty Site, additional groundwater investigations were performed between 2000 and 2016, which included the collection of groundwater from 13 temporary or permanent well locations (GP-14, GP-15, GP-19, MW-101/SB-4, MW-107, MW-109, MW-201-159, MW-202-159, MW-203-159, SB-1, SB-3, SB-5, and SB-6). The historical groundwater monitoring data for the Building 159 Parking Lot are summarized in **Table 13**.

Table 13: Building 159 Parking Lot Groundwater Monitoring Data Summary

	Benzene	MTBE	Total BTEX	VOCs	CVOCs	Total Lead
Data Sets	108	122	108	27	3	0
Detections	36	59	39	10	0	NA
Detections Over WQs*	35	21	37	10	0	NA
Max Concentration (µg/L)**	3,090	851	39,520	56,067.5	NA	NA
Sample ID for Max Concentration	SB-5	GP-14	SB-5	SB-5	NA	NA
Year Max Concentration Detected	2010	2002	2010	2010	NA	NA

NA = Not Analyzed or Not Applicable

* For Total BTEX, VOCs, and CVOCs, one (1) or more individual BTEX or VOC concentrations were detected above the NYSDEC WQs

** All compound concentrations are in µg/L.

Groundwater analysis for the Building 159 Parking Lot primarily consisted of BTEX and MTBE. However, there were approximately 27 data sets that included additional VOC analysis. Based upon the available groundwater analytical data, various VOC compounds and MTBE were detected above the NYSDEC WQs at the Building 159 Parking lot property.

- Dissolved-phase benzene concentrations above the NYSDEC WQs were detected approximately 35 times at 9 of the 13 sample well locations. The highest benzene detections were encountered at temporary well location SB-5 at a concentration of 3,090 µg/L.
- The highest total BTEX and total VOC concentrations were also encountered at temporary well location SB-5 at concentrations of 39,520 µg/L and 56,067.5 µg/L, respectively.
- Based upon the total BTEX analyte make-up during the initial investigations performed between 2000 and 2016, ethylbenzene and total xylenes were the predominate BTEX compounds detected with benzene being the third largest compound being detected. This is consistent with the BTEX analyte make-up encountered on the Getty Site.

- Ethylbenzene and total xylenes made up an average of 65% of the total BTEX concentrations.
- Benzene made up an average of 31% of the total BTEX concentrations
- MTBE was detected above the NYSDEC WQSs 21 times at three (3) sample locations with a maximum concentration of 851 µg/L at GP-14 in 2002. Based upon the historical northwesterly groundwater flow direction, it is likely that the dissolved-phase MTBE impacts detected on the Building 159 Parking Lot is from the Getty Site. While the MTBE impacts on the Building 159 Parking Lot are higher than those detected on the Getty Site, MTBE easily dissolves in groundwater and will migrate faster and farther in the ground as compared to other gasoline compounds. Therefore, based upon the estimated release date, it is likely that the heart of the MTBE plume has migrated off of the Getty Site which would explain higher dissolved-phase MTBE concentrations on the Building 159 Parking Lot.
- Lead analysis was not performed on any of the groundwater samples collected. In order to fully evaluate the nature of the dissolved-phase impacts at the Getty Site, Lead (TEL and TML) should have been included in the laboratory analysis to account for all of the historical products stored at the Getty Site.
- SVOC analysis was not performed on any of the groundwater samples collected. In order to fully evaluate the nature of the dissolved-phase impacts migrating from the Getty Site, SVOCs STARS List should have been included in the laboratory analysis list to account for all of the historical and current products stored on the property.
- CVOC analysis was limited to groundwater collected from three (3) wells during an August 2016 sampling event. All CVOC concentrations were below the laboratory detection limits.

WPHA Property (Building 159, WPHA Recreation Area, and Building 33)

Groundwater investigations across the WPHA Property were performed at various times between 2000 and 2016. The various WPHA investigations were performed to evaluate dissolved-phase impacts related to the WPHA 2000 fuel oil spill in the vicinity of the WPHA Recreation Area, the potential migration of dissolved-phase impacts originating from the Marianina Property, and the potential migration of dissolved-phase impacts originating from the Getty Site.

WPHA Recreation Area

Groundwater investigations in the vicinity of the WPHA Recreation Area were first performed in 2000 as result of the WPHA fuel oil Spill. Groundwater investigations related to this spill were limited and only included the collection of groundwater from one (1) boring location (B-5). The exact location of this soil boring is unknown due to the poor quality of the Soil Boring Diagram included in the May 25, 2000 Dorson Environmental Management, Inc. (Dorson) *Spill Closure Report*. It should be noted that Dorson proposed the collection of groundwater from three (3) temporary wells if groundwater was collected within 10 feet. The 2000 Dorson *Spill Closure Report* did not include boring logs and did not include an explanation as to why only one (1) groundwater sample was collected therefore, deviations from the 2000 *Scope of Work* is unclear.



The collection of groundwater from only one (1) location is not adequate to fully investigate the potential for impacts to the groundwater from the fuel oil release.

Subsequent groundwater investigations were performed within the WPHA Recreation Area in 2013 at three (3) locations (B-1, MW-105, and MW-106). These groundwater investigations were performed to evaluate the potential migration of dissolved-phase impacts from the Getty Site and the Building 159 Parking Lot that were previously documented. Groundwater monitoring activities at MW-105 and MW-106 were performed between 2013 and 2016 and groundwater monitoring activities at B-1 were limited to October of 2013 as B-1 was installed as a temporary monitoring well.

Groundwater investigations to evaluate the potential migration of dissolved-phase impacts from the Marianina Property and the Building 33 Parking Lot to the WPHA Recreation Area included the collection of groundwater from two (2) temporary monitoring wells (TWB-5 and TWB-6) and one (1) permanent monitoring well (MW-205-33). Groundwater monitoring activities at MW-205-33 were performed between 2015 and 2016 while groundwater monitoring activities at TWB-5 and TWB-6 were limited to April of 2015 as they were installed as a temporary monitoring wells.

Based upon the available historical documentation, there have been a minimum of 21 groundwater data sets collected from the seven (7) above-referenced temporary or permanent well locations.

The historical groundwater monitoring data for the WPHA Recreation Area are summarized in **Table 14**.

Table 14: WPHA Recreation Area Groundwater Monitoring Data Summary

	Benzene	MTBE	Total BTEX	VOCs	CVOCs	Total Lead
Data Sets	21	21	21	21	4	6
Detections	6	13	8	13	1	6
Detections Over WQs*	5	0	NA	NA	0	3
Max Concentration (µg/L)**	28	3.4	7,780	12,500	10	270
Sample ID for Max Concentration	MW-106	MW-105	TWB-5	TWB-5	MW-106	TWB-6
Year Max Concentration Detected	2015	2016	2015	2015	2015	2015

NA = Not Analyzed or Not Applicable

* For Total BTEX, VOCs, and CVOCs, one (1) or more individual BTEX or VOC concentrations were detected above the NYSDEC WQs

** All compound concentrations are in µg/L.

Groundwater analysis for the WPHA Recreation Area consisted of VOCs CP-51 List and MTBE for all data sets, CVOCs for 4 data sets collected from two (2) wells, total lead for 6 data sets collected from four (4) wells, and alkylated lead compounds for 2 data sets collected from two (2) wells. Based upon the available groundwater analytical data, various VOC compounds and total lead were detected above the NYSDEC WQSs within the WPHA Recreation Area.

- Dissolved-phase benzene concentrations above the NYSDEC WQSs were detected a total of 5 times between 2 of the 7 sample locations. The highest benzene detections were encountered at monitoring well MW-106 at a concentration of 28 µg/L. MW-106 is hydraulically downgradient of both the Getty Site and the Marianina Property. Based upon the current monitoring well network in the WPHA Recreation Area, benzene is below the NYSDEC WQSs at all monitoring well locations.
- One (1) or more total BTEX compounds above the NYSDEC WQSs were detected at 3 of the 7 sample locations (TWB-5, TWB-6, and MW-205-33) which are located hydraulically downgradient of the Marianina Property. The highest total BTEX concentration was encountered at temporary well location TWB-5 at concentration of 7,780 µg/L. TWB-5 was installed as a temporary well; therefore, total BTEX trends at this location can not be evaluated. However, MW-203-33 installed on the Building 33 Parking Lot is located hydraulically upgradient of TWB-5 and hydraulically downgradient of the Marianina Property. The total BTEX trends at MW-203-33 have been trending downward and the total BTEX concentration as of November 2016 was 180 µg/L. Additionally, based upon the monitoring well network in the WPHA Recreation Area as of November of 2016, all compounds included in total BTEX are below the NYSDEC WQSs at all monitoring well locations.
- The highest total VOC concentrations were encountered at temporary well location TWB-5 at a concentration of 12,500 µg/L. Based upon the monitoring well network in the WPHA Recreation Area as of November of 2016, the maximum total VOC concentration was 4.1 µg/L at MW-106, and all individual compounds were below the NYSDEC WQSs.
- Sampling for dissolved-phase MTBE was first performed in April of 2000 as part of the WPHA 2000 fuel oil spill investigation (groundwater sampled from soil boring B-5). In April of 2000, MTBE concentrations were below the NYSDEC WQSs as well as the laboratory detection limit of 1 µg/L. Additional groundwater sampling in the WPHA Recreation Area did not take place until October of 2013. During the October 2013 sampling event, MTBE was detected at monitoring wells MW-105 and MW-106 at concentrations of 1.6 µg/L and 2 µg/L, respectively and at soil boring B-1 at a concentration of 0.78 µg/L. Therefore, the data suggest that the MTBE plume on the WPHA Property migrated from upgradient MTBE sources (Former Getty Property and the Marianina Property) to the WPHA Recreation Area between 2000 and 2013. Between 2013 and 2016, MTBE was detected in 13 of the 21 data sets at 5 of the 7 well locations. While there were MTBE detections in the vicinity of the WPHA Recreation Area, all MTBE concentrations were below the NYSDEC WQSs.

