HAMILTON GREEN

200 HAMILTON AVENUE, WHITE PLAINS, NEW YORK

Draft Remedial Investigation Work Plan

BCP Site #: C360177

AKRF Project Number: 170029

Prepared for:

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1.0 INTRODUCTION

This Draft Remedial Investigation Work Plan (RIWP) has been prepared by AKRF, Inc. (AKRF) on behalf of S-WD/WP LLC (the Volunteer) for the Hamilton Green site located at 200 Hamilton Avenue in the City of White Plains, Westchester County, New York (the "Site"). The 3.74-acre Site, as shown on Figure 1, includes the two-story White Plains Mall and east-adjacent asphalt-paved parking lot, and is identified as Tax Map ID Section 125.67, Block 5, Lot 1 on the City of White Plains tax map.

S-WD/WP LLC has been accepted into the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) as a Volunteer (BCP Site No. C360177), and entered into a Brownfield Cleanup Agreement (BCA) with the NYSDEC (BCA Index No. C360177-08-03) on August 16, 2018. The Volunteer entered into the BCP to facilitate the continued investigation and ultimate remediation of contaminated soil, groundwater, and soil vapor that has been identified at the Site, as summarized below.

A Phase I Environmental Site Assessment (ESA) indicated that, prior to 1970, the Site was historically bisected by a public street (William Street) and contained several private residential dwellings, a candy manufacturer, and two gasoline stations, one at 230 Hamilton Avenue (southeastern portion of the Site) and a second at 250 Hamilton Avenue (southern portion of the Site). A Subsurface (Phase II) Investigation conducted at the Site identified evidence of petroleum contamination at the groundwater interface in the vicinity of the former on-site gasoline stations, and petroleum-related volatile organic compounds (VOCs), including methyl tert-butyl ether (MTBE), were detected in groundwater above the NYSDEC Ambient Water Quality Standards (AWQSs). The petroleum-related groundwater contamination was reported to the NYSDEC Spills division, and Spill Number 1706297 was assigned to the Site. Petroleum-related VOCs and the chlorinated solvent trichloroethene (TCE) were detected above New York State Department of Health background levels and or Air Guideline Values (AGVs) in soil vapor samples collected during the Phase II investigation.

The findings from a Spill Investigation (SI) conducted to further assess the extent of the contamination revealed petroleum-contaminated soil and VOCs exceeding the NYSDEC soil cleanup levels in the footprint of the former gasoline station in the southeastern portion of the Site. Field evidence of petroleum contamination was also noted at the groundwater interface in the footprint and immediately downgradient of the former gasoline station in the southern portion of the Site. Consistent with the Phase II investigation, petroleum-related VOCs, including MTBE, were detected in groundwater at concentrations above the NYSDEC AWQSs.

Based on the results of the Phase II investigation and SI, an area of petroleum-contaminated soil and groundwater exists in the southeastern and southern portions of the Site. The petroleum contamination is attributed to a historic release or releases from the former on-site gasoline stations, with the presence of MTBE in groundwater indicating that an off-site source (e.g., the up-gradient east-adjacent gasoline station) has also contributed to the documented on-site groundwater contamination. MTBE is an oxygenate that was used as a gasoline additive in New York State between 1979 and 2004, and since the former on-site gasoline stations were closed prior to 1970, the source of the MTBE contamination could not have originated on-site. Therefore, it is likely that the groundwater contamination at the Site represents a comingled plume from historic releases from both the former on-site and existing off-site gasoline stations. In addition to the petroleum-related contamination, semivolatile organic compounds (SVOCs) and metals were detected in a shallow fill layer at the Site at levels above the 6 NYCRR Part 375 Soil Cleanup Objectives (SCOs). Petroleum-related VOCs detected above NYSDOH background levels in soil vapor samples collected during the Phase II investigation were attributed to the petroleum groundwater contamination and any residual soil contamination. TCE detected above the NYSDOH AGV

in the Phase II soil vapor samples was potentially related to a former on-site dry cleaner; however, the levels detected were not considered indicative of an on-site release.

This RIWP describes the procedures to be used to further define the nature and extent of the known contamination at the Site through the collection of soil and groundwater data from locations in and adjacent to the footprints of the former on-site gasoline stations, and other areas of the Site to be excavated as part of the proposed redevelopment. The current on-site structure occupies approximately two-thirds of the Site, including the footprint of the former gasoline station in its southern portion, limiting the locations available for soil and groundwater sampling. As such, the proposed Remedial Investigation (RI) field program will not be completed until the on-site structure has been demolished, and access to all areas of the Site is available.

In conjunction with the data from the Phase II investigation and SI, the information compiled from the RI will be used to develop a Remedial Action Work Plan (RAWP) for the remediation of the known and any newly-identified contamination. All work will be completed in accordance with this RIWP, which includes a Quality Assurance Project Plan (QAPP) (Appendix A) and a Health and Safety Plan and Community Air Monitoring Plan (HASP and CAMP) (Appendix B).

2.0 SITE DESCRIPTION AND HISTORY

2.1 Site Description and Surrounding Land Use

The 3.74-acre Site consists of a rectangular-shaped, two-story shopping mall and an east-adjacent asphalt-paved parking lot, with additional parking on the building roof, accessed by a ramp on the northern side of the building. The Site is bounded by Barker Avenue to the north followed by offices, a hotel, and commercial development; Cottage Place to the east followed by a gasoline station and commercial buildings; Hamilton Avenue to the south followed by commercial and government buildings; and Dr. Martin Luther King Jr. Boulevard to the west followed by commercial development. The surrounding area consists primarily of commercial and governmental uses, with residences further north of the Site. A Site Plan is provided as Figure 2.

2.2 Site Geology, Hydrogeology, and Subsurface Characteristics

The topography surrounding the Site slopes downward to the west from approximately 200 feet above mean sea level [referenced to North American Vertical Datum of 1988 (NAVD 88)] along Cottage Place to approximately 190 feet along Martin Luther King Jr. Boulevard. Subsurface soil encountered during previous environmental and geotechnical investigations indicated that the Site is underlain by a layer of fill extending from ground surface to depths ranging from 5 to 12 feet below ground surface (bgs). The fill layer included sand, silt, gravel, organics (wood/grass), brick, asphalt, and rubber. Apparent native soil composed of varying amounts of sand, silt, and gravel was identified underlying the fill layer. During a recent geotechnical investigation of the Site, bedrock was reported at depths ranging from approximately 13 feet below existing grade in the northeastern portion of the parking lot to approximately 37 feet below existing grade in the central portion of the parking lot, corresponding to approximate elevations of 183 and 165 feet, respectively.

During the recent SI, the water table was measured in the nine on-site groundwater monitoring wells at depths ranging from 9.58 to 23.90 feet bgs, corresponding to elevations ranging from 178.70 to 181.89 feet. Higher elevations were observed in the eastern portion of the Site (along Cottage Place), and lower elevations were observed in the southern and western portions of the Site (along Hamilton Avenue and Martin Luther King Boulevard). Groundwater elevation contour maps indicated that groundwater generally flows in a southwesterly direction across the Site. Groundwater elevation contour maps are provided as Figure 3 and Figure 4. Groundwater at the Site and in the surrounding area is not used as a potable source. There are no surface water bodies or streams on or adjacent to the Site.

2.3 Site History

Historic Sanborn fire insurance maps, as outlined in AKRF's Phase I ESA, indicate that the Site was historically bisected by a public street (William Street) and contained several private residential dwellings, a candy manufacturer, and two gasoline stations. The gasoline stations included one facility with three gasoline tanks at 230 Hamilton Avenue (southeastern portion of the Site) on the 1930 through 1950 maps, and a second facility with greasing operations and four gasoline tanks at 250 Hamilton Avenue (southern portion of the Site) on the 1950 map. The former on-site structures were likely present until construction of the current two-story shopping mall and east-adjacent asphalt-paved parking lot. Based on historic records and interviews, the shopping mall was constructed in 1972 and has operated as the White Plains Mall with a variety of tenants since its construction, including potential dry cleaners listed in historic City Directories. As documented in Section 4.0, previous investigations conducted at the Site have identified soil and groundwater contamination resulting from the historic uses of the Site.

3.0 PROPOSED SITE DEVELOPMENT

The proposed Site redevelopment includes demolition of the existing mall structure (including asbestos abatement) and construction of a mixed-use transit oriented community development occupying nearly the entire Site footprint. The proposed project comprises four residential buildings totaling approximately 860 units and 762,300 gross square feet (GSF) set on a "Public Platform" that includes 85,400 GSF of specialty retail and restaurant space, including an upscale Food + Craft Hall; 40,000 GSF of dynamic programmed public open space; and 27,000 GSF of office space. A sub-grade level below the platform would include a loading area in the western portion, and a parking garage, accessory storage areas, and mechanical spaces in the eastern portion, all at an elevation of approximately 184 feet. Retail spaces in the southwestern and northwestern portions of the Site would be constructed at street level, with no sub-grade space below. Based on the current Site elevations, the overall excavation depths for Site redevelopment are anticipated to be approximately 7 feet below grade in the area of the existing mall building and approximately 14 to 20 feet below grade in the area of the existing parking lot, with deeper excavations required for pile caps and elevator pits. Based on groundwater elevations recorded during the most recent investigation (approximately 178.70 to 181.89 feet), dewatering for select foundation elements such as pile caps and elevator pits is anticipated.

4.0 PREVIOUS INVESTIGATIONS

Phase I Environmental Site Assessment (ESA), 200 Hamilton Avenue, AKRF, Inc. – May 2017

AKRF conducted a Phase I ESA as detailed in a May 2017 report. The objective of the Phase I ESA was to evaluate the Site for Recognized Environmental Conditions (RECs) and environmental concerns resulting from past or current uses of the Site and neighboring properties. The Phase I ESA identified the following RECs:

On-Site Recognized Environmental Conditions

- Based on review of historic records, two gasoline service stations were located on the Site prior to construction of the White Plains Mall. Historic Sanborn (fire insurance) maps depicted one gasoline station with three gas tanks on the 1930 through 1950 maps at the corner of Hamilton Avenue and William Street (230 Hamilton Avenue), and a second gasoline station with greasing operations and four gasoline tanks at the corner of Hamilton Avenue and Cottage Place (250 Hamilton Avenue). These gasoline stations may have been present until construction of the current building in approximately 1970. Over 20 private dwellings were shown within the current building footprint on historic Sanborn maps from 1894 to 1950. Based on these findings, the Phase I ESA identified the potential for abandoned underground storage tanks (USTs) and/or associated petroleum contamination in the Site subsurface associated with the gasoline stations and/or heating oil for the residential dwellings.
- The Site was identified in the EDR Historic Cleaners database from 2004 to 2011 and potential dry cleaners ("Mall Cleaners" and "White Plains Mall Cleaners") were listed in the City Directories at 200 Hamilton Avenue in 1992, 1995, 1999, and 2008. The Site was not listed on the Resource Conservation and Recovery Act (RCRA) generator report or any other database.

Off-Site Recognized Environmental Conditions

- The regulatory database, historic city directories, site reconnaissance, and Sanborn maps identified an east-adjacent operating gasoline station with an open NYSDEC Spill (Spill No. 97-07887), and also listed on the petroleum bulk storage (PBS), RCRA, and Historic Auto databases.
- The regulatory database and Sanborn maps identified facilities in the surrounding area with some potential to have affected the Site subsurface, including: RCRA generators, Spills, PBS facilities, a NYSDEC Brownfield Cleanup (BCP) site, and a NYSDEC Voluntary Cleanup (VCP) site.

The Phase I concluded with a recommendation to conduct a Phase II investigation to determine whether soil and groundwater at the Site were affected by the identified RECs.

Subsurface (Phase II) Investigation, White Plains Mall, 200 Hamilton Avenue, AKRF, Inc. – October 2017

AKRF conducted a Phase II investigation at the Site that was detailed in an October 2017 report. The objectives of the Phase II investigation were to further assess the RECs identified in AKRF's May 2017 Phase I ESA for the Site. The scope of the Phase II investigation included a sampling program to characterize soil, soil vapor, and groundwater in the area of RECs and areas that would be disturbed during the proposed redevelopment of the Site. Based on the field observations and laboratory analytical results, the following conclusions were presented:

- A fill layer was encountered extending from ground surface to depths ranging from 5 to 10 feet bgs. Apparent native soil composed of varying amounts of sand, silt, and gravel was identified underlying the fill layer extending to approximately 25 feet bgs (the maximum boring depth).

- Groundwater was recorded at depths ranging from 9.9 feet bgs to 23 feet bgs. The deeper groundwater depths were noted at higher elevations in the eastern portion of the Site (along Cottage Place) and at shallower depths in lower elevations in the southern and western portions of the Site (along Hamilton Avenue and Martin Luther King Boulevard).
- A historical petroleum release or releases was identified that affected groundwater beneath the Site, resulting in the presence of petroleum-related VOCs above the NYSDEC AWQSs. The observed groundwater contamination was attributed to the former on-site gasoline stations. The presence of MTBE in groundwater suggested that an off-site source (e.g., the existing gas station across Cottage Place) also contributed to the contamination, since the on-site gasoline stations closed before 1970 (before MTBE was used in New York State). Field evidence of petroleum contamination observed in the "smear zone" in two soil borings (SB-4 and SB-5), and petroleum-related VOCs detected above New York State Department of Health (NYSDOH) background levels in soil vapor were attributed to the groundwater contamination and any residual soil contamination. The petroleum-related contamination was reported to the NYSDEC Spills division, and Spill Number 1706297 was assigned to the Site.
- The chlorinated solvent trichloroethene (TCE) was detected in two sub-slab vapor samples at concentrations (13 and 69 micrograms per cubic meter) above the NYSDOH Air Guidance Value (AGV), with one concentration (69 micrograms per cubic meter) exceeding the "mitigate" level in NYSDOH Soil Vapor/Indoor Air Matrix A. However, TCE was not detected above the regulatory standards or guidance values in any soil or groundwater samples collected during the Phase II investigation. Although TCE may have been used by one of the potential former on-site dry cleaners identified in the May 2017 Phase I ESA, the levels detected in soil vapor were not considered to be indicative of a widespread release or on-site source area.
- Metals and semivolatile organic compounds (SVOCs) were detected in soil at levels above their respective Part 375 Unrestricted and/or Restricted Residential Use Soil Cleanup Objectives which were likely attributable to contaminants in the shallow fill layer observed in the Site subsurface or to background conditions, and not likely to an on-site release or other source area.

The Phase II investigation report concluded with a recommendation to conduct a Spill Investigation (SI) to assess the extent of the petroleum-related contamination in groundwater and to further investigate potential on-site source area(s).

Spill Investigation, White Plains Mall, 200 Hamilton Avenue, AKRF, Inc. – April 2007

A Spill Investigation (SI) was conducted in February 2018 and documented in an April 2018 report. The investigation was conducted to further delineate the extent of the petroleum-related contamination identified in the southeastern and southern portions of the Site during the Phase II investigation. The investigation scope of work included the collection of soil and groundwater samples from accessible areas in and adjacent to the footprints of the former gasoline stations, and water level gauging of newly installed and existing monitoring wells to verify the assumed southwesterly groundwater flow direction. Based on the field observations and laboratory analytical results, the following conclusions were presented:

- Soil encountered included a fill layer extending from ground surface to depths ranging from 5 to 12 feet bgs. Apparent native soil composed of varying amounts of sand, silt, and gravel was identified underlying the fill layer extending to approximately 30 feet bgs (the maximum boring depth).
- Groundwater elevation contour maps indicated that groundwater flows in a southwesterly direction across the Site, with groundwater elevations ranging from 178.70 to 181.89 feet.

- Petroleum-contaminated soil was identified in the unsaturated zone and extended below the water table within the footprint of the former gasoline station in the southeastern portion of the Site. Evidence of contamination included field observations of staining and odors as shallow as 5 feet bgs, and detection of petroleum-related VOCs exceeding the NYSDEC soil cleanup levels in samples as shallow as 10 feet bgs from soil borings in this area. This contamination was likely the result of a historic petroleum release or releases from the former gasoline station in this area and represented an on-site source of the documented groundwater contamination at the Site.
- Field evidence of petroleum-contamination was noted just above and extending into the saturated zone in soil borings located within the footprint and immediately downgradient of former on-site gasoline station in the southern portion of the site; however, VOCs were not detected above the NYSDEC soil cleanup levels in soil samples collected from this area. The contamination observed in this area was likely associated with groundwater contamination identified at the Site. Results were inconclusive as to whether this contamination was indicative of a second on-site source area as much of the former gasoline station footprint was inaccessible during the investigation.
- The presence of MTBE in groundwater suggested that an off-site source (e.g., the existing gas station across Cottage Place) has contributed to the documented on-site groundwater contamination. Since the on-site gasoline stations were closed prior to 1970, the source of the MTBE contamination could not have originated on-site. Therefore, it is likely that the groundwater contamination at the Site represents a comingled plume from historic releases from both the former on-site and existing off-site gasoline stations. It appears that the original source of the MTBE contamination is no longer present or has diminished significantly, since the highest levels were detected over 300 feet downgradient of the nearest off-site gasoline station.
- The metals and SVOCs detected in soil at levels above their respective Part 375 Unrestricted and/or Restricted Residential Use Soil Cleanup Objectives, and CP-51 Soil Cleanup Levels were likely attributable to contaminants in the shallow fill layer observed in the Site subsurface or to background conditions, and not likely to an on-site release or other source area.

The SI report concluded with recommendations to pursue enrollment in the NYSDEC BCP to facilitate the continued investigation and ultimate remediation of the contamination identified at the Site. A remedial investigation was also recommended to further delineate the extent of contamination, and to provide additional data to integrate the designs for the remediation and proposed redevelopment.

Digital copies of the previous investigation reports are provided on the CD in Appendix C.

5.0 ENVIRONMENTAL ASSESSMENT

Based on the results of the Phase II investigation and SI, an area of petroleum-contaminated soil and groundwater exists in the southeastern and southern portions of the Site. The petroleum contamination is attributed to a historic release or releases from the former on-site gasoline stations. The presence of MTBE in groundwater suggests that an off-site source (e.g., the up-gradient east-adjacent gasoline station) has also contributed to the documented on-site groundwater contamination. It is likely that the groundwater contamination at the Site represents a commingled plume from historic releases from both the former on-site and existing off-site gasoline stations. Metals and SVOCs identified during previous investigation are generally attributable to the shallow fill layer observed at the Site. Petroleum-related VOCs detected in soil vapor samples are attributed to the petroleum contamination in soil and groundwater; and trichloroethene detected in soil vapor is potentially related to a former on-site dry cleaner. A summary of the exceedances to applicable regulatory standards and guidance values identified in the soil, groundwater, and soil vapor samples collected during previous investigations are provided below, and summarized on Figures 5 through 7.

5.1 Soil

Evidence of petroleum contamination (petroleum-like odors and staining) and elevated photoionization detector (PID) readings as high as 1,370 parts per million (ppm) were noted above the saturated zone, as shallow as 8 feet bgs, and extending to below the water table in soil borings advanced in and adjacent to the footprint of the former gasoline station in the southeastern portion of the Site (SB-4, SB-11, SB-13, SB-14, and SB-18). Evidence of petroleum contamination and elevated PID readings as high as 1,101 ppm were observed in the smear zone and extending below the water table in soil borings advanced in and adjacent to the footprint of the former gasoline station in the southern portion of the Site (SB-5, SB-15, SB-16, and SB-17).

As summarized below, soil samples collected from four of the borings exhibiting field evidence of petroleum contamination also contained petroleum-related VOCs at concentrations above the NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives (UUSCOs), Protection of Groundwater Soil Cleanup Objectives (PGWSCOs), and Restricted Residential Soil Cleanup Objectives (RRSCOs), and the Soil Cleanup Levels (SCLs) for gasoline-contaminated soil listed in CP-51 Table 2. In addition, SVOCs and metals were detected above the Part 375 SCOs in soil samples collected during the Phase II investigation and SI. The SVOC and metals exceedances were in soil samples collected from the shallow fill layer identified at the Site that did not exhibit other field evidence of contamination.

Volatile Organic Compounds (VOCs)

The VOC exceedances in soil are summarized in the following table and on Figure 5.

Volatile Organic Compounds Detected in Soil Above the Part 375 SCOs and CP-51 SCLs

Boring ID **Depth (ft bgs)** **Date Sampled** **Units = mg/kg**	***Part 375 UUSCO/ CP-51 SCL***	***Part 375 PGWSCO***	***Part 375 RRSCO***	**SB-11 (17-19) 2/6/2018**	**SB-13 (10-12) 2/6/2018**	**SB-14 (15-16) 2/6/2018**	**SB-18 (12-14) 2/6/2018**
1,2,4-Trimethylbenzene	*3.6*	*3.6*	*52*	**60**	**69**	19	**100**
1,3,5-Trimethylbenzene	*8.4*	*8.4*	*52*	17	22	11	34
Benzene	*0.06*	*0.06*	*4.8*	--	--	0.12 J	--
Ethylbenzene	*1*	*1*	*41*	11	14	4.9	11
Isopropylbenzene	*2.3*	*NS*	*NS*	4.1	3.1	2.5	2.4
n-Propylbenzene	*3.9*	*3.9*	*100*	15	12	4.1	7.2

Boring ID Depth (ft bgs) Date Sampled Units = mg/kg	*Part 375 UUSCO/ GP-51 SCL*	*Part 375 PGWSCO*	*Part 375 RRSCO*	SB-11 (17-19) 2/6/2018	SB-13 (10-12) 2/6/2018	SB-14 (15-16) 2/6/2018	SB-18 (12-14) 2/6/2018
Toluene	*0.7*	*0.7*	*100*	--	0.87	--	--
Xylenes, Total	*0.26*	*1.6*	*100*	18	68	17 J	78

Notes:
Bold = Exceeds Unrestricted Use Soil Cleanup Objective (UUSCO)/CP-51 Table 2 Soil Cleanup Level (SCL), and/or Protection of Groundwater Soil Cleanup Objective (PGWSCO)
Highlighted = Exceeds Restricted Residential Soil Cleanup Objective (RRSCO)
NS = No published Soil Cleanup Objective
J = Estimated concentration
ft bgs = feet below ground surface
mg/kg = milligrams per kilogram
-- = No exceedance

Semivolatile Organic Compounds (SVOCs)

The SVOC exceedances in soil are summarized in the following table and on Figure 5.

Semivolatile Organic Compounds Detected in Soil Above the Part 375 SCOs and CP-51 SCLs

Boring ID Depth (ft bgs) Date Sampled Units = mg/kg	*Part 375 UUSCO/ CP-51 SCL*	*Part 375 PGWSCO*	*Part 375 RRSCO*	SB-6 (2-4) 8/8/2017	SB-17 (5-7) 2/9/2018
Benzo(a)anthracene	*1*	*1*	*1*	--	2.8
Benzo(a)pyrene	*1*	*22*	*1*	--	2.4
Benzo(b)fluoranthene	*1*	*1.7*	*1*	--	3.3
Benzo(k)fluoranthene	*0.8*	*1.7*	*3.9*	--	0.85
Chrysene	*1*	*1*	*3.9*	--	2.2
Dibenzo(a,h)anthracene	*0.33*	*1,000*	*0.33*	--	0.41
Indeno(1,2,3-cd)pyrene	*0.5*	*8.2*	*0.5*	0.54	1.8

Notes:
Bold = Exceeds Unrestricted Use Soil Cleanup Objective (UUSCO)/CP-51 Table 3 Soil Cleanup Level (SCL), and/or Protection of Groundwater Soil Cleanup Objective (PGWSCO)
Highlighted = Exceeds Restricted Residential Soil Cleanup Objective (RRSCO)
ft bgs = feet below ground surface
mg/kg = milligrams per kilogram
-- = No exceedance

Metals

The metals exceedances in soil are summarized in the following table and on Figure 5.

Metals Detected in Soil Above the Part 375 SCOs

Boring ID Depth (ft bgs) Date Sampled Dilution Factor Units = mg/kg	*Part 375 UUSCO*	*Part 375 PGWSCO*	*Part 375 RRSCO*	SB-1 (2-4) 8/8/2017 ¼ †	SB-5 (2-4) 8/8/2017 ¼ †	SB-6 (2-4) 8/8/2017 ¼ †	SB-6 (9-11) 8/8/2017 ¼ †	SB-7 (1-3) 8/9/2017 ¼ †	SB-8 (2-4) 8/8/2017 ¼ †
Chromium	*30**	*NS*	*180**	--	--	33.8	36.8	--	31.4
Lead	*63*	*450*	*400*	--	295	77.9	--	67.3	--
Mercury	*0.18*	*0.73*	*0.81*	--	--	--	--	0.48	--
Zinc	*109*	*2,480*	*10,000*	568	247	--	--	--	--

Boring ID Depth (ft bgs) Date Sampled Dilution Factor Units = mg/kg	*Part 375 UUSCO*	*Part 375 PGWSCO*	*Part 375 RRSCO*	SB-9 (1-3) 8/8/2017 ¼ †	SB-10 (3-5) 2/7/2018 1	SB-12 (2-4) 2/6/2018 1	SB-14 (2-4) 2/6/2018 1	SB-15 (2-4) 2/9/2018 1
Chromium	*30**	*NS*	*180**	--	39.5	113	--	--
Lead	*63*	*450*	*400*	92.1	--	--	140	--
Mercury	*0.18*	*0.73*	*0.81*	--	--	--	--	0.4
Zinc	*109*	*2,480*	*10,000*	--	--	--	--	--

Notes:
Bold = Exceeds Unrestricted Use SCO (UUSCO)
NS = No published Soil Cleanup Objective
mg/kg = milligrams per kilogram
ft bgs = feet below ground surface
¼ † = Dilution factor varies
* = Standard reflects trivalent chromium, not total chromium
-- = No exceedance

5.2 Groundwater

Groundwater sampling completed during the Phase II investigation and SI included the collection of samples from both temporary well points and permanent groundwater monitoring wells. No separate phase product was detected in the on-site monitoring wells; however, petroleum-like odors and sheen were noted on purge water during one or both sampling events at permanent wells MW-2, MW-6, MW-7, and MW-8; and in temporary well point TW-1 during the Phase II investigation.

As summarized below, groundwater samples collected from TW-1 and MW-6 during the Phase II investigation, and from MW-7 and MW-8 during the SI contained petroleum-related VOCs at concentrations above the NYSDEC AWQSs. In addition, the gasoline additive MTBE was detected at concentrations above the NYSDEC AWQS in groundwater samples collected from TW-1, TW-2, and MW-2 during the Phase II investigation, and from MW-2, MW-7, MW-8, and MW-9 during the SI. The presence of MTBE in groundwater suggests that an off-site source (e.g., the existing gas station across Cottage Place) has contributed to the documented on-site groundwater contamination. The highest MTBE concentrations were detected in MW-2, located approximately 300 feet from the nearest off-site gas station, suggesting that the original source is no longer present or has diminished significantly.

Volatile Organic Compounds (VOCs) and Methyl tert-butyl ether (MTBE)

The VOC and MTBE exceedances in groundwater are summarized in the following tables and on Figure 6.

Volatile Organic Compounds Detected in Groundwater Above the Class GA AWQVs (Excluding MTBE)

Sample ID Date Sampled Dilution Factor Units = µg/L	*Class GA AWQS*	TW-1 8/9/2017 5	MW-6 * 8/10/2017 1	MW-7 2/16/2018 2	MW-8 2/16/2018 2
1,2,4-Trimethylbenzene	*5*	NA	NA	**110**	--
1,3,5-Trimethylbenzene	*5*	NA	NA	**56**	**57**
Benzene	*1*	**14**	--	--	--
Ethylbenzene	*5*	**150**	**5.2**	**92**	**33**
Isopropylbenzene	*5*	**35**	--	**14**	**44**
Naphthalene	*10*	--	--	**14**	**23**
n-Butylbenzene	*5*	NA	NA	--	**36**
n-Propylbenzene	*5*	NA	NA	**14**	**130**
o-Xylene	*5*	--	--	**28**	--
p/m-Xylene	*5*	**46**	--	**290**	**22**
p-Isopropyltoluene	*5*	NA	NA	--	**8.3**
sec-Butylbenzene	*5*	NA	NA	--	**25**
Toluene	*5*	**6.1**	--	--	--

Notes:
Bold = Exceeds the Class GA AWQS
µg/L = micrograms per liter
NA = Not analyzed
* = Referred to as GW-3 in the Phase II investigation (re-designated as MW-6 for the SI)
-- = No exceedance

MTBE Detected in Groundwater Above the Class GA AWQVs

Sample ID Date Sampled Dilution Factor Units = µg/L	*Class GA AWQS*	TW-1 8/9/2017 5	TW-2 8/9/2017 1	MW-2** 8/10/2017 10	MW-2 2/16/2018 10	MW-7 2/16/2018 2	MW-8 2/16/2018 2	MW-9 2/16/2018 1
MTBE	*10*	**260**	**23**	**2,000**	**1,800**	**15**	**20**	**34**

Notes:
Bold = Exceeds the Class GA AWQS
µg/L = micrograms per liter
** = Referred to as GT-2 in the Phase II investigation (re-designated as MW-2 for the SI)

5.3 Sub-Slab/Soil Vapor

Five sub-slab/soil vapor points (SV-1 through SV-5) were installed during the Phase II investigation to facilitate the collection of vapor samples for laboratory analysis. The sub-slab/soil vapor sampling included two exterior locations in the current asphalt-paved parking lot (SV-1 and SV-2) and three interior locations inside the current Site building (SV-3 through SV-5).

As summarized below, VOC concentrations above the NYSDOH published background levels were detected in the five sub-slab/soil vapor samples collected. In addition, the chlorinated solvent TCE was detected above the NYSDOH AGV in two samples, and above the "Mitigate" level for sub-slab soil vapor concentrations listed in Matrix A of the NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in New York State* in one sample. The petroleum-related VOCs detected above background levels in soil vapor are attributed to the petroleum contamination

identified in soil and groundwater at the Site. TCE was not detected above the regulatory standards or guidance values in any soil or groundwater samples collected during the Phase II investigation. Although TCE may have been used by one of the potential former on-site dry cleaners identified in the May 2017 Phase I ESA, the levels detected in soil vapor are not considered to be indicative of a widespread release or on-site source area.

Volatile Organic Compounds (VOCs)

The VOC exceedances in sub-slab/soil vapor are summarized in the following table and on Figure 7.

Volatile Organic Compounds Detected in Sub-Slab/ Soil Vapor Above Air Guidance Values or Background Levels

Sample ID Date Sampled Dilution Factor Units = µg/m³	*NYSDOH AGV*	*NYSDOH Upper Fence/ EPA 90th Percentile*	SV-1 8/8/2017 8	SV-2 8/8/2017 13.1	SV-3 8/9/2017 6	SV-4 8/9/2017 1	SV-5 8/9/2017 10
1,3-Butadiene	*NS*	*NS / <3.0*	7.2	87	--	--	5.4
2,2,4-Trimethylpentane	*NS*	*5 / NS*	25	15	--	--	--
Acetone	*NS*	*115 / 98.9*	170	170	270	--	750
Benzene	*NS*	*13 / 9.4*	11	52	--	--	--
Carbon disulfide	*NS*	*NS / 4.2*	--	100	--	--	--
Chloroform	*NS*	*1.2 / 1.1*	--	--	--	1.2	10
Chloromethane	*NS*	*4.2 / 3.7*	--	20	--	--	--
Cumene	*NS*	*0.8 / NS*	--	--	--	--	13
Cyclohexane	*NS*	*6.3 / NS*	--	18	26	--	--
Ethylbenzene	*NS*	*6.4 / 5.7*	50	38	--	--	10
Methyl Ethyl Ketone	*NS*	*16 / 12*	36	44	18	--	26
Methylene Chloride	*60*	*16 / 10*	--	--	240	--	53
n-Heptane	*NS*	*18 / NS*	--	240	--	--	--
n-Hexane	*NS*	*14 / 10.2*	40	590	350	--	100
n-Propylbenzene	*NS*	*1.5 / NS*	8.6	--	--	1.7	--
o-Xylene	*NS*	*7.1 / 7.9*	7.4	--	--	--	--
Toluene	*NS*	*57 / 43*	--	--	250	--	45
Trichloroethene	*2*	*0.5 / 4.2*	--	--	69	--	13

Notes:
Bold = Exceeds the Soil Vapor Intrusion Air Guidance Values (AGVs)
Highlighted = Exceeds the Soil Vapor Indoor Upper Fence Air Values
Bold Border = Exceeds the EPA Base 90th Percentile Indoor Air Values
µg/m³ = micrograms per cubic meter
-- = No exceedance

6.0 FIELD PROGRAM

The RI field program will focus on collecting soil and groundwater data to further determine the nature and extent of known contamination at the Site and to assist with determining the appropriate remedial action going forward. The current on-site structure occupies approximately two-thirds of the Site, including the footprint of the former gasoline station in its southern portion, limiting the locations available for soil and groundwater sampling. As such, much of the proposed RI field program will not be completed until the on-site structure has been demolished, and access to all areas of the Site is available. This will allow for Site-wide delineation of known contamination in and adjacent to the footprints of the former on-site gasoline stations, and further investigation of other areas of the Site. Notwithstanding, some RI work may commence in currently accessible areas (e.g., in the current parking lot) prior to the start or during demolition. As of the date of this report, the demolition work including asbestos abatement has been tentatively scheduled to begin in January 2019 and is expected to be completed by March 2019.

Based on results from soil vapor sampling conducted during the previous Phase II investigation, it is anticipated that remedial action for the Site will include a vapor barrier/waterproofing installed under the entire new building slab, with a passive sub-slab depressurization system (SSDS) installed under any occupied spaces where the bottom of slab is not in contact or in close proximity to the water table. Therefore, the RI field program does not include additional soil vapor sampling. Testing would be conducted in accordance with NYSDOH protocols after building construction to determine whether the SSDS would need to be upgraded to an active system.

6.1 Field Program Summary

The field sampling scope of work consists of: the advancement of 33 soil borings to further delineate the extent of the petroleum-related contamination in and adjacent to the footprints of the former on-site gasoline stations, and to characterize the condition of the fill layer identified at the Site; the installation of six 2-inch diameter temporary well points to delineate the extent of the petroleum-related contamination and to further characterize groundwater across the Site; and the collection of soil and groundwater samples from the soil borings, select existing monitoring wells, and the newly installed temporary well points for laboratory analysis. If warranted based on field observations, additional soil borings and/or temporary well points may be advanced to further delineate the horizontal and vertical extent of contamination at the Site. The proposed sample locations are shown on Figure 8. As previously noted, due to access limitations associated with the current on-site structure, much of the field program will not be implemented until the mall building has been demolished. The following sections describe the methods that will be used to complete the scope of work. The rationale for the proposed sample locations is summarized in the following table.

Proposed Sample Locations

Sample Locations	Location	Rationale
SB-19 through SB-24	Southeastern portion of the Site; in and adjacent to the footprint of the former gasoline station.	To further assess and delineate the extent of petroleum-contaminated soil, and to characterize the condition of the fill layer.
SB-25 through SB-34	Southern portion of the Site; in, adjacent to, and downgradient of the footprint of the former gasoline station.	To further assess and delineate the extent of petroleum-contaminated soil, and to characterize the condition of the fill layer.
SB-35	Southern corner of the Site; adjacent to SB-6.	To further characterize the condition of the fill layer, and delineate the vertical extent of documented SCO exceedances.
SB-36 through SB-51	Within the footprint of the mall building and in the parking lot area.	To further characterize the fill layer.

TW-3 through TW-6	Southern portion of the Site; installed at soil borings SB-25, SB-28, SB-33, and SB-34.	To further assess and delineate the nature and extent of the petroleum-contaminated groundwater in this area.
TW-7	Western portion of the Site; installed at soil boring SB-37.	To characterize groundwater in this area.
TW-8	Northern portion of the Site; installed at soil boring SB-44.	To characterize groundwater in this area.
MW-1, MW-2, and MW-5 through MW-9	Existing monitoring wells in the eastern and southern portions of the Site.	Sampling of existing groundwater monitoring wells in, adjacent to, and downgradient of petroleum-contaminated areas.

6.2 Soil Sampling

All soil borings (SB-19 through SB-51) will be advanced with a track-mounted Geoprobe® direct push probe (DPP) unit to a minimum of 5 feet below the groundwater interface or until refusal, whichever is shallower, and samples will be collected continuously using 2-inch diameter macrocore piston rod samplers fitted with dedicated acetate liners. Each macrocore sample liner will be split lengthwise and AKRF field personnel will record and document subsurface conditions. Macrocore samples will be inspected for evidence of contamination (e.g., odors, staining), screened for the presence of volatile organics with a PID equipped with a 10.6 electron volt (eV) lamp, and logged using the modified Burmister Soil Classification system. The PID will be calibrated in accordance with manufacturer's specifications prior to sampling.

Two soil samples will be collected from each soil boring advanced in, adjacent to, and downgradient of the former gasoline stations (SB-19 through SB-34). One sample will be collected from the 2-foot interval in the unsaturated zone that exhibits the greatest evidence of contamination (i.e., PID readings, odors, staining) and a second sample will be collected from the 2-foot interval in the saturated zone exhibiting the greatest evidence of contamination. In the absence of contamination, the samples will be collected from the interval directly above and below the groundwater interface. In an effort to characterize the condition of the fill layer at the Site, one to three samples will be collected from a 2-foot interval within and/or below the fill layer from select soil borings (SB-19, SB-22, SB-25, SB-33, and SB-35 through SB-51). Additional samples may be collected for laboratory analysis based on field observations to further delineate petroleum contamination, extent of fill, etc. All sampling equipment (e.g., drilling/direct push probe rods and macrocore samplers) will be either dedicated or decontaminated between sampling locations. Disposable sampling equipment, including spoons, gloves, bags, paper towels, etc. that come in contact with environmental media will be double bagged and disposed of as municipal trash in a facility trash dumpster as non-hazardous refuse.

Soil samples slated for laboratory analysis will be labeled and placed in laboratory-supplied containers and shipped to a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory via courier with appropriate chain of custody documentation in accordance with appropriate EPA protocols. The samples collected from the locations in, adjacent to, and downgradient of the former gasoline stations will be analyzed for the VOCs listed in NYSDEC Commissioners Policy CP-51: Table 2 – Soil Cleanup Levels for Gasoline Contaminated Soil by EPA Method 8260. The samples collected from within and below the fill layer will be analyzed for Base Neutral (BN)-SVOCs by EPA Method 8270 and Resource Conservation and Recovery Act (RCRA) 8 Metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) plus zinc by the EPA's 6000/7000 series methods. In addition, a minimum of 10% of the soil samples (approximately 7 samples) collected will be analyzed for the full NYSDEC Part 375 List,

including target compound list (TCL) VOCs by EPA Method 8260, TCL SVOCs by EPA Method 8270, PCBs by EPA Method 8082, Pesticides by EPA Method 8081, Herbicides by EPA Method 8151, and Target Analyte List (TAL) metals by EPA's 6000/7000 series methods. As discussed in Section 6.6, additional samples will be collected and analyzed for quality assurance/quality control (QA/QC) purposes. The associated laboratory analytical data report will be prepared using Category B deliverables. A table summarizing the target depth of the soil borings, anticipated sampling intervals, and corresponding analytical parameters is provided as Table 1.

After each soil boring is completed, soil borings not designated for installation of temporary well points will be backfilled with drill cuttings (if not grossly contaminated), sand, and/or hydrated bentonite and patched to match existing surface conditions. All investigation derived waste (IDW) associated with the soil borings (i.e., grossly contaminated drill cuttings) will be containerized in properly labeled Department of Transportation (DOT)-approved 55-gallon drums for future off-site disposal at a permitted facility as described in Section 6.8.

6.3 Temporary Well Point Installation and Well Development

Temporary well points TW-3 through TW-8 will be installed at soil borings SB-25, SB-28, SB-33, SB-34, SB-37, and SB-44, respectively. The temporary well points will be installed in the open bore holes, and will be constructed using 2-inch diameter, 10-foot long polyvinyl chloride (PVC) well screen set at a minimum of 5 feet below the observed groundwater table. Solid PVC riser pipe will be used to bring each well point to grade surface. Following installation, a peristaltic pump (or equivalent) will be used to purge approximately three well volumes from each well point. The purged water will be monitored for turbidity and water quality indicators (i.e., pH, temperature, and specific conductivity) to ensure that sedimentation/turbidity is reduced, to the extent practical. The development water will be containerized in properly labelled DOT-approved 55-gallon drums for future off-site disposal at a permitted facility as described in Section 6.8.

6.4 Groundwater Sampling

Groundwater samples for laboratory analysis will be collected from the six newly installed temporary well points (TW-3 through TW-8), and seven of the existing on-site monitoring wells located in, adjacent to, and downgradient of petroleum-contaminated areas (MW-1, MW-2, and MW-5 through MW-9). The existing permanent monitoring wells may be sampled during a separate event just prior to or during demolition. Prior to collecting groundwater samples, the headspace at each monitoring well will be screened for the presence of VOCs using a calibrated PID after removing the well cap. An electronic oil/water interface probe accurate to 0.01 feet will be used to measure the depth to groundwater in each well, and to check for the potential presence of light non-aqueous phase liquid (LNAPL).

Low-flow sampling techniques and dedicated tubing will be utilized to purge the monitoring wells and temporary well points prior to sample collection in accordance with EPA and prevailing NYSDEC protocols. The QAPP included in Appendix A specifies detailed protocols that will be followed for the emerging contaminant sample collection, including acceptable equipment, supplies, and personal protective equipment. A peristaltic pump will be used to purge and sample the 1-inch diameter permanent monitoring well (MW-8), and a submersible bladder pump will be used to purge and sample the 2-inch diameter temporary well points (TW-3 through TW-8) and the 2-inch diameter permanent monitoring wells (MW-1, MW-2, MW-5 through MW-7, and MW-9). The purged water will be monitored for turbidity and water quality indicators (i.e., pH, temperature, dissolved oxygen, oxidation-reduction potential, and specific conductivity) with measurements collected approximately every five minutes. Purging of the wells will continue

until the turbidity is less than 50 NTU for three successive readings and water quality indicators stabilize to the extent practicable. If turbidity and/or water quality indicators did not stabilize after two hours, purging will be discontinued and samples will be collected.

Groundwater samples slated for laboratory analysis will be labeled and placed in laboratory-supplied containers and shipped to a NYSDOH ELAP-certified laboratory via courier with appropriate chain of custody documentation in accordance with appropriate EPA protocols. All groundwater samples will be analyzed for the VOCs listed in CP-51: Table 2 by EPA Method 8260. In addition, at least three of the groundwater samples collected will be analyzed for the full NYSDEC Part 375 and Emerging Contaminants Lists, including TCL VOCs by EPA Method 8260, TCL SVOCs by EPA Method 8270, PCBs by EPA Method 8082, Pesticides by EPA Method 8081, Herbicides by EPA Method 8151, dissolved TAL metals by EPA's 6000/7000 series methods, 1,4-dioxane by EPA Method 8270 SIM, and TAL Per- and Polyfluoroalkyl Substances (PFAS) by Modified EPA Method 537. As discussed in Section 6.6, additional samples will be collected and analyzed for QA/QC purposes. The associated laboratory analytical data report will be prepared using Category B deliverables. A table summarizing the groundwater sampling locations and corresponding analytical parameters is provided as Table 2.

Following collection of the samples at the temporary well points, the wells will be removed and the boreholes will be backfilled with drill cuttings (if not grossly contaminated), sand, and/or hydrated bentonite and patched to match existing surface conditions.

6.5 Fluid Level Gauging

Two rounds of fluid level gauging will be conducted on the nine permanent groundwater monitoring wells at the Site (MW-1 through MW-9) as part of the RI. The headspace at each monitoring well will be screened for the presence of VOCs using a calibrated PID after removing the well cap and an electronic oil/water interface probe accurate to 0.01 feet will be used to measure the depth to groundwater in each well, and to check for the potential presence of LNAPL. The fluid level measurements will be used to supplement the current groundwater elevation data and to create updated groundwater elevation contour maps.

6.6 Quality Assurance / Quality Control (QA/QC)

Additional analysis will be included for quality control/quality assurance measures, as required by the Category B sampling techniques. The QA/QC samples for soil and groundwater will include one field blank, one trip blank, one matrix spike/matrix spike duplicate (MS/MSD), and one blind duplicate sample at a frequency of one sample set per 20 field samples per media. The MS/MSD and blind duplicate samples will be analyzed for the same list of parameters as the corresponding field sample. The field blank will be analyzed for the cumulative list of parameters designated for all corresponding field samples included in the same sample delivery group for each media. The laboratory-prepared trip blank will be analyzed for VOCs by EPA Method 8260 to determine the potential for cross-contamination during sample shipment. The associated laboratory analytical data reports will be prepared using Category B deliverables.

A QAPP describing the QA/QC protocols and procedures that will be followed during implementation of the RIWP, including a table summarizing the required analyses for the QA/QC samples, is provided as Appendix A. The laboratory analytical data generated from the RI will be reviewed by a third-party validator and a Data Usability Summary Report (DUSR) will be prepared to document the usability and validity of the data.

6.7 Decontamination Procedures

All non-dedicated sampling equipment (e.g., drilling/direct push probe rods, macrocore samplers, submersible pumps, and oil/water interface probes) will be decontaminated between sampling locations using the following procedure:

1. Scrub equipment with a bristle brush using a tap water/Simple Green® solution.
2. Rinse with tap water.
3. Scrub again with a bristle brush using a tap water/Simple Green® solution.
4. Rinse with tap water.
5. Rinse with distilled water.
6. Air-dry the equipment.

6.8 Management of Investigation-Derived Waste (IDW)

Equipment decontamination fluids, grossly contaminated soil cuttings, and monitoring well purge water will be containerized in properly labeled DOT-approved 55-gallon drums for future off-site disposal at a permitted facility. The drums will be sealed at the end of each work day and labeled with the date, the well or boring number(s), the type of waste (i.e., drill cuttings, decontamination fluids, or purge water) and the name of an AKRF point-of-contact. All drums will be labeled "pending analysis" until laboratory data is available. All IDW will be disposed of or treated according to applicable local, state, and federal regulations. Disposable sampling equipment, including spoons, gloves, bags, paper towels, etc. that come in contact with environmental media will be double bagged and disposed of as municipal trash in a facility trash dumpster as non-hazardous refuse.

7.0 REPORTING REQUIREMENTS

7.1 Remedial Investigation Report (RIR)

Upon completion of all field work and receipt of laboratory analytical results, a Remedial Investigation Report (RIR) will be prepared that will: document field activities; present field and laboratory data; evaluate exposure pathways in an exposure assessment; and discuss conclusions and recommendations drawn from the results of the investigation.

7.1.1 Description of Field Activities

This section of the RIR will describe the field methods used to characterize the Site conditions, including: sampling techniques; field screening equipment; drilling equipment; monitoring well installation procedures; and management of IDW.

7.1.2 Soil Boring Assessment

The RIR will include a section that presents field and laboratory data for soil results. This section will include a description of soil characteristics and provide figures that illustrate soil boring locations. Field and laboratory analytical results will be presented in the body of the report and summarized in tables and figures, with the detected concentrations compared to regulatory standards and/or guidance values. Soil boring logs and laboratory analytical reports will be provided as attachments. Category B deliverables will be provided by the laboratory, and a third-party DUSR will be prepared to document the usability and validity of the data.

7.1.3 Groundwater Assessment

The RIR will include a section that presents field and laboratory data from the groundwater sampling. This section will include a description of groundwater characteristics and provide figures that illustrate the monitoring well locations. Monitoring well survey data for the existing monitoring wells and fluid level gauging measurements will be used to create an updated groundwater elevation contour map that will document groundwater flow direction. Field and laboratory analytical results will be presented and compared with regulatory standards and/or guidance values. Groundwater sampling logs and the laboratory analytical data reports will be provided as attachments. Category B deliverables will be provided by the laboratory, and a third-party DUSR will be prepared to document the usability and validity of the data.

7.1.4 Qualitative Human Health Exposure Assessment

A Qualitative Human Health Exposure Assessment will be performed in accordance with DER-10 Section 3.3. The assessment will be included in the RIR.

8.0 SCHEDULE OF WORK

The following tentative schedule has been developed for the project. This schedule is subject to change, in consultation with NYSDEC.

Table 8
Project Schedule

Activity	Time To Complete
Prepare BCP Application, Submit to NYSDEC	May 2018; Completed
NYSDEC Completeness Review of BCP Application	June 2018; Completed
30-day Public Comment Period for BCP Application Initiated	July 2018; Completed
Public Comment Period for BCP Application Ends	August 2018; Completed
BCP Acceptance	August 2018; Completed
Execute Brownfield Cleanup Agreement (BCA), Enter BCP	August 2018; Completed
Prepare Citizen Participation Plan (CPP)	September 2018
Prepare RIWP, Submit to NYSDEC	September 2018
30-day Public Comment Period for RIWP Initiated	October 2018
Public Comment Period for RIWP Ends	November 2018
Remedial Investigation Field Work Completed	March 2019
Draft Remedial Investigation Report (RIR), Submit to NYSDEC	April 2019
Draft Remedial Action Work Plan (RAWP) and Fact Sheet, Submit to NYSDEC	April 2019
45-day Public Comment Period for RAWP is Initiated	May 2019
Public Comment Period for RAWP Ends	July 2019
NYSDEC Approves RAWP and Issues Decision Document	August 2019
Complete Remedial Action	August 2019 – March 2020
Draft Final Engineering Report (FER), Submit FER to NYSDEC	April 2020
Certificate of Completion is Issued	May 2020

9.0 CERTIFICATION

I, Rebecca A. Kinal, P.E., certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Remedial Investigation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

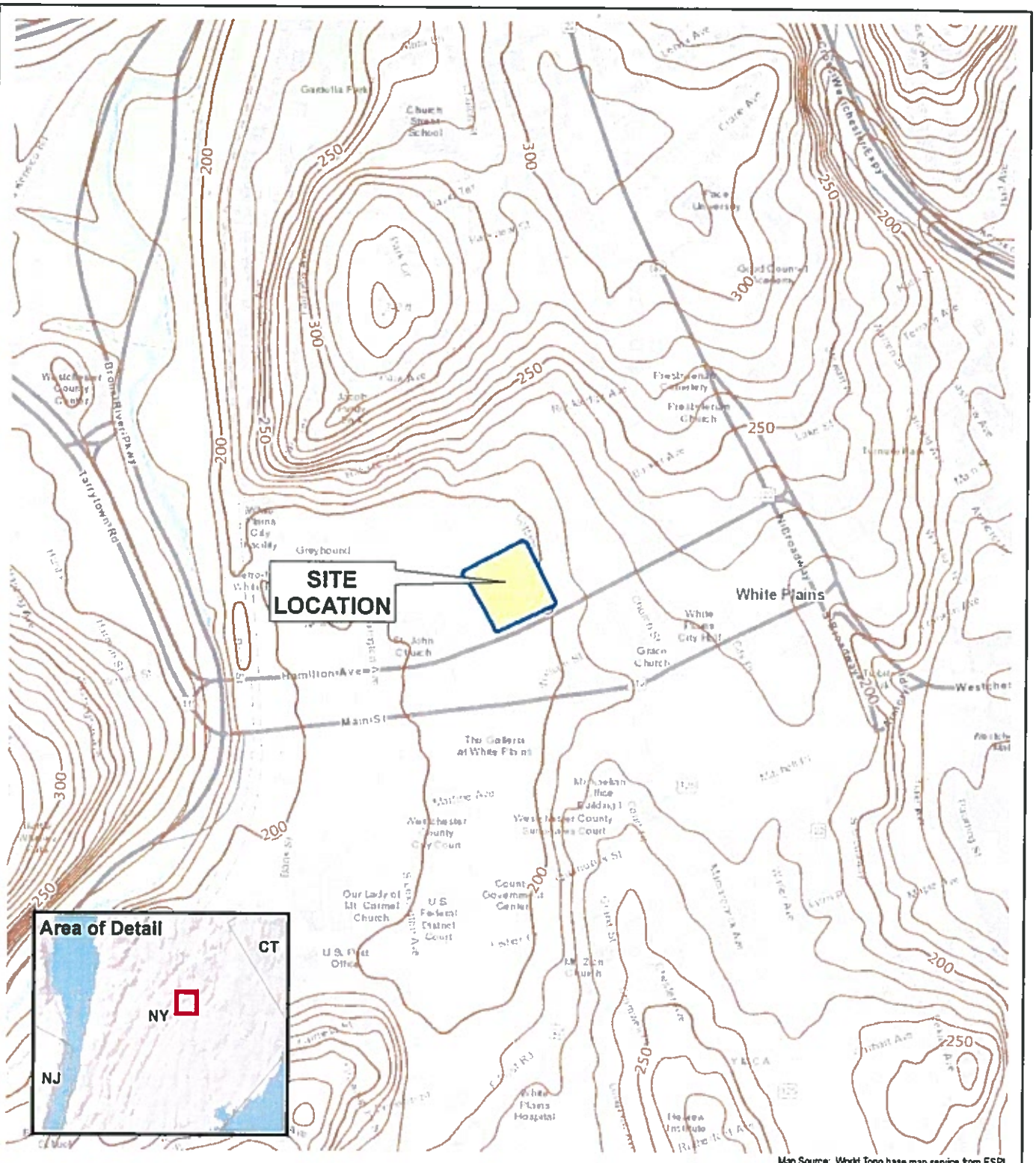
Rebecca A. Kinal, P.E.

Name Signature Date

10.0 REFERENCES

- Phase I Environmental Site Assessment (ESA), 200 Hamilton Avenue, White Plains, New York; AKRF, Inc.; prepared for SWD II, LLC; dated May 2017.
- Subsurface (Phase II) Investigation, White Plains Mall, 200 Hamilton Avenue, White Plains, New York; AKRF, Inc.; prepared for SWD II, LLC; dated October 2017.
- Spill Investigation, White Plains Mall, 200 Hamilton Avenue, White Plains, New York; AKRF, Inc.; prepared for SWD II, LLC; dated April 2018.
- U.S. Geological Survey, *White Plains, NY Quadrangle*, 7.5 minute Series (Topographic), Scale 1:24,000, 2010.
- DER-10 Technical Guidance for Site Investigation and Remediation, May 3, 2010.
- 6 NYCRR § 375, New York State Department of Environmental Conservation Rules and Regulations, Remedial Program Requirements, December 14, 2006.
- 6 NYCRR Chapter X § 700 – 706, New York State Department of Environmental Conservation Water Quality Regulations, Surface Water and Ground Water Classifications and Standards, June 12, 2008.
- Commissioners Policy CP-51 Soil Cleanup Guidance; New York State Department of Environmental Conservation, October 21, 2010.
- DER-10 Technical Guidance for Site Investigation and Remediation, May 3, 2010.
- Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006, New York State Department of Health Center for Environmental Health, Bureau of Environmental Exposure Investigation; including the September 2013 NYSDOH Fact Sheet update for tetrachloroethene (PCE), the August 2015 NYSDOH Fact Sheet update for trichloroethene (TCE), and the May 2017 NYSDOH Matrices update for 1,1,1-trichloroethane, 1,1-dichloroethene, carbon tetrachloride, cis-1,2-dichloroethylene, methylene chloride, PCE, TCE, and vinyl chloride.

FIGURES



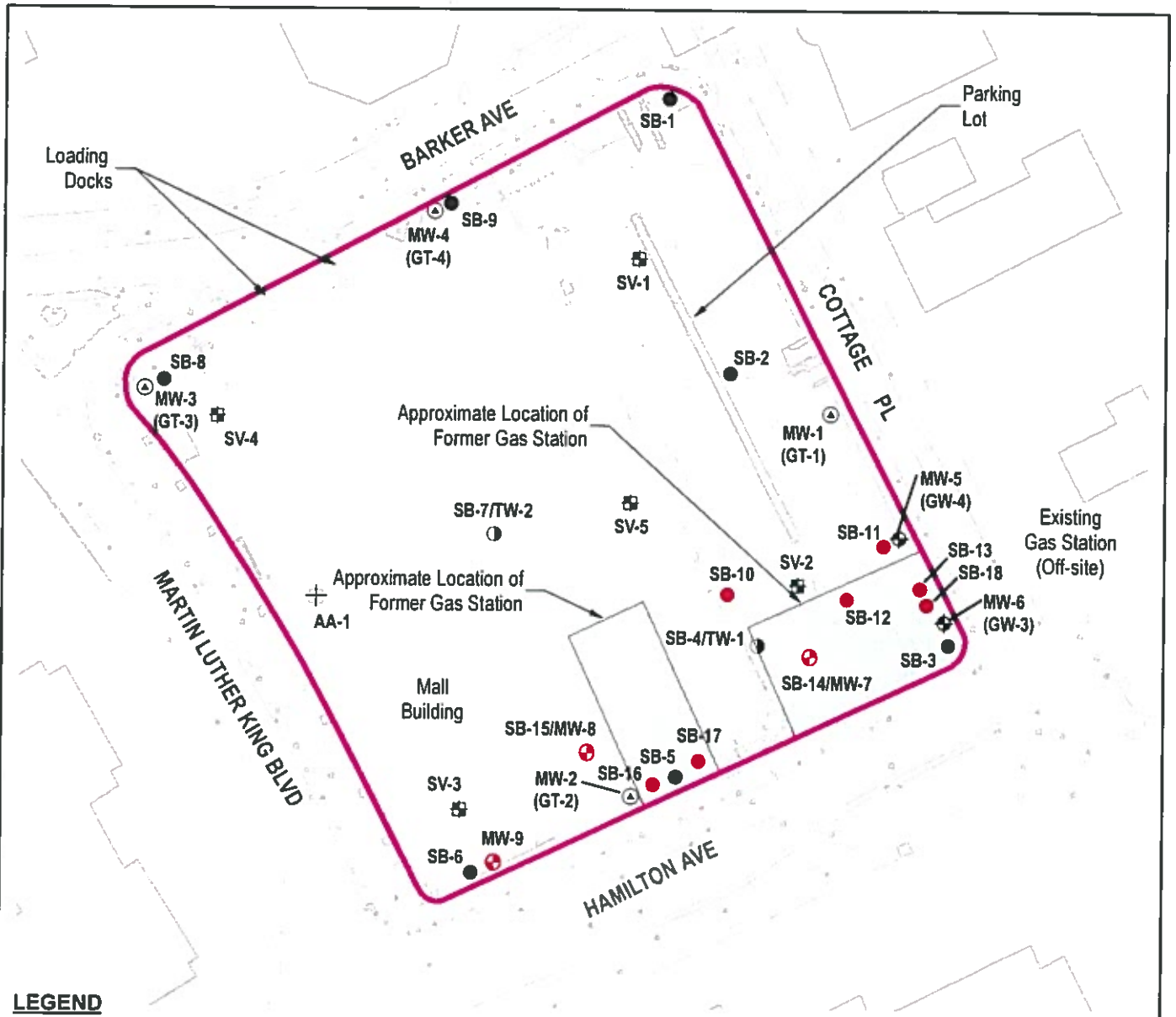
AKRF

440 Park Avenue South, New York, NY 10016

200 Hamilton Avenue
White Plains, New York

SITE LOCATION

DATE	5/2/2018
PROJECT NO.	170029
FIGURE	1



LEGEND

- PROPERTY BOUNDARY
- EXISTING MONITORING WELL LOCATION (FROM 2015 GEOTECHNICAL INVESTIGATION)
- EXISTING MONITORING WELL (UNKNOWN)
- SOIL BORING/TEMPORARY WELL (FROM 2017 PHASE II INVESTIGATION)
- SOIL BORING LOCATION (FROM 2017 PHASE II INVESTIGATION)
- SUB-SLAB SOIL VAPOR SAMPLE LOCATION (FROM 2017 PHASE II INVESTIGATION)
- AMBIENT AIR SAMPLE LOCATION (FROM 2017 PHASE II INVESTIGATION)
- SOIL BORING/MONITORING WELL LOCATION (FROM 2018 SPILL INVESTIGATION)
- SOIL BORING LOCATION (FROM 2018 SPILL INVESTIGATION)

Map Source:
Insite Engineering, Surveying & Landscape Architecture, P.C.
May 4, 2017

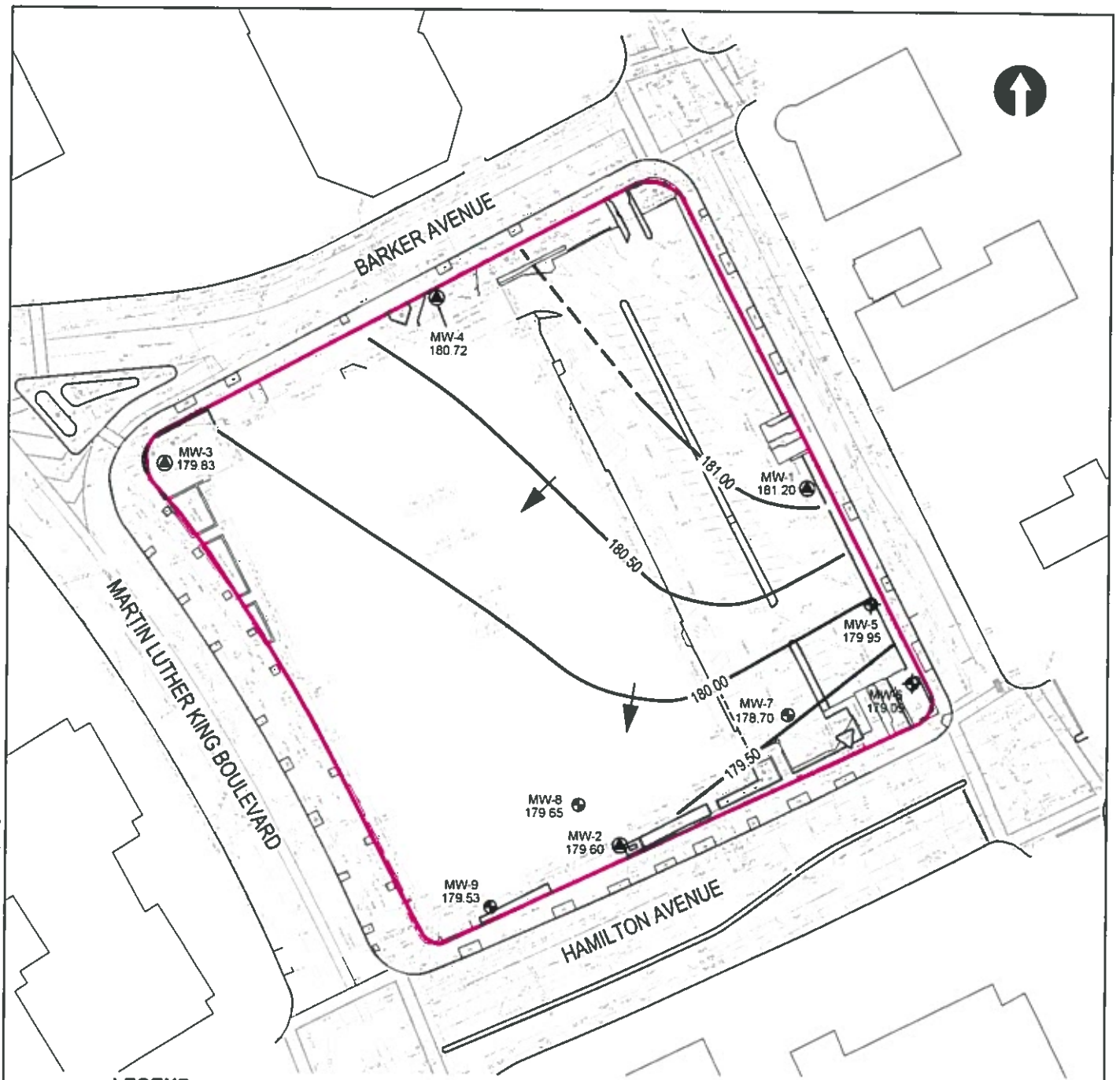
0 100 200
SCALE IN FEET

AKRF
440 Park Avenue South, New York, NY 10016

200 Hamilton Avenue
White Plains, New York

SITE PLAN

DATE: 5/2/2018
PROJECT NO.: 170029
FIGURE: 2



LEGEND

- PROPERTY BOUNDARY
- EXISTING MONITORING WELL LOCATION (FROM 2015 GEOTECHNICAL INVESTIGATION)
- EXISTING MONITORING WELL (UNKNOWN)
- MONITORING WELL (2018 SPILL INVESTIGATION)
- 180.00 — GROUNDWATER ELEVATION CONTOUR IN FEET (DASHED WHERE INFERRED)
- INFERRED GROUNDWATER FLOW DIRECTION

NOTE: ELEVATION DATA FROM MW-7 NOT USED IN CREATING CONTOURS DUE TO SLOW RECHARGE IN THIS WELL.