- Total Lead was detected above the NYSDEC WQSs at three (3) locations (TWB-5, TWB-6, and MW-106) in April of 2015 at concentrations ranging from 39 µg/L (MW-106) to 270 µg/L (TWB-6); however, it should be noted that the proper low-flow sampling technique for the collection of dissolved-phase metals was not performed at these well locations. Additionally, it does not appear that the samples were field or laboratory filtered prior to analysis. Therefore, the lead detections at these locations are not truly representative of dissolved-phase lead. TWB-5 and TWB-6 were temporary monitoring wells, so additional sampling employing the correct sampling technique for metals could not be performed.

The wells sampled in April of 2015 for lead were analyzed for total lead. Total lead is not the appropriate analysis to determine if there was a potential release from leaded gasoline or not. Instead, TEL and TML should have been analyzed as these are the main lead compounds found in leaded gasoline.

During the sampling of MW-106 and MW-205-33 in December of 2015, proper low-flow sampling techniques were utilized, and the lead laboratory analysis included TEL and TML in addition to total organic lead. While the proper low-flow sampling technique was utilized, there is no indication if the samples were field filtered or not. Based upon the results on the additional lead sampling, all lead compounds were below the laboratory detection limits. Therefore, there is no evidence that the historical dissolved-phase impacts on the WPHA Recreation Area is a result of a leaded gasoline release.

- SVOC analyses was not performed on any of the groundwater samples collected in the vicinity of the WPHA Recreation Area. It should be noted that the groundwater sample collected from B-5 during the 2000 Dorson investigation was only submitted for VOCs STARS List. Since the nature of the 2000 WPHA release was fuel oil, SVOCs STARS List should have been included in the laboratory analysis list. Additionally, DTW in this area has been documented to be as shallow as 5.78 feet below TOC at MW-205-33. The soil excavation extended past this depth in some location to remove fuel oil impacted soils; therefore, the 2000 fuel oil release likely reached the water table. Therefore, all groundwater samples collected in the WPHA Recreation Area should be analyzed for SVOCs.
- CVOC analysis was limited to groundwater collected from two (2) wells during the December 2015 and August 2016 sampling events. All CVOC concentrations were below the laboratory detection limits.

Building 159:

Groundwater investigations in the vicinity of Building 159 were first performed in 2013 to evaluate the potential migration of dissolved-phase impacts from the Getty Site and the Building 159 Parking Lot. Groundwater investigations in the vicinity of Building 159 included the collection of groundwater from three (3) permanent monitoring wells (MW-102, MW-103, MW-104) and one (1) sump pit located in Building 159 (sample IDs SUMP1B and SUMP1T). There have been a



total of 17 groundwater data sets collected over 4 sampling events from the above-referenced well and sump locations. Groundwater analysis for the above referenced sampling events included VOCs CP-51 List and MTBE at all locations and CVOCs at the three (3) well locations during one (1) sampling event. The historical groundwater monitoring data for Building 159 are summarized in **Table 15**.

Table 15: Building 159 Groundwater Monitoring Data Summary

	Benzene	MTBE	Total BTEX	VOCs	CVOCs	Total Lead
Data Sets	17	17	7	7	3	7
Detections	8	16	8	9	3	NA
Detections Over WQs*	7	0	NA	NA	2	NA
Max Concentration (µg/L)**	19	5.4	19.0	115.3	114	NA
Sample ID for Max Concentration	MW-103	MW-104	MW-103	MW-104	MW-104	NA
Year Max Concentration Detected	2013	2016	2013	2016	2016	NA

NA = Not Analyzed or Not Applicable

* For Total BTEX, VOCs, and CVOCs, one (1) or more individual BTEX or VOC concentrations were detected above the NYSDEC WQs

** All compound concentrations are in µg/L.

Based upon the available groundwater analytical data, only benzene and CVOC compounds were detected above the NYSDEC WQs within the vicinity of Building 159.

- Dissolved-phase benzene concentrations above the NYSDEC WQs were detected a total of 7 times between 2 (MW-103 and MW-104) of the 5 sample locations. The highest benzene detections were encountered at monitoring well MW-103 at a concentration of 19 µg/L in 2013. MW-103 is hydraulically downgradient of both the Getty Site and the Building 159 Parking Lot. Based upon the current monitoring well network in the vicinity of Building 159, benzene was only detected at MW-103 at a concentration of 1.3 µg/L. Dissolved-phase benzene concentrations at all other sampling locations were below the NYSDEC WQs.
- With the exception of benzene, all total BTEX compounds and CP-51 Listed VOC compounds are below the NYSDEC WQs at all of the sample locations.
- MTBE was detected in 16 of the 21 data sets at all four (4) well locations; however, all MTBE concentrations were all below the NYSDEC WQs.
- CVOC analysis was limited to groundwater collected from three (3) wells during the August 2016 sampling event. One (1) or more chlorinated compounds (PCE, TCE, Vinyl Chloride, and/or cis,1,2-Dichloroethene) were detected above the NYSDEC WQs at 2 of the 3



wells sampled for CVOCs. The highest CVOC detections were encountered at MW-104. These wells are located hydraulically downgradient of the Getty Site. Based upon the historical automotive repair facility use, the Getty Site could be the contributing source. However, CVOC analysis has been limited across the Investigation Area, therefore, there is not enough evidence to determine if the Getty Site is the contributing source. Additionally, based upon the presence of significant utility corridors acting as potential preferential pathways across the WPHA Recreation Area, it is possible that the CVOCs are migrating from other off-site sources.

- Lead and SVOC analyses were not performed on any of the groundwater samples collected. In order to fully evaluate the nature of the dissolved-phase impacts originating from the Getty Site and the WPHA 2000 fuel oil release, SVOCs STARS List and lead (TEL and TML) should have been included in the analyte list to account for all of the historical and current products stored at the Getty Site and on the WPHA Property.

Building 33:

Groundwater investigations in the vicinity of Building 33 were first performed in 2015 to evaluate the potential migration of dissolved-phase impacts from the Marianina Property and the Building 33 Parking Lot. Groundwater investigations in the vicinity of Building 33 have been limited and only included the collection of groundwater from one (1) permanent monitoring well (MW-204-33). There have been a total of 4 groundwater data sets collected over 3 sampling events from the above-referenced well location. Groundwater analysis for the above referenced sampling events included VOCs CP-51 List and MTBE for all sampling events and CVOCs collected during two (2) of the sampling events (December 2015 and August 2016). The historical groundwater monitoring data for Building 33 are summarized in **Table 16**.

Table 16: Building 33 Groundwater Monitoring Data Summary

	Benzene	MTBE	Total BTEX	VOCs	CVOCs	Total Lead
Data Sets	4	4	4	4	2	2
Detections	0	4	0	0	2	2
Detections Over WQSS*	0	4	0	0	2	1
Max Concentration (µg/L)**	ND	47	ND	ND	1,074	28
Sample ID for Max Concentration	NA	MW-204-33	NA	NA	MW-204-33	MW-204-33
Year Max Concentration Detected	NA	2015	NA	NA	2016	2015

NA = Not Analyzed or Not Applicable

ND = Not Detected

* For Total BTEX, VOCs, and CVOCs, one (1) or more individual BTEX or VOC concentrations were detected above the NYSDEC WQSS

** All compound concentrations are in µg/L.

Based upon the available groundwater analytical data, only MTBE and CVOC compounds were detected above the NYSDEC WQSS within the vicinity of Building 33.

- Dissolved-phase benzene concentrations, total BTEX compound concentrations, and CP-51 Listed VOC compound concentrations have been below the NYSDEC WQSS at MW-204-33 during all of the sampling events.
- Dissolved-phase MTBE concentrations above the NYSDEC WQSS were detected at MW-204-33 during each of the three (3) sampling events. The highest dissolved-phase MTBE concentrations were detected at MW-204-33 in 2015 at a concentration of 47 µg/L.
- CVOC analysis was limited to groundwater collected from monitoring well MW-204-33 during the December 2015 and August 2016 sampling events. One (1) or more chlorinated compounds (PCE, TCE, Vinyl Chloride, and/or cis,1,2-Dichloroethene) were detected above the NYSDEC WQSS during each sampling event. The highest CVOC detections were encountered during the August 2016 sampling event. Based upon the presence of utility corridors acting as potential preferential pathways across the WPHA Recreation Area, it is possible that the CVOCs are migrating from off-site sources as discussed above.
- Total lead was detected above the NYSDEC WQSS during the December 2015 sampling event at a concentration of 28 µg/L. In addition to total lead, groundwater samples collected from MW-204-33 were submitted for laboratory analysis of organic lead including TEL and TML. Based upon the results on the additional lead sampling, all lead compounds indicative of leaded gasoline were below the laboratory detection limits. Therefore, there

is no evidence that the historical dissolved-phase impacts in the vicinity of Building 33 is a result of a leaded gasoline release.

- SVOC laboratory analysis was not performed on any of the groundwater samples collected from MW-204-33. In order to fully evaluate the nature of the dissolved-phase impacts originating from the Marianina Property and the WPHA 2000 fuel oil release, SVOCs STARS List should have been included in the analytes to account for the historical and current products stored at the Marianina Property and on the WPHA Property.