Map Source: Insite Engineering, Surveying & Landscaping Architecture, P.C. May 4, 2017.

0 50 100 200

SCALE IN FEET

AKRF

440 Park Avenue South, New York, NY 10016

200 Hamilton Avenue

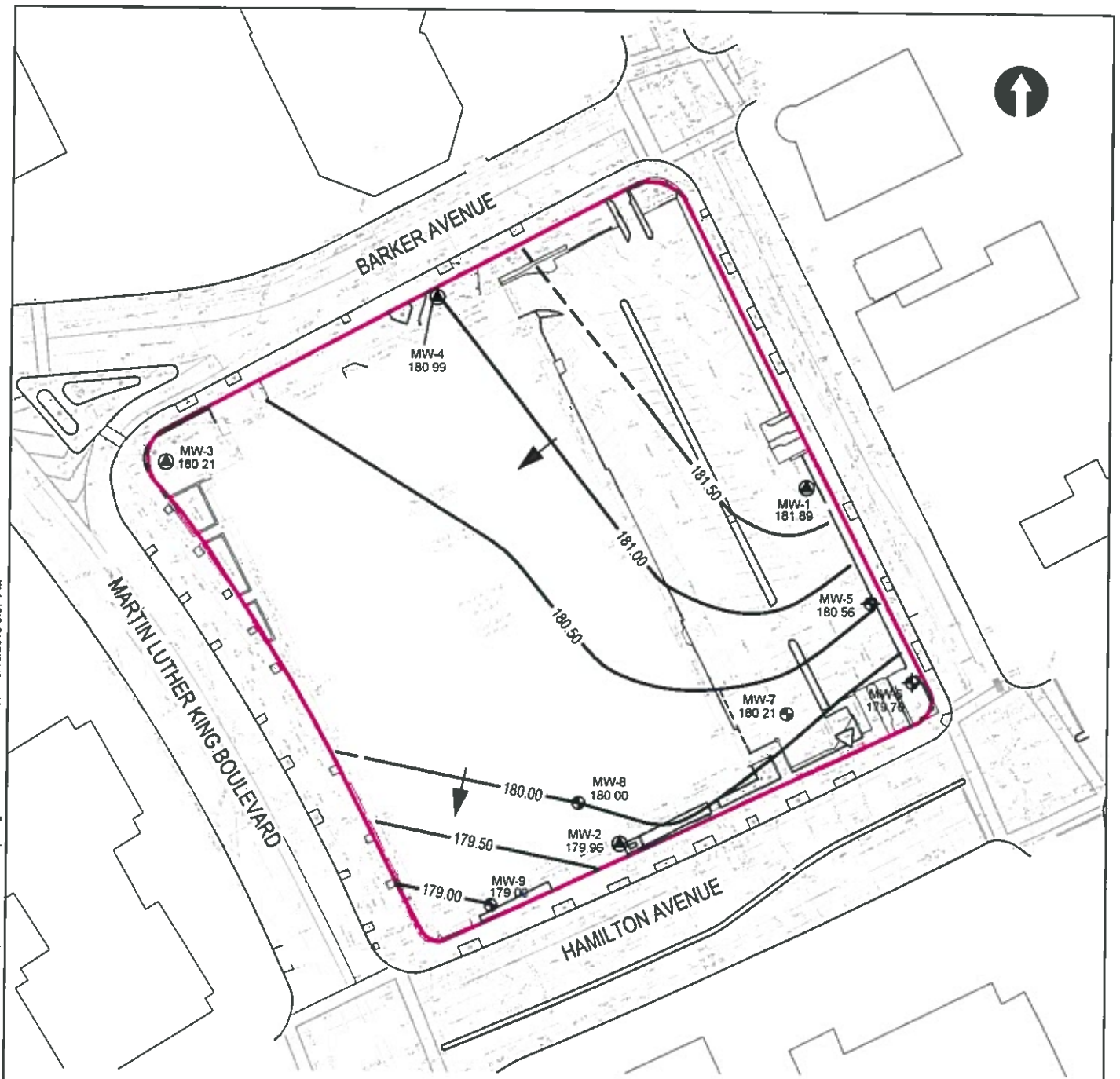
White Plains, New York

GROUNDWATER ELEVATION CONTOUR MAP
FEBRUARY 16, 2018

DATE: 5/10/2018

PROJECT NO.: 170029

FIGURE: 3



Map Source: Insite Engineering, Surveying & Landscaping Architecture, P.C. May 4, 2017.

LEGEND

- PROPERTY BOUNDARY
- EXISTING MONITORING WELL LOCATION (FROM 2015 GEOTECHNICAL INVESTIGATION)
- EXISTING MONITORING WELL (UNKNOWN)
- MONITORING WELL (2018 SPILL INVESTIGATION)
- 180.00 — GROUNDWATER ELEVATION CONTOUR IN FEET (DASHED WHERE INFERRED)
- INFERRED GROUNDWATER FLOW DIRECTION

0 50 100 200

SCALE IN FEET

AKRF

440 Park Avenue South, New York, NY 10016

200 Hamilton Avenue

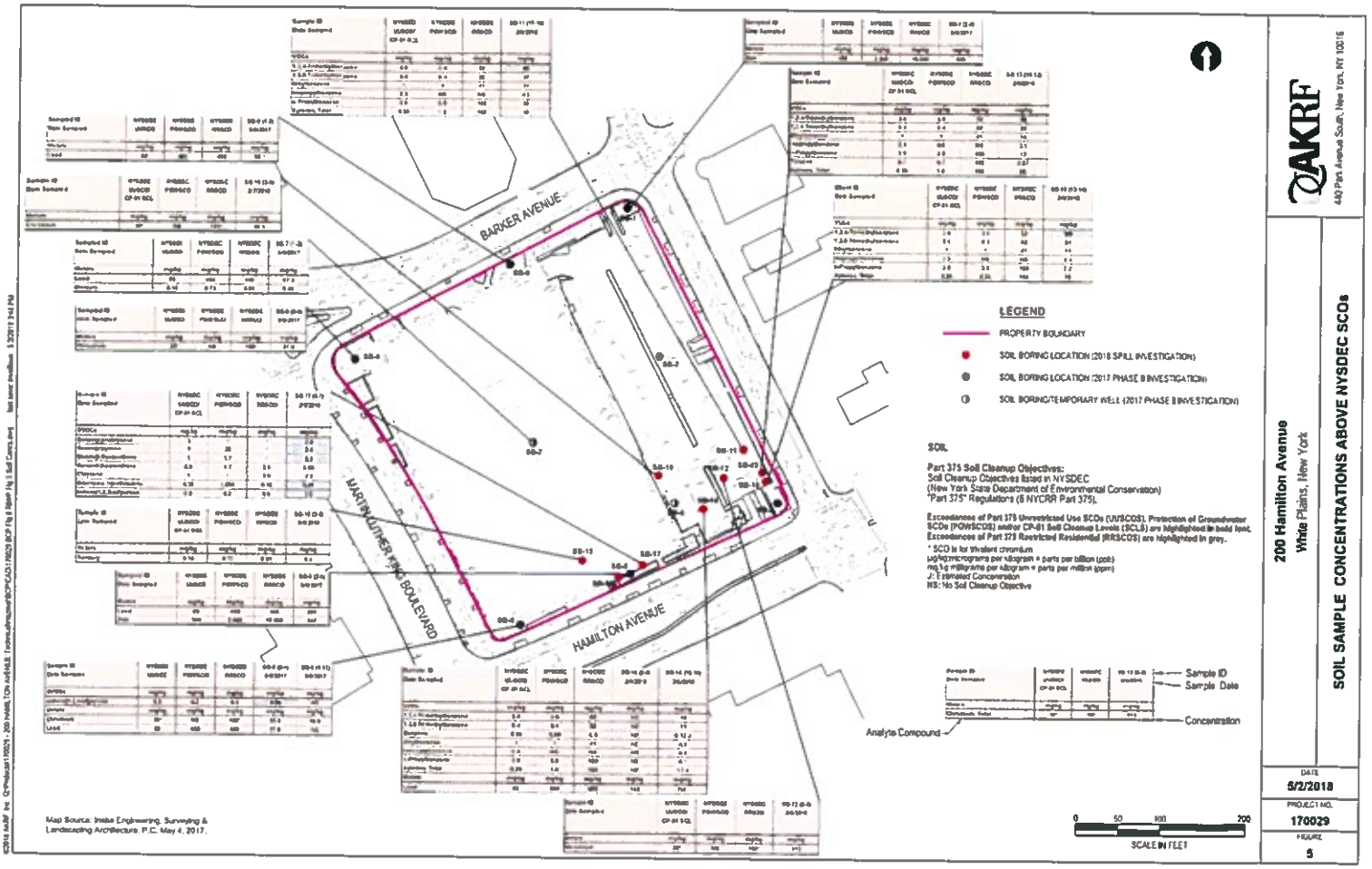
White Plains, New York

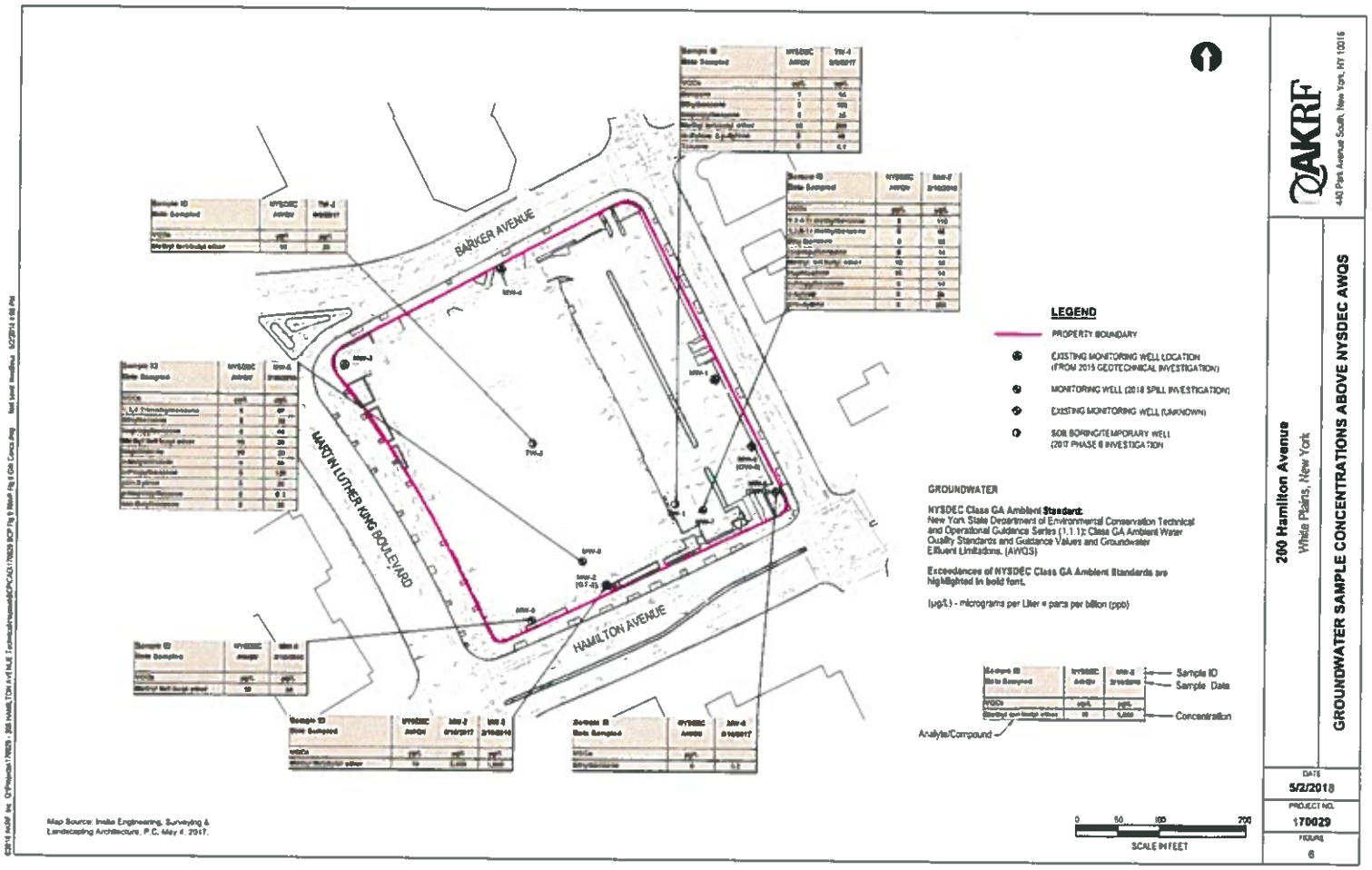
GROUNDWATER ELEVATION CONTOUR MAP
FEBRUARY 26, 2018

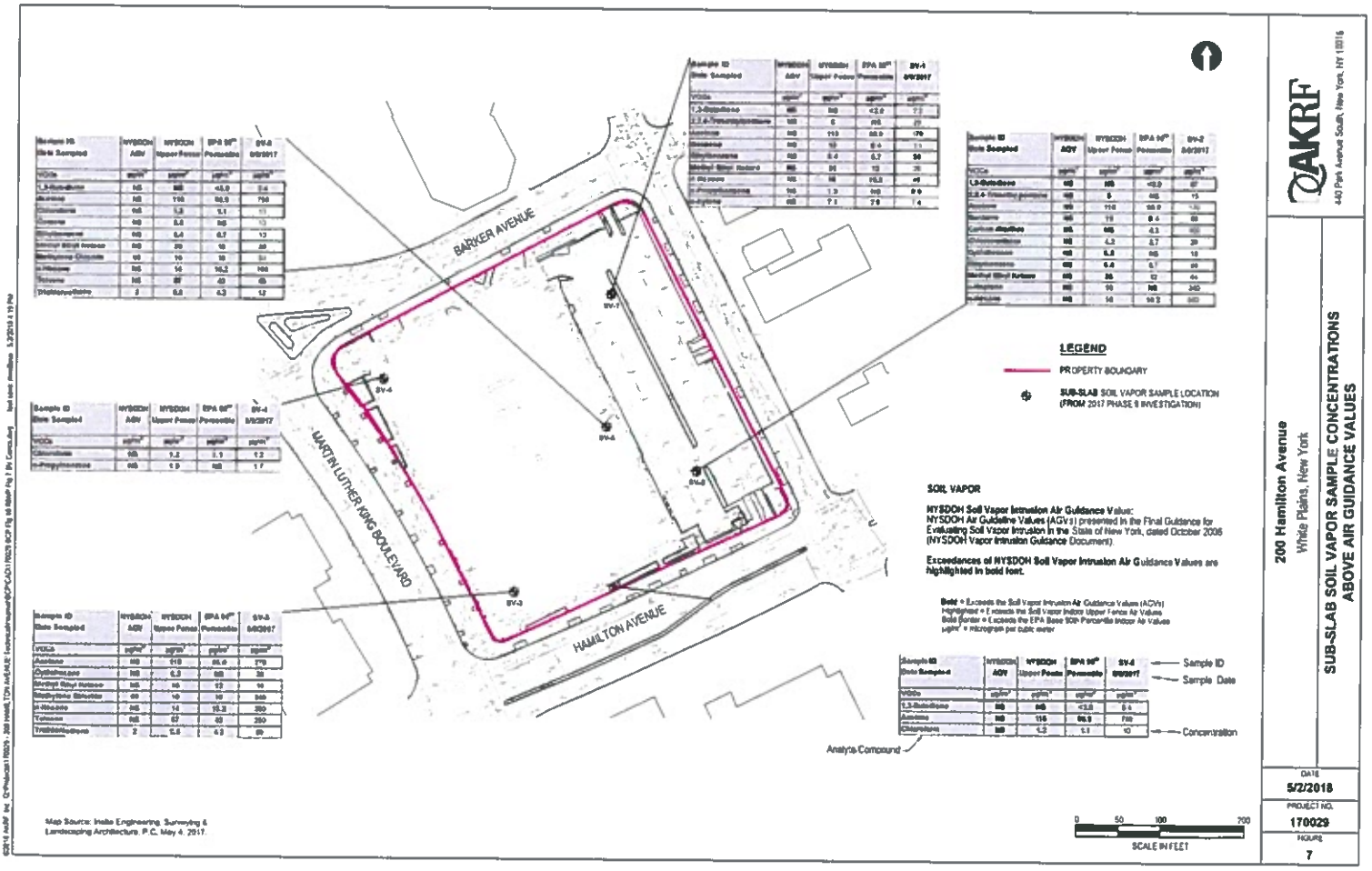
DATE: 5/10/2018

PROJECT NO.: 170029

FIGURE: 4


BARKER AVENUE
MARTIN LUTHER KING BOULEVARD
HAMILTON AVENUE
SB-1
SB-2
SB-3
SB-4
SB-5
SB-6
SB-7
SB-8
SB-9
SB-10
SB-11
SB-12
SB-13
SB-14
SB-15
SB-16
SB-17
LEGEND
PROPERTY BOUNDARY
SOIL BORING LOCATION (2018 SPILL INVESTIGATION)
SOIL BORING LOCATION (2017 PHASE II INVESTIGATION)
SOIL BORING/TEMPORARY WELL (2017 PHASE II INVESTIGATION)
SOIL
Part 375 Soil Cleanup Objectives:
Soil Cleanup Objectives listed in NYSDEC
(New York State Department of Environmental Conservation)
"Part 375" Regulations (6 NYCRR Part 375).
Exceedances of Part 375 Unrestricted Use SCOs (UUSCOS), Protection of Groundwater SCOs (PGWSCOS) and/or CP-51 Soil Cleanup Levels (SCLS) are highlighted in bold font.
Exceedances of Part 375 Restricted Residential (RRSCOS) are highlighted in grey.
* SCO is for trivalent chromium
ug/kg=micrograms per kilogram = parts per billion (ppb)
mg/kg=milligrams per kilogram = parts per million (ppm)
J: Estimated Concentration
NS: No Soil Cleanup Objective
Sample ID
Sample Date
Concentration
Analyte Compound
0
50
100
200
SCALE IN FEET
Map Source: Intuit Engineering, Surveying & Landscaping Architecture, P.C. May 4, 2017.
AKRF
440 Park Avenue South, New York, NY 10016
200 Hamilton Avenue
White Plains, New York
SOIL SAMPLE CONCENTRATIONS ABOVE NYSDEC SCOs
DATE
5/2/2018
PROJECT NO.
170029
FIGURE
5


BARKER AVENUE
MARTIN LUTHER KING BOULEVARD
HAMILTON AVENUE
LEGEND
PROPERTY BOUNDARY
EXISTING MONITORING WELL LOCATION (FROM 2015 GEOTECHNICAL INVESTIGATION)
MONITORING WELL (2018 SPILL INVESTIGATION)
EXISTING MONITORING WELL (UNKNOWN)
SOIL BORING/TEMPORARY WELL (2017 PHASE II INVESTIGATION
GROUNDWATER
NYSDEC Class GA Ambient Standard:
New York State Department of Environmental Conservation Technical and Operational Guidance Series (1.1.1): Class GA Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. (AWQS)
Exceedance of NYSDEC Class GA Ambient Standards are highlighted in bold font.
(ug/L) - micrograms per Liter = parts per billion (ppb)
Sample ID
Sample Date
Concentration
Analyte/Compound
0
50
100
200
SCALE IN FEET
Map Source: Insite Engineering, Surveying & Landscaping Architecture, P.C. May 4, 2017.
AKRF
440 Park Avenue South, New York, NY 10016
280 Hamilton Avenue
White Plains, New York
GROUNDWATER SAMPLE CONCENTRATIONS ABOVE NYSDEC AWQS
DATE
5/2/2018
PROJECT NO.
170029
FIGURE
6



Map Source: Insite Engineering, Surveying & Landscaping Architecture, P.C. May 4, 2017.

AKRF
440 Park Avenue South, New York, NY 10016

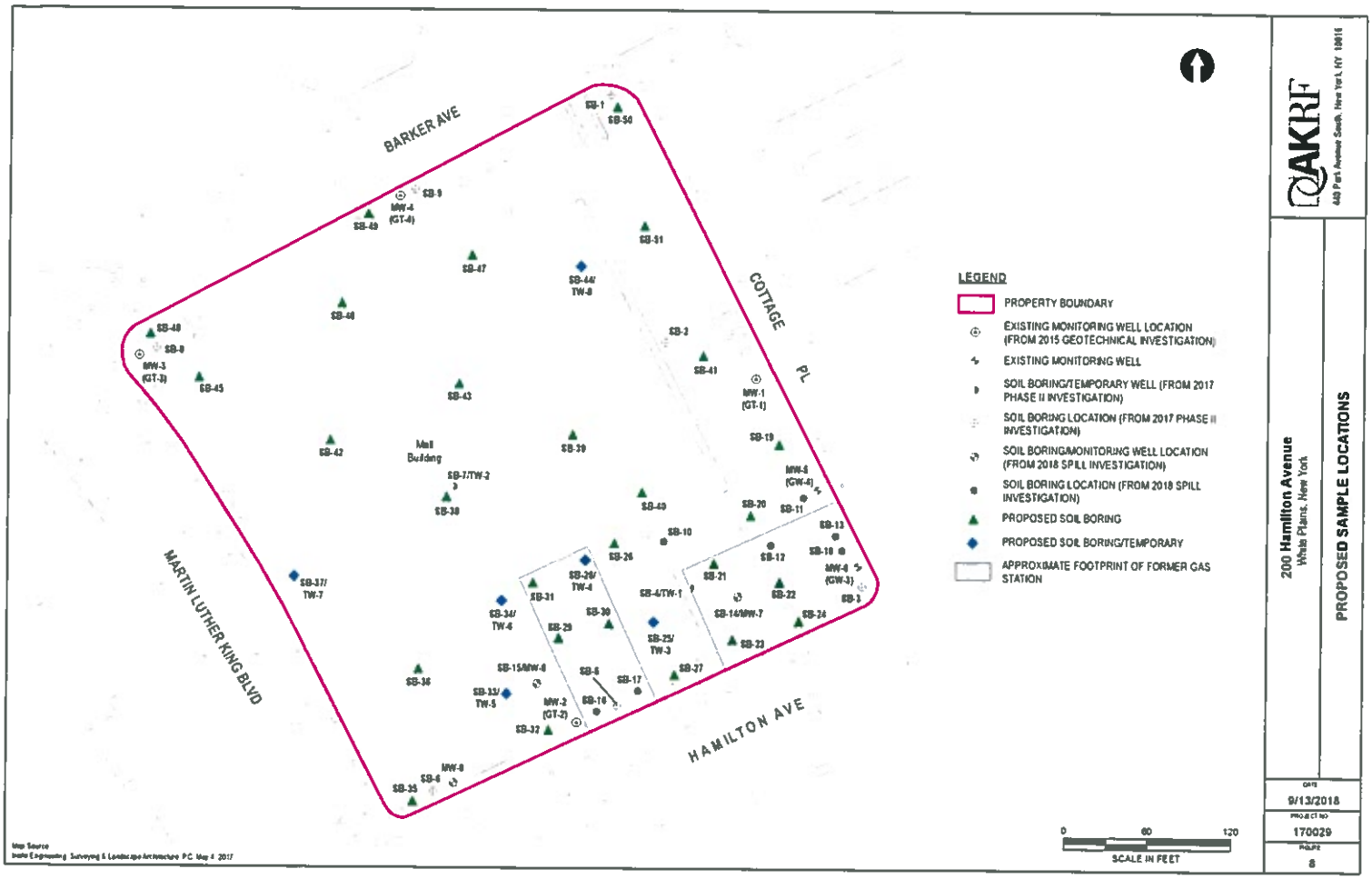
200 Hamilton Avenue
White Plains, New York

SUB-SLAB SOIL VAPOR SAMPLE CONCENTRATIONS ABOVE AIR GUIDANCE VALUES

DATE
5/2/2018

PROJECT NO.
170029

FIGURE
7


BARKER AVE
COTTAGE PL
HAMILTON AVE
MARTIN LUTHER KING BLVD
Mall Building
SB-1
SB-50
SB-9
MW-4 (GT-4)
SB-49
SB-51
SB-47
SB-44/ TW-8
SB-48
SB-40
SB-8
MW-3 (GT-3)
SB-45
SB-2
SB-41
MW-1 (GT-1)
SB-43
SB-42
SB-39
SB-19
MW-5 (GW-4)
SB-7/TW-2
SB-38
SB-49
SB-20
SB-11
SB-10
SB-13
SB-18
SB-26
SB-12
SB-21
MW-6 (GW-3)
SB-3
SB-37/ TW-7
SB-26/ TW-4
SB-31
SB-4/TW-1
SB-22
SB-34/ TW-6
SB-30
SB-14/MW-7
SB-24
SB-29
SB-25/ TW-3
SB-23
SB-15/MW-6
SB-6
SB-17
SB-27
SB-36
SB-33/ TW-5
MW-2 (GT-2)
SB-16
SB-32
MW-8
SB-35
SB-6
LEGEND
PROPERTY BOUNDARY
EXISTING MONITORING WELL LOCATION (FROM 2015 GEOTECHNICAL INVESTIGATION)
EXISTING MONITORING WELL
SOIL BORING/TEMPORARY WELL (FROM 2017 PHASE II INVESTIGATION)
SOIL BORING LOCATION (FROM 2017 PHASE II INVESTIGATION)
SOIL BORING/MONITORING WELL LOCATION (FROM 2018 SPILL INVESTIGATION)
SOIL BORING LOCATION (FROM 2018 SPILL INVESTIGATION)
PROPOSED SOIL BORING
PROPOSED SOIL BORING/TEMPORARY
APPROXIMATE FOOTPRINT OF FORMER GAS STATION
0
60
120
SCALE IN FEET
Map Source
Insite Engineering, Surveying & Landscape Architecture P.C. May 4, 2017
AKRF
440 Park Avenue South, New York, NY 10016
200 Hamilton Avenue
White Plains, New York
PROPOSED SAMPLE LOCATIONS
DATE
9/13/2018
PROJECT NO.
170029
FIGURE
8

TABLES

TABLE 1
PROPOSED SOIL SAMPLE DEPTHS AND ANALYSES

Soil Boring ID	Proposed Sampling Interval	Target Analyses	Additional Analyses[5]	Sampling Rationale
SB-19	Top of Fill	RCRA Metals + Zn BN SVOCs		Characterize shallow fill layer
	Bottom of Fill	RCRA Metals + Zn BN SVOCs		Characterize shallow fill layer
	Unsaturated Zone - Most Contaminated Interval or 15-17[1]	CP-51 VOCs or RCRA Metals + Zn BN SVOCs		Delineate petroleum contamination or Characterize soil at anticipated final excavation depth
	Saturated Zone - Most Contaminated Interval or Below GW Interface[2]	CP-51 VOCs		Delineate petroleum contamination/ Determine Clean Endpoint
SB-20	Unsaturated Zone - Most Contaminated Interval or Immediately Above GW Interface[3]	CP-51 VOCs		Delineate petroleum contamination
	Saturated Zone - Most Contaminated Interval or Below GW Interface[2]	CP-51 VOCs		Delineate petroleum contamination/ Determine Clean Endpoint
SB-21	Unsaturated Zone - Most Contaminated Interval or Immediately Above GW Interface[3]	CP-51 VOCs		Delineate petroleum contamination
	Saturated Zone - Most Contaminated Interval or Below GW Interface[2]	CP-51 VOCs		Delineate petroleum contamination/ Determine Clean Endpoint
SB-22	Bottom of Fill	RCRA Metals + Zn BN SVOCs		Further Characterize shallow fill layer identified in SB-12
	Unsaturated Zone - Most Contaminated Interval or Immediately Above GW Interface[3]	CP-51 VOCs	Full Part 375 List	Delineate petroleum contamination
	Saturated Zone - Most Contaminated Interval or Below GW Interface[2]	CP-51 VOCs		Delineate petroleum contamination/ Determine Clean Endpoint
SB-23	Unsaturated Zone - Most Contaminated Interval or Immediately Above GW Interface[3]	CP-51 VOCs		Delineate petroleum contamination
	Saturated Zone - Most Contaminated Interval or Below GW Interface[2]	CP-51 VOCs		Delineate petroleum contamination/ Determine Clean Endpoint
SB-24	Unsaturated Zone - Most Contaminated Interval or Immediately Above GW Interface[3]	CP-51 VOCs		Delineate petroleum contamination
	Saturated Zone - Most Contaminated Interval or Below GW Interface[2]	CP-51 VOCs		Delineate petroleum contamination/ Determine Clean Endpoint
SB-25	Within Fill Layer	RCRA Metals + Zn BN SVOCs		Characterize shallow fill layer
	Unsaturated Zone - Most Contaminated Interval or Immediately Above GW Interface[3]	CP-51 VOCs		Delineate petroleum contamination
	Saturated Zone - Most Contaminated Interval or Below GW Interface[2]	CP-51 VOCs		Delineate petroleum contamination/ Determine Clean Endpoint

TABLE 1
PROPOSED SOIL SAMPLE DEPTHS AND ANALYSES

Soil Boring ID	Proposed Sampling Interval	Target Analyses	Additional Analyses[5]	Sampling Rationale
SB-26	Unsaturated Zone - Most Contaminated Interval or Immediately Above GW Interface[1]	CP-51 VOCs		Delineate petroleum contamination
	Saturated Zone - Most Contaminated Interval or Below GW Interface[2]	CP-51 VOCs		Delineate petroleum contamination/ Determine Clean Endpoint
SB-27	Unsaturated Zone - Most Contaminated Interval or Immediately Above GW Interface[1]	CP-51 VOCs		Delineate petroleum contamination
	Saturated Zone - Most Contaminated Interval or Below GW Interface[2]	CP-51 VOCs		Delineate petroleum contamination/ Determine Clean Endpoint
SB-28	Unsaturated Zone - Most Contaminated Interval or Immediately Above GW Interface[1]	CP-51 VOCs		Delineate petroleum contamination
	Saturated Zone - Most Contaminated Interval or Below GW Interface[2]	CP-51 VOCs		Delineate petroleum contamination/ Determine Clean Endpoint
SB-29	Unsaturated Zone - Most Contaminated Interval or Immediately Above GW Interface[1]	CP-51 VOCs	Full Part 375 List	Delineate petroleum contamination
	Saturated Zone - Most Contaminated Interval or Below GW Interface[2]	CP-51 VOCs		Delineate petroleum contamination/ Determine Clean Endpoint
SB-30	Unsaturated Zone - Most Contaminated Interval or Immediately Above GW Interface[1]	CP-51 VOCs		Delineate petroleum contamination
	Saturated Zone - Most Contaminated Interval or Below GW Interface[2]	CP-51 VOCs		Delineate petroleum contamination/ Determine Clean Endpoint
SB-31	Unsaturated Zone - Most Contaminated Interval or Immediately Above GW Interface[1]	CP-51 VOCs		Delineate petroleum contamination
	Saturated Zone - Most Contaminated Interval or Below GW Interface[2]	CP-51 VOCs		Delineate petroleum contamination/ Determine Clean Endpoint
SB-32	Unsaturated Zone - Most Contaminated Interval or Immediately Above GW Interface[1]	CP-51 VOCs		Delineate petroleum contamination
	Saturated Zone - Most Contaminated Interval or Below GW Interface[2]	CP-51 VOCs		Delineate petroleum contamination/ Determine Clean Endpoint
SB-33	Within Fill Layer	RCRA Metals + Zn BN SVOCs		Characterize shallow fill layer
	Unsaturated Zone - Most Contaminated Interval or Immediately Above GW Interface[1]	CP-51 VOCs		Delineate petroleum contamination
	Saturated Zone - Most Contaminated Interval or Below GW Interface[2]	CP-51 VOCs		Delineate petroleum contamination/ Determine Clean Endpoint