4.6 Air Quality

In March of 2017, First Environment performed an indoor air investigation at Building 33. During the March 2017 indoor air sampling, a total of two (2) indoor air samples (B33-IA-1 and B33-IA-2) and one (1) ambient air sample (B33-AA) were collected. Sub-slab samples were not collected during the March 2017 indoor air investigation. However, based upon the historical depth to water measurements in the vicinity of Building 33, it is assumed that the basement slab is in contact with the water table which would preclude the collection of sub-slab samples. If that is the case, near-slab samples should have been collected to adequately evaluate the potential for vapor intrusion from the subsurface versus indoor air quality issues related to chemicals stored in the building. Additionally, it should also be noted that there were no reported air quality issues in living spaces.

As part of the March 2017 indoor air investigation, a building inventory was performed. The building inventory included questions that address specific activities that might affect test results, including recent painting, remodeling, smoking, attached garages, carpet cleaning, dry-cleaning, use of solvents or adhesives, and other activities that might contribute VOCs to indoor air. While a building inventory was performed, it was not performed in accordance with the October 2006 New York State Department of Health (NYSDOH) *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH Guidance). Per the NYSDOH Guidance, an initial building inventory should be performed prior to any sampling activities to allow for the identification and potential removal of chemicals being stored in the test area prior to sampling, and on the day of the indoor air sampling to ensure no additional chemicals have been added to the sample area. The building inventory for the March 2017 sampling was performed on March 27, 2017 while the air sampling was performed three (3) days earlier on March 24, 2017.

Based upon the March 27, 2017 building inventory results, it was noted that the basement is unoccupied and is generally used to house the boiler, as a degreasing area for cleaning boiler parts, and as a place to store used appliances, petroleum-powered lawn equipment, and a variety of cleaning solutions. It was also noted during the building inventory that floor cleaners were recently used in the area, and that pesticides were periodically sprayed in the basement for rodent control.

Based upon the results of the March 2017 investigation, a total of 22 compounds were detected in the indoor air sampled. The compounds detected included those found in solvents, paints,



cleaning fluids used as degreasing agents, synthetic rubber compounds, compounds typically found in cigarette smoke, and various pesticide compounds. In addition, low levels of BTEX compounds were detected. All of the compounds detected in the indoor air samples can be found in the materials and chemicals stored in the Basement of Building 33. Since near-slab sampling was not performed and all of the compounds detected are found in the materials stored in the basement of Building 33, there is no evidence that the indoor air detections from the March 2017 indoor air investigation are a result of subsurface conditions.

In December of 2018, additional indoor air sampling was performed at Building 33. The sampling included the collection of two (2) indoor air samples (IA-B33-Sump and IA-B33-SE) one (1) ambient air sample (AA-B33). Based upon the available records, it does not appear that a proper building inventory was performed and that near-slab samples were collected. Therefore, a full evaluation of the December 2018 data cannot be made.

5 Opinions

Based on my review of the documents listed in **Appendix A**, the information provided herein regarding the Investigation Area and surrounding properties, and based upon my experience, the subsections provided below represent my key findings and opinions. The opinions expressed herein are based upon a reasonable degree of scientific certainty consistent with the standards of my profession in the field of environmental geology.

5.1 There is no evidence that Sinclair's and/or BP's operations at the Marianina Property prior to 1984 caused any environmental contamination at the WPHA Property

WPHA has claimed that during Sinclair's and/or BP's operations prior to 1984 at the Marianina Property, gasoline that included benzene, lead, and other constituents was released into the environment and has impacted the WPHA Property. Based on my experience, and my review of relevant information, the data and evidence do not support that allegation. Instead, the data support a post-1983 release.

The presence of organic lead in the soil and/or groundwater would substantiate a leaded gasoline release prior to the mid to late 1980s (when leaded grades of gasoline were phased out in New York between 1985 and 1987). Based upon the data, organic lead was not detected in any of the groundwater samples collected.

Across the Investigation Area, 19 soil samples were collected and submitted for laboratory analysis of total lead. Based upon the laboratory analytical results, total lead was detected at 5 of the 19 locations (three on the Marianina Property, one on the Building 33 Parking Lot area, and one within the WPHA Recreation Area). With the exception of the soil sample collected within the WPHA Recreation Area, all total lead concentrations were below the NYSDEC SCLs. The total lead sample collected within the WPHA Recreation Area was collected from the unsaturated vadose zone and was detected at a concentration of 84.4 mg/kg, which exceeds the NYSDEC SCL of 63 mg/kg. While unsaturated vadose zone soil impacts are indicative of a localized release, the total lead exceedances in the vicinity of the WPHA Recreation Area are likely a result of background lead concentrations as unsaturated soils in this area as well as the Investigation Area as a whole are primarily comprised of non-native fill material. Therefore, it is likely that these lead concentrations above the NYSDEC SCLs can be attributable to background lead concentrations and not an active release.

Based upon the available groundwater analytical data, organic lead (including TEL and TML) analyses were not performed on any of the groundwater samples collected from the Marianina Property. Therefore, there is no direct evidence that the source material for dissolved-phase impacts originating on the Marianina Property is leaded gasoline.

Dissolved-phase total lead was detected above the NYSDEC WQSs at five (5) temporary and permanent monitoring well locations across the Investigation Area between April 2015 and December 2015:

- April 2015: Dissolved-phase lead was detected above the NYSDEC WQSs at one (1) temporary well location in the Building 33 Parking Lot (TWB-3) and three (3) locations within the WPHA Recreation Area (temporary wells TWB-5 and TWB-6 and permanent well MW-106). Dissolved-phase lead concentrations above the NYSDEC WQSs in April of 2015 ranged from 39 µg/L at MW-106 to 270 µg/L at TWB-6.
- December 2015: Dissolved-phase lead was detected above the NYSDEC WQSs at one (1) permanent well location in the vicinity of Building 33 (MW-204-33). Dissolved-phase lead concentrations at MW-204-33 were 28 µg/L.

During the April 2015 sampling event, the groundwater samples were collected utilizing standard purge and bail technique, and it does not appear as if the samples were lab or field filtered prior to analysis. While dissolved-phase lead was detected in April of 2015, the data are not substantial as the proper low-flow sampling technique for metals was not employed when collecting samples from these well locations. Samples with high levels of sediment can reveal biased high metal concentrations. Low-flow sampling and/or sample filtering (field or lab filtering) ensures water samples are free of sediments and particulates that can result in elevated metal concentrations. Because the proper sampling techniques were not employed, the lead detections at these locations are not truly representative of the dissolved-phase lead conditions across the Investigation Area and can be attributable to background lead concentrations.

In December of 2015, an additional round of dissolved-phase lead sampling was performed. Wells TWB-3, TWB-5, and TWB-6 were temporary monitoring wells, so additional sampling employing the correct sampling technique for metals could not be performed at these well locations in December of 2015. Permanent monitoring well MW-106 was resampled in December of 2015 utilizing the proper low-flow sampling technique. Based upon the December 2015 laboratory analytical results, dissolved-phase lead at MW-106 reduced from 39 µg/L to 9.9 µg/L when the proper sampling technique was employed. Monitoring well MW-204-33 was also sampled for dissolved-phase lead in December of 2015 utilizing low-flow sampling techniques. The laboratory analytical results revealed a dissolved-phase lead concentration of 28 µg/L at MW-204-33 which exceeds the NYSDEC WQS of 25 µg/L. While the proper sampling technique was employed at MW-204-33, turbidity logs were not available to ensure the samples collected exhibited proper turbidity levels of less than or equal to 20 nephelometric turbidity units (NTUs).

Despite the dissolved-phase lead results from the April and December 2015 sampling events, total lead analysis is not the appropriate analysis to determine if there was a potential release from leaded gasoline. Instead, organic lead (including TEL and TML) is the appropriate laboratory analysis. TEL and TML are the main lead compounds found in leaded gasoline, and the percentage of TEL to organic lead can be used to date a leaded gasoline release.



During the December of 2015 groundwater sampling event, six (6) permanent wells within the Investigation Area (MW-106 and MW-201-33 through MW-205-33) were also analyzed for organic lead compounds. Based upon the laboratory analytical results, all of the organic lead compounds were below the laboratory detection limits at all of the well locations. Therefore, there is no evidence that the historical dissolved-phase impacts on the WPHA Property are a result of a leaded gasoline release, rather, the total lead detections are likely a result of background levels related to historic fill material.

The data support a post-1987 release based on the presence of MTBE. A post-1987 release is further supported by documented releases and housekeeping issues reported during Marianina's operations. These known historical releases and housekeeping issues include:

- The discovery of petroleum-impacted soil during Marianina's 1994 tank replacement (Spill #94-06684). During the advancement of the test pits prior to the removal of the UST system in 1994, petroleum impacted soils were encountered from grade to approximately ten (10) feet bgs, and LPH was detected at the soil-groundwater interface at approximately eight (8) feet bgs. During the tank replacement activities, approximately 1,601.11 tons of petroleum-impacted soils were excavated, and endpoint samples were collected. Based upon the laboratory analytical results, VOC compounds including MTBE were detected providing evidence of a gasoline with MTBE additive release.
- Two (2) reported surface spills occurred as a result of a tilted UST and malfunctioning dispenser nozzles (automatic dispenser nozzle shut-off valve malfunctioned multiple times over the course of a month).
- An EPA Civil Enforcement violation was issued to the Marianina Property as a result of Marianina failing to conduct annual tests of line leak detectors. The case was closed once Marianina complied and performed an annual line leak detector test.

Based upon my review of the available information, there is no indication or data to suggest that there was a release from the UST system at the Marianina Property before 1984. However, under Marianina's operation, there were multiple spills (surface and subsurface) reported to the NYSDEC as well as noted housekeeping and compliance issues. This coupled with the presence of MTBE provides evidence of a release occurring after 1983 but in or before 1994. The nature and extent of petroleum-impacts in the soil and groundwater are discussed in further detail in Section 5.4 provided below.

5.2 Groundwater flow direction is predominately to the northwest with some variation

Groundwater elevation data has been collected across the Investigation Area since at least 1998 when a Phase II ESA was performed on the Getty Site. The historical groundwater elevation data from 1998 through 2016 was reviewed to determine groundwater flow directionality in the vicinity of the Investigation Area. Based upon an evaluation of 27 data sets collected between 1998 and 2016, the predominate groundwater flow direction is northwesterly with some fluctuations to the

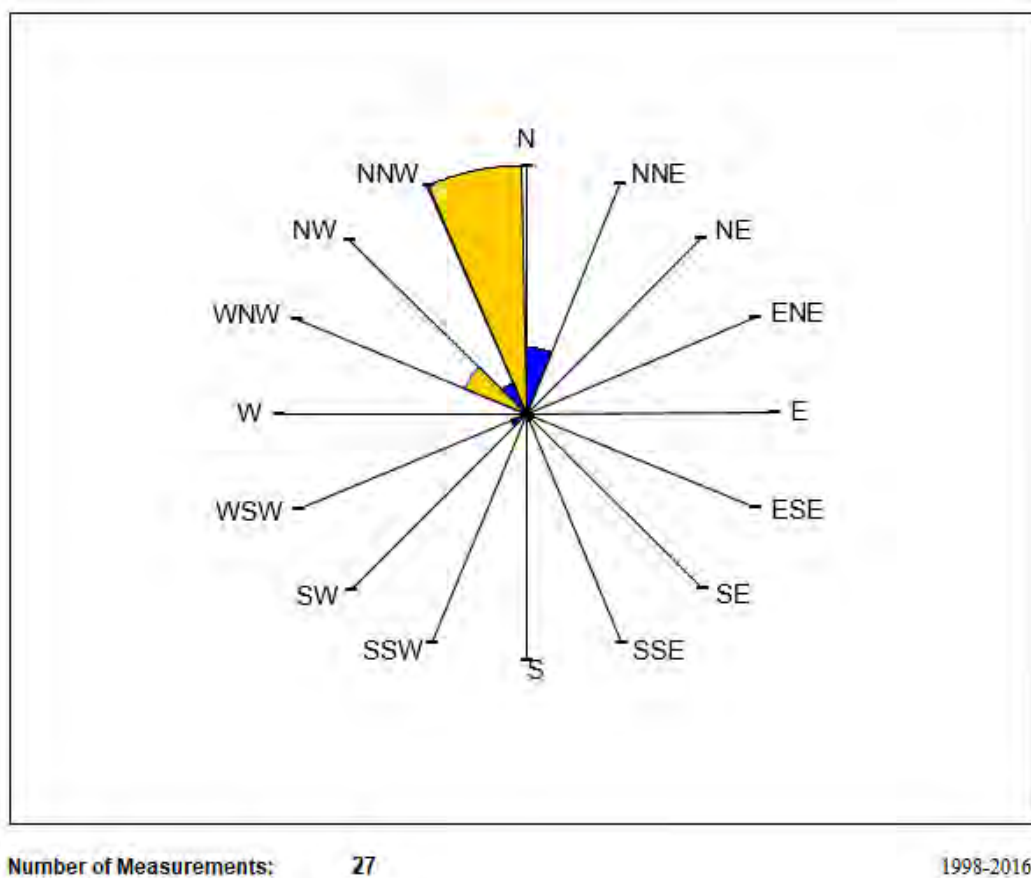
northeast, southwest, and southeast. The groundwater flow direction prominence breakdown since 1998 within the Investigation Area includes:

- 77.8% northwesterly flow direction
- 14.8% northeasterly flow direction
- 3.7% southwesterly flow direction
- 3.7% southeasterly flow direction

The figure provided below and provided herein as **Figure 3** demonstrates the groundwater flow direction across the Investigation Area between 1998 and 2016.

Figure 3 – Groundwater Flow Direction Frequency

*Marianina Property, Getty Site, WPHA Property
White Plains, Westchester County, New York*



5.3 Dissolved-phase plumes from the Marianina Property and the Getty Site have migrated to the WPHA Property and comingled

The data demonstrate that dissolved-phase plumes have originated on both the Former Getty Property and the Marianina Property.

The dissolved-phase plume on the Former Getty Property was first discovered in 1997 during the subsurface investigation performed by Weston as part of a Phase II ESA. In 2010, additional investigations were performed along the northern property boundary of the Getty Site and in the Building 159 Parking Lot. These investigations revealed the off-site migration of dissolved-phase impacts from the Getty Site to the north onto the Building 159 Parking Lot. In October of 2013, subsurface investigations were expanded further downgradient onto the WPHA Property in the vicinity of the WPHA Recreation Area. The results of the October 2013 investigation identified additional dissolved-phase impacts on the southeastern portion of the WPHA Recreation Area (see **Figure 7**). Based upon the October 2013 investigation sampling results, WPHA's environmental consultant, First Environment, recognized that the Marianina Property was a potential source of petroleum impacts on WPHA's property. Based upon my review of the October 2013 investigation data and my experience, the data indicated that the Marianina Property was a potential contributing source of petroleum impacts on the WPHA Property that warranted further investigation.

In the April 2014 First Environment *Supplemental Remedial Investigation/Phase I Remedial Action Workplan*, First Environment outlined the results of the October 2013 investigation and stated that, "there was no investigation conducted on the right-of-way (RoW) or the property located to the east of the Former Getty station." Based upon this observation, First Environment concluded that, "Due to the northwesterly groundwater flow, a soil and groundwater investigation in these locations could indicate if there were other source(s) of contamination contributing to the elevated benzene levels located on the WPHA property". Dissolved-phase impacts associated with the Marianina Property were confirmed in 2014 when two (2) temporary monitoring wells (MW-110 and MW-111) were installed in the right-of-way of Brookfield Street along the western property boundary of the Marianina Property.

As depicted by **Figure 7** provided below, both the Getty Site and the Marianina Property BTEX plumes have migrated downgradient in a northerly direction (northwesterly to northeasterly) to the WPHA Property and have comingled at the southern portion of the WPHA Recreation Area in the vicinity of the basketball courts.

Figure 5 – Dissolved-phase MTBE Plume (2016)
Marianina Property and WPHA Property
White Plains, Westchester County, New York

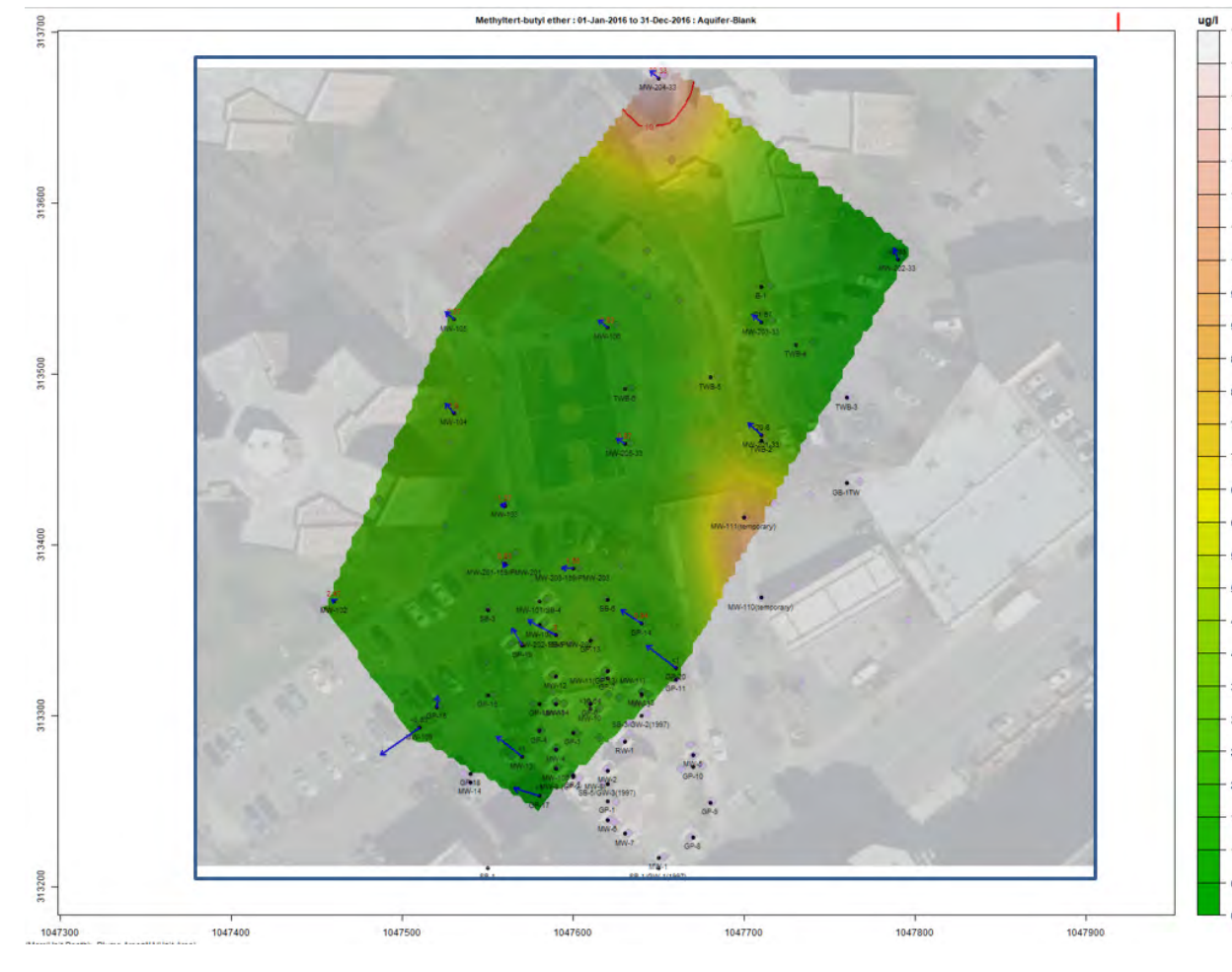
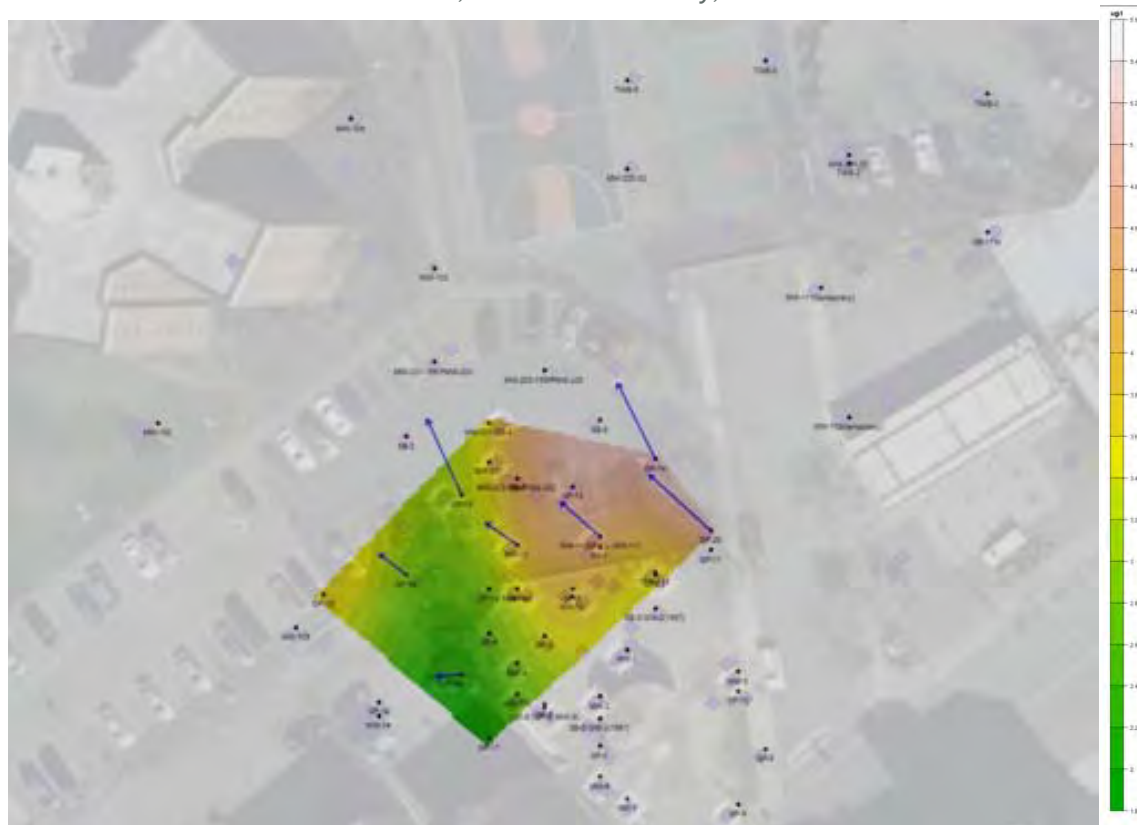