TABLE 1
PROPOSED SOIL SAMPLE DEPTHS AND ANALYSES

Soil Boring ID	Proposed Sampling Interval	Target Analyses	Additional Analyses[5]	Sampling Rationale
SB-34	Unsaturated Zone - Most Contaminated Interval or Immediately Above GW Interface[1]	CP-51 VOCs		Delineate petroleum contamination
	Saturated Zone - Most Contaminated Interval or Below GW Interface[2]	CP-51 VOCs		Delineate petroleum contamination/ Determine Clean Endpoint
SB-35	13-15	RCRA Metals + Zn BN SVOCs		Delineate SCO exceedance at 9-11 ft bgs in SB-6
SB-36	Within Fill Layer	RCRA Metals + Zn BN SVOCs		Characterize shallow fill layer
	5-7[4]	RCRA Metals + Zn BN SVOCs	Full Part 375 List	Characterize soil at anticipated final excavation depth
SB-37	Within Fill Layer	RCRA Metals + Zn BN SVOCs		Characterize shallow fill layer
	5-7[4]	RCRA Metals + Zn BN SVOCs		Characterize soil at anticipated final excavation depth
SB-38	Within Fill Layer	RCRA Metals + Zn BN SVOCs		Characterize shallow fill layer
	5-7[4]	RCRA Metals + Zn BN SVOCs		Characterize soil at anticipated final excavation depth
SB-39	Within Fill Layer	RCRA Metals + Zn BN SVOCs	Full Part 375 List	Characterize shallow fill layer
	5-7[4]	RCRA Metals + Zn BN SVOCs		Characterize soil at anticipated final excavation depth
SB-40	Bottom of Fill Layer	RCRA Metals + Zn BN SVOCs		Further Characterize shallow fill layer identified in SB-10
	15-17[4]	RCRA Metals + Zn BN SVOCs		Characterize soil at anticipated final excavation depth
SB-41	Within Fill Layer	RCRA Metals + Zn BN SVOCs		Characterize shallow fill layer
SB-42	Within Fill Layer	RCRA Metals + Zn BN SVOCs		Characterize shallow fill layer
	5-7[4]	RCRA Metals + Zn BN SVOCs		Characterize soil at anticipated final excavation depth
SB-43	Within Fill Layer	RCRA Metals + Zn BN SVOCs	Full Part 375 List	Characterize shallow fill layer
	5-7[4]	RCRA Metals + Zn BN SVOCs		Characterize soil at anticipated final excavation depth
SB-44	Top of Fill	RCRA Metals + Zn BN SVOCs		Characterize shallow fill layer
	Bottom of Fill	RCRA Metals + Zn BN SVOCs		Characterize shallow fill layer
	15-17[4]	RCRA Metals + Zn BN SVOCs		Characterize soil at anticipated final excavation depth
SB-45	Within Fill Layer	RCRA Metals + Zn BN SVOCs		Characterize shallow fill layer
	5-7[4]	RCRA Metals + Zn BN SVOCs	Full Part 375 List	Characterize soil at anticipated final excavation depth
SB-46	Within Fill Layer	RCRA Metals + Zn BN SVOCs		Characterize shallow fill layer
	5-7[4]	RCRA Metals + Zn BN SVOCs		Characterize soil at anticipated final excavation depth
SB-47	Within Fill Layer	RCRA Metals + Zn BN SVOCs		Characterize shallow fill layer
	5-7[4]	RCRA Metals + Zn BN SVOCs		Characterize soil at anticipated final excavation depth
SB-48	Bottom of Fill Layer	RCRA Metals + Zn BN SVOCs		Further Characterize shallow fill layer identified in SB-8
SB-49	Middle of Fill Layer	RCRA Metals + Zn BN SVOCs		Further Characterize shallow fill layer identified in SB-9
SB-50	Middle of Fill Layer	RCRA Metals + Zn BN SVOCs	Full Part 375 List	Further Characterize shallow fill layer identified in SB-1
	15-17[4]	RCRA Metals + Zn BN SVOCs		Characterize soil at anticipated final excavation depth
SB-51	15-17[4]	RCRA Metals + Zn BN SVOCs		Characterize soil at anticipated final excavation depth

[1] Sample to be collected at anticipated final excavation depth if no field evidence of petroleum contamination is identified.
[2] Sample to be collected below GW Interface if no field evidence of petroleum contamination is identified in the saturated zone.
[3] Sample to be collected immediately above the GW Interface if no field evidence of petroleum contamination is identified in the unsaturated zone.
[4] An additional sample will be collected below the anticipated final excavation depth to submit "on-hold" for potential delineation.
[5] Additional analysis of 10% of soil samples to provide full Part 375 List characterization.

TABLE 2
PROPOSED GROUNDWATER SAMPLES AND ANALYSES

Monitoring Well ID	Target Analyses	Additional Analyses[1]	Sampling Rationale
TW-3	CP-51 VOCs		Characterize/delineate petroleum groundwater contamination in south/southeastern portions of Site
TW-4	CP-51 VOCs		Characterize/delineate petroleum groundwater contamination in south/southeastern portions of Site
TW-5	CP-51 VOCs		Characterize/delineate petroleum groundwater contamination in south/southeastern portions of Site
TW-6	CP-51 VOCs		Characterize/delineate petroleum groundwater contamination in south/southeastern portions of Site
TW-7	CP-51 VOCs		Characterize/delineate MTBE identified in TW-2
TW-8	CP-51 VOCs		Characterize groundwater up gradient of the area of petroleum contamination
MW-1	CP-51 VOCs	Full Part 375 + 1,4-Dioxane/PFAS	Continued monitoring of existing monitoring well
MW-2	CP-51 VOCs		Continued monitoring of existing monitoring well
MW-5	CP-51 VOCs		Continued monitoring of existing monitoring well
MW-6	CP-51 VOCs		Continued monitoring of existing monitoring well
MW-7	CP-51 VOCs	Full Part 375 + 1,4-Dioxane/PFAS	Continued monitoring of existing monitoring well
MW-8	CP-51 VOCs	Full Part 375 + 1,4-Dioxane/PFAS	Continued monitoring of existing monitoring well
MW-9	CP-51 VOCs		Continued monitoring of existing monitoring well

[1] Additional analysis to provide full Part 375 list and emerging contaminants characterization.

APPENDIX A

QUALITY ASSURANCE PROJECT PLAN

HAMILTON GREEN

200 HAMILTON AVENUE, WHITE PLAINS, NEW YORK

Quality Assurance Project Plan

BCP Site #: C360177

AKRF Project Number: 170029

Prepared for:

S-WD/WP LLC dba Street-Works Development
168-A Irving Avenue, Suite 200K
Port Chester, NY 10573

Prepared by:

AKRF, Inc.
440 Park Avenue South
New York, New York 10016
(212) 696-0670

SEPTEMBER 2018

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TABLES

ATTACHMENTS

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) describes the protocols and procedures that will be followed during implementation of all environmental sampling associated with the Remedial Investigation Work Plan (RIWP) at the Hamilton Green site located at 200 Hamilton Avenue in the City of White Plains, Westchester County, New York (the "Site"). The 3.74-acre Site, as shown on Figure 1, includes the two-story White Plains Mall and east-adjacent asphalt-paved parking lot, and is identified as Tax Map ID Section 125.67, Block 5, Lot 1 on the City of White Plains tax map.

S-WD/WP LLC has been accepted into the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) as a Volunteer (BCP Site No. C360177), and entered into a Brownfield Cleanup Agreement (BCA) with the NYSDEC (BCA Index No. C360177-08-03) on August 16, 2018. The Volunteer entered into the BCP to facilitate the continued investigation and ultimate remediation of contaminated soil and groundwater that has been identified at the Site. The objective of this QAPP is to provide for Quality Assurance (QA) and Quality Control (QC) over environmental investigative, sampling, and remedial activities under NYSDEC oversight following approval of the RIWP. Adherence to the QAPP will ensure that defensible data will be obtained during all environmental work at the Site.

2.0 PROJECT TEAM

The project team will be drawn from AKRF professional and technical personnel, and AKRF's subcontractors. All field personnel and subcontractors will have completed a 40-hour training course and updated 8-hour refresher course that meet the Occupational Safety and Health Administration (OSHA) requirements of 29 CFR Part 1910. The following sections describe the key project personnel and their responsibilities.

2.1 Project Director and Remedial Engineer

The project director will be responsible for the general oversight of all aspects of the project, including scheduling, budgeting, data management, and field program decision-making. The project director will communicate regularly with all members of the AKRF project team and the NYSDEC to ensure a smooth flow of information between involved parties. Ms. Rebecca Kinal, P.E. will serve as the project director for the RIWP. Ms. Kinal's resume is included in Attachment A.

2.2 Quality Assurance / Quality Control (QA/QC) Officer

Ms. Marc Godick will serve as the QA/QC officer and will be responsible for adherence to the QAPP. The QA/QC officer will review the procedures with all personnel prior to commencing any fieldwork and will conduct periodic Site visits to assess implementation of the procedures. The QA/QC officer will also be responsible for reviewing Data Usability Summary Reports (DUSRs) for soil analytical results. Mr. Godick's resume is included in Attachment A.

2.3 Project Manager

The project manager will be responsible for directing and coordinating all elements of the RIWP. The project manager will prepare reports and participate in meetings with the Site owner/Volunteer, and/or the NYSDEC. Mr. Timothy McClintock will serve as the project manager for the RIWP. Mr. McClintock's resume is included in Attachment A.

2.4 Deputy Project Manager

The deputy project manager will be responsible for assisting the project manager. The deputy project manager will help prepare reports and will participate in meetings with the Site owner/Volunteer, and/or the NYSDEC. Mr. Patrick McHugh will serve as the deputy project manager for the RIWP. Mr. McHugh's resume is included in Attachment A.

2.5 Field Team Leader and Alternate

The field team leader will be responsible for supervising the daily sampling and health and safety activities in the field and will ensure adherence to the RIWP, and the Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP), included in Appendix B of the RIWP. The field team leader will also act as the field technician and Site safety officer (SSO), and will report to the project manager or deputy project manager on a regular basis regarding daily progress and any deviations from the work plan. The field team leader will be a qualified and responsible person able to act professionally and promptly during environmental work at the Site. Mr. Jacob Menken will act at the field team leader. Mr. John Sulich will act as the field team leader alternate. Resumes for Mr. Menken and Mr. Sulich are included in Attachment A.

2.6 Laboratory Quality Assurance / Quality Control (QA/QC) Officer

The laboratory QA/QC officer will be responsible for quality control procedures and checks in the laboratory and ensuring adherence to laboratory protocols. The QA/QC officer will track the

movement of samples from the time they are checked in at the laboratory to the time that analytical results are issued, and will conduct a final check on the analytical calculations and sign off on the laboratory reports. The laboratory QA/QC officers will be Carl Ambruster, Luke Orchard, and Lisa Stafford of TestAmerica Laboratories (TestAmerica), the New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP)-certified laboratory being employed for all environmental sampling at the Site.

2.7 Laboratory Data Validator

The laboratory data validator will be responsible for third party data validation and preparation of Data Usability Summary Reports (DUSRs). The third-party laboratory data validator will be Lori Beyer of L.A.B. Validation Corp.

3.0 STANDARD OPERATING PROCEDURES (SOPS)

The following sections describe the Scope of Work (SOW) and Standard Operating Procedures (SOPs) for the remedial investigative activities included in the RIWP. During these operations, safety monitoring will be performed as described in the HASP and CAMP, included as Appendix B of the RIWP. The current on-site structure occupies approximately two-thirds of the Site, including the footprint of the former gasoline station in its southern portion, limiting the locations available for soil and groundwater sampling. As such, much of the proposed Remedial Investigation (RI) field program will not be completed until the on-site structure has been demolished, and access to all areas of the Site is available. This will allow for Site-wide delineation of known contamination in and adjacent to the footprints of the former on-site gasoline stations, and other areas of the Site to be excavated as part of the proposed redevelopment.

3.1 Soil Sampling

Thirty-three soil borings (SB-19 through SB-51) will be advanced to characterize subsurface soils and collect soil samples for laboratory analysis. Figure 8 of the RIWP depicts the proposed soil boring locations as well as the location of the existing on-site structure, which will be demolished prior to implementation of the RI field program. All soil borings will be advanced with a track-mounted Geoprobe® direct push probe (DPP) unit to a minimum of 5 feet below the groundwater interface or until refusal, whichever is shallower, and samples will be collected continuously using 2-inch diameter macrocore piston rod samplers fitted with dedicated acetate liners. Each macrocore sample liner will be split lengthwise and AKRF field personnel will record and document subsurface conditions. As described in Section 4.1, macrocore samples will be inspected for evidence of contamination (e.g., odors, staining), screened for the presence of volatile organics with a photoionization detector (PID) equipped with a 10.6 electron volt (eV) lamp, and logged using the modified Burmister Soil Classification system. The PID will be calibrated in accordance with manufacturer's specifications prior to sampling.

Two soil samples will be collected from each soil boring advanced in, adjacent to, and downgradient of the former gasoline stations (SB-19 through SB-34). One sample will be collected from the 2-foot interval in the unsaturated zone that exhibits the greatest evidence of contamination (i.e., PID readings, odors, staining) and a second sample will be collected from the 2-foot interval in the saturated zone exhibiting the greatest evidence of contamination. In the absence of contamination, the samples will be collected from the interval directly above and below the groundwater interface. In an effort to characterize the condition of the fill layer at the Site, one to three samples from a 2-foot interval within and/or below the fill layer from select soil borings (SB-19, SB-22, SB-25, SB-33, and SB-35 through SB-51) will be collected. Additional samples may be collected for laboratory analysis based on field observations to further delineate petroleum contamination, extent of fill, etc. All sampling equipment (e.g., drilling/direct push probe rods and macrocore samplers) will be either dedicated or decontaminated between sampling locations in accordance with Section 3.5.

As described in Section 4.0, soil samples slated for laboratory analysis will be labeled and placed in laboratory-supplied containers and shipped to a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory via courier with appropriate chain of custody documentation in accordance with appropriate EPA protocols. The samples collected from the locations in, adjacent to, and downgradient of the former gasoline stations will be analyzed for the VOCs listed in NYSDEC Commissioners Policy CP-51: Table 2 – Soil Cleanup Levels for Gasoline Contaminated Soil by EPA Method 8260. The samples collected from within or below the fill layer will be analyzed for Base Neutral (BN)-SVOCs by EPA Method 8270 and Resource Conservation and Recovery Act (RCRA) 8 Metals (arsenic, barium, cadmium, chromium, lead,

mercury, selenium, and silver) plus zinc by the EPA's 6000/7000 series methods. In addition, a minimum of 10% of the soil samples collected will be analyzed for the full NYSDEC Part 375 List, including target compound list (TCL) VOCs by EPA Method 8260, TCL SVOCs by EPA Method 8270, PCBs by EPA Method 8082, Pesticides by EPA Method 8081, Herbicides by EPA Method 8151, and Target Analyte List (TAL) metals by EPA's 6000/7000 series methods. Additional samples will be collected and analyzed for quality assurance/quality control (QA/QC) purposes in accordance with Section 4.4. The associated laboratory analytical data report will be prepared using Category B deliverables. A table summarizing the target depth of the soil borings, anticipated sampling intervals, and corresponding analytical parameters is included as Table 1 in the RIWP.

After each soil boring is completed, soil borings not designated for installation of temporary well points will be backfilled with drill cuttings (if not grossly contaminated) and/or hydrated bentonite and patched to match existing surface conditions. All contaminated investigation derived waste (IDW) associated with the soil borings (i.e., grossly contaminated drill cuttings) will be containerized in properly labeled Department of Transportation (DOT)-approved 55-gallon drums for future off-site disposal at a permitted facility in accordance with Section 3.5 of this document.

3.2 Temporary Well Point Installation and Well Development

As depicted on Figure 8 of the RIWP, temporary well points TW-3 through TW-8 will be installed at soil borings SB-25, SB-28, SB-33, SB-34, SB-37, and SB-44, respectively. The temporary well points will be installed in the open bore holes, and will be constructed using 2-inch diameter, 10-foot long polyvinyl chloride (PVC) well screen set at a minimum of 5 feet below the observed groundwater table. Solid PVC riser pipe will be used to bring each well point to grade surface. Following installation, a peristaltic pump (or equivalent) will be used to purge approximately three well volumes from each well point. The purged water will be monitored for turbidity and water quality indicators (i.e., pH, temperature, and specific conductivity) to ensure that sedimentation/turbidity is reduced, to the extent practical. The development water will be containerized in properly labelled DOT-approved 55-gallon drums for future off-site disposal at a permitted facility in accordance with Section 3.6.

3.3 Groundwater Sampling

Groundwater samples for laboratory analysis will be collected from the six newly installed temporary well points (TW-3 through TW-8), and seven of the existing on-site monitoring wells located in, adjacent to, and downgradient of petroleum-contaminated areas (MW-1, MW-2, and MW-5 through MW-9). Prior to collecting groundwater samples, the headspace at each monitoring well will be screened for the presence of VOCs using a calibrated PID after removing the well cap. An electronic oil/water interface probe accurate to 0.01 feet will be used to measure the depth to groundwater in each well, and to check for the potential presence of light non-aqueous phase liquid (LNAPL).

Low-flow sampling techniques and dedicated tubing will be utilized to purge the monitoring wells and temporary well points prior to sample collection in accordance with EPA and prevailing NYSDEC protocols. A peristaltic pump will be used to purge and sample the 1-inch diameter permanent monitoring well (MW-8), and a submersible bladder pump will be used to purge and sample the 2-inch diameter temporary well points (TW-3 through TW-8) and the 2-inch diameter permanent monitoring wells (MW-1, MW-2, MW-5 through MW-7, and MW-9). The purged water will be monitored for turbidity and water quality indicators (i.e., pH, temperature, dissolved oxygen, oxidation-reduction potential, and specific conductivity) with measurements collected

approximately every five minutes. Purging of the wells will continue until the turbidity is less than 50 NTU for three successive readings and water quality indicators stabilize to the extent practicable. If turbidity and/or water quality indicators did not stabilize after two hours, purging will be discontinued and samples will be collected.

As described in Section 4.0, groundwater samples slated for laboratory analysis will be labeled and placed in laboratory-supplied containers and shipped to a NYSDOH ELAP-certified laboratory via courier with appropriate chain of custody documentation in accordance with appropriate EPA protocols. All groundwater samples will be analyzed for the VOCs listed in CP-51: Table 2 by EPA Method 8260. In addition, a minimum of three (or 20%) of the groundwater samples collected will be analyzed for the full NYSDEC Part 375 and Emerging Contaminants Lists, including TCL VOCs by EPA Method 8260, TCL SVOCs by EPA Method 8270, PCBs by EPA Method 8082, Pesticides by EPA Method 8081, Herbicides by EPA Method 8151, dissolved TAL metals by EPA's 6000/7000 series methods, 1,4-dioxane by EPA Method 8270 Selective Ion Monitoring (SIM), and TAL Per- and Polyfluoroalkyl Substances (PFAS) by Modified EPA Method 537. Additional samples will be collected and analyzed for QA/QC purposes in accordance with Section 4.4. The associated laboratory analytical data report will be prepared using Category B deliverables. A table summarizing the groundwater sampling locations and corresponding analytical parameters is included as Table 2 in the RIWP.

3.4 Fluid Level Gauging

Two rounds of fluid level gauging will be conducted on the nine permanent groundwater monitoring wells at the Site (MW-1 through MW-9) as part of the RI. The headspace at each monitoring well will be screened for the presence of VOCs using a calibrated PID after removing the well cap and an electronic oil/water interface probe accurate to 0.01 feet will be used to measure the depth to groundwater in each well, and to check for the potential presence of LNAPL. The fluid level measurements will be used to supplement the current groundwater elevation data and to create updated groundwater elevation contour maps.

3.5 Decontamination of Sampling Equipment

All sampling equipment (e.g., drilling rods, macrocore samplers, pumps, etc.) will be either dedicated or decontaminated between sampling locations. Decontamination will be conducted on plastic sheeting (or equivalent) that is bermed to prevent discharge to the ground. The decontamination procedure will be as follows:

1. Scrub using tap water/Simple Green® mixture and bristle brush.
2. Rinse with tap water.
3. Scrub again with tap water/Simple Green® mixture and bristle brush.
4. Rinse with tap water.
5. Rinse with distilled water.
6. Air-dry the equipment, if possible.

3.6 Management of Investigation Derived Waste (IDW)

Equipment decontamination fluids, grossly contaminated soil cuttings, and monitoring well purge water will be containerized in properly labeled DOT-approved 55-gallon drums for future off-site disposal at a permitted facility. The drums will be sealed at the end of each work day and labeled with the date, the well or boring number(s), the type of waste (i.e., contaminated drill cuttings, decontamination fluids, or purge water) and the name of an AKRF point-of-contact. All drums will be labeled "pending analysis" until laboratory data is available. All IDW will be disposed of or treated according to applicable local, state, and federal regulations. Disposable sampling

equipment, including spoons, gloves, bags, paper towels, etc. that come in contact with environmental media will be double bagged and disposed of as municipal trash in a facility trash dumpster as non-hazardous refuse.

4.0 SAMPLING AND LABORATORY PROCEDURES

4.1 Soil Sampling

Soil sampling will be conducted in accordance with the following procedures:

- Characterize the soil samples according to the modified Burmister soil classification system.
- Describe any evidence of contamination (e.g., non-aqueous phase liquid (NAPL), staining, sheens, and/or odors).
- Inspect the soil samples for evidence of contamination (e.g., odors and/or staining) using visual and olfactory methods and screen the samples for VOCs using a PID equipped with a 10.6 eV lamp. The PID will be calibrated each day in accordance with the manufacturer's specifications.
- Collect an aliquot of soil from each proposed sample location/interval, place the aliquot in laboratory-supplied containers as described in Section 4.3, Table 2, label the sample in accordance with Section 4.5.2, Table 3, and place the sample containers in an ice-filled cooler for shipment to the laboratory.
- Complete the proper chain of custody documentation and seal the cooler.
- Record the sample location, sample depth, and sample observations (evidence of contamination, PID readings, soil classification, etc.) in field log book and boring log data sheet, if applicable.
- Decontaminate reusable soil sampling equipment and discard disposal equipment between sample locations as described in Section 3.5.

4.2 Monitoring Well Sampling

Low flow sampling techniques, as described in U.S. EPA's Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers [EPA 542-S-02-001, May 2002], will be used to collect groundwater samples. As described in Section 3.3, a minimum of 10% of the groundwater samples collected will be analyzed for the for emerging contaminants (1,4-dioxane and PFAS) as required by the NYSDEC. The sampling for emerging contaminants will be conducted in accordance with the protocols for acceptable/specific sampling materials, equipment, QA/QC requirements, and personnel protective equipment published in the NYSDEC's Groundwater Sampling for Emerging Contaminants (April 2018) and Collection of Groundwater Samples for Perfluorooctonic Acid (PFOA) and Perfluorinated Compounds (PFCs) from Monitoring Wells Sample Protocol (Revision 1.2, June 29, 2016) guidance documents. Copies of the NYSDEC's guidance documents are included as Attachment B. Sampling will be conducted in accordance with the following procedure:

- Prepare the sampling area by placing plastic sheeting over the well. Cut a hole in the sheeting to provide access to the well cover.
- Slowly remove the well cap and immediately measure the vapor concentrations in the well with a PID calibrated in accordance with the manufacturer's specifications.
- Measure the depth to water and total well depth, and check for the presence of NAPL using an oil/water interface probe. Measure the thickness of NAPL, if any, and record in field book and well log. Groundwater samples will not be collected from wells containing measurable NAPL.

- Use the water level and total well depth measurements to calculate the length of the mid-point of the water column within the screened interval. For example, for a well where the total depth is 20 feet, screened interval is 10 to 20 feet, and depth to water is 14 feet, the mid-point of the water column within the screened interval would be 17 feet.
- Connect dedicated tubing to a peristaltic pump and/or submersible bladder pump, and lower the tubing and/or pump into the well such that the intake is set at the mid-point of the water column within the screened interval. Connect the discharge end of the tubing to the flow-through cell of a multi-parameter groundwater meter. Connect a length of tubing to the output of the flow-through cell and place the discharge end of the tubing in a five-gallon bucket. A peristaltic pump will be used to purge and sample the 1-inch diameter permanent monitoring well (MW-8), and a submersible bladder pump will be used to purge and sample the 2-inch diameter temporary well points (TW-3 through TW-8) and the 2-inch diameter permanent monitoring wells (MW-1, MW-2, MW-5 through MW-7, and MW-9).
- Activate the pump at the lowest flow rate setting of the pump.
- Measure the depth to water within the well following activation of the pump. The pump flow rate may be increased such that the water level measurements do not change by more than 0.3 feet as compared to the initial static reading. The well-purging rate should be adjusted so as to produce a smooth, constant (laminar) flow rate and so as not to produce excessive turbulence in the well. The expected targeted purge rate will be approximately 100 milliliters/minute.
- Collect water quality indicator parameters (e.g., turbidity, pH, temperature, dissolved oxygen, reduction-oxidation potential, and specific conductivity) during purging with measurements collected approximately every five minutes.
- Continue purging the well until turbidity is less than 50 NTU and water quality indicators have stabilized to the extent practicable. The criteria for stabilization will be three successive readings for the following parameters and criteria:

Table 1
Groundwater Sampling Stabilization Criteria

Parameter	Stabilization Criteria
Specific Conductance	+/- 3 mS/cm
Dissolved Oxygen	+/- 0.3 mg/l
pH	+/- 0.1 pH units
ORP/Eh	+/- 10mV
Turbidity	<50 NTU

Notes:
mS/cm = millisiemens per centimeter
mV = millivolts
NTU = nephthalometric turbidity units
mg/l = milligrams per liter

- If the water quality parameters do not stabilize and/or turbidity is greater than 50 NTU after two hours, purging may be discontinued. Efforts to stabilize the water quality for the well must be recorded in the field book, and samples may then be collected as described herein.
- After purging, disconnect the tubing to the inlet of the flow-through cell. Collect groundwater samples directly from the discharge end of the tubing and place into the required laboratory-supplied containers as described in Section 4.3, Table 2. Use an in-line filter to collect

samples slated for dissolved metals analysis. Label the sample in accordance with Section 4.5.2, Table 3, and place the sample in an ice-filled cooler for shipment to the laboratory.

- Once sampling is complete, remove the tubing and/or submersible pump from the well. Decontaminate the pump (if applicable), oil/water interface probe, and flow-through cell, as described in Section 3.5. Dispose of the dedicated sampling equipment, and transfer decontamination fluid and purge water to properly labeled DOT-approved 55-gallon drums for future off-site disposal at a permitted facility in accordance with Section 3.6.
- Record all measurements (depth to water, depth to NAPL, water quality parameters, turbidity), calculations (well volume) and observations in the project logbook and field data sheet, if applicable.

4.3 Laboratory Methods

Table 2 summarizes the laboratory methods that will be used to analyze field samples and describes the laboratory-supplied sample container type, preservation, and applicable holding times for each analysis. TestAmerica of Edison, NJ and Sacramento, CA, NYSDOH ELAP-certified laboratories subcontracted by AKRF, will be used for all chemical analyses in accordance with the Division of Environmental Remediation (DER)-10 Chapter 2. All analytical results will be reported with Category B deliverables. TestAmerica will achieve a minimum detection limit of 0.28 micrograms per liter (µg/L) for 1-4-dioxane and 2 nanograms per liter (ng/L) for the standard list of 21 PFAS compounds.

Table 2
Laboratory Analytical Methods for Analysis Groups

Matrix	Analysis	EPA Method	Container Type	Preservative	Hold Time
Soil and Soil QA/QC	Volatile Organic Compounds (VOCs)	8260C	EnCore Samplers (3) and 2 oz. Plastic Jar	≤ 6 °C	48 hours to extract; 14 days to analyze
	Semivolatile Organic Compounds (SVOCs)	8270D	8 oz. Glass Jar	≤ 6 °C	14 days to extract; 40 days to analyze
	Polychlorinated Biphenyls (PCBs)	8082A	8 oz. Glass Jar	≤ 6° C	14 days to extract; 40 days to analyze
	Pesticides	8081B	8 oz. Glass Jar	≤ 6 °C	14 days to extract; 40 days to analyze
	Herbicides	8151A	8 oz. Glass Jar	≤ 6 °C	14 days to extract; 40 days to analyze
	Target Analyte List (TAL) Metals, and Resource Conservation and Recovery (RCRA) 8 Metals plus Zinc	6000/7000 Series	8 oz. Glass Jar	≤ 6 °C	6 months for metals; 28 days for mercury

Matrix	Analysis	EPA Method	Container Type	Preservative	Hold Time
Groundwater and Groundwater QA/QC	VOCs	8260C	40 mL Glass Vials (3)	HCl to pH < 2 and ≤ 6 °C	14 days to analyze
	SVOCs and 1,4-Dioxane	8270D plus Selective Ion Monitoring (SIM) for 1,4-Dioxane	2,000 mL Amber Jar	≤ 6 °C	7 days to extract; 40 days to analyze
	Polychlorinated Biphenyls (PCBs)	8082A	2,000 mL Amber Jar	≤ 6 °C	7 days to extract; 40 days to analyze
	Pesticides	8081B	2,000 mL Amber Jar	≤ 6 °C	7 days to extract; 40 days to analyze
	Herbicides	8151A	2,000 mL Amber Jar	≤ 6 °C	7 days to extract; 40 days to analyze
	Target Analyte List (TAL) Metals	6000/7000 Series	500 mL Plastic	HNO_3 to pH < 2	6 months for metals; 28 days for mercury
	Per- and Polyfluoroalkyl Substances (PFAS) Compounds	Modified 537	3 x 250 mL Polypropylene Bottles	≤ 6 °C, Trizma	14 days to analyze

Notes:
EPA - Environmental Protection Agency

4.4 Quality Control (QC) Sampling

In addition to the laboratory analysis of the soil and groundwater samples, additional analysis will be included for QC measures, as required by the Category B sampling methods. These samples will include field blank, trip blank, matrix spike/matrix spike duplicate (MS/MSD), and blind duplicate samples at a frequency of one sample per 20 field samples per media or per sample delivery group (SDG). The MS/MSD and blind duplicate samples will be analyzed for the same list of parameters as the corresponding field sample. The field blank will be analyzed for the cumulative list of parameters designated for all corresponding field samples included in the same sample delivery group for each media. The laboratory-prepared trip blank will be analyzed for the VOC list only.

4.5 Sample Handling

4.5.1 Sample Identification

All samples will be consistently identified in all field documentation, chain-of-custody (COC) documents, and laboratory reports. Soil and groundwater samples collected during the RI will be identified with "SB-" for soil borings, "MW-" for groundwater monitoring wells, and "TW-" for temporary well points, and the soil boring, groundwater monitoring well, or temporary well point identification number. All sample IDs will be appended with a collection date at the end of the sample name in a year, month, day (YYYYMMDD) format. Soil sample IDs will also be appended with the sample collection depth interval in parentheses. Blind duplicate sample nomenclature will consist of the sample type, followed by an "X"; MS/MSD samples nomenclature will consist of the corresponding sample name and collection date, followed by "MS/MSD"; and trip and field blanks will consist of "TB-" and "FB-", respectively, followed by a sequential number of the trip/field blanks collected within the SDG. Special characters, including primes and/or apostrophes, will not be used for sample nomenclature. Table 3

provides examples of the sampling identification scheme for samples collected during the RI.

Table 3
Remedial Investigation Sample Nomenclature

Sample Description	Sample Designation
Groundwater sample collected from groundwater monitoring well MW-7 on November 1, 2018	MW-07_20181101
Matrix spike/matrix spike duplicate sample of groundwater sample collected from groundwater monitoring well MW-7 on November 1, 2018	MW-07_20181101_MS/MSDS
Blind duplicate sample of groundwater sample collected from groundwater monitoring well MW-7 on November 1, 2018	MW-X_20181101
Second field blank collected on November 1, 2018	FB-02_20181101
Soil sample collected from soil boring SB-26 between 7 and 9 feet below grade on November 1, 2018	SB-26_(7-9)_20181101
Blind duplicate sample of soil sample collected from soil boring SB-26 between 7 and 9 feet below grade on November 1, 2018	SB-X_(7-9)_20181101

4.5.2 Waste Classification Sample Identification

Any waste classification sample IDs associated with the IDW will be appended with "WC-" and the alphanumeric IDW drum identification number. Table 4 provides examples of the sampling identification scheme for proposed waste classification samples collected during the RI.

Table 4
Waste Classification Sample Nomenclature

Sample Description	Sample Designation
Waste classification sample collected from Drum 1 on November 1, 2018	WC-D1-20181101

4.5.3 Sample Labeling and Sample Shipment

All sample container labels will contain the following information:

- Project identification, including the Site name, BCP Site number, and Site address;
- Sample identification;
- Date and time of sample collection;
- Analysis(es) to be performed; and
- Sampler's initials.

Once the samples are collected and labeled, they will be wrapped in bubble wrap to prevent breakage and placed in chilled coolers that will be stored in a cool area away from direct sunlight. Field personnel will be responsible for maintaining the sample cooler(s) in a secured location until they are shipped to the laboratory, and will add ice to the cooler(s) as needed. The samples will be shipped to the laboratory via courier with appropriate COC documentation in accordance with EPA protocols. The COC documentation will be properly completed by the sampler in ink and will contain the

following information: project name; names of sampling personnel; sample name; sample matrix; date and time of collection; and signatures of individuals involved in sample transfer, including the dates and times of transfers. All coolers shipped to the laboratory will be sealed with a COC seal to ensure that the samples remain under strict COC protocol. Laboratory personnel will note the condition of the custody seal and sample containers at sample check-in. It is anticipated that samples will be shipped to the laboratory on a daily basis.

4.6 Field Instrumentation

Field personnel will be trained in the proper operation of all field instruments at the start of the field program. Instruction manuals for the equipment will be on file at the Site for referencing proper operation, maintenance, and calibration procedures. The equipment will be calibrated according to manufacturer specifications at the start of each day of fieldwork. If an instrument fails calibration, the project manager or QA/QC officer will be contacted immediately to obtain a replacement instrument. A calibration log will be maintained to record the date of each calibration, any failure to calibrate, and corrective actions taken. The PID will be equipped with a 10.6 eV lamp and will be calibrated each day using 100 parts per million (ppm) isobutylene standard gas in accordance with the manufacturer's specifications.

4.7 Quality Assurance (QA)

All soil and groundwater laboratory analytical data will be reviewed by a third-party validator and a Data Usability Summary Report (DUSR) will be prepared to document the usability and validity of the data. The RIR will include a detailed description of the RI sampling activities, data summary tables, figures showing sample locations and concentrations, laboratory reports, and DUSRs.

ATTACHMENT A

RESUMES OF PROJECT DIRECTOR, QUALITY ASSURANCE/QUALITY CONTROL OFFICER, PROJECT MANAGER, DEPUTY PROJECT MANAGER, AND FIELD TEAM LEADER AND ALTERNATE

REBECCA KINAL, P.E.

VICE PRESIDENT

Rebecca Kinal has over 20 years of experience in the assessment and remediation of soil and groundwater contamination and other hazardous/non-hazardous waste problems. Ms. Kinal's experience includes environmental due diligence, soil and groundwater investigations, leaking underground storage tank studies, soil gas/vapor intrusion surveys, and oversight of small- and large-scale remediation programs, including design of groundwater remediation systems and vapor mitigation systems. She has directed numerous Phase I and Phase II investigations and remediation programs, many of them in conjunction with commercial/residential developers, law firms, lending institutions, and public agencies. She is experienced in the cleanup of contaminated properties under New York State Brownfield Cleanup Program (BCP) regulations and the New York City "E-designation" program. As a part of this work, her duties have included technical and report review, proposal writing, scheduling, budgeting, and acting as liaison between clients and regulatory agencies, and project coordination with federal, state, and local authorities.

BACKGROUND

Education

M.S., Hydrogeology, Rensselaer Polytechnic Institute, 1995

B.S., Civil Engineering, Lafayette College, 1992

Licenses/Certifications

State of New York, P.E. Registration No. 082046, 2004

Years of Experience

Year started in company: 2000

Year started in industry: 1996

RELEVANT EXPERIENCE

New York City School Construction Authority On-Call Contract for Environmental Consulting Services, Various Sites, NY

Ms. Kinal serves as the project manager for AKRF's on-call hazardous materials consulting contract with the New York City School Construction Authority for over 8 years. For potential new school sites, assignments include initial due diligence, Phase I environmental site assessments, (ESAs) and subsurface investigation of soil, groundwater, and soil vapor to determine the suitability of a site for development as a school, likely remediation requirements, and associated costs. For sites undergoing design and development, assignments include preparation of remediation plan, contract specifications, and design drawings. The work has also included conducting indoor air quality testing, vapor intrusion assessments, preparation of specifications, supervision of storage tank removals, and investigation and remediation of spills for existing schools. Due to the sensitivity of school sites, work under this contract is often conducted on short notice and during non-school hours.

USTA National Tennis Center, Queens, NY

AKRF prepared an EIS for the New York City Departments of City Planning (DCP) and Environmental Protection (DEP) as co-lead agencies to analyze the expansion of the National Tennis Center, which includes

multiple improvements and construction projects at the USTA campus over several years. As part of the EIS requirements, AKRF prepared a Remedial Action Plan for implementation during the proposed project's construction. In accordance with the RAP, vapor mitigation systems were incorporated into the design for several of the proposed structures at the facility, including two new stadiums, a new transportation center, and several practice court facilities. Ms. Kinal prepared the specifications and design drawings for the vapor mitigation and is providing on-going construction support to review contractor submittals and inspect the vapor barrier and sub-slab depressurization system installations.

Montefiore Medical Center, Various Locations, NY

Ms. Kinal provides due diligence assistance to Montefiore Medical Center (MMC) for the ongoing expansion of their facilities, primarily in the Bronx and Westchester County. She conducts and manages environmental due diligence tasks related to their property transactions, including Phase I Environmental Site Assessments (ESAs), Phase II investigations, and geophysical surveys. She also assists MMC in making decisions with respect to environmental risk issues.

Queens West Development Project, Long Island City, NY

For over 20 years, AKRF has played a key role in advancing the Queens West development, which promises to transform an underused industrial waterfront property into one of largest and most vibrant mixed-use communities just across the East River from the United Nations. AKRF has prepared an Environmental Impact Statement that examines issues pertaining to air quality, land use and community character, economic impacts, historic and archaeological resources, and infrastructure. As part of the project, AKRF also undertook the largest remediation ventures completed to date under the NYSDEC Brownfields Cleanup Program (BCP). Ms. Kinal helped prepare the Remedial Work Plan (RWP) and oversaw the remediation of Parcel 9, a 1.8-acre former industrial site. Remediation includes installation of a sheet pile containment wall, excavation of coal tar- and petroleum-contaminated soil under a temporary structure to control odors during remediation, vapor mitigation for the future buildings, and institutional controls. Upon completion of the remediation activities, Ms. Kinal managed the preparation of a Final Engineering Report (FER) to document the clean-up activities. The NYSDEC issued a Certificate of Completion (COC) for the Parcel 9 site in December 2006. Ms. Kinal continues to oversee post-remediation monitoring and site management activities to ensure that the remedy remains in-place and effective.

Roosevelt Union Free School District, Roosevelt, NY

Ms. Kinal is managing environmental investigation and remediation activities for the sites of three new elementary schools and a new middle school in Roosevelt, New York. Remediation activities include removal/closure of contaminated dry wells and underground petroleum storage tanks, and excavation and off-site disposal of petroleum- and pesticide-contaminated soil.

Proposed NYC Public School Campus, Bronx, NY

Ms. Kinal provided environmental consulting services to the selected environmental remediation contractor for this former manufactured gas plant in the Mott Haven neighborhood of the Bronx, which was remediated under the NYSDEC BCP. These services included: preparation of an in situ sampling plan and excavation plan for waste characterization and disposal; supervision of waste characterization sampling activities; development and implementation of a community air monitoring program during all remediation activities; and daily reporting to the NYC School Construction Authority.

National Grid – Halesite Manufactured Gas Plant Site, Town of Huntington, NY

Ms. Kinal served as the project manager for the remedial design and engineering work associated with remediation of National Grid's former manufactured gas plant (MGP) located in the Town of Huntington. The site is situated

in a sensitive location along the waterfront, surround by commercial and residential properties, and half the property where the remediation was conducted is a steep slope. The remedy consisted of soil removal, oxygen injection, and non-aqueous phase liquid recovery. Ms. Kinal developed the remedial work plans, design/construction documents, and managed environmental oversight of the remedial work, including waste characterization and tracking, confirmatory endpoint sampling, air monitoring, and reporting to the NYSDEC. After the remediation work was completed, Ms. Kinal prepared appropriate close-out documentation in accordance with NYSDEC requirements.

Shell Service Station, Millwood, NY

Ms. Kinal planned and oversaw a Phase I Environmental Site Assessment and Phase II Subsurface Investigation of this active gasoline station in northern Westchester County. The Phase I/Phase II investigations were performed for the potential buyer of the property who wished to redevelop it with a more modern service station and convenience store. Ms. Kinal also prepared a conceptual remediation plan to address several areas of petroleum contamination identified during the Phase II. The plan, which was approved by NYSDEC, will be implemented in conjunction with the site redevelopment activities to achieve closure for several spills reported at the site.

Pelham Plaza Shopping Center Site Investigation & Remediation, Pelham Manor, NY

Ms. Kinal managed a Site Investigation at Pelham Plaza, an approximately ten-acre site that formerly contained a manufactured gas plant. The site was investigated under a voluntary clean-up agreement entered into with the NYSDEC by the site owner. The site investigation included advancing over 100 soil borings with continuous soil sampling to bedrock, installing monitoring and recovery wells, and conducting test pitting both indoor and outdoor locations to collect soil and groundwater samples and determine the extent of Non-Aqueous Phase Liquid (NAPL). The investigation also included: soil gas sampling to determine contaminant concentrations in the vapors beneath the foundation of an on-site retail store; sediment sampling in an adjacent creek to identify off-site impacts; and a tidal survey to determine tidal influence on groundwater levels at the site. Ms. Kinal also oversaw on-going interim remedial measures, which include biweekly pumping of recovery wells to remove dense NAPL (DNAPL) from the site subsurface.

Shaws Supermarket Redevelopment Project, New Fairfield, CT

Ms. Kinal managed the Remedial Investigation (RI) for an approximately nine-acre shopping center site that was contaminated by releases from former dry cleaning operations. The site was being redeveloped with a new supermarket and separate retail stores. The investigation included the installation of monitoring wells in the intermediate overburden aquifer and bedrock aquifer, sampling of existing and newly installed wells, geophysical logging in bedrock wells, and pump testing in intermediate and bedrock wells. Ms. Kinal prepared a Remedial Action Work Plan (RAWP) based on results from the RI, which included a groundwater pump and treat system to contain a plume of perchlorethylene (PCE)-contaminated groundwater, and excavation and disposal of contaminated soil in the presumed source area. Following CTDEP approval of the RAWP, Ms. Kinal prepared bid specifications for soil excavation and remediation system installation, and oversaw their implementation. Ms. Kinal also prepared NPDES permit applications for discharges from construction dewatering and the groundwater remediation system, and conducted associated discharge monitoring.

Yankee Stadium, Bronx, NY

Ms. Kinal performed the hazardous materials analysis for the Draft Environmental Impact Statement for the proposed new Yankee Stadium. The analysis included a Phase I Environmental Site Assessment of the entire project area and Subsurface (Phase II) Investigation in areas where environmental conditions were identified. The Phase II investigation included geophysical surveys to search for potential underground storage tanks; and soil, soil gas, and groundwater sampling at over 40 locations to determine potential environmental impacts during and after the proposed construction.

Avalon on the Sound, New Rochelle, NY

Ms. Kinal oversaw environmental investigation and soil remediation during the construction of two luxury high-rise apartment buildings and an associated parking garage. Investigation activities included an electromagnetic survey to search for possible underground storage tanks, and subsurface sampling to characterize soil and groundwater. Remediation activities included removing underground storage tanks, excavating and disposing of soil contaminated with volatile and semi-volatile organic compounds, and collecting end-of-excavation confirmation samples.

Davids Island Environmental Audit, New Rochelle, NY

Ms. Kinal managed the hazardous materials portion of the audit of this undeveloped island site, including a Phase I Environmental Site Assessment (ESA) and Subsurface (Phase II) Investigation in areas where environmental conditions were identified. The Phase II investigation included collecting soil samples from more than 100 locations and analyzing them for targeted compounds, including volatile organic compounds, semi-volatile compounds, metals, pesticides, and polychlorinated biphenyls (PCBs). Ms. Kinal also oversaw an electromagnetic (EM) survey conducted to identify the location of suspected underground storage tanks on the island. Based on soil sample results, Ms. Kinal estimated the volume of contaminated soil requiring remediation and prepared cost estimates for soil excavation and for transportation and disposal of contaminated soil and hazardous materials.

Outlet City Site Investigation, Queens, NY

Ms. Kinal prepared a work plan for remedial investigation of the Outlet City site, a property in Long Island City that was formerly occupied by a manufacturer of industrial cleaners and pharmaceuticals. The site is being investigated and remediated under the NYSDEC voluntary clean-up program. In preparing the work plan, Ms. Kinal evaluated results from several previous investigations and conducted a limited groundwater sampling program to determine future data needs for designing remediation of creosote-contaminated soil and groundwater. The work plan included additional soil and groundwater sampling, a tidal survey to determine tidal influence on groundwater levels, and pilot free product recovery testing. Ms. Kinal also helped design a venting system for an on-site basement and performed exposure calculations for the vented vapors.

Yonkers Waterfront Redevelopment Project, Yonkers, NY

For this redevelopment along Yonkers' Hudson River waterfront, Ms. Kinal supervised the remediation of Parcels H and I that were contaminated with hazardous soil. During the remediation process, she reviewed the subcontractor health and safety plans, delineated the areas of excavation, and oversaw field activities to ensure compliance with the specifications and appropriate regulations. This property was remediated under the NYSDEC Environmental Restoration Program (ERP).

U.S. Post Office Main Vehicle Maintenance Facility, Washington, D.C.

While with another firm, Ms. Kinal designed and supervised the installation of a remediation system to treat petroleum-contaminated groundwater. Ms. Kinal also established O&M and monitoring protocols to ensure efficient operation of the air sparging/soil vapor extraction system, and to monitor contaminant recovery/degradation rates.

Aberdeen Proving Ground Building 4025 Site, Aberdeen, MD

While with another firm, Ms. Kinal provided services for this leaking underground storage tank site, Ms. Kinal planned and oversaw investigation and pilot testing activities to delineate contamination and determine feasible in-situ remediation options. Investigation activities included soil and groundwater sampling using a direct-push (Geoprobe) rig and mobile laboratory. Pilot testing included in-situ respirometry testing, and field testing of bioremediation and free-product recovery technologies.

MICHELLE LAPIN, P.E.

SENIOR VICE PRESIDENT

Michelle Lapin is a Senior Vice President with more than 30 years of experience in the assessment and remediation of hazardous waste issues. She leads the firm's Hazardous Materials group and offers extensive experience providing strategic planning and management for clients. Ms. Lapin has been responsible for the administration of technical solutions to contaminated soil, groundwater, air and geotechnical problems. Her other duties have included technical and report review, proposal writing, scheduling, budgeting, and acting as liaison between clients and regulatory agencies, and project coordination with federal, state, and local authorities.

Ms. Lapin's hydrogeologic experience includes groundwater investigations, formulation and administration of groundwater monitoring programs and remediation throughout the Northeast. Her experience with groundwater contamination includes Level B hazardous waste site investigations; leaking underground storage tank studies, including hazardous soil removal and disposal and associated soil and water issues; soil gas/vapor intrusion surveys; and wetlands issues. Ms. Lapin is experienced in coordinating and monitoring field programs concerning hazardous waste cell closures. She has directed hundreds of Phase I, Phase II, and Phase III investigations and remediations, many of them in conjunction with developers, law firms, lending institutions, and national retail chains. She is also experienced in the cleanup of contaminated properties under Brownfield Cleanup Program (BCP) and Voluntary Cleanup Program (VCP) regulations.

BACKGROUND

Education

M.S., Civil Engineering, Syracuse University, 1985
B.S., Civil Engineering, Clarkson University, 1983

Professional Licenses/Certifications

New York State P.E.
State of Connecticut P.E.

Professional Memberships

Member, National Society of Professional Engineers (NSPE), National and CT Chapters
Member, American Society of Civil Engineers (ASCE), National and CT Chapters
Member, Connecticut Business & Industry Association (CBIA), CBIA Environmental Policies Council (EPC)
Member, Environmental Professionals' Organization of Connecticut (EPOC)
Board Member, New York City Brownfield Partnership
Member, NAIOP, a Commercial Real Estate Development Association

Years of Experience

Year started in company: 1994
Year started in industry: 1986

RELEVANT EXPERIENCE

Memorial Sloan Kettering Cancer Center-CUNY 74th Street EIS, New York, NY

AKRF was engaged by Memorial Sloan-Kettering Cancer Center (MSK) and CUNY-Hunter College (CUNY) to prepare an EIS for a proposed joint facility located on a New York City-owned parcel located between East 73rd Street and East 74th Street adjacent to the FDR Drive in Manhattan. The proposed facility was formerly occupied by the Department of Sanitation, with over 41 underground storage tanks, will include an ambulatory medical care center for MSK and educational and medical research facilities for CUNY.

Ms. Lapin led the hazardous materials work, which included the preparation of the Phase I and II environmental site assessments, remedial action work plans (RAWPs), and construction health and safety plans (CHASPs) for submission to the New York City Office of Environmental Remediation (OER) for the Voluntary Cleanup Program (VCP) and to the New York State Department of Environmental Conservation (NYSDEC) for remediation of a petroleum spill. The RAWPs and CHASPs included provisions for excavation of contaminated soil and rock, removal of tanks and environmental monitoring during the construction activities. AKRF also performed a pre-demolition asbestos survey of the remaining concrete foundation structures and prepared specifications for asbestos abatement, soil management and underground storage tank removal and disposal.

The subgrade remediation was completed in compliance with the OER-approved RAWP and the spill was closed by the NYSDEC. The project has been completed, the spill was closed by the NYSDEC, and a Notice of Satisfaction was issued from the OER.

New York City Transit Hazardous Materials On-Call Contract, Various Locations, New York City, NY

As part of a five-year, $10 million on-call environmental engineering and consulting services contract with MTA New York City Transit (NYCT), AKRF performed phase I Environmental Site Assessments (ESAs), asbestos, lead paint, indoor air quality and hazardous materials consulting services at various stations, tunnels and structures. Ms. Lapin oversaw the firm's team of technicians responsible for work at construction work sites occupied by multiple contractors and trades, monitoring contractor work practices, and inspection hazardous waste storage activities. She also reviewed AKRF's asbestos consulting services, coordinating the efforts of AKRF team members who conducted asbestos surveys and reporting, design services, and asbestos abatement oversight at manholes, stations, tunnels and other structures throughout New York.

Brooklyn Bridge Park, Brooklyn, NY

AKRF prepared an Environmental Impact Statement (EIS) and is continuing to provide technical and planning support services for Brooklyn Bridge Park, which revitalizing the 1.3-mile stretch of the East River waterfront between Jay Street on the north and Atlantic Avenue on the south. The new park, allows public access to the water's edge, allowing people to enjoy the spectacular views of the Manhattan skyline and New York Harbor. It also provides an array of passive and active recreational opportunities, including lawns, pavilions, and a marina. As with many waterfront sites around New York City, the lands along the Brooklyn waterfront have a long history of industrial activities. Some of these industries used dangerous chemicals and generated toxic by-products that could have entered the soil and groundwater. In addition, landfilling activities along the shoreline also used ash and other waste materials from industrial processes. Based on site inspections, historical maps, government records, and other sources, AKRF has been investigating the potential for the presence for hazardous materials in the park. This information was compiled into a Phase 1 Environmental Site Assessment report. AKRF has also provided and continues to support to the design team related to designing the project to minimize costs related to remediating hazardous materials where possible. Ms. Lapin is serving as senior manager for the hazardous materials investigations.

Columbia University Manhattanville Academic Mixed-Use Development, New York, NY

Ms. Lapin served as Hazardous Materials Task Leader on this Environmental Impact Statement (EIS) for approximately 4 million square feet of new academic, research and neighborhood uses to be constructed north of Columbia University's existing Morningside campus. The work included Phase I Environmental Site Assessments for the properties within the site boundaries, and estimates for a Subsurface (Phase II) Investigation of the entire

development area. The firm's Hazardous Materials group performed over 30 individual Phase I Environmental Site Assessments for properties within the development area. In addition, a Preliminary Environmental Site Assessment (PESA) was completed in conjunction with the Environmental Impact Statement (EIS). Based on the Phase I studies, AKRF conducted a subsurface (Phase II) investigation in accordance with a New York City Department of Environmental Protection (NYCDEP) approved investigative work plan and health and safety plan. Subsurface activities included the advancement of soil borings, groundwater monitor wells, and the collection of soil and groundwater samples for laboratory analysis. This study was used to estimate costs to remediate contaminated soil and groundwater, and underground storage tanks and hazardous building materials, including lead-based paint and asbestos-containing materials.

Albert Einstein College of Medicine Center for Genetic and Translational Medicine, Bronx, NY

Ms. Lapin directed the firm's hazardous materials work in connection with the construction a new Center for Genetics and Translational Medicine (CGTM) building on the Bronx campus of the Albert Einstein College of Medicine of Yeshiva University. AKRF prepared an Environmental Assessment Statement (EAS) that examined such issues as land use, zoning, air quality, urban design and visual resources, hazardous materials, traffic, noise, and air quality. Ms. Lapin's work included analysis of the existing conditions and potential impacts that the construction could cause to the environment and human health.

West 61st Street Rezoning/Residential Development, New York, NY

Ms. Lapin directed the firm's hazardous materials work for this mixed-use development in Manhattan. The Algin Management Company hired AKRF to prepare an environmental impact statement (EIS) for the proposed rezoning of the western portion of the block between West 60th and 61st Streets, between Amsterdam and West End Avenues. The purpose of the proposed action was to facilitate the development of two 30-story residential towers with accessory parking spaces, and landscaped open space. The EIS examined a "worst case" condition for rezoning the block, which allowed Algin to build a residential building of approximately 375,000 square feet at their site. The building now contains 475 apartments, 200 accessory parking spaces, a health club, and community facility space. This site, with the services of AKRF, entered into New York State's Brownfield Cleanup Program (BCP). On-site issues included underground storage tanks remaining from previous on-site buildings, petroleum contamination from these tanks and possibly from off-site sources, and other soil contaminants (metals, semi-volatile organic compounds, etc.) from fill materials and previous on-site buildings. AKRF oversaw the adherence to the Construction Health and Safety Plan (HASP), which was submitted to and approved by the New York State Department of Environmental Conservation (NYSDEC), and monitored the waste streams, to ensure that the different types of waste were disposed of at the correct receiving facilities. This oversight also included confirmation and characteristic soil sampling for the receiving facilities and NYSDEC. A "Track 1" Clean up of the majority of the property (the portion including the buildings) was completed and the final Engineering Report was approved by the NYSDEC. AKRF has also completed a smaller portion of the property as a "Track 4" cleanup, which includes a tennis court and landscaped areas. Ms. Lapin continues to manage the annual inspections for the property owner in accordance with the Brownfield Cleanup Agreement.

2477 Third Avenue, Bronx, NY

AKRF conducted the investigation and remediation of the former 2477 Third Avenue gasoline station property under the New York State Department of Environmental Conservation's (NYSDEC's) Brownfield Cleanup Program (BCP). The work included shallow and deep aquifer groundwater testing, delineation of known areas of soil contamination, soil vapor analyses, and investigation and delineation of non-aqueous phase liquid (DNAPL) from past industrial activities. Upon NYSDEC approval of the Remedial Action Work Plan (RAWP), AKRF conducted the removal of the nine on-site underground storage tanks (USTs) and 1,100 tons of petroleum-contaminated soil, the application of six in-situ chemical oxidation (ISCO) groundwater treatments, and the implementation of four Enhanced Fluid Recovery (EFR) events to remove desorbed gasoline-related hydrocarbons in the groundwater. The site received a Certificate of Completion (COC) from the BCP in

December 2015 and a Notice of Satisfaction (NOS) in October 2016 from the Mayor's Office of Environmental Remediation (OER) in connection with the hazardous materials E-Designation assigned to the property. Ms. Lapin was the professional engineer of record, responsible for the remediation design elements and overall adherence to the NYSDEC and New York City Office of Environmental Remediation (OER) regulations.

Larkin Plaza, Yonkers, NY – Remedial Investigation, Construction Oversight

AKRF assisted RXR Realty with enrolling the 1.1-acre Larkin Plaza site in the New York State Department of Environmental Conservation's (NYSDEC's) Brownfield Cleanup Program (BCP). Since being accepted into the program, AKRF conducted an extensive remedial investigation, prepared the necessary remedial action plans, managed the citizen participation tasks, and is in the process of conducting the remediation in conjunction with NYSDEC oversight. To date, the remedial work has included in-situ chemical oxidation (ISCO) treatments, contaminated soil removal, and petroleum product recovery. AKRF also assisted RXR with various construction-related services, including dewatering discharge permitting, soil disposal characterization testing, and storm water pollution prevention plan (SWPPP) preparation. AKRF's Cultural Resources department is in the process of preparing a submission to the State Historic Preservation Office (SHPO) on behalf of RXR related to the acquisition of additional public funding sources for the construction project. A Certificate of Completion (COC) from the NYSDEC is anticipated at the end of 2018. Ms. Lapin is the professional engineer of record, responsible for the remediation design elements and adherence to the NYSDEC-approved work plans and remediation design.

NY Wheel, Staten Island, NY

Working with the New York City Department of Small Business Services (SBS) as lead agency, AKRF conducted an environmental review for the forthcoming Empire Outlets and New York Observation Wheel (NY Wheel), a mixed-use development situated on a State Voluntary Cleanup Program (VCP) site managed by the New York City Economic Development Corporation (EDC), on the northern Staten Island waterfront. AKRF provided an EIS analyzing the combined project. In addition, AKRF prepared an updated Site Management Plan (SMP) reflecting the proposed development for the VCP site. The SMP was approved by the New York State Department of Environmental Conservation (NYSDEC) in March 2015.

Hazardous materials services provided by AKRF for New York Wheel LLC during construction on the NY Wheel site include environmental construction oversight, inspection and documentation of SSDS installation, soil sampling, and reporting to ensure compliance with the SMP, storm water pollution prevention plan (SWPPP) inspections, and site design services. AKRF's work entails regular coordination with EDC for reporting to NYSDEC, modifications to the SMP, etc. Ms. Lapin is the professional engineer of record, responsible for adherence to the NYSDEC-approved plans and coordination with the NYSDEC regarding the design elements.

443 Greenwich Street, Manhattan, NY

This Site was assigned an E-Designation for hazardous materials (as well as air quality and noise) during the North Tribeca Rezoning in 2010, which requires environmental testing and, if necessary, remediation to the satisfaction of the New York City Mayor's Office of Environmental Remediation (OER). After years of public opposition to the original redevelopment scheme calling for a boutique hotel, this former manufacturing building and its current developer gained acceptance through the Department of City Planning and the Landmarks Preservation Commission to move forward with redevelopment as residential lofts. The redevelopment process began in 2012 and led to initial re-occupancy in 2016 after overcoming several regulatory challenges while seeking LEED® certification.

Once trichloroethene (TCE) was identified on-site, the typically straight forward assignment of delineating contaminant sources for AKRF became much more complex following the identification of an off-site TCE groundwater plume. Based on the completion of several rounds of additional sampling and investigation activities including a compound specific isotopic analysis (CSIA) of the chlorinated volatile organic compounds (VOCs) detected in the central portion of the Site and the off-site monitor wells south of the Site, the presence of two

separate releases (one originating on-site and one originating off-site) of TCE was confirmed. Based on the confirmation that the Site was not the contamination source associated with the off-site plume, the redevelopment of the Site proceeded under the review of the OER, and did not require direct or continued oversight from the New York State Department of Environmental Conservation (NYSDEC). Furthermore, the developer of the Site, who had become the owner, was not deemed responsible to complete additional off-site investigation or remediation associated with the separate, off-site TCE groundwater plume.

For this project, AKRF utilized forensic-based analysis of chlorinated VOC plumes and was one of the first projects that included a groundwater treatment technology managed by the OER in its E-Designation program. The Site also includes an engineered cap to prevent exposure to underlying soil/fill, a vapor barrier/waterproofing system beneath the building slab and along foundation sidewalls, and the operation of an active sub-slab depressurization (SSD) system. The project was awarded the 2017 Environmental Protection award by the New York City Brownfield Partnership. Ms. Lapin was the professional engineer of record, responsible for the remediation design and adherence of the remediation and remediation systems installation and ongoing operation.

Hudson River Park, New York, NY

Ms. Lapin is directing AKRF's hazardous materials work during construction of Hudson River Park, a five-mile linear park along Manhattan's West Side. As the Hudson River Park Trust's (HRPT's) environmental consultant, AKRF has overseen preparation and implementation of additional soil and groundwater investigations [working with both the New York State Department of Environmental Conservation (NYSDEC) and the New York City Department of Environmental Protection (NYCDEP)], all health and safety activities, and removal of both known underground storage tanks and those encountered during construction. Previously, the firm performed hazardous materials assessments as part of the Environmental Impact Statement (EIS) process, including extensive database and historical research, and soil and groundwater investigations. Ms. Lapin has been the senior consultant for the soil and groundwater investigations and remediation, and the asbestos investigations and abatement oversight.

Roosevelt Union Free School District – District-wide Improvement Program, Roosevelt, NY

Ms. Lapin managed the hazardous materials investigation for the Draft and Final Environmental Impact Statements (EIS) for the improvement program, which included the demolition of three existing elementary schools and portions of the junior-senior high school, and the reconstruction of three replacement elementary schools, a separate replacement middle school, and renovations to the high school. Following the EIS, additional hazardous materials investigations were completed, including comprehensive asbestos and lead surveys; Phase I and Phase II Environmental Site Assessments; the preparation of asbestos, lead, hazardous materials and demolition specifications; and obtaining site-specific variances from the New York State Department of Labor (NYSDOL). The middle school remediation was conducted through coordination with the New York State Department of Environmental Conservation (NYSDEC), the New York State Department of Health (NYSDOH), the New York State Education Department (NYSED) and the local school district. The project was approved, and construction/renovation for the new middle school completed such that the school opened for the Fall 2008 semester as planned.

Fiterman Hall Deconstruction and Decontamination Project, New York, NY

The 15-story Fiterman Hall building, located at 30 West Broadway between Barclay and Murray Streets, originally constructed as an office building in the 1950s, had served as an extension of the City University of New York (CUNY) Borough of Manhattan Community College (BMCC) since 1993. The building was severely damaged during the September 11, 2001, attack on the World Trade Center (WTC) when 7 WTC collapsed and struck the south façade of the building, resulting in the partial collapse of the southwest corner of the structure. The building was subsequently stabilized, with breaches closed and major debris removed, however, extensive mold and WTC dust contaminants remain within the building, which must be taken down. The project required the preparation of two Environmental Assessment Statements (EASs) for the redevelopment of Fiterman Hall—one for the deconstruction and decontamination of the building and one for the construction of a replacement building on the

site. AKRF prepared the EAS for the Deconstruction and Decontamination project, which included the decontamination of the interior and exterior of the building, the removal and disposal of all building contents, and the deconstruction of the existing, approximately 377,000-gross-square-foot partially collapsed structure. Ms. Lapin reviewed the deconstruction and decontamination plans for the EAS. The cleanup plan was submitted to the United States Environmental Protection Agency (USEPA).