Figure 6 – Dissolved-phase MTBE Plume (2013)
Getty Site
White Plains, Westchester County, New York



While the exact date of these releases cannot be determined based upon the available groundwater monitoring data, it can be assumed that one (1) or more releases occurred between 1987 and 2004 due to the absence of organic lead and due to the presence of MTBE (MTBE was banned in NY as of 2004). It should also be noted that the potential exists that there was a release of gasoline with ethanol additives to the subsurface based upon the known NYSDEC spills; however, ethanol analysis was not performed on any of the soil and groundwater samples to confirm this notion.

5.4 A No Further Action can be obtained from the NYSDEC without extensive soil removal from the WPHA Property

Based upon my extensive experience in the state of New York working with the NYSDEC, an NFA can be achieved at the Marianina Property by removing the source material at the Marianina Property followed by post-remediation monitoring to demonstrate stable or decreasing dissolved-phase trends following the source removal.

In December of 2016, the NYSDEC issued a letter to the Marianina identifying Marianina as a responsible party and mandating that site assessment activities be performed to determine the extent of contamination followed by the appropriate remedial activities. In January of 2017, HydroEnvironmental Solutions, Inc. (HES), on behalf of Marianina, performed a soil and groundwater investigation on the Marianina Property. In the March 7, 2017 HES *Subsurface Investigation Report*, HES summarized the results of the investigation and proposed soil excavation activities across the Marianina Property to remove the source material. In September of 2017, the NYSDEC issued a Notice of Violation for Marianina's failure to proceed with remediation activities as proposed. The NYSDEC stated that, "the DEC will hire a contractor to conduct a site assessment and to complete appropriate remedial actions". After further discussions with Marianina, the NYSDEC held off on hiring their own contractor to performed remediation activities, and in February of 2018, the NYSDEC issued a consent order to Marianina mandating that Marianina proceed with remediation activities.

Based upon available information, in my experience, if Marianina fails to proceed with the investigation and remediation activities, the NYSDEC will proceed to undertake the necessary remedial work.

Based upon a review of the soil analytical data and as outlined in Section 4.4, petroleum-impacted soils are present on the Marianina Property in the unsaturated vadose and smear zones. Immediately downgradient of the Marianina Property, petroleum-impacted smear zone soil impacts are primarily limited to the southwestern portion of the Building 33 Parking Lot, and saturated soil impacts are located adjacent to the WPHA Recreation Area along the western side of the eastern most basketball court.

When remediating soils, it is appropriate to address the unsaturated vadose and smear zone impacts as these impacts will continue to contribute to dissolved-phase impacts. While there were saturated soil impacts located adjacent to the WPHA Recreation Area, these impacts were limited to TWB-5 located adjacent to the WPHA Recreation Area along the eastern side of the eastern most basketball court. Due to the floating nature of petroleum compounds, it is likely that these observed saturated exceedances were a result of smearing impacts downward in the borehole during soil sampling activities. Therefore, the excavation of soil in the vicinity of TWB-5 is not necessary, and these saturated impacts will naturally attenuate following the removal of the source area on the Marianina Property. The below figure included as **Figure 4** and discussed in Section 4.4, demonstrates the limits of the smear zone impacts that should be excavated to fully remove the source material.

Smear Zone Soil TVOC Concentrations Screenshot

Attached as **Figure 4**

Marianina Property and WPHA Property
White Plains, Westchester County, New York



In January of 2017, Frist Environment prepared a map depicting the WPHA Property area that should be excavated based upon their evaluation of the data. A screenshot of this map is provided below as **Figure 8**.

Figure 8 – First Environment Proposed WPHA Property Soil Excavation Zone

White Plains Housing Authority Property
White Plains, Westchester County, New York



Soil impacts were not detected as First Environment depicted; therefore, the excavation of this area in its entirety is not necessary to achieve an NFA. At most, the source area as depicted in **Figure 4** may need to be excavated. This area is limited to the Marianina Property and a limited portion of the Building 33 Parking Lot. Only dissolved-phase impacts exist downgradient of these locations as discussed above, and soil excavation is not an appropriate remediation technology for dissolved-phase impacts. Once the source area is removed on the Marianina Property, the downgradient dissolved-phase impacts will naturally attenuate as there will no longer be a contributing source upgradient.

Following the removal of the source material, a post-remediation monitoring program should be performed for a minimum of four (4) quarters to evaluate post-remediation dissolved-phase trends and to account for seasonal fluctuations in the water table elevation. The monitoring program should include the monitoring and sampling of wells within the limits of the excavation as well as existing wells located downgradient of the Marianina Property on the WPHA Property.



In my experience, once the source area within the vadose and smear zones have been removed, dissolved-phase impacts will trend downward and the dissolved-phase plume will shrink. Based upon a review of the dissolved-phase data at downgradient wells on the WPHA, there is existing evidence that the dissolved-phase plume is shrinking. As commented by Daniel Bendell of the NYSDEC during his deposition on October 9, 2018, the removal of residual fuel from the USTs on the Marianina Property is a “big step” in stopping the source or potential source.

The removal of source material followed by post-remediation monitoring is the same approach taken on the Getty Site. Following the completion of source area removal from the Getty Station and the Building 159 Parking lot, post-remediation groundwater concentrations continued to trend downward. Based upon this information, the NYSDEC granted an NFA for the Getty Site property.

Based upon this information and my experience, it is my opinion that source removal on the Marianina Property is sufficient in obtaining an NFA.

5.5 Contaminants on the WPHA Property do not pose an imminent and substantial endangerment to human health or the environment

Environmental contamination on the WPHA Property emanating from the Marianina Property does not pose an imminent and substantial endangerment to human health or the environment, including to workers who may need to excavate contaminated soils in the vicinity of Building 33, or to the persons living in Building 33.

In the environmental industry, it is common practice to perform a full hazard assessment prior to initiating any field work. This hazard assessment identifies and quantifies the health and safety hazards associated with each site operation and evaluates any potential risk to works. Using this information, a Health and Safety Plan (HASP) is developed. The HASP outlines the details of the hazard assessment, outlines the minimum personal protective equipment (PPE) required for the contaminants on hand, and lists any other appropriate control methods to mitigate or eliminate the potential risks to workers. By implementing a HASP and donning the appropriate PPE, there is no imminent or substantial endangerment to workers. It should be noted that in First Environment’s HASP included as Appendix D in the November 29, 2016 *Remedial Investigation Report*, First Environment stated that the Overall Hazard Evaluation for the Investigation Area is “Low” and that the primary protective equipment for the known constituents of concern observed in the Investigation Area is Level D PPE. Level D PPE typically includes protective eye wear (safety glasses) and protective hand wear (nitrile gloves) to protect workers from the VOC COCs. Additionally, level D PPE includes hearing protection when working with equipment that generates noise over 85 decibels, head protection (hard hat) when working with overhead hazards, and the donning of high visibility clothing in high traffic area.