Yonkers Waterfront Redevelopment Project, Yonkers, NY

For this redevelopment along Yonkers' Hudson River waterfront, Ms. Lapin headed the remedial investigation and remediation work that included Phase I Environmental Site Assessments of 12 parcels, investigations of underground storage tank removals and associated soil remediation, remedial alternatives reports, and remedial work plans for multiple parcels. Several of the city-owned parcels were remediated under a Voluntary Cleanup Agreement; others were administered with state Brownfields grants. Hazardous waste remediation was completed on both brownfield and voluntary clean-up parcels, which enabled construction of mixed-use retail, residential development, and parking.

Davids Island Site Investigations, New Rochelle, NY

Ms. Lapin managed the hazardous materials investigation of Davids Island, the largest undeveloped island on the Long Island Sound in Westchester County. The 80-acre island features pre- and post-Civil War military buildings and parade grounds, and is viewed as a major heritage, tourism, and recreational amenity. The island, formerly known as Fort Slocum, was used by the U.S. military, beginning in the 19th century, as an Army base, hospital, and training center. The island was planned for county park purposes. The investigation included a Phase I Environmental Site Assessment, with historical research going back to the 17th century, a Phase II (Subsurface) Investigation, underground storage tank investigations, asbestos surveys, and conditions surveys of all remaining structures. Cost estimates were submitted to Westchester County for soil remediation, asbestos abatement, and building demolition.

Site Selection and Installation of 11 Turbine Generators, New York and Long Island, NY

AKRF was retained by the New York Power Authority (NYPA) to assist in the State Environmental Quality Review Act (SEQRA) review of the proposed siting, construction, and operation of 11 single-cycle gas turbine generators in the New York metropolitan area. Ms. Lapin managed the hazardous materials investigation of the sites. The work has included Phase I Environmental Site Assessments, subsurface investigations, and construction health and safety plans.

Cross Westchester (I-287) Expressway Phases V and VI, Westchester County, NY

For the New York State Department of Transportation's (NYSDOT) I-287 reconstruction project, Ms. Lapin served as Project Manager and was responsible for directing the contaminated materials aspect of the final design effort for the reconstruction of Westchester County's major east-west artery. As part of her duties, Ms. Lapin managed the asbestos investigations at eight bridges and wetland delineation along the entire corridor and wrote the scope of work and provided general management of the project.

Supermarket Redevelopment, New Fairfield, CT

AKRF provided consulting services to the developer and owner of a nine-acre site, including conducting a remedial investigation and remediation of a site contaminated from former dry cleaning operations and off-site gasoline spills. The investigation included the installation of monitoring wells in three distinct aquifers, geophysical logging, pump tests, and associated data analysis. Ms. Lapin presented the environmental issues and planned remediation to local and state officials during the early stages of the planning process to incorporate their comments into the final remedial design. A remedial action work plan (RAWP) was completed and approved by the Connecticut Department of Environmental Protection (CTDEP) within a year to enable redevelopment work for a new supermarket and shopping center. The RAWP included the remediation of soil within the source area

and a multi-well pump and treat system for the recovery of non-aqueous and dissolved phase contamination in groundwater. The design of the recovery well system included extensive groundwater modeling to ensure capture of the contaminant plume and the appropriate quantity and spacing of the wells. Ms. Lapin directed the soil removal remedial activities and monitoring for additional potential contamination during construction. In addition, AKRF performed comprehensive pre-demolition asbestos and lead-based paint surveys of the former site structures, conducted abatement, air monitoring and oversight, and provided environmental consulting support for the development of the site. The groundwater remediation system was installed during site development and began operation once development was complete.

Broad Street, Stamford, CT [former Project name: Target Stamford)

AKRF originally completed a Phase I Environmental Site Assessment (ESA) for a developer of this property, located at southeastern corner of Broad Street and Washington Boulevard in downtown Stamford, Connecticut, for a proposed residential development. Four years later, an update of this Phase I ESA was conducted for a proposed Target retail development. The study area included the current Target site and the west-adjacent site which was subsequently developed as a luxury residential tower. Following the Phase I report, a subsurface (Phase II) investigation was conducted, which included soil borings, groundwater monitor wells, soil and groundwater sample collection and analysis. The results of the Phase II investigation were used to develop a remediation strategy. An additional Phase I/Phase II investigation was conducted of the adjacent former transmission repair facility, which included a site inspection, review of local and state records, an underground storage tank markout survey, advancement of soil borings, and collection of soil samples for laboratory analysis. AKRF also conducted asbestos surveys prior to abatement and demolition of the former Broad Street and Washington Boulevard buildings.

EPA Brownfields Assessment Program, Naugatuck, CT

Ms. Lapin is currently serving as the Principal-in-Charge for a USEPA Brownfields Assessment program project in Naugatuck, Connecticut. She is overseeing the assessment and investigation of key development parcels, including Work Plan and QAPP preparation, and conducting community outreach tasks to communicate site risks and the project process. Mr. Stefaniak plays the lead role in administering the USEPA Cooperative Agreement on behalf of the Borough.

East 75th/East 76th Street Site, New York, NY

Ms. Lapin served as Senior Manager for this project that encompassed coordination and direct remediation efforts of this former dry cleaning facility and parking garage prior to the sale of the property and its ultimate redevelopment for use as a private school. A preliminary site investigation identified 20 current and former petroleum and solvent tanks on the property. A soil and groundwater testing program was designed and implemented to identify the presence and extent of contamination resulting from potential tank spills. This investigation confirmed the presence of subsurface petroleum contamination in the soil and solvent contamination from former dry cleaning activities in the bedrock. AKRF completed oversight of the remediation under the State's Voluntary Cleanup Program. Remediation, consisting of tank removals and excavation of contaminated soil and the removal of solvent-contaminated bedrock down to 30 feet below grade, has been completed. AKRF completed oversight of the pre-treatment of groundwater prior to discharge to the municipal sewer system and an off-site study to determine impacts to groundwater in downgradient locations.

Former Macy's Site, White Plains, NY

While assisting Tishman Speyer with plans to redevelop this site, Ms. Lapin managed the pre-demolition work, which included a Phase I site assessment; subsurface investigation (Phase II), including the analysis of soil and groundwater samples for contamination; a comprehensive asbestos, lead paint, and PCB investigation; radon analysis; and coordination and oversight of the removal of hazardous materials left within the building by previous

tenants. Work also included asbestos abatement specifications and specifications for the removal of two 10,000-gallon vaulted fuel-oil underground storage tanks.

Storage Deluxe, Various Locations, NY

Ms. Lapin manages the firm's ongoing work with Storage Deluxe, which includes Phase I Environmental Site Assessments and Phase II Subsurface Investigations, underground storage tank removals and associated remediation, asbestos surveys and abatement oversight, and contaminated soil removal and remediation for sites in Connecticut, the Bronx, Brooklyn, Manhattan, Westchester County, and Long Island.

Home Depot, Various Locations, NY and CT

Ms. Lapin, serving as either Project Manager or Senior Manager, has managed the investigations and remediation at multiple Home Depot sites in the five boroughs, Long Island, and Connecticut. The investigations have included Phase I, II, and III site assessments, asbestos and lead paint surveys, abatement specifications and oversight, and soil and groundwater remediation.

Avalon on the Sound, New Rochelle, NY

For Avalon Bay Communities, Ms. Lapin managed the investigations and remediation of two phases of this residential development, including two luxury residential towers and an associated parking garage. Remediation of the first phase of development (the first residential tower and the parking garage) included gasoline contamination from a former taxi facility, fuel oil contamination from multiple residential underground storage tanks, and chemical contamination from former on-site manufacturing facilities. The remediation and closure of the tank spills was coordinated with the New York State Department of Environmental Conservation (NYSDEC). The initial investigation of the Phase II development—an additional high-rise luxury residential building—detected petroleum contamination. A second investigation was conducted to delineate the extent of the contamination and estimate the costs for remediation. AKRF oversaw the remediation and conducted the Health and Safety monitoring. The remediation was completed with closure and approvals of the NYSDEC.

Mill Basin, Gerritsen Inlet, and Paerdegat Basin Bridges, Final Design, Shore Parkway, Brooklyn, NY

Following the preparation of the Generic Environmental Impact Statement (GEIS) for the Belt Parkway Bridges Project, the firm was retained for supplemental work during the final design phase of the project. This included National Environmental Policy Act (NEPA) and State Environmental Quality Review Act (SEQRA) documentation for three of the bridges—Mill Basin, Gerritsen Inlet, and Paerdegat Basin—which will be federally funded. Ms. Lapin managed the contaminated materials investigation that included a detailed subsurface contaminated materials assessment, both subaqueous and along the upland approaches.

NYSDOT Transportation Management Center (TMC), Hawthorne, NY

AKRF conducted environmental studies for the New York State Department of Transportation (NYSDOT) at the current troopers' headquarters in Hawthorne, NY. The property is the proposed site of a new Transportation Management Center. AKRF completed a comprehensive asbestos survey of the on-site building and prepared asbestos abatement specifications; performed a Phase I site assessment; conducted an electromagnetic (EM) survey that located two fuel oil underground storage tanks, and developed removal specifications for the two underground storage tanks and an aboveground storage tank.

Metro-North Railroad Poughkeepsie Intermodal Station/Parking Improvement Project, Poughkeepsie, NY

Ms. Lapin served as Project Manager of the hazardous materials investigation in connection with AKRF's provision of planning and environmental services for parking improvement projects at this station along the Hudson Line. The project included an approximately 600-space garage, additional surface parking, and an intermodal station to facilitate bus, taxi, and kiss-and-ride movements. Ms. Lapin conducted Phase I and II

contaminated materials assessments and worked with the archaeologists to locate an historical roundhouse/turntable.

Metro-North Railroad Golden's Bridge Station Parking Project, Westchester County, New York

For Metro-North Railroad, Ms. Lapin managed a Phase I Environmental Site Assessment of a property that has since become the new parking area, used by the existing Golden's Bridge train station. Ms. Lapin also conducted a subsurface (Phase II) investigation of the original parking area, track area, and existing platform for the potential impact of moving tracks in the siding area to extend the existing parking area and adding an access from a proposed overhead walkway (connecting the train station to the new parking area over a highway). The study also included an assessment for lead-based paint and asbestos on the platform structures.

East River Science Park, New York, NY

Originally, New York University School of Medicine (NYUSOM) retained the firm to prepare a full Environmental Impact Statement (EIS) for its proposed East River Science Park (ERSP). The proposed complex was to occupy an underutilized portion of the Bellevue Hospital campus between East 30th Street and approximately East 28th Street, immediately south of NYU's campus. As originally contemplated, Phase I was to include 618,000 square feet of development, including a clinical practice and research building, a biotech center, 220 housing units for post-doctorate staff, a child care center, and a conference center. This phase would include reuse of the former Bellevue Psychiatric Building, a historic structure on East 30th Street east of First Avenue. Phase II was to include a second biotech building with a library to serve NYU and Bellevue at the eastern end of the block between 29th and 30th Streets. Phase III was to include a third biotech building and parking. The project's EIS considered a full range of issues, including land use, socioeconomics, shadows, historic resources, open space, traffic and transportation, air quality, noise, and construction. The firm also prepared all of the traffic and transportation studies for the urban design and master planning efforts. Ms. Lapin managed the Phase I Environmental Site Assessment and other hazardous materials-related issues.

Events relating to September 11, 2001 put a hold on the project for a number of years. When the project resurfaced, it had a new developer and a decreased scope. Ms. Lapin updated the hazardous materials issues for the new developer and consulted with them regarding remediation strategies and involvement of regulatory agencies. For the actual remediation/development, the city requested oversight by AKRF to represent its interests (the city is retaining ownership of the land). Ms. Lapin completed directing the remediation oversight on behalf of the City of New York for the remediation of the former psychiatric hospital building, laundry building and parking areas associated with Bellevue Hospital. The new development includes a biotechnology center (Commercial Life Science Research and Office Park) comprising two buildings (combined 550,000 square feet), street level retail, and an elevated plaza.

68, 76 and 78 Forest Street and 96-98 Grove Street, Stamford, CT

Ms. Lapin led this project, for which AKRF was retained to complete a Phase I Environmental Site Assessment (ESA) of five residential properties, and asbestos surveys and lead-based paint surveys of the five multi-family residential structures prior to a real estate transaction. The investigations were completed to allow demolition of the residential structures and prepare the properties for development into the Highgrove high rise condominium complex. AKRF represented the purchaser and site developer during the due diligence process, identified areas of environmental concern, and completed underground storage tank closure activities prior to initiating site development. In addition, AKRF conducted a Phase I ESA of a property on Summer Street that was being used by the developer as a "temporary" office building and a parking area utilized as a sales center and apartment model for the Highgrove residential development.

Shelton Storage Deluxe, Shelton, CT

AKRF completed Phase I, Phase II and Tank Removal/Remediation services for a storage facility in Shelton, Connecticut. Based on this information from the Phase I ESA, AKRF conducted a Phase II study that revealed

groundwater impact (gasoline), possibly from an off-site source. Additional testing was then conducted to determine the source of the gasoline contamination. Testing of a wood block floor revealed concentrations of volatile and semivolatile organic compounds and total petroleum hydrocarbons; therefore, disposal of this material had to be as a petroleum-contaminated waste. The additional testing included upstream and downstream surface water samples, and on-site detention pond water and sediment samples. Subsequent to the Phase II testing, a 4,000-gallon on-site underground storage tank was removed. Upon removal, contaminated soil and groundwater were observed and a spill was called into the Connecticut Department of Environmental Protection (CTDEP). Following completion of remedial activities and submission of a closure report, the spill was closed by the CTDEP. Ms. Lapin directed the firm's efforts to complete this project.

DPR Soundview Park Playgrounds and Open Space, Bronx, NY

AKRF is part of a team working on the reconstruction of this 212-acre NYCDPR public park located along the Bronx River in the Bronx, New York. The park was identified as an underutilized park and is being improved in accordance with the goals of PlaNYC. Ms. Lapin is overseeing AKRF's hazardous materials investigations including environmental and remediation-related work. AKRF prepared the Environmental Assessment Statement (EAS) and the project has moved into the design and construction phase. The remediation/construction of multiple phases of the development is currently underway.

164 Kent Avenue, Brooklyn, NY (AKA Northside Piers and 1 North 4th Place)

The project was a multi-phase development consisting of a large waterfront block in the Williamsburg Rezoning Area. The project site has been developed with a mixed-use residential-commercial high rise towers with an esplanade and a pier along the East River. AKRF provided acquisition and development support, including performing Phase I and II environmental site assessments, and preparation of Remedial Action Plans (RAPs) and Construction Health and Safety Plan (CHASPs) for approval by DEP and OER. AKRF provided assistance with construction oversight during soil handling activities and managing the Community Air Monitoring Plan (CAMP) activities. To date, closure reports have been prepared and occupancy achieved for three of the four buildings. Ms. Lapin is the Professional Engineer (P.E.) of record for the DEP and OER RAPs, CHASPs and Remedial Closure Reports (RCRs).

Rego Park Home Depot, Queens, NY

Solvent contamination was encountered during retail development of a former industrial property in Rego Park, Queens, New York. The site work included an extensive investigation and a multi-phase remediation performed under the NYSDEC Voluntary Cleanup Program (BCP). Remediation included removal of aboveground and underground storage tanks (ASTs and USTs) and hotspot soil removal. An Air Sparging/Soil Vapor Extraction (AS/SVE) groundwater remediation system designed by AKRF was installed as part of the building construction. Continued remediation work included upgrading and expanding the AS/SVE system after the store was opened. AKRF prepared the Final Engineering Report and obtained closure with a Release and Covenant Not to Sue issued by NYSDEC in 2013. AKRF continues operations, maintenance, and monitoring under the NYSDEC-approved Site Management Plan. Ms. Lapin is the Professional Engineer (P.E.) of record for the remediation design and implementation in accordance with the NYSDEC Brownfield Cleanup Program (BCP).

250 North 10th Street, LLC., Residential Redevelopment Site, Brooklyn, NY

AKRF was retained to investigate and remediate this former industrial property in the Williamsburg section of Brooklyn, New York in connection with site redevelopment. The site is approximately 50,000 square feet, and redevelopment included a six story residential building and parking garage. The work was completed to satisfy the requirements of the NYC E-designation Program and NYC Voluntary Cleanup Program (NYC VCP). AKRF completed a Remedial Investigation (RI) to evaluate the nature and extent of site contamination, and developed a Remedial Action Work Plan (RAWP) to properly address site contamination during redevelopment. Remediation included removal of underground storage tanks, more than 7,500 tons of contaminated soil, and installation of a

vapor barrier and site cap across the entire property. The remediation was completed under oversight of the NYC Office of Environmental Remediation (OER), and in a manner that has rendered the Site protective of public health and the environment consistent with residential use of the property. Ms. Lapin is the Professional Engineer (P.E.) of record for the remedial effort in accordance with the OER Voluntary Cleanup Program (VCP).

AP-Williamsburg, LLC, 50 North 5th Street Development, Brooklyn, NY

AKRF directed the remedial program at a 55,000-square foot site located in the Williamsburg section of Brooklyn, New York. The site had an industrial and manufacturing history for over 100 years that included a barrel making factory, use of kilns, and a carpet and flooring materials warehouse. AKRF completed a Remedial Investigation (RI) to evaluate the nature and extent of site contamination, and developed a Remedial Action Work Plan (RAWP) to properly address site contamination during redevelopment. Remediation included removal of more than 5,000 tons of contaminated soil, and installation of a vapor barrier and sub-slab depressurization system (SSDS) beneath the site building. The remediation was completed in a manner that has rendered the Site protective of public health and the environment consistent with commercial and residential use of the property, and in accordance with the requirements of the NYC OER E-designation program. The site includes a seven story residential apartment building with street level retail space and a parking garage. Ms. Lapin is the Professional Engineer (P.E.) of record for the NYC OER RAWP and Remedial Closure Report (RCR).

New York City School Construction Authority (NYCSCA), Environmental Consulting Hazardous Materials Services

AKRF has undertaken various assignments under consecutive hazardous materials on-call contracts, including environmental assessment, remedial design, and plumbing disinfection consulting tasks. For potential new school sites, assignments include initial due diligence, Phase I environmental site assessments (ESAs) and multi-media subsurface investigation of soil, groundwater, and soil vapor to determine the suitability of a site for development as a school, likely remediation requirements, and associated costs. For sites undergoing design and development, assignments include preparation of remediation plans, design of sub-slab depressurization systems (SSDS) and contract specifications, and construction oversight. The work has also included conducting Phase I ESAs and indoor air quality testing, preparation of specifications, supervision of storage tank removals, and investigation and remediation of spills for existing schools. Due to the sensitivity of school sites, work under this contract is often conducted on short notice and during non-school hours. Ms. Lapin is the QA/QC officer for all of the SCA hazardous materials assignments and the Professional Engineer (P.E.) of record for the various remediation systems, including SSDS. In addition, Ms. Lapin is also the QA/QC officer for the lead in drinking water and plumbing disinfection tasks also under AKRF's on-call hazardous materials consulting contract with the NYCSCA. AKRF performed lead in drinking water sampling in about 160 schools during two three-month periods in 2016 and 2017 and continues to provide lead sampling, reporting, and recommendations as new plumbing is installed. AKRF also oversees plumbing disinfection work, which is required prior to new plumbing being placed into service. The assignments involve reviewing and commenting on disinfection plans, supervision of the disinfection and confirmation testing, and preparation of reports documenting that the work was conducted in accordance with the specifications and applicable requirements. As with the Phase I/II studies, work under the lead testing and plumbing disinfection contract is often conducted on short notice during non-school hours.

TIMOTHY MCCLINTOCK

ENVIRONMENTAL SCIENTIST

Mr. McClintock has over 9 years of environmental consulting experience, including implementing and managing Phase I Environmental Site Assessments, Phase II Environmental Site Investigations and Remedial Investigations, overseeing remedial action programs including soil excavation, groundwater handling, remediation system installation, operation and maintenance, and project management and reporting. He has successfully remediated projects and obtained closure from several northeast authorities, including the New York State Department of Environmental Conservation (NYSDEC), New Jersey Department of Environmental Protection (NJDEP), Pennsylvania Department of Department of Environmental Protection (PADEP), Connecticut Department of Energy & Environmental Protection (CTDEEP) and Massachusetts Department of Environmental Protection (MassDEP).

BACKGROUND

Education
B.S. Environmental Science/Earth Science, University at Albany, 2008

Licenses & Certifications
OSHA 40-hour Health & Safety Training for Hazardous Waste Operations (September, 2019)
OSHA 10-hour Health and Safety Training for Construction Safety and Health
NJDEP Subsurface Evaluator & UST Closure (December, 2019)
NYSDOH Certified Asbestos Inspector (March, 2019)
NYSDOH Mold Assessor (November, 2018)

Years of Experience
Date started at AKRF: August, 2017
Prior industry experience: Dorson Environmental Management, Inc. – August 2008 to August 2017 (9 years)

RELEVANT EXPERIENCE

Former Farm Gasoline Underground Storage Tank Remediation, Somerset County, NJ

Mr. McClintock serves as the field team leader and deputy project manager for the LSRP-led remediation of a former gasoline UST located on a farm property in the Watchung Mountain region of New Jersey. Following a site investigation (contamination screening), AKRF is currently conducting an investigation to bioremediate groundwater at the site, which contains residual benzene and MTBE. Mr. McClintock is integral to the preparation of a Remedial Action Workplan (RAWP), for the carrying out of groundwater sampling investigations, a biotreatability study, and the evaluation of data resulting from the site work.

1-65 North 12th Street, Brooklyn, New York

The former Bayside Fuel Oil Company operated a commercial petroleum bulk storage facility at the property for several decades. Soil and groundwater contamination resultant of on-site and off-site petroleum releases, off-site manufactured gas plant (MGP) releases, and historic fill have been identified throughout the property. Mr. McClintock assisted senior AKRF project staff with the evaluation of historical assessment information, the preparation of a Remedial Action Plan (RAP), and a Construction Health and Safety Plan (CHASP) for this site.

Confidential Client: New York City Institutional Site - Soil Classification:

Mr. McClintock is the field team leader for the soil classification work associated with the proposed development of an addition at a New York City institutional site. He assisted senior project staff with the coordination of site work,

and directed the field effort including the collection of soil samples to characterize the current subsurface conditions. Mr. McClintock's role included evaluating soil analytical data and project reporting.

White Plains Mall, 200 Hamilton Avenue, White Plains, New York - Spill Investigation and Brownfield Cleanup Program Enrollment

Mr. McClintock served as the field team leader for the Spill Investigation work associated with historic gasoline stations at the White Plains Mall. He assisted senior project staff with the evaluation of historical assessment information, and the development and implementation of a Spill Investigation to delineate the extent of petroleum-contaminated soil and groundwater. He directed field sampling, including soil and groundwater samples, and evaluated the data and associated reporting. The project would apply for the NYSDEC Brownfield Cleanup Program.

Proposed Public School, Queens, New York - Phase II Investigation

Mr. McClintock served as field team leader for the Phase II Investigation work associated with proposed development of NYCDOE Public School at a vacant lot in Queens, New York. He assisted senior project staff with the evaluation of historical assessment information, the development and implementation of the Phase II Investigation to characterize the current subsurface conditions, and directed the field effort including the collection of soil, soil vapor, and groundwater samples. Mr. McClintock evaluated analytical data, and contributed to the reporting effort.

Petroleum Release/Oil Tank Remediation Projects – New York, New Jersey, Pennsylvania and Connecticut (2008 – 2017)

Mr. McClintock completed the design and implementation of environmental investigations and remediation projects associated with petroleum releases at residential and commercial sites throughout the northeast. Tasks included project design, site investigation, project direction and oversight, soil and groundwater sampling, data evaluation, client and contractor coordination, regulatory agency interaction and associated reporting and deliverable production.

Phase I Environmental Site Assessment and Phase II Environmental Site Investigation Projects – New York and New Jersey (2008 – 2017)

Mr. McClintock completed Phase I and Phase II environmental site assessments (ESAs) and investigations (ESIs) at residential and commercial properties associated with real estate transactions. Tasks included site inspections, historic environmental data report and regulatory record evaluations, environmental media sampling, client and contractor coordination, and associated reporting and deliverable production.

Storm Water Investigation Projects – New York (2008 – 2017)

Mr. McClintock assisted senior project staff with the investigation of actual and suspected storm water discharges at various sites throughout New York while at Dorson Environmental Management, Inc. Tasks included investigation into suspected non-permitted storm water discharges for environmental attorneys, preparation of Storm Water Pollution Prevention Plans (SWPPP) to assist property owners with obtaining the NYSDEC General Permit for Storm Water Discharges, storm water sampling, storm water drainage mapping, data evaluation, and associated reporting and deliverable production.

Former Flamingo Cleaners, 149 North Avenue, New Rochelle, New York

Mr. McClintock completed site investigations, developed a Remedial Action Work Plan (RAWP), provided remediation oversight and regulatory agency interaction, conducted environmental media sampling, and prepared report packages associated with comingled petroleum and chlorinated contamination at a former dry cleaning facility. The work was conducted in accordance with the NYSDEC Brownfield Cleanup Program and included site characterization, excavation and disposal of contaminated source material, removal and treatment of contaminated

groundwater, in situ chemical oxidation of residual contamination and the implementation of institutional and engineering controls.

Former Gasoline Station, 66 Milton Road, Rye, NY

Mr. McClintock designed and implemented a site investigation and remedial excavation program to address historic contamination at a former gasoline station. The site work included the delineation of the residual soil and groundwater contamination, excavation of contaminated source material, removal of contaminated groundwater, post-remedial soil and groundwater sampling and associated reporting to close the NYSDEC spill number associated with the property. All site work was coordinated through the current building management and tenant association, the NYSDEC and the City of Rye.

Water and Mold Damage Investigation and Remediation Projects – New York, New Jersey, and Connecticut (2008 – 2017)

Mr. McClintock completed the design and implementation of environmental investigations, cause and origin analyses, and remedial projects associated with water and mold damage claims for various insurance carriers during his tenure with Dorson Environmental Management. Tasks included site investigation, cause and origin determination, project direction and oversight, environmental media sampling, data evaluation, client and contractor coordination, and associated reporting and deliverable production.

PATRICK MCHUGH, PROFESSIONAL ENGINEER

SENIOR PROFESSIONAL

Patrick McHugh is a Senior Professional with more than five years of professional experience in assessment, investigation, and remediation of environmental contamination-related issues. Mr. McHugh also has 16 months' experience in petroleum engineering associated with exploration of oil and gas aquifers.

Mr. McHugh has managed a variety of environmental projects with multi-disciplinary teams, including public agencies, developers, property owners, architects, and construction managers. His projects have fallen under the regulatory oversight of the USEPA and NYSDEC, including the New York State Brownfield Cleanup Program (BCP) and NY petroleum spills program, as well as multiple agencies in the Midwest. His proficiency in all aspects of remedial design—supplemented by his field-experience, his knowledge of regulations and regulatory programs, and his excellent rapport with regulatory personnel—allows him to lead field efforts toward remediation and development, and to achieve project objectives effectively.

Mr. McHugh's experience includes the design, implementation, and management of environmental assessment, investigation and remediation projects in the New York Metropolitan Area and the Minneapolis, Minnesota Metropolitan Area, including soil and groundwater investigation, monitoring, and sampling programs; Brownfield and hazardous waste site investigations; and underground storage tank studies, which involved soil contamination delineation, classification, and waste removal and disposal. Mr. McHugh has also led remediation design efforts, including in-situ chemical oxidation, in-situ soil stabilization, soil vapor extraction systems, and pump and treat groundwater systems. In addition, Mr. McHugh has designed and implemented indoor air and soil vapor intrusion surveys at industrial, commercial, and residential properties in accordance with NYSDOH protocols, some requiring sub-slab depressurization systems.

BACKGROUND

Education

M.S., Engineering Management, Duke University

B.S., Civil Engineering, University of Notre Dame

Licenses/Certifications

New York State Professional Engineer - 098204
Minnesota State Professional Engineer -53131
Health and Safety Operations at Hazardous Materials Sites 29 CFR 1910.120

Professional Memberships

Member, American Society of Civil Engineers (ASCE)

Years of Experience

Year started in company: 2017
Year started in industry: 2012

AKRF

RELEVANT EXPERIENCE

Redevelopment at Polychrome West Research and Development Site, AvalonBay, Yonkers, NY

Mr. McHugh served as the Project Manager responsible for the preparation and submission of the Remedial Investigation Report (RIR), which included multiple phases of remedial investigation for the former research and development (R & D) site, a NYSDEC Brownfield redevelopment project along the Hudson River. The RIR included soil, groundwater and soil vapor environmental sampling as well as LNAPL and DNAPL source identification and evaluation. As part of the remedial investigation efforts, TarGOST drilling techniques (laser induced fluorescence) and modeling were utilized to determine the extent of LNAPL and DNAPL. Mr. McHugh was the Project Engineer responsible for the preparation and NYSDEC submission of the Remedial Action Work Plan (RAWP) for the proposed hot spot excavation, LNAPL collection, in-situ soil stabilization (ISS), soil management, building abatement and demolition, site-wide engineered cover systems with a vapor management system (VMS) and stormwater management system. Mr. McHugh will serve as the project manager for oversight of the remedial work, anticipated to begin in early 2018.

Redevelopment at Polychrome East Manufacturing Site, AvalonBay, Yonkers, NY

Mr. McHugh served as the Project Manager responsible for preparation and submission of a supplemental remedial investigation for the site, a NYSDEC Brownfield redevelopment project along Alexander Street. The investigation included soil, groundwater and vapor environmental sampling as well as direct correspondence with NYSDEC project management. Mr. McHugh was the project engineer responsible for the preparation and negotiations with NYSDEC and for the concepts of the RAWP, which included hot spot excavations, UST removal, building abatement and demolition, ISS, site-wide engineered cover systems with a VMS and stormwater management system. Mr. McHugh will serve as the project manager for oversight of the remedial work, anticipated to begin in early 2018.

Redevelopment at Former Halstead Quinn/ATI Tank Farm Site, AvalonBay, Yonkers, NY

Mr. McHugh serves as the Project Manager responsible for implementation of the Site Management Plan (SMP) at the Former Halstead Quinn/ATI Tank Farm Site, a NYSDEC Brownfield redevelopment project along the Hudson River. As part of redevelopment efforts, Mr. McHugh is responsible for design and completion of an active sub-slab depressurization system. Mr. McHugh leads direct communication with NYSDEC regarding redevelopment activities at the site, including the remedial design components of the shoreline stabilization measures (bulkhead and rip-rap design) and its efficacy in controlling LNAPL at the Site.

Former General Motors Assembly Plant Technical Lead, Edge on Hudson, Sleepy Hollow, NY

Mr. McHugh served as the technical lead responsible for the SMP and Excavation Workplan (EWP) compliance documentation and reporting during the phased mixed use redevelopment at the former GM facility. Field activities included the operation and maintenance of the community air monitoring program (CAMP) and the tracking of over 200,000 cubic yards of on-site soil reuse and imported fill material activities. Mr. McHugh also managed and led correspondence and field efforts related to a soil vapor intrusion investigation undertaken as part of redevelopment activities.

Spill Management/In-situ Chemical Oxidation, City of Yonkers Department of Public Works, Yonkers, NY

Mr. McHugh served as the Project Manager responsible for groundwater monitoring and remediation for the City of Yonkers Department of Public Works site. The site is in the NYSDEC spill program and had ongoing monitoring and remediation requirements. As part of the remediation, Mr. McHugh designed an in-situ chemical oxidation (ISCO) feasibility program to assess the viability of ISCO as a remedial strategy, and was in charge of the

performance monitoring and reporting requirements. As part of remedial efforts, Mr. McHugh was responsible for leading direct communication with NYSDEC spill program management in relation to remediation and monitoring activities at the site.