In addition to precautions outlined in a site-specific HASP, a Community Air Monitoring Plan (CAMP) should be prepared to provide a measure of protection for the downwind community and off-site receptors including residents and workers from potential airborne contaminant releases as a result of remedial work activities performed at the Site. The CAMP outlines monitoring

techniques to monitor the levels of airborne particulates and/or VOCs within, upwind, and downwind of the ground disturbance area. These measures are put in place to protect the workers in the work zone and the community outside of the work zone from potential release of contaminants to the air generated during the work activities. If VOC levels in the breathing zone exceed pre-established action levels outlined in the HASP or if airborne particulates are visually observed migrating towards any sensitive receptors during the monitoring activities, suppression measures can be implemented. Typical suppression measures include wetting the particulate source with water or other particulate suppression materials to reduce the migration of particulates and/or the migration of VOCs to the breathing zone immediately in the work area or outside of the work area.

The implementation of a HASP and CAMP will adequately protect workers and residents during any work in the vicinity of the Building 33. Therefore, an imminent and substantial endangerment to workers and residents in the Building 33 will not exist during any earth moving work if these measures are taken.

In my opinion, the contamination on the WPHA Property does not pose an imminent and substantial endangerment to the persons living in Building 33 or to the environment, based upon the data and the information provided herein.

Soil impacts in the vicinity of Building 33 are currently below the NYSDEC SCLs. Petroleum-impacted smear zone soil impacts originating from the Marianina Property are primarily limited to the Building 33 Parking Lot, and saturated soil impacts are located adjacent to the WPHA Recreation Area along the eastern side of the eastern most basketball court. Therefore, soil impacts are not in the vicinity of Building 33.

Petroleum-impacted groundwater emanating from the Marianina Property extends from the Marianina Property, to the Building 33 Parking Lot, the eastern side of the WPHA Recreation Area, and to the southern Portion of the Building 33. As of November 2016, the highest total BTEX concentrations at MW-203-33, the downgradient-most well between the Marianina Property and the Building 33, were 180 µg/L (250 µg/L as reported by First Environment during their split sampling) with the dissolved-phase benzene levels being below the laboratory detection limits. In February of 2019, MW-203-33 was resampled, and total BTEX concentrations were 35 µg/L with benzene levels being below the laboratory detection limits. Based upon this information, the dissolved-phase BTEX plume at this location is shrinking rather than continuing to migrate.

In First Environment's March 19, 2019 *Report of February 25, 2019 Groundwater Sampling*, First Environment stated that the dissolved-phase reductions between November of 2016 and February of 2019 are a result of localized dilution and that the concentration reductions do not represent a natural degradation of constituents over time. While the water table at MW-203-33 did rise approximately 1.18 feet, a seasonal fluctuation in the water table does not directly correlate to diluted concentrations. Since petroleum compounds float on top of the water table, impacts originating from the source area (on the Marianina Property) would continue to migrate along the surface of the water table from the source area. Therefore, it is more likely that the



dissolved-phase concentrations naturally attenuated. Regardless of the change in the water table elevation in February of 2019, significant decreasing trends (64% reduction in total BTEX concentrations) were observed between December of 2015 and November of 2016 when there were only minor fluctuations in the water table.

Based upon the results of the March 2017 First Environment indoor air investigation, a total of 22 compounds were detected in the indoor air sampled. The compounds detected included those found in solvents, paints, cleaning fluids used as degreasing agents, synthetic rubber compounds, compounds typically found in cigarette smoke, and various pesticide compounds. In addition, low levels of BTEX compounds were detected. All of the compounds detected in the indoor air samples can be found in the materials and chemicals stored in the Basement of Building 33. Since near-slab sampling was not performed and all of the compounds detected are found in the materials stored in the basement of Building 33, there is no evidence that the indoor air detections from the March 2017 indoor air investigation are a result of subsurface conditions.

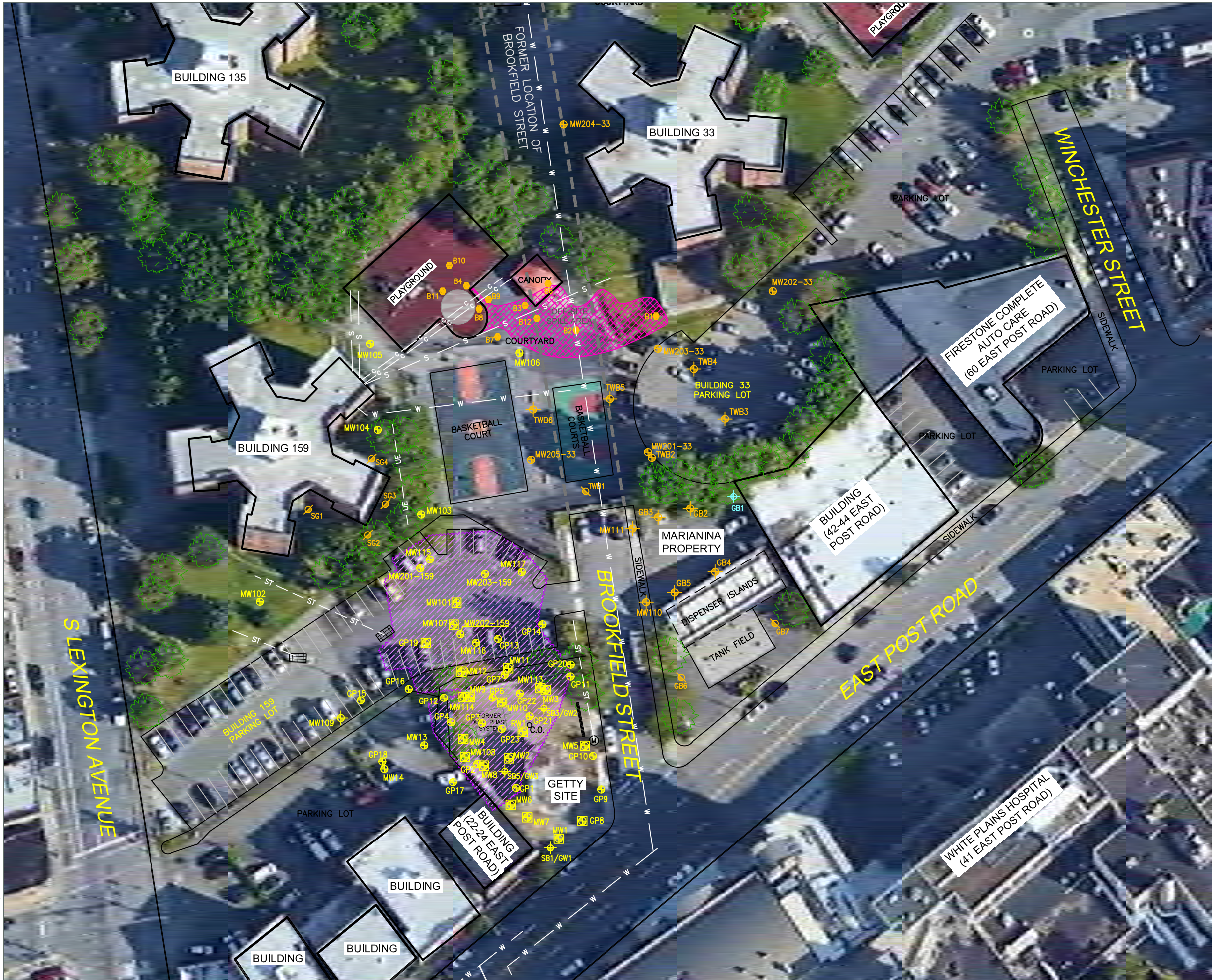
While the indoor air sampling did not confirm a vapor intrusion concern at the Building 33, and there is no evidence of odors or vapors detected in the occupied areas of Building 33, precautionary measures can be taken to ensure that the migration of contaminants from the soil and groundwater does not occur in the future. Based upon my experience, the installation of a vapor barrier would prevent potential soil or groundwater vapor intrusion into the building. Based upon documents reviewed, water infiltration at the Building on the Winbrook Complex is a significant problem. Therefore, it is likely that new construction plans will include the installation of a moisture barrier as part of waterproofing measures. A moisture barrier will also serve as a vapor barrier and will mitigate any potential vapors from entering the newly constructed building. If the foundation of the newly constructed building is not in contact with the groundwater, a passive sub-slab venting system could also be included as a conservative approach; however, it is not necessary.

Lastly, it has been noted that during the WPHA construction activities being performed on the northern portions of the WPHA Property, residents from these areas, including Building 135 have been relocated to Building 33. Such action is not consistent with any claimed imminent and substantial endangerment to human health at or in the vicinity of Building 33.