Remedial Investigation at the Former Glenwood Container Site, Fondak Enterprises, LLC, Yonkers, NY

Mr. McHugh served as the Project Manager for a remedial investigation and soil vapor intrusion assessment at an industrial property in the City of Yonkers. The intended final use of the property was a brewery in which the existing structure would be reused. Mr. McHugh served as the lead engineer and was in charge of development of the remedial investigation work plan (RIWP) and its associated approval and remedial investigation oversight.

Phase Is and Phase IIs, Multiple Clients, MN and NY

Mr. McHugh has completed numerous Phase I environmental assessments and file reviews for various industrial, commercial, and residential sites in accordance with the ASTM E-1527-13 standard. He has performed Phase II environmental assessments (including but not limited to: drilling, groundwater/soil/vapor sampling, contract drafting, contractor scheduling and reporting) on a variety of residential and commercial properties.

Saint Paul Park Refining Company, Minneapolis, MN

Mr. McHugh served as a staff engineer for a local refinery and took on a variety of different roles and responsibilities. One of these tasks was the management of an ISCO bench test for the refinery. The initial phase of this effort was drafting a work plan and gaining approval from the Minnesota Pollution Control Agency (MPCA). After approval, further duties included coordination and contract negotiations with subcontractors; TarGOST drilling investigation oversight; interpretation of TarGOST data; interpretation of environmental sampling results; design of bench testing of the environmental sampling material collected during the TarGOST investigation; analysis of the bench testing results; and design of the potential injection options for ISCO.

Mr. McHugh also worked as a staff engineer collecting groundwater and soil vapor concentrations from various onsite production wells in order to complete a natural source zone depletion analysis in support of Monitored Natural Attenuation (MNA) evaluation. The main contaminants of concern onsite were associated with the various types of petroleum produced or used at the Refinery.

Additionally, Mr. McHugh directed and participated in field operations of the soil vapor extraction (SVE) systems and groundwater pump and treat systems that operated onsite. He also collected groundwater samples, performed transmissivity testing on LNAPL, interpreted NAPL fingerprint analytical results, and performed a variety of additional environmental activities. All site work required extensive, site specific safety training to complete within normal facility operations. Mr. McHugh was also in charge of drafting annual reporting requirements to the MPCA.

Groundwater Monitoring and Assessment, Solvay Manufacturing Company, Butte, MT

Mr. McHugh completed multiple groundwater sampling and monitoring investigations, serving as a field and Project Manager. The site had various industrial contaminants of concern (COCs), but the main COC was elemental phosphorous. Mr. McHugh helped design an enhanced cap system for the main area of concern, and was in charge of estimating costs for remedial options, including capping of the contaminants in place, incineration of waste material and a mud still secondary processing of the historic phosphorous waste material. This project required submission of multiple documents and drafting of reports for EPA review as well as site specific safety training due to the high risks associated with the contaminants.

Vapor Intrusion Assessment and Monitoring at City Landfill, City of New Brighton, Minneapolis, MN

Mr. McHugh worked as both a Staff Engineer and Project Manager for the City of New Brighton to help address various vapor intrusion issues identified by the MPCA in connection to an old City of New Brighton owned construction and demolition landfill. The main vapor intrusion concern for the MPCA was methane, but volatile

organic compounds were a secondary concern. Redevelopment of the area surrounding the landfill was ongoing and a variety of soil vapor investigations and monitoring activities were conducted in both commercial and residential redevelopment areas. Mr. McHugh managed the environmental monitoring program for the City and, as a staff engineer, oversaw the installation of a passive soil gas venting and collection system which was designed to alleviate methane migration from the landfill.

MGP Investigation and Remediation, Confidential Utility Client, Fargo, ND

Mr. McHugh served as a field engineer for an investigation at a former manufactured gas plant (MGP) property. The MGP property had been developed into an apartment complex prior to a full environmental investigation and remediation. As the site had not been remediated, Mr. McHugh was part of the field team responsible with the initial field investigation (groundwater, soil vapor and soil sampling). The project was located within a high traffic area and had considerable public interest.

TCE Feasibility Study, Confidential Industrial Client, Minneapolis, MN

Mr. McHugh participated as a staff engineer on a team tasked with completing a feasibility study for mitigation of a Trichloroethene (TCE) groundwater plume within a large residential and mixed use commercial area. Mr. McHugh was directly responsible for drafting the sections of the feasibility report regarding in-situ chemical oxidation, enhanced reductive de-chlorination and aerobic cometabolism. Remedial options were evaluated for cost, contaminant reduction efficacy and implementability. Mr. McHugh participated as a field engineer in the initial sub-slab and indoor air investigation efforts and completed extensive sub-slab and indoor air sampling. After the extent of the TCE impacts had been evaluated for vapor intrusion, Mr. McHugh provided oversight of the construction and design input of multiple sub-slab depressurization systems for both commercial and residential buildings.

Field Compliance Manager, Confidential Utility Client, Minneapolis, MN

Mr. McHugh served as the Project Manager of four environmental inspectors tasked with monitoring field compliance of maintenance excavations/activities of a multi-state pipeline. Pipeline maintenance excavations occurred in IL, IN, OH, MI and NY. As the field compliance manager, duties included logistical support of active maintenance crews, correspondence with state and local regulators regarding the maintenance activities, compliance, spill report review and cost estimating/invoice review of subcontractors for the client. Mr. McHugh also assisted with upfront permitting for these maintenance activities, including permitting efforts through the US Army Corps of Engineers.

Refinery/Terminal Groundwater Operations, Confidential Refinery/Pipeline Client, Fairbanks, AK

Mr. McHugh spent time in Alaska assisting a pipeline refinery client transition to a pipeline terminal while continuing the operational requirements of their environmental monitoring program after a sudden loss of their lead onsite environmental personnel. Duties included teaching onsite personnel how to operate multiple wastewater treatment systems (working with engineers and operators to help identify optimal times for carbon change out of granulated activated carbon (GAC) treatment vessels, backwashing of the GAC treatment vessels, etc.), LNAPL recovery (skimmer pumps, hand pumps, coalescer, etc.) and environmental sampling. Mr. McHugh also assisted senior staff with annual state reporting requirements.

Pump and Treat Groundwater System Installation, Confidential Industrial Client, Cass Lake, MN

Mr. McHugh was in charge of oversight of a pump and treat system extension on a superfund site in northern Minnesota. Approximately four miles of HDPE forcemain were installed in accordance with design specifications to connect supplemental pumping well locations to the existing pump and treat system. Duties included soil management, groundwater dewatering management, safety, air monitoring, field oversight and hazardous waste disposal.

CCR Compliance Engineer, Confidential Utility Client (Various Sites in Midwest)

Mr. McHugh served as a Project Manager and a Staff Engineer for a utility client by providing assistance with various field and closure planning efforts at an electric generating facility. The client was adjusting to the EPA's new coal combustion residual (CCR) rules for coal fired power plants. Mr. McHugh guided the client in the updated legislation to help ensure a smooth transition to compliance under the new CCR rules and spent time at the client's site to observe CCR removal and consolidation operations. Additionally, Mr. McHugh was tasked with helping the client interpret the rules' operational and financial impacts and reporting requirements associated with partial and complete closure of plant areas containing CCR material.

EPA Penalty and Financial Modeling Assessment, Confidential Industrial Client, Minneapolis, MN

Mr. McHugh assisted his client by utilizing the EPA's BEN software to determine the client's perceived economic benefit received during litigation from the EPA's perspective. This process was essential in identifying the assumptions taken by the EPA. The calculations and analysis were used to help the client negotiate a settlement with the EPA in avoidance of excessive fines.

Borehole Geophysics for Wireline Operations, Various Clients, Peru, South America

Mr. McHugh implemented WireLine tools and techniques in order to evaluate oilfield reservoirs using borehole geophysics for production of oil and/or gas. Mr. McHugh managed a crew of two to four technicians, often in very remote locations, with the task of planning operations from the beginning, including job preparation, fatigue management, logistics, client relations, on site safety, data acquisition, field tickets (costs for work done) and data delivery. As part of these duties, he was also in charge of radioactive sources used for density and porosity evaluations as well as explosives for perforation activities. These duties required extensive safety and technical training which was completed over a period of three and a half months. Additionally, Mr. McHugh was responsible for helping teach a new software package (MaxWell) to other Field and Senior Field Engineers throughout Peru. This included troubleshooting with other field staff while they were in the field.

JACOB MENKEN

FIELD TECHNICIAN

Mr. Menken has a Master of Science in Geology, Bachelor of Arts in Geology, and Bachelor of Science in Environmental Science from the University of Vermont. He is familiar with the following professional techniques: powder and single crystal x-ray diffraction; field geology; remote sensing of natural resources using airborne and satellite imagery; geophysical survey using ground penetrating radar, electromagnetic induction and seismic refraction; optical and hand sample identification of minerals; aseptic laboratory techniques; and stable isotope geochemistry. Mr. Menken's familiarity with hardware includes the following: Crystallography: APEX II Single Crystal X-Ray Diffractometer, Rigaku Powder X- Ray Diffractometer; Geophysical: Ground Penetrating Radar: GSSI SIR 3000 with 400 and 200MHz antennas, Electromagnetic Induction: SSI Profiler EMP-400; Stable Isotope: VG/Fisons SIRA Series II Stable Isotope Ratio Mass Spectrometer Honeywell Photoionization Detector; HACH Portable Water Quality Meter. Mr. Menken is familiar with the following software: X-Ray Crystallography: PDXL, Standard Measurement, APEX 2, ATOMS; Statistical Software: R, SPSS, Geophysical, Geogiga Pro, GSSI Radan 7, GSSI Profiler; Microsoft Office Suite, Adobe Creative Suite; Geospatial: ENVI 5.0, 4.0 and Classic ArcGIS.

BACKGROUND

Education

M.S., Geology, University of Vermont, 2014

B.A., Geology, University of Vermont, 2012

B.S., Environmental Science, University of Vermont, 2012

Certifications

OSHA 40-Hour Health & Safety Training for Hazardous Waste Operations, May 2011

OSHA 8-Hour Health & Safety Training for Hazardous Waste Operations, September, 2016

OSHA 10-Hour Health & Safety Training for Hazardous Waste Operations, August, 2016

Professional Memberships

Mineralogical Society of America

Mineralogical Society of Canada

Geological Society of America

The Society of Sigma Gamma Epsilon, Eta Kappa, National Honor Society in the Earth Sciences

Burlington Gem and Mineral Club

Years of Experience

Year started in company: 2016

Year started in industry: 2012

RELEVANT EXPERIENCE - AKRF

AKRF

3200 Jerome Ave, Bronx, NY 10468 – Groundwater and Soil Vapor Sampling

AKRF provided groundwater and soil vapor testing for the NYCSCA at the former P.S. 51X. Mr. Menken assisted with the collection of groundwater and soil vapor sampling for waste characterization purposes. Groundwater was sampled from wellheads and soil vapor was sampled from a Sub-Slab Depressurization System (SSDS). All samples were collected in accordance with existing protocol.

112 Atlantic Ave, Brooklyn, NY 11201 – Construction Oversite and Community Air Monitoring

AKRF provided community air monitoring on this site for dust and volatile organic compounds (VOCs) in accordance with existing community air quality standards. Additionally, AKRF provided onsite oversite to ensure additional discovered soil contamination was left in place for determination of the extent of soil. AKRF was also responsible for logging any incoming or outgoing soil or fill laden trucks. For this project Mr. Menken provided on-site monitoring.

285 East 138th Street, Bronx, NY 10454 – Construction Oversite and Community Air Monitoring

AKRF is overseeing implementation of the NYSDEC-approved RAWP and Site Management Plan (SMP) for this BCP site in the Bronx. AKRF serves as the on-site contact who conducts waste characterization sampling, oversees soil management, conducts community air monitoring, and prepares daily reports for submittal to the AKRF and NYSDEC project managers. For this project Mr. Menken provided on-site monitoring.

4950 Arthur Kill Road, Staten Island, NY 10309 – Groundwater and Soil Vapor Sampling and Subsurface Characterization Phase II

AKRF provided Phase II services for a wooded site in Staten Island. AKRF characterized eight drill bores drilled by a contractor. Groundwater and soil vapor samples from four of the sites. Additionally, AKRF provided oversite for the excavation of six test pits on the site to characterize the surficial materials and explore subsurface anomalies as detected by previously conducted ground penetrating radar (GPR).

32 N. Main Street, New City, NY – Wastewater Drum Disposal

Mr. Menken oversaw the disposal of two wastewater drums by a contractor. Mr. Menken ensured that the contractor completed the appropriate documented, the wastewater was properly transferred from a damaged to undamaged drum and that the appropriate drums were removed from the site.

158th Street and Brooks Ave, Bronx, NY – Wastewater Drum Disposal

Mr. Menken oversaw the disposal of two wastewater drums by a contractor. Mr. Menken ensured that the contractor completed the appropriate documented, the wastewater was properly transferred from a damaged to undamaged drum and that the appropriate drums were removed from the site.

3610 Glenwood Rd, Brooklyn, NY 11210 – Drinking Water Sampling Oversight

AKRF provided oversight of water quality testing for the NYCSCA at K042. AKRF oversaw the drinking water sampling of a newly installed pluming at a Brooklyn, NY pre-kindergarten for compliance with drinking water bacteria level guidelines. Sampling was observed to ensure compliance with pre-existing water disinfecting and

testing standard operating procedures (SOPs) for total coliform, E. Coli bacteria and heterotrophic plate count analysis.

34 Berry Street, Williamsburg, NY

AKRF was retained to prepare close-out documentation for this former industrial/warehouse facility in Williamsburg, which was remediated under the New York City Office of Environmental Remediation (OER) E-designation and NYSDEC Spills programs. The closure report, which was based on documentation provided by the environmental contractor, was prepared on an expedited basis so that the developer could obtain a Certificate of Occupancy in time for the scheduled opening of the new building. AKRF is currently providing on-going remediation monitoring services to fulfill NYSDEC Spill closure requirements. For this project, Mr. Menken performed monthly/quarterly groundwater monitoring.

11 Greene Street, Manhattan, NY 10013 – Construction Oversite and Community Air Monitoring

AKRF is overseeing implementation of the approved RAWP and Site Management Plan (SMP) for this OER site in Manhattan. AKRF serves as the on-site contact who conducts waste characterization sampling, oversees soil management and conducts community air monitoring and completes daily reports for submittal to the AKRF and NYCDEP project managers. For this project Mr. Menken provided on-site monitoring.

SCA City Wide Portable Water Lead Sampling – Drinking Water Sampling

As part of an on-call contract with the SCA, AKRF provided water sampling services at various public schools in New York City. AKRF sampled potable water fixtures for lead concentration at public schools in all five boroughs. Work was performed at night or when school was not in session and coordinated with the SCA, custodial engineers and various contractors.

Staten Island Wheel, Staten Island, New York 10301 – Construction Oversite and Community Air Monitoring

AKRF is overseeing implementation of the approved RAWP and Site Management Plan (SMP) for this site in the Staten Island. AKRF serves as the on-site contact who conducts waste characterization sampling, oversees soil management, conducts community air monitoring, and prepares daily reports for submittal to the AKRF. For this project Mr. Menken provided on-site monitoring.

Adelaar/Concord Resort, 219 Concord Road, Monticello, New York 12751 – Construction Oversite and Community Air Monitoring

AKRF is overseeing implementation of the NYSDEC-approved RAWP and Site Management Plan (SMP) for this BCP site in the Catskills. AKRF serves as the on-site contact who conducts waste characterization sampling, oversees soil management and conducts community air monitoring for submittal to the AKRF and NYSDEC project managers. For this project Mr. Menken provided on-site monitoring.

References:

Ilan Rubinstein

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Mr. Paul Sherwood
Industrial and Environmental Hygiene Division
New York City School Construction Authority
30-30 Thompson Avenue
Long Island City, NY 11101
psherwood@nycsca.org

ATTACHMENT B

NYSDEC EMERGING CONTAMINANT SAMPLING GUIDANCE DOCUMENTS

Groundwater Sampling for Emerging Contaminants

April 2018

Issue: NYSDEC has committed to analyzing representative groundwater samples at remediation sites for emerging contaminants (1,4-dioxane and PFAS) as described in the below guidance.

Implementation

NYSDEC project managers will be contacting site owners to schedule sampling for these chemicals. Only groundwater sampling is required. The number of samples required will be similar to the number of samples where "full TAL/TCL sampling" would typically be required in a remedial investigation. If sampling is not feasible (e.g., the site no longer has any monitoring wells in place), sampling may be waived on a site-specific basis after first considering potential sources of these chemicals and whether there are water supplies nearby.

Upon a new site being brought into any program (i.e., SSF, BCP), PFAS and 1,4-dioxane will be incorporated into the investigation of groundwater as part of the standard "full TAL/TCL" sampling. Until an SCO is established for PFAS, soil samples do not need to be analyzed for PFAS unless groundwater contamination is detected. Separate guidance will be developed to address sites where emerging contaminants are found in the groundwater. The analysis currently performed for SVOCs in soil is adequate for evaluation of 1,4-dioxane, which already has an established SCO.

Analysis and Reporting

Labs should provide a full category B deliverable, and a DUSR should be prepared by a data validator, and the electronic data submission should meet the requirements provided at: https://www.dec.ny.gov/chemical/62440.html ,

The work plan should explicitly describe analysis and reporting requirements.

PFAS sample analysis: Currently, ELAP does not offer certification for PFAS compounds in matrices other than finished drinking water. However, laboratories analyzing environmental samples (ex. soil, sediments, and groundwater) are required, by DER, to hold ELAP certification for PFOA and PFOS in drinking water by EPA Method 537 or ISO 25101.

Modified EPA Method 537 is the preferred method to use for groundwater samples due to the ability to achieve 2 ng/L (ppt) detection limits. If contract labs or work plans submitted by responsible parties indicate that they are not able to achieve similar reporting limits, the project manager should discuss this with a DER chemist. Note: Reporting limits for PFOA and PFOS should not exceed 2 ng/L.

PFAS sample reporting: DER has developed a PFAS target analyte list (below) with the intent of achieving reporting consistency between labs for commonly reportable analytes. It is expected that reported results for PFAS will include, at a minimum, all the compounds listed. This list may be updated in the future as new information is learned and as labs develop new capabilities. If lab and/or matrix specific issues are encountered for any particular compounds, the NYSDEC project manager will make case-by-case decisions as to whether particular analytes may be temporarily or permanently discontinued from analysis for each site. Any technical lab issues should be brought to the attention of a NYSDEC chemist.

Some sampling using this full PFAS target analyte list is needed to understand the nature of contamination. It may also be critical to differentiate PFAS compounds associated with a site from other

sources of these chemicals. Like routine refinements to parameter lists based on investigative findings, the full PFAS target analyte list may not be needed for all sampling intended to define the extent of contamination. Project managers may approve a shorter analyte list (e.g., just the UCMR3 list) for some reporting on a case by case basis.

1,4-Dioxane Analysis and Reporting: The method detection limit (MDL) for 1,4-dioxane should be no higher than 0.28 µg/l (ppb). ELAP offers certification for both EPA Methods 8260 and 8270. In order to get the appropriate detection limits, the lab would need to run either of these methods in "selective ion monitoring" (SIM) mode. DER is advising the use of method 8270, since this method provides a more robust extraction procedure, uses a larger sample volume, and is less vulnerable to interference from chlorinated solvents (we acknowledge that 8260 has been shown to have a higher recovery in some studies).

Full PFAS Target Analyte List

Group	Chemical Name	Abbreviation	CAS Number
Perfluoroalkyl sulfonates	**Perfluorobutanesulfonic acid**	**PFBS**	**375-73-5**
	Perfluorohexanesulfonic acid	**PFHxS**	**355-46-4**
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanessulfonic acid	**PFOS**	**1763-23-1**
	Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluoroalkyl carboxylates	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	**PFHpA**	**375-85-9**
	Perfluorooctanoic acid	**PFOA**	**335-67-1**
	Perfluorononanoic acid	**PFNA**	**375-95-1**
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUA/PFUdA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTriA/PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTA/PFTeDA	376-06-7
Fluorinated Telomer Sulfonates	6:2 Fluorotelomer sulfonate	6:2 FTS	27619-97-2
	8:2 Fluorotelomer sulfonate	8:2 FTS	39108-34-4
Perfluorooctane-sulfonamides	Perfluroroctanesulfonamide	FOSA	754-91-6
Perfluorooctane-sulfonamidoacetic acids	N-methyl perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethyl perfluorooctanesulfonamidoacetic acid	N-EtFOSAA	2991-50-6

Bold entries depict the 6 original UCMR3 chemicals

Collection of Groundwater Samples for Perfluorooctanoic Acid (PFOA) and Perfluorinated Compounds (PFCs) from Monitoring Wells Sample Protocol

Samples collected using this protocol are intended to be analyzed for perfluorooctanoic acid (PFOA) and other perfluorinated compounds by Modified (Low Level) Test Method 537.

The procedure used must be consistent with the NYSDEC March 1991 Sampling Guidelines and Protocols http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf with the following materials limitations.

At this time acceptable materials for sampling include: stainless steel, high density polyethylene (HDPE), PVC, silicone, acetate and polypropylene. Equipment blanks should be generated at least daily. Additional materials may be acceptable if pre-approved by NYSDEC. Requests to use alternate equipment should include clean equipment blanks. **NOTE: Grunfos pumps and bladder pumps are known to contain PFC materials (e.g. Teflon™ washers for Grunfos pumps and LDPE bladders for bladder pumps).** All sampling equipment components and sample containers should not come in contact with aluminum foil, low density polyethylene (LDPE), glass or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer. Standard two step decontamination using detergent and clean water rinse will be performed for equipment that does come in contact with PFC materials. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFC materials must be avoided. Many food and drink packaging materials and "plumbers thread seal tape" contain PFCs.

All clothing worn by sampling personnel must have been laundered multiple times. The sampler must wear nitrile gloves while filling and sealing the sample bottles.

Pre-cleaned sample bottles with closures, coolers, ice, sample labels and a chain of custody form will be provided by the laboratory.

1. Fill two pre-cleaned 500 mL HDPE or polypropylene bottle with the sample.
2. Cap the bottles with an acceptable cap and liner closure system.
3. Label the sample bottles.
4. Fill out the chain of custody.
5. Place in a cooler maintained at 4 ± 2° Celsius.

Collect one equipment blank for every sample batch, not to exceed 20 samples.

Collect one field duplicate for every sample batch, not to exceed 20 samples.

Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, not to exceed 20 samples.

Request appropriate data deliverable (Category A or B) and an electronic data deliverable.

APPENDIX B

HEALTH AND SAFETY PLAN AND COMMUNITY AIR MONITORING PLAN

HAMILTON GREEN

200 HAMILTON AVENUE, WHITE PLAINS, NEW YORK

Health and Safety Plan and Community Air Monitoring Plan

BCP Site #: C360177

AKRF Project Number: 170029

Prepared for:

SW-D/WP LLC dba Street-Works Development
168-A Irving Avenue, Suite 200K
Port Chester, NY 10573

Prepared by:

AKRF, Inc.
440 Park Avenue South
New York, New York 10016
(212) 696-0670

SEPTEMBER 2018

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1.0 INTRODUCTION

This Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) has been prepared by AKRF, Inc. (AKRF) to describe the protocols and procedures that will be followed during the implementation of all environmental sampling associated with the Remedial Investigation Work Plan (RIWP) at the Hamilton Green site located at 200 Hamilton Avenue in the City of White Plains, Westchester County, New York (the "Site"). The 3.74-acre Site includes the two-story White Plains Mall and east-adjacent asphalt-paved parking lot, and is identified as Tax Map ID Section 125.67, Block 5, Lot 1 on the City of White Plains tax map.

As described in Section 3.0 of the RIWP, a Phase I Environmental Site Assessment (ESA) of the Site indicated that, prior to 1970, the Site was historically bisected by a public street (William Street) and contained several private residential dwellings, a candy manufacturer, and two gasoline stations, one at 230 Hamilton Avenue (southeastern portion of the Site) and the second at 250 Hamilton Avenue (southern portion of the Site). A Subsurface (Phase II) Investigation conducted at the Site identified evidence of petroleum contamination at the groundwater interface in the vicinity of the former on-site gasoline stations, and petroleum-related volatile organic compounds (VOCs), including methyl tert-butyl ether (MTBE), were detected in groundwater above the New York State Department of Environmental Conservation (NYSDEC) Ambient Water Quality Standards (AWQSs).

The findings from a Spill Investigation (SI) conducted to further investigate the extent of the petroleum-related contamination revealed petroleum-contaminated soil and VOCs exceeding the NYSDEC soil cleanup levels in the footprint of the former gasoline station in the southeastern portion of the Site. Field evidence of petroleum contamination was also noted at the groundwater interface in the footprint and immediately downgradient of the former gasoline station in the southern portion of the Site. Consistent with the Phase II investigation, petroleum-related VOCs, including MTBE, were detected in groundwater at concentrations above the NYSDEC AWQSs. Based on the results of the previous investigations, an area of petroleum-contaminated soil and groundwater exists in the southeastern and southern portions of the Site. The petroleum contamination is attributed to a historic release or releases from the former on-site gasoline stations, with the presence of MTBE in groundwater indicating that an off-site source (e.g., the up-gradient east-adjacent gasoline station) has contributed to the documented on-site groundwater contamination since the former on-site gasoline stations were closed prior to the use of MTBE in New York State. In addition, metals and semi-volatile organic compounds (SVOCs) were identified at concentrations exceeding NYSDEC Unrestricted and Restricted Residential Soil Cleanup Objectives (SCOs) soil samples collected from a shallow fill layer at the Site. Petroleum-related VOCs detected above New York State Department of Health (NYSDOH) background levels in soil vapor samples collected during the Phase II investigation were attributed to the petroleum groundwater contamination and any residual soil contamination. The chlorinated solvent trichloroethene (TCE) was detected above the NYSDOH Air Guideline Value in the Phase II soil vapor samples and is potentially related to a former on-site dry cleaner; however, the levels detected re not considered indicative of an on-site release

Based on the findings from the previous investigations and the proposed future use of the Site, AKRF developed a Remedial Investigation (RI) scope of work to further characterize the shallow fill layer and define the nature and extent of the known petroleum contamination at the Site through the collection of soil and groundwater data from locations in and adjacent to the footprints of the former on-site gasoline stations, and other areas of the Site to be excavated as part of the proposed redevelopment. The RI scope of work, as described in the RIWP, includes the installation of soil borings and temporary groundwater monitoring wells for the collection of soil and groundwater samples for field-screening and laboratory analysis. The current on-site structure occupies approximately two-thirds of the Site, including the footprint of the former gasoline station in its southern portion, limiting the locations available for soil and

groundwater sampling. As such, much of the proposed RI field program will not be completed until the on-site structure has been demolished, and access to all areas of the Site is available.

1.1 Scope and Applicability of the Health and Safety Plan

All AKRF employees are directed that all work must be performed in accordance with this HASP, the Company's Generic HASP, and all Occupational Safety and Health Administration (OSHA) applicable regulations for the work activities required for the project. All project personnel are furthermore directed that they are not permitted to enter Permit Required Confined Spaces (as defined by OSHA). For issues unrelated to contaminated materials, all non-AKRF employees are to be bound by all applicable OSHA regulations as well as any more stringent requirements specified by their employer in their corporate HASP or otherwise. AKRF is not responsible for providing oversight for issues unrelated to contaminated materials for non-employees. This oversight shall be the responsibility of the employer of that worker or other officials designated by that employer.

1.2 General Information

Site Name: Hamilton Green – 200 Hamilton Avenue, White Plains, NY

Client/Volunteer: S-WD/WP LLC

Site Location: The Site is located at 200 Hamilton Avenue in the City of White Plains, New York, and is identified as Tax Map ID Section 125.67, Block 5, Lot 1 on the City of White Plains tax map.

HASP Prepared By: AKRF, Inc.

Project Objective: Remedial Investigation

Proposed Date(s) of Field Work: January through March 2019

Proposed On-Site Work Duration: 10 days

1.3 Organizational Structure

Title	Name	Responsibilities
Principal-In-Charge and Project Director	Rebecca Kinal	Overall project direction and responsibility.
Project Manager and Project Health and Safety Officer (PHSO)	Timothy McClintock	Day to day responsibility for project management and implementation, and enforcement of the HASP. Review site-specific safety issues and provide oversight of the Site Safety Officers (SSOs).
Field Representative – Site Safety Officer (SSO)	Jacob Menken	Monitor health and safety, and act as the SSO. The SSOs are the only full-time Project Team personnel with authority under this HASP.

2.0 HEALTH AND SAFETY GUIDELINES AND PROCEDURES

2.1 Hazard Evaluation

2.1.1 Hazards of Concern

Check all that apply		
(X) Organic Chemicals	(X) Inorganic Chemicals	( ) Radiological
( ) Biological	(X) Explosive/Flammable	( ) Oxygen Deficient Atm.
(X) Heat Stress	(X) Cold Stress	( ) Other
Comments: No personnel are permitted to enter permit required confined spaces.		

2.1.2 Physical Characteristics

Check all that apply		
(X) Liquid	(X) Solid	( ) Sludge
(X) Vapors	( ) Unknown	( ) Other
Comments:		

2.1.3 Hazardous Materials

Check all that apply					
Chemicals	**Solids**	**Sludges**	**Solvents**	**Oils**	**Other**
( ) Acids	( ) Ash	( ) Paints	(X) Halogens	( ) Transformer	( ) Lab
( ) Caustics	( ) Asbestos	( ) Metals	(X) Petroleum	( ) Other DF	( ) Pharm
( ) Pesticides	( ) Tailings	( ) POTW	( ) Other	(X) Motor or Hydraulic Oil	( ) Hospital
(X) Petroleum	(X) Other	( ) Other		(X) Gasoline	( ) Rad
( ) Inks	Fill material			(X) Fuel Oil	( ) MGP
( ) PCBs					( ) Mold
(X) Metals					( ) Cyanide
(X) Other: SVOCs					

2.1.4 Chemicals of Concern

Chemicals	REL/PEL/STEL (ppm)	Health Hazards
Benzene	REL = 0.1 ppm PEL = 1 ppm STEL = 5 ppm	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude, dermatitis; bone marrow depression, potential occupational carcinogen.
Toluene	REL = 100 ppm PEL = 200 ppm STEL = 300 ppm	Irritation eyes, nose; lassitude, confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage.
Ethylbenzene	REL = 100 ppm PEL = 100 ppm	Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma.
Xylenes	REL = 100 ppm PEL = 100 ppm	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, poor coordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis.
Methyl Tert-Butyl Ether (MTBE)	ACGIH TLV as TWA: 50 ppm PEL (CalOSHA): 40 ppm	Potential Symptoms: Drowsiness, dizziness, headache, weakness, unconsciousness; redness of skin and eyes; Acute ingestion: Nausea, vomiting, abdominal pain; chemical pneumonitis (by aspiration). Health Effects: Irritation-Eyes, skin---mild (HE16); Nervous system disturbances. Explosive, flammable. Confirmed Animal Carcinogen with Unknown Relevance to Humans.
Polyaromatic Hydrocarbons (PAHs)	REL= 0.1 mg/m^3 PEL= 5 mg/m^3	Harmful effects on the skin, body fluids, and ability to fight disease after both short and long term exposure, birth defects, and potential occupational carcinogen.
Naphthalene	REL = 10 ppm PEL = 10 ppm	Irritation eyes; headache, confusion, excitement, malaise; nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage.
Chromium	REL = 0.5 mg/m^3 PEL - 1 mg/m^3	Irritation eyes, skin; lung fibrosis (histologic).
Lead	REL= 0.1 mg/m^3 PEL= 0.05 mg/m^3	Weak, lassitude, insomnia; facial pallor, pale eye, anorexia, low-weight, malnutrition, constipation, abdominal pain, colic; anemia; gingival lead line; tremors, paralysis wrists and ankles; encephalopathy; kidney disease; irritation eyes; hypotension.
Mercury	REL = 0.1 mg/m^3 PEL = 0.05 mg/m^3	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria.
Trichloroethene	REL = 25 ppm PEL = 100 ppm	Headaches, lung irritation, dizziness, poor coordination, impaired heart function, unconsciousness, and nerve, kidney and liver damage.
Comments: REL = NIOSH Recommended Exposure Limit		

Chemicals	REL/PEL/STEL (ppm)	Health Hazards
PEL = OSHA Permissible Exposure Limit STEL = OSHA Short Term Exposure Limit TLV as TWA = ACGIH Threshold Limit Value as Time Weighted Average		

2.2 Designated Personnel

AKRF will appoint one of its on-site personnel as the Site Safety Officer (SSO). This individual will be responsible for the implementation of the HASP. The SSO will have a 4-year college degree in occupational safety or a related science/engineering field, and experience in implementation of air monitoring and hazardous materials sampling programs. Health and safety training required for the SSO and all field personnel is outlined in Section 2.3 of this HASP.