Figures










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LEGEND

-  CATCH BASIN
-  UTILITY MANHOLE
-  MONITORING WELL
-  TEMPORARY MONITORING WELL
-  GETTY MONITORING WELL
-  GETTY TEMPORARY MONITORING WELL
-  DESTROYED/ABANDONED WELL
-  TEMPORARY MONITORING WELL(off-site)
-  SHALLOW MONITORING WELL
-  SOIL BORING W/GW SAMPLE ONLY
-  SOIL BORING W/SOIL SAMPLE ONLY

-  SOIL BORING/GW SAMPLE 1997

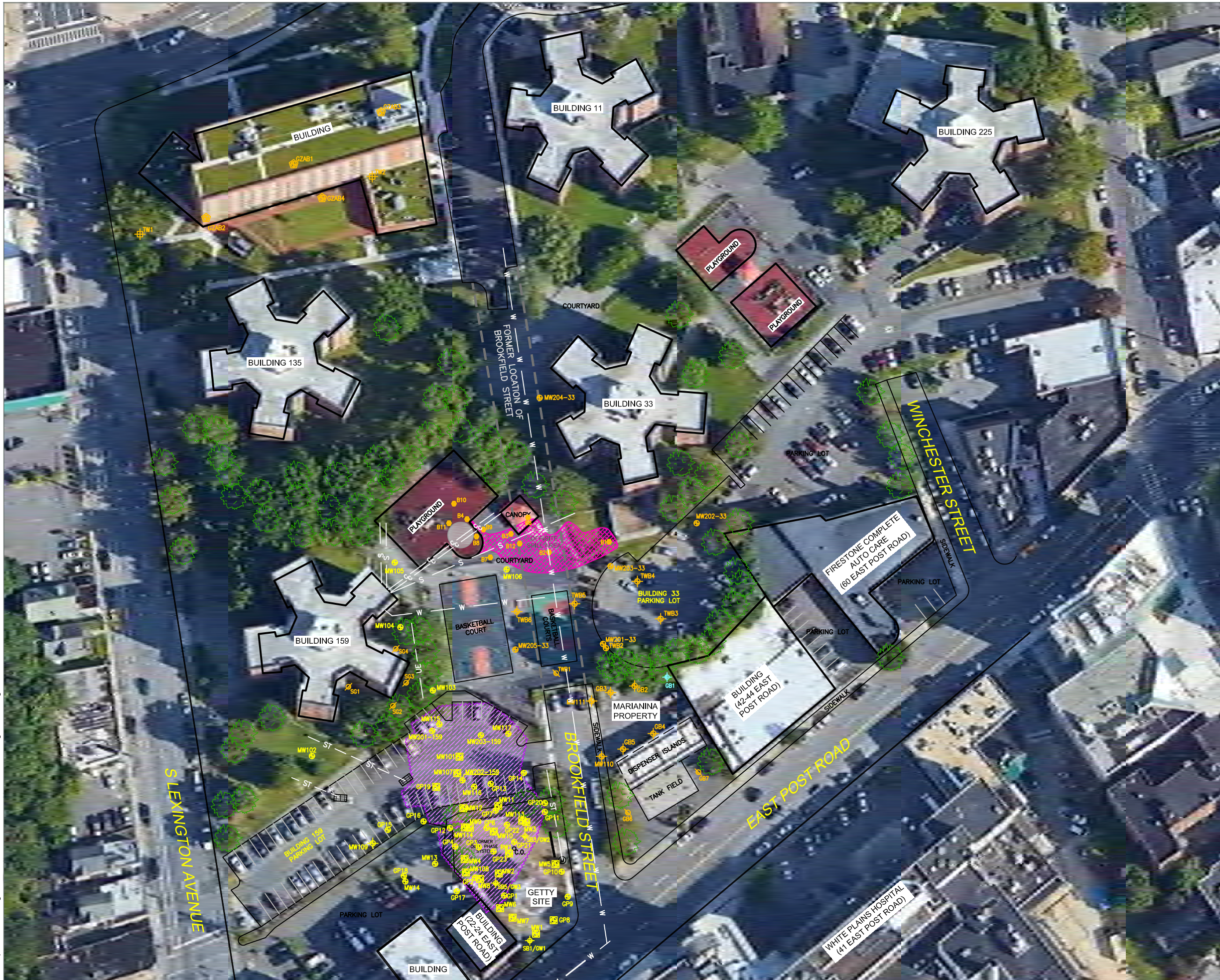
-  SOIL GAS POINT
-  SOIL BORING (SPILL AREA)*
-  APPROXIMATE EXCAVATION LIMITS (2014)
-  UNDERGROUND STORM SEWER LINE
-  UNDERGROUND STEAM LINE
-  UNDERGROUND ELECTRIC LINE
-  UNDERGROUND WATER LINE
-  CONDUIT (ELEC., GAS, TEL)
-  APPROXIMATE LOCATION OF B5

NOTES:













ALL LOCATIONS OF WELLS AND SOIL BORINGS ARE APPROXIMATE BASED ON MULTIPLE MAPS FROM MULTIPLE CONSULTANTS FROM MULTIPLE DATES.










DUE TO POOR QUALITY OF DORSON MAY 2000 SOIL MAP, LOCATION OF B5 COULD NOT BE DETERMINED.

Site Map	
Atlantic Richfield Company 34 East Post Road and Surrounding Investigation Areas White Plains, Westchester County, New York	
Drawn E.V. Designed	Date 05/17/19 Figure 1
Approved H.E.C.	
 Scale In Feet 	
 Groundwater & Environmental Services, Inc.	



LEGEND

-  CATCH BASIN
-  UTILITY MANHOLE
-  MONITORING WELL
-  TEMPORARY MONITORING WELL
-  GETTY MONITORING WELL
-  GETTY TEMPORARY MONITORING WELL
-  DESTROYED/ABANDONED WELL
-  TEMPORARY MONITORING WELL(off-site)
-  SHALLOW MONITORING WELL
-  SOIL BORING W/GW SAMPLE ONLY
-  SOIL BORING W/SOIL SAMPLE ONLY
-  SOIL BORING/GW SAMPLE 1997

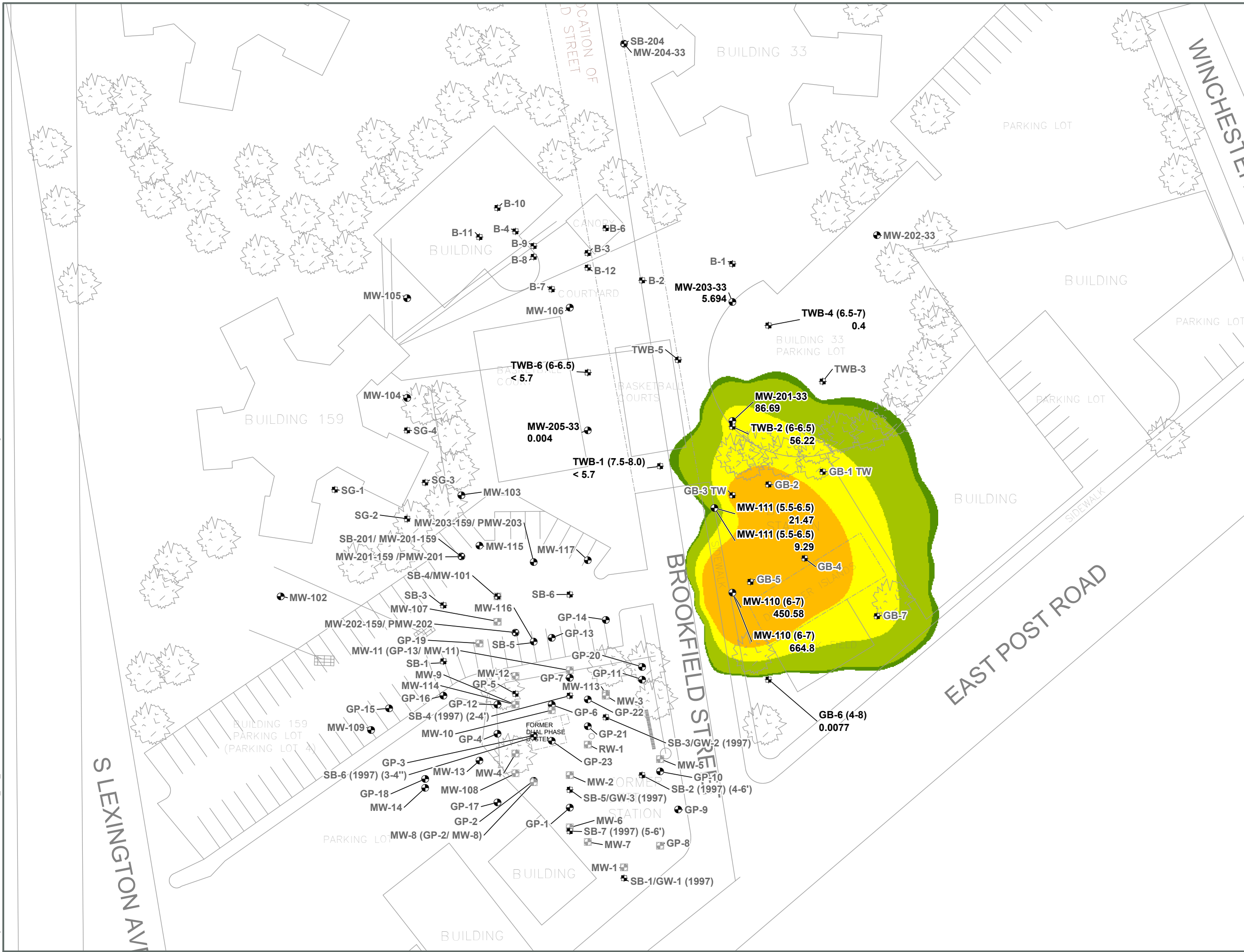
-  SOIL GAS POINT
-  SOIL BORING (SPILL AREA)*
-  APPROXIMATE EXCAVATION LIMITS (2014)
-  ST — UNDERGROUND STORM SEWER LINE
-  S — UNDERGROUND STEAM LINE
-  UE — UNDERGROUND ELECTRIC LINE
-  W — UNDERGROUND WATER LINE
-  C — CONDUIT (ELEC., GAS, TEL)
-  APPROXIMATE LOCATION OF B5

NOTES:

ALL LOCATIONS OF WELLS AND SOIL BORINGS ARE APPROXIMATE BASED ON MULTIPLE MAPS FROM MULTIPLE CONSULTANTS FROM MULTIPLE DATES.

DUE TO POOR QUALITY OF DORSON MAY 2000 SOIL MAP, LOCATION OF B5 COULD NOT BE DETERMINED.

Local Area Map	
Atlantic Richfield Company 34 East Post Road and Surrounding Investigation Areas White Plains, Westchester County, New York	
Drawn E.V. Designed	Date 05/17/19 Figure 2
 Scale In Feet   Groundwater & Environmental Services, Inc.	
Approved H.E.C.	



Legend

- Monitoring Well
- Abandoned Monitoring Well
- ✦ Soil Boring

TVOCs (mg/kg)

- < 5.7
- 5.7 - 10
- 11 - 50
- 51 - 100
- 101 - 500
- 501 - 1,000
- > 1,000

Notes:
 TVOC - Total Volatile Organic Compounds

Non-detect values were included in contouring at half the non-detect value (i.e., a value of < 5.7 mg/kg was contoured as a value of 2.85 mg/kg)

The vadose has been defined as 0-1.5 feet bgs in the vicinity of the Former Getty Station and the Building 159 Parking Lot and 0-5.5 ft bgs in the vicinity of the Subject Property, WPHA Building 159, WPHA Building 33, and the WPHA Recreation Area between Building 33 and Building 159.

All sample locations that cross multiple hydrogeological zones have been included on all the corresponding concentration maps.

In instances where analytical data were not available and there were available field screening readings (PID readings), PID readings were utilized to estimate the vertical extent of soil impacts.

Soil TVOC Concentrations Smear Zone

34 East Post Road and White Plains, Westchester County, New York

Drawn by **GKS**
 Designed by **DMC**
 Approved by **HEC**

Date **5/17/19**
 Figure **4**

Scale In Feet (Approximate)
 0 50

GES
 Groundwater & Environmental Services, Inc.



Appendix A

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January 29, 2019. *Answer of BP and ARC to Second Amended Complaint*

First Environment, Inc. March 19, 2019. *Report of February 25, 2019 Groundwater Sampling.*



Appendix B



Heather E. Cloud, PG

Senior Operations Manager

LOCATION

Hauppauge, NY

EDUCATION

BA, Biology – Boston University

LICENSES/REGISTRATIONS

Professional Geologist – NY

AFFILIATIONS

National Groundwater Association (NGA)

Long Island Association of Professional Geologists (LIAPG)

Society of American Military Engineers (SAME)

Long Island Gasoline Retail Association (LIGRA)

EXPERTISE

- Project/Contract Management
- Senior project oversight
- Site investigation and remediation
- QA/QC
- Regulatory compliance
- Regulatory strategy and negotiation

Heather Cloud, PG, has over 18 years of experience in the field of hydrogeology and environmental geology. Heather’s professional and field experience has focused on the assessment and remediation of petroleum and chlorinated compounds at retail petroleum stations, vehicle maintenance facilities, commercial facilities, and industrial locations across the Midwest and Eastern United States with primary focus in the State of New York. Her professional and field expertise include Phase I and Phase II environmental site assessments, underground storage tank (UST) studies and closures, and contaminant fate and transport modeling. Heather’s extensive remediation experience includes preparing remedial action work plans and implementing various remedial technologies related to pump-and-treat, high vacuum extraction, soil vapor extraction, air/oxygen injection, bioremediation, liquid phase hydrocarbon (LPH) recovery, chemical oxidation, and monitored natural attenuation (MNA).

Throughout her career, Heather has either actively supported, self-performed, or independently directed over 300 projects involving the development of geologic and hydrogeologic work plans, ensuring smooth execution of these work plans, interpreting geologic and hydrogeologic data, implementing quality assurance/quality control (QA/QC) programs, and ultimately progressing spill cases to closure while ensuring project regulatory/policy compliance.

Heather has developed strong working relationships with New York State Department of Environmental Conservation (NYSDEC) regulators, primarily in NYSDEC Regions 1, 2, and 3, while consulting on behalf of private clients, and directly as an environmental consultant for the NYSDEC on various state funded assessment and remediation projects, on behalf of GES.



Project Experience

Gasoline Release Site - New York:

Ms. Cloud served as a lead project geologist for a gasoline release site in NYSDEC Region 3 that involved a tanker truck release of 12,000 gallons of gasoline into a wooded area of land owned by a municipal airport. The area was 300 feet away from a major surface-water body, within a mile of public water supply wells, and in the immediate vicinity of private drinking water wells. The project presented many challenges as there was complex geology, including various old stream channel beds and stormwater conduits. Ms. Cloud's involvement with the project included field support as well as data management and interpretation as outlined below.

- Oversaw soil excavation activities which included the removal and proper disposal of over 1,000 tons of impacted soil.
- Installed over 50 wells and 250 soil borings to rapidly assess contaminant migration.
- Installed over 100 sparge, vent, and recovery wells as part of site wide remediation activities.
- Collected stream water and groundwater samples daily for 13 months.
- Conducted an extensive geophysical survey to map the paleo-channels across the site.
- Performed slug testing at approximately 85 wells across the site.
- Interpreted slug testing and pump testing data utilizing AQTESOLV.
- Performed aquifer testing with a network of transducers to evaluate whether the contamination would reach the town's pumping wells prior to being remediated.

CPT/MIP VOC and cVOC Investigation; Industrial Manufacturing Site - New Jersey:

Ms. Cloud served as lead project geologist for a comprehensive subsurface investigation utilizing direct push techniques as well as Cone Penetrometer Testing (CPT) technology to collect highly accurate lithologic data and accurately map the perched water zones, various confining layers, and the unconfined aquifer. Additionally Membrane Interface Probe (MIP) technology was employed to continuously screen chlorinated and additional volatile organic compound (VOC) impacts across the property. The investigation included the advancement of approximately 43 CPT/MIP borings and the installation of approximately 19 monitoring wells installed at various depths in various aquifers (perched and regional).

Environmental Due Diligence; Major Oil Phase II ESA Program - New York:

Ms. Cloud served as project manager for a 150 site Phase II Environmental Site Assessment (ESA) program. The Phase II ESA scopes included sensitive receptor surveys, geophysical investigations, and subsurface investigations on each property. Ms. Cloud was responsible for the management of the program as well as evaluating property conditions resulting in the storage and dispensing of motor fuels in support of property transactions. The Phase II ESA program was expedited at the request of the client and was completed within a 3 month period.

VOC Investigation and ISCO/Soil Excavation Remediation; Commercial Property - New York City:

Ms. Cloud served as project manager for an investigation and remediation project in an urban neighborhood with residual VOC adsorbed and dissolved-phase impacts. Ms. Cloud was responsible for developing and implementing a strategy to expedite spill case closure, allowing re-use of the property. Utilizing 10 years of previously collected geologic and hydrogeologic data collected on the property, a CSM was developed which allowed for proper assessment of additional soil and groundwater data required to target residual impacts. After developing the CSM and collecting additional soil and groundwater (quality and geochemical) data at the site, in-situ chemical oxidation (ISCO), in conjunction with spot excavation, was identified as the most cost-effective and quickest strategy.



Ms. Cloud was able to develop an effective conceptual site model and select aggressive technologies which resulted in achieving regulatory site closure. Assessment and remediation activities were completed in an expedited manner to achieve the client's goals for site redevelopment.

Field Sampling Program at Superfund Waterway, Queens, NY

Ms. Cloud managed large scale, 2-year point source, in-river surface water, sediment, and biological tissue sampling program at a Superfund waterway in New York City. Project management duties included client lead; financial management, and coordination of 46 on-call staff to respond in the field within 24- to 48-hours of a viable storm event. The purpose of the investigation and data collection was to characterize the physical and chemical conditions of the surface water, understand seasonal and tidal variations in the water quality, characterize physical properties and chemical nature of the creek sediments, and establish a list of contaminants based on their potential contribution to risk.

Portfolio Management of Retail Petroleum Station Facilities, NYSDEC Regions 1, 2, and 3

Ms. Cloud served as project manager for over 175 retail petroleum stations, performing site investigation; remedial testing, design, and implementation; system operation and maintenance (O&M); innovative remediation; monitored natural attenuation; and site closure.

Insurance Claim Investigation and Review, NY

Ms. Cloud has served as project manager for over 25 insurance claim investigations involving petroleum compounds. Desk top and in-field investigations were performed to evaluate facility history and information relating to potential contaminate discharges to the subsurface. The investigations included records review at state and local agencies and interviews with knowledgeable parties to gather facts. Ms. Cloud was also responsible for reviewing proposals from consultants for insured parties to evaluate if scope and cost are reasonable and appropriate for extent and type of impact associated with claim.

Sub-Slab Depressurization (SSD) System Communication Testing at Superfund Manufacturing Facility, Westbury, NY

Ms. Cloud served as project manager under the management of the NYSDEC for a 1-acre tetrachloroethylene (PCE) impacted Superfund site. Sub-slab soil vapor samples revealed TCE and PCE in the soil vapor beneath three downgradient commercial properties, indicating volatilization of VOCs from groundwater. To mitigate vapor intrusion, sub-slab depressurization (SSD) systems were designed. Ms. Cloud was responsible for the management of the design and installation of the SSD system which included SSD communication testing, performing ground-penetrating radar (GPR), installing the system, and managing the waste at 3 off-site facilities which ranged from 6,400 to 28,000 square feet in size.

Training

Loss Prevention System (LPS)

OSHA HAZWOPER – initial, refresher, and supervisor

Hazardous Materials Evaluations – RCRA and DOT

American Petroleum Institute (API) Training

Shell Safety Passport

Driver Training – Smith System

First Aid and CPR/AED – American Red Cross