2.3 Training

All personnel who enter the work area while intrusive activities are being performed will have completed a 40-hour training course that meets OSHA requirements of 29 CFR Part 1910, Occupational Safety and Health Standards. In addition, all personnel will have up-to-date 8-hour refresher training. The training will allow personnel to recognize and understand the potential hazards to health and safety. All field personnel must attend a training program, whose purpose is to:

- Make them aware of the potential hazards they may encounter;
- Provide the knowledge and skills necessary for them to perform the work with minimal risk to health and safety; make them aware of the purpose and limitations of safety equipment; and
- Ensure that they can safely avoid or escape from emergencies.

Each member of the field crew will be instructed in these objectives before he/she goes onto the Site. A site safety meeting will be conducted at the start of the project. Additional meetings shall be conducted, as necessary, for new personnel working at the Site.

2.4 Medical Surveillance Program

All AKRF and subcontractor personnel performing field work involving subsurface disturbance at the site are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120 (f). A physician's medical release for work will be confirmed by the SSO before an employee can begin site activities. The medical release shall consider the type of work to be performed and the required PPE. The medical examination will, at a minimum, be provided annually and upon termination of hazardous waste site work.

2.5 Site Work Zones

During any activities involving subsurface disturbance, the work area must be divided into various zones to prevent the spread of contamination, ensure that proper protective equipment is donned, and provide an area for decontamination.

The Exclusion Zone is defined as the area where exposure to impacted media could be encountered. The Contamination Reduction Zone (CRZ) is the area where decontamination procedures take place and is located next to the Exclusion Zone. The Support Zone is the area where support facilities such as vehicles, fire extinguisher, and first aid supplies are located. The emergency staging area (part of the Support Zone) is the area where all workers on-site would

assemble in the event of an emergency. A summary of these areas is provided below. These zones may be changed by the SSO, depending on that day's activities. All field personnel will be informed of the location of these zones before work begins.

Site Work Zones			
Task	**Exclusion Zone**	**CRZ**	**Support Zone**
Soil Borings	10 ft from Drill Rig	20 ft from Drill Rig	As Needed
Monitoring Well Installation	10 ft from Drill Rig	20 ft from Drill Rig	As Needed
Comments: Control measures such as "caution tape" and/or traffic cones will be placed around the perimeter of the work area when work is being done in a public area.			

2.6 Air Monitoring

The purpose of the air monitoring program is to identify any exposure of the field personnel to potential environmental hazards in the soil and groundwater. Results of the air monitoring will be used to determine the appropriate response action, if needed.

2.6.1 Volatile Organic Compounds

A photoionization detector (PID) will be used to perform air monitoring during soil disturbance activities to determine airborne levels of total VOCs. The PID will be calibrated at the start of the work day with a 100 ppm isobutylene standard in accordance with the manufacture's specifications.

2.6.2 Work Zone Air Monitoring

Real time air monitoring will be performed with the PID. Measurements will be taken prior to commencement of work and continuously during the work, as outlined in the following table. Measurements will be made as close to the workers as practicable and at the breathing height of the workers. The SSO shall set up the equipment and confirm that it is working properly. His/her designee may oversee the air measurements during the day. The initial measurement for the day will be performed before the start of work and will establish the background level for that day. The final measurement for the day will be performed after the end of work. The action levels and required responses are listed in the following table.

Instrument	Action Level	Response Action
PID	Less than 10 ppm in breathing zone	Level D or D-Modified
	Between 10 ppm and 50 ppm	Level C
	More than 50 ppm	Stop work. Resume work when readings are less than 50 ppm.
CO Detector	Less than 25 ppm	Level D or D-Modified
	Above 25 ppm	Stop work, ventilate, and evacuate work area. Resume work when readings are less than 25 ppm.

2.6.3 Community Air Monitoring Plan

Community air monitoring will be conducted during all intrusive site activities in compliance with the New York State Department of Health (NYSDOH) Generic

Community Air Monitoring Plan (CAMP). Real-time air monitoring for volatile compounds at the perimeter of the exclusion zone will be performed as described below.

VOC Monitoring

Periodic monitoring for VOCs will be conducted during non-intrusive activities such as the collection of groundwater samples. Periodic monitoring may include obtaining measurements upon arrival at a location, while opening a monitoring well cap, when bailing/purging a well, and upon leaving the location. In some instances, depending on the proximity of exposed individuals, continuous monitoring may be conducted during these activities.

Continuous monitoring for VOCs will be conducted during all ground intrusive activities (i.e., soil boring and monitoring well/soil gas point installation). Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background concentrations. VOCs will be monitored continuously at the downwind perimeter of the exclusion zone. Monitoring will be conducted with a PID equipped with a 10.6 eV lamp capable of calculating 15-minute running average concentrations. The following actions will be taken based on organic vapor levels measured:

- If total organic vapor levels exceed 5 ppm above background for the 15-minute average at the exclusion zone perimeter, work activities will be temporarily halted and monitoring continued. If levels readily decrease (per instantaneous readings) below 5 ppm above background, work activities will resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the exclusion zone persist at levels in excess of 5 ppm above background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the hot zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less – but in no case less than 20 feet – is below 5 ppm above background for the 15-minute average.
- If the total organic vapor level is above 25 ppm at the perimeter of the exclusion zone, activities will be shutdown.

More frequent intervals of monitoring will be conducted if required as determined by the SSO. All 15-minute readings will be recorded and available for NYSDEC and NYSDOH personnel to review. Instantaneous readings, if any, will also be recorded.

Major Vapor Emission Response Plan

If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work Site, or half the distance to the nearest residential or commercial property, whichever is less, all work activities must be halted or vapor controls must be implemented.

If, following the cessation of the work activities, or as the result of an emergency, organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the exclusion zone, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20 Foot Zone).

If either of the following criteria is exceeded in the 20 Foot Zone, then the Major Vapor Emission Response Plan shall automatically be implemented.

- Sustained organic vapor levels approaching 1 ppm above background for a period of more than 30 minutes, or
- Organic vapor levels greater than 5 ppm above background for any time period.

Upon activation, the following activities shall be undertaken as part of the Major Vapor Emission Response Plan:

- The NYSDEC, NYSDOH, and local police authorities will immediately be contacted by the SSO and advised of the situation;
- Frequent air monitoring will be conducted at 30-minute intervals within the 20 Foot Zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the Site Health and Safety Officer; and
- All Emergency contacts will go into effect as appropriate.

All readings will be recorded and be available for NYSDEC and NYSDOH personnel to review.

2.7 Personal Protection Equipment

The personal protection equipment required for various kinds of investigation tasks are based on 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, Appendix B, "General Description and Discussion of the Levels of Protection and Protective Gear."

AKRF field personnel and other site personnel shall wear, at a minimum, Level D personal protective equipment. The protection will be based on the air monitoring described in Section 2.6.

LEVEL OF PROTECTION & PPE		**Soil Boring/Water Sampling**
Level D (X) Steel Toe Shoes (X) Hard Hat (within 20 ft of drill rig) (X) Work Gloves	(X) Safety Glasses ( ) Face Shield (X) Ear Plugs (within 20 ft of drill rig) (X) Nitrile Gloves (X) Tyvek for drill operator if NAPL present	Yes
Level C *(in addition to Level D)* (X) Half-Face Respirator OR (X) Full Face Respirator ( ) Full-Face PAPR	( ) Particulate Cartridge ( ) Organic Cartridge (X) Dual Organic/ Particulate Cartridge	If PID > 10 ppm (breathing zone)
Comments: Cartridges to be changed out at least once per shift unless warranted beforehand (e.g., more difficult to breathe or any odors detected).		

2.8 General Work Practices

To protect the health and safety of the field personnel, field personnel will adhere to the guidelines listed below during activities involving subsurface disturbance:

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited, except in designated areas on the site. These areas will be designated by the SSO.
- Workers must wash their hands thoroughly on leaving the work area and before eating, drinking, or any other such activity.
- The workers should shower as soon as possible after leaving the site. Contact with contaminated or suspected surfaces should be avoided.
- The buddy system should always be used; each buddy should watch for signs of fatigue, exposure, and heat/cold stress.

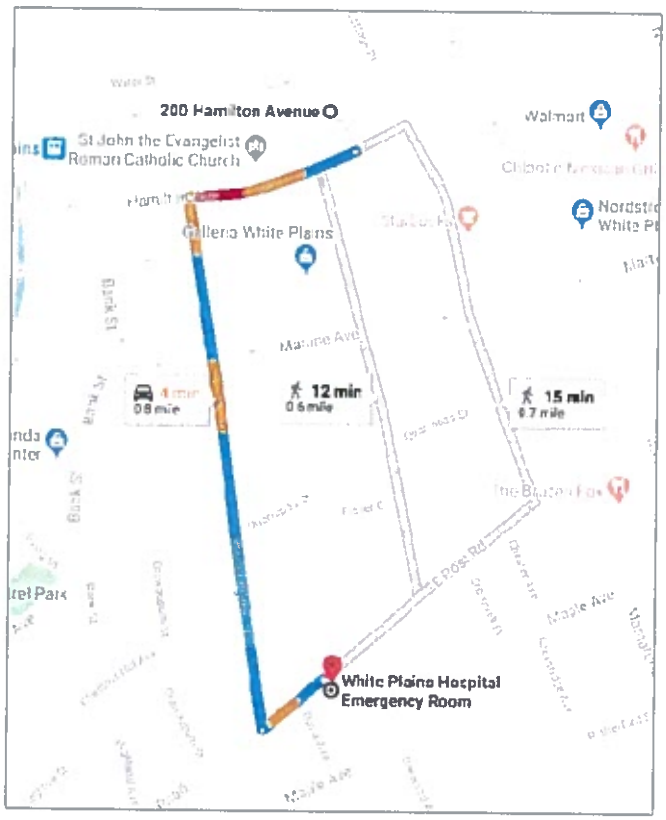
3.0 EMERGENCY PROCEDURES AND EMERGENCY RESPONSE PLAN

The field crew will be equipped with emergency equipment, such as a first aid kit and disposable eye washes. In the case of a medical emergency, the SSO will determine the nature of the emergency and he/she will have someone call for an ambulance, if needed. If the nature of the injury is not serious, i.e., the person can be moved without expert emergency medical personnel, he/she should be driven to the White Plains Hospital by on-site personnel. Directions to the hospital are provided below, and a hospital route map is included as Figure 1.

3.1 Hospital Directions

Hospital Name:	White Plains Hospital
Phone Number:	(914) 681-0600
Address/Location:	41 East Post Road White Plains, NY 10601 The Emergency Department is located on East Post Road
Directions:	1. Go **SOUTHWEST** on *Hamilton Avenue toward Dr. Martin Luther King, Jr. Boulevard* 2. Turn **LEFT** onto *North Lexington Avenue* 3. Turn **LEFT** onto *East Post Road* The Emergency Department entrance is located on East Post Road

A map illustrating where the White Plains Hospital is located relative to the 200 Hamilton Avenue property is provided in the insert map below, and attached as Figure 1.



3.2 Emergency Contacts

Company	Individual Name	Title	Contact Number
AKRF	Rebecca Kinal	Project Director	914-922-2362 (office 914-263-8739 (cell)
	Timothy McClintock	Project Manager	914-922-2374 (office) 914-439-1629 (cell)
	Jacob Menken	Site Safety Officer	914-922-2373 (office) 914-552-7694 (cell)
Ambulance, Fire Department & Police Department	-	-	911
NYSDEC Spill Hotline	-	-	800-457-7362

4.0 APPROVAL & ACKNOWLEDGMENTS OF HASP

APPROVAL

Signed: _____ Date: _____

AKRF Principal-In-Charge and Project Director – Rebecca Kinal, P.E.

Signed: _____ Date: _____

AKRF Project Manager and Health and Safety Officer - Timothy McClintock

Below is an affidavit that must be signed by all workers who enter the Site. A copy of the HASP must be on-site at all times and will be kept by the SSO.

AFFIDAVIT

I, _____ (name), of _____ (company name), have read the Health and Safety Plan (HASP) for the Hamilton Green site. I agree to conduct all on-site work in accordance with the requirements set forth in this HASP and understand that failure to comply with this HASP could lead to my removal from the Site.

Signed: _____ Company: _____ Date: _____
Signed: _____ Company: _____ Date: _____
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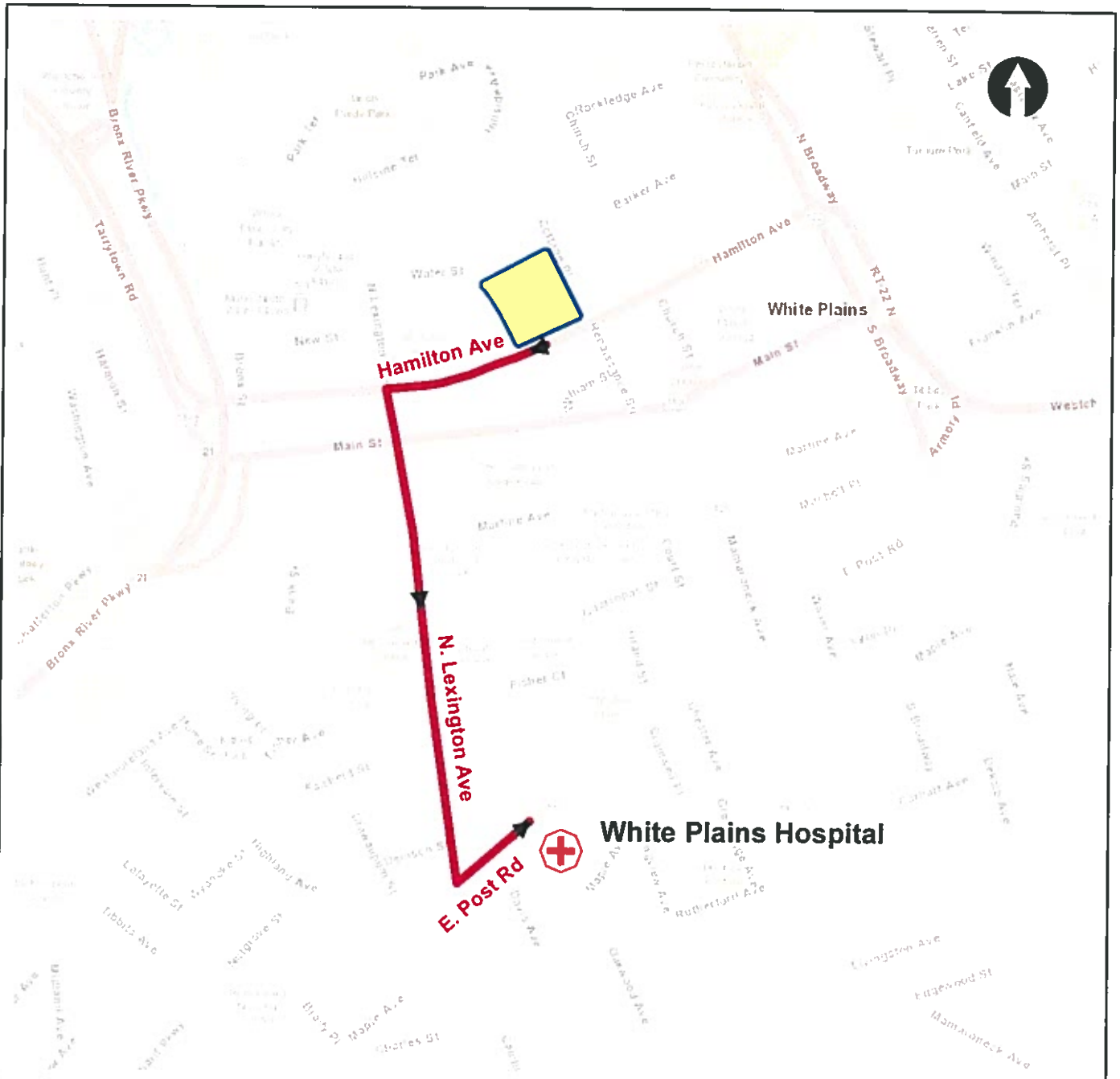
FIGURE 1

HOSPITAL ROUTE MAP



Service Layer Credits: ESRC World Street Map 2018

LEGEND

- PROJECT SITE BOUNDARY
- ROUTE TO HOSPITAL
- HOSPITAL LOCATION

White Plains Hospital
41 E. Post Road
White Plains, NY 10601
(914) 681-0600

0 700 1,400
SCALE IN FEET

AKRF
440 Park Avenue South, New York, NY 10016

200 Hamilton Avenue
White Plains, New York

HOSPITAL ROUTE MAP

DATE: 5/2/2018
PROJECT NO.: 170029
FIGURE: 1

ATTACHMENT A

POTENTIAL HEALTH EFFECTS FROM ON-SITE CONTAMINANTS

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

BENZENE
CAS # 71-43-2

This fact sheet answers the most frequently asked health questions (FAQs) about benzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Benzene is a widely used chemical formed from both natural processes and human activities. Breathing benzene can cause drowsiness, dizziness, and unconsciousness; long-term benzene exposure causes effects on the bone marrow and can cause anemia and leukemia. Benzene has been found in at least 813 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is benzene?

(Pronounced bĕn′zēn′)

Benzene is a colorless liquid with a sweet odor. It evaporates into the air very quickly and dissolves slightly in water. It is highly flammable and is formed from both natural processes and human activities.

Benzene is widely used in the United States; it ranks in the top 20 chemicals for production volume. Some industries use benzene to make other chemicals which are used to make plastics, resins, and nylon and synthetic fibers. Benzene is also used to make some types of rubbers, lubricants, dyes, detergents, drugs, and pesticides. Natural sources of benzene include volcanoes and forest fires. Benzene is also a natural part of crude oil, gasoline, and cigarette smoke.

What happens to benzene when it enters the environment?

- Industrial processes are the main source of benzene in the environment.
- Benzene can pass into the air from water and soil.
- It reacts with other chemicals in the air and breaks down within a few days.
- Benzene in the air can attach to rain or snow and be carried back down to the ground.
- It breaks down more slowly in water and soil, and can pass through the soil into underground water.
- Benzene does not build up in plants or animals.

How might I be exposed to benzene?

- Outdoor air contains low levels of benzene from tobacco smoke, automobile service stations, exhaust from motor vehicles, and industrial emissions.
- Indoor air generally contains higher levels of benzene from products that contain it such as glues, paints, furniture wax, and detergents.
- Air around hazardous waste sites or gas stations will contain higher levels of benzene.
- Leakage from underground storage tanks or from hazardous waste sites containing benzene can result in benzene contamination of well water.
- People working in industries that make or use benzene may be exposed to the highest levels of it.
- A major source of benzene exposures is tobacco smoke.

How can benzene affect my health?

Breathing very high levels of benzene can result in death, while high levels can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. Eating or drinking foods containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, and death.

The major effect of benzene from long-term (365 days or longer) exposure is on the blood. Benzene causes harmful effects on the bone marrow and can cause a decrease in red blood cells leading to anemia. It can also cause excessive bleeding and can affect the immune system, increasing the chance for infection.

Some women who breathed high levels of benzene for many months had irregular menstrual periods and a decrease in the size of their ovaries. It is not known whether benzene exposure affects the developing fetus in pregnant women or fertility in men.

Animal studies have shown low birth weights, delayed bone formation, and bone marrow damage when pregnant animals breathed benzene.

How likely is benzene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that benzene is a known human carcinogen. Long-term exposure to high levels of benzene in the air can cause leukemia, cancer of the blood-forming organs.

Is there a medical test to show whether I've been exposed to benzene?

Several tests can show if you have been exposed to benzene. There is test for measuring benzene in the breath; this test must be done shortly after exposure. Benzene can also be measured in the blood, however, since benzene disappears rapidly from the blood, measurements are accurate only for recent exposures.

In the body, benzene is converted to products called metabolites. Certain metabolites can be measured in the urine. However, this test must be done shortly after exposure and is not a reliable indicator of how much benzene you have been exposed to, since the metabolites may be present in urine from other sources.

Has the federal government made recommendations to protect human health?

The EPA has set the maximum permissible level of benzene in drinking water at 0.005 milligrams per liter (0.005 mgL). The EPA requires that spills or accidental releases into the environment of 10 pounds or more of benzene be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit of 1 part of benzene per million parts of air (1 ppm) in the workplace during an 8-hour workday, 40-hour workweek.

Glossary

Anemia: A decreased ability of the blood to transport oxygen.

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Chromosomes: Parts of the cells responsible for the development of hereditary characteristics.

Metabolites: Breakdown products of chemicals.

Milligram (mg): One thousandth of a gram.

Pesticide: A substance that kills pests.

References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Benzene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

TOLUENE
CAS # 108-88-3

Division of Toxicology ToxFAQs™ February 2001

This fact sheet answers the most frequently asked health questions (FAQs) about toluene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to toluene occurs from breathing contaminated workplace air, in automobile exhaust, some consumer products paints, paint thinners, fingernail polish, lacquers, and adhesives. Toluene affects the nervous system. Toluene has been found at 959 of the 1,591 National Priority List sites identified by the Environmental Protection Agency

What is toluene?

Toluene is a clear, colorless liquid with a distinctive smell. Toluene occurs naturally in crude oil and in the tolu tree. It is also produced in the process of making gasoline and other fuels from crude oil and making coke from coal.

Toluene is used in making paints, paint thinners, fingernail polish, lacquers, adhesives, and rubber and in some printing and leather tanning processes.

What happens to toluene when it enters the environment?

❑ Toluene enters the environment when you use materials that contain it. It can also enter surface water and groundwater from spills of solvents and petrolieum products as well as from leasking underground storage tanks at gasoline stations and other facilities.

❑ When toluene-containing products are placed in landfills or waste disposal sites, the toluene can enter the soil or water near the waste site.

❑ Toluene does not usually stay in the environment long.

❑ Toluene does not concentrate or buildup to high levels in animals.

How might I be exposed to toluene?

❑ Breathing contaminated workplace air or automobile exhaust.

❑ Working with gasoline, kerosene, heating oil, paints, and lacquers.

❑ Drinking contaminated well-water.

❑ Living near uncontrolled hazardous waste sites containing toluene products.

How can toluene affect my health?

Toluene may affect the nervous system. Low to moderate levles can cause tiredness, confusion, weakness, drunken-type actions, memory loss, nausea, loss of appetite, and

hearing and color vision loss. These symptoms usually disappear when exposure is stopped.

Inhaling High levels of toluene in a short time can make you feel light-headed, dizzy, or sleepy. It can also cause unconsciousness, and even death.

High levels of toluene may affect your kidneys.

How likely is toluene to cause cancer?

Studies in humans and animals generally indicate that toluene does not cause cancer.

The EPA has determined that the carcinogenicity of toluene can not be classified.

How can toluene affect children?

It is likely that health effects seen in children exposed to toluene will be similar to the effects seen in adults. Some studies in animals suggest that babies may be more sensitive than adults.

Breathing very high levels of toluene during pregnancy can result in children with birth defects and retard mental abilities, and growth. We do not know if toluene harms the unborn child if the mother is exposed to low levels of toluene during pregnancy.

How can families reduce the risk of exposure to toluene?

❑ Use toluene-containing products in well-ventilated areas.

❑ When not in use, toluene-containing products should be tightly covered to prevent evaporation into the air.

Is there a medical test to show whether I've been exposed to toluene?

There are tests to measure the level of toluene or its breakdown products in exhaled air, urine, and blood. To determine if you have been exposed to toluene, your urine or blood must be checked within 12 hours of exposure. Several other chemicals are also changed into the same breakdown products as toluene, so some of these tests are not specific for toluene.

Has the federal government made recommendations to protect human health?

EPA has set a limit of 1 milligram per liter of drinking water (1 mg/L).

Discharges, releases, or spills of more than 1,000 pounds of toluene must be reported to the National Response Center.

The Occupational Safety and Health Administration has set a limit of 200 parts toluene per million of workplace air (200 ppm).

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for Toluene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html . ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

ETHYLBENZENE
CAS # 100-41-4

This fact sheet answers the most frequently asked health questions (FAQs) about ethylbenzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Ethylbenzene is a colorless liquid found in a number of products including gasoline and paints. Breathing very high levels can cause dizziness and throat and eye irritation. Ethylbenzene has been found in at least 731 of the 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is ethylbenzene?

(Pronounced ĕth′ əl bĕn′ zēn′)

Ethylbenzene is a colorless, flammable liquid that smells like gasoline. It is found in natural products such as coal tar and petroleum and is also found in manufactured products such as inks, insecticides, and paints.

Ethylbenzene is used primarily to make another chemical, styrene. Other uses include as a solvent, in fuels, and to make other chemicals.

What happens to ethylbenzene when it enters the environment?

- Ethylbenzene moves easily into the air from water and soil.
- It takes about 3 days for ethylbenzene to be broken down in air into other chemicals.
- Ethylbenzene may be released to water from industrial discharges or leaking underground storage tanks.
- In surface water, ethylbenzene breaks down by reacting with other chemicals found naturally in water.
- In soil, it is broken down by soil bacteria.

How might I be exposed to ethylbenzene?

- Breathing air containing ethylbenzene, particularly in areas near factories or highways.
- Drinking contaminated tap water.
- Working in an industry where ethylbenzene is used or made.
- Using products containing it, such as gasoline, carpet glues, varnishes, and paints.

How can ethylbenzene affect my health?

Limited information is available on the effects of ethylbenzene on people's health. The available information shows dizziness, throat and eye irritation, tightening of the chest, and a burning sensation in the eyes of people exposed to high levels of ethylbenzene in air.

Animals studies have shown effects on the nervous system, liver, kidneys, and eyes from breathing ethylbenzene in air.

How likely is ethylbenzene to cause cancer?

The EPA has determined that ethylbenzene is not classifiable as to human carcinogenicity.

No studies in people have shown that ethylbenzene exposure can result in cancer. Two available animal studies suggest that ethylbenzene may cause tumors.

How can ethylbenzene affect children?

Children may be exposed to ethylbenzene through inhalation of consumer products, including gasoline, paints, inks, pesticides, and carpet glue. We do not know whether children are more sensitive to the effects of ethylbenzene than adults.

It is not known whether ethylbenzene can affect the development of the human fetus. Animal studies have shown that when pregnant animals were exposed to ethylbenzene in air, their babies had an increased number of birth defects.

How can families reduce the risk of exposure to ethylbenzene?

Exposure to ethylbenzene vapors from household products and newly installed carpeting can be minimized by using adequate ventilation.

Household chemicals should be stored out of reach of children to prevent accidental poisoning. Always store household chemicals in their original containers; never store them in containers children would find attractive to eat or drink from, such as old soda bottles. Gasoline should be stored in a gasoline can with a locked cap.

Sometimes older children sniff household chemicals, including ethylbenzene, in an attempt to get high. Talk with your children about the dangers of sniffing chemicals.

Is there a medical test to show whether I've been exposed to ethylbenzene?

Ethylbenzene is found in the blood, urine, breath, and some body tissues of exposed people. The most common way to test for ethylbenzene is in the urine. This test measures substances formed by the breakdown of ethylbenzene. This test needs to be done within a few hours after exposure occurs, because the substances leave the body very quickly.

These tests can show you were exposed to ethylbenzene, but cannot predict the kind of health effects that might occur.

Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level of 0.7 milligrams of ethylbenzene per liter of drinking water (0.7 mg/L).

The EPA requires that spills or accidental releases into the environment of 1,000 pounds or more of ethylbenzene be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set an occupational exposure limit of 100 parts of ethylbenzene per million parts of air (100 ppm) for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for ethylbenzene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

XYLENE
CAS # 1330-20-7

This fact sheet answers the most frequently asked health questions (FAQs) about xylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to xylene occurs in the workplace and when you use paint, gasoline, paint thinners and other products that contain it. People who breathe high levels may have dizziness, confusion, and a change in their sense of balance. This substance has been found in at least 658 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is xylene?

(Pronounced zī'lēn)

Xylene is a colorless, sweet-smelling liquid that catches on fire easily. It occurs naturally in petroleum and coal tar and is formed during forest fires. You can smell xylene in air at 0.08–3.7 parts of xylene per million parts of air (ppm) and begin to taste it in water at 0.53–1.8 ppm.

Chemical industries produce xylene from petroleum. It's one of the top 30 chemicals produced in the United States in terms of volume.

Xylene is used as a solvent and in the printing, rubber, and leather industries. It is also used as a cleaning agent, a thinner for paint, and in paints and varnishes. It is found in small amounts in airplane fuel and gasoline.

What happens to xylene when it enters the environment?

- Xylene has been found in waste sites and landfills when discarded as used solvent, or in varnish, paint, or paint thinners.
- It evaporates quickly from the soil and surface water into the air.
- In the air, it is broken down by sunlight into other less harmful chemicals.
- It is broken down by microorganisms in soil and water.
- Only a small amount of it builds up in fish, shellfish, plants, and animals living in xylene-contaminated water.

How might I be exposed to xylene?

- Breathing xylene in workplace air or in automobile exhaust.
- Breathing contaminated air.
- Touching gasoline, paint, paint removers, varnish, shellac, and rust preventatives that contain it.
- Breathing cigarette smoke that has small amounts of xylene in it.
- Drinking contaminated water or breathing air near waste sites and landfills that contain xylene.
- The amount of xylene in food is likely to be low.

How can xylene affect my health?

Xylene affects the brain. High levels from exposure for short periods (14 days or less) or long periods (more than 1 year) can cause headaches, lack of muscle coordination, dizziness, confusion, and changes in one's sense of balance. Exposure of

people to high levels of xylene for short periods can also cause irritation of the skin, eyes, nose, and throat; difficulty in breathing; problems with the lungs; delayed reaction time; memory difficulties; stomach discomfort; and possibly changes in the liver and kidneys. It can cause unconsciousness and even death at very high levels.

Studies of unborn animals indicate that high concentrations of xylene may cause increased numbers of deaths, and delayed growth and development. In many instances, these same concentrations also cause damage to the mothers. We do not know if xylene harms the unborn child if the mother is exposed to low levels of xylene during pregnancy.

How likely is xylene to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that xylene is not classifiable as to its carcinogenicity in humans.

Human and animal studies have not shown xylene to be carcinogenic, but these studies are not conclusive and do not provide enough information to conclude that xylene does not cause cancer.

Is there a medical test to show whether I've been exposed to xylene?

Laboratory tests can detect xylene or its breakdown products in exhaled air, blood, or urine. There is a high degree of agreement between the levels of exposure to xylene and the levels of xylene breakdown products in the urine. However, a urine sample must be provided very soon after exposure ends because xylene quickly leaves the body. These tests are not routinely available at your doctor's office.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 10 ppm of xylene in drinking water.

The EPA requires that spills or accidental releases of xylenes into the environment of 1,000 pounds or more must be reported.

The Occupational Safety and Health Administration (OSHA) has set a maximum level of 100 ppm xylene in workplace air for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH) also recommend exposure limits of 100 ppm in workplace air.

NIOSH has recommended that 900 ppm of xylene be considered immediately dangerous to life or health. This is the exposure level of a chemical that is likely to cause permanent health problems or death.

Glossary

Evaporate: To change from a liquid into a vapor or a gas.

Carcinogenic: Having the ability to cause cancer.

CAS: Chemical Abstracts Service.

ppm: Parts per million.

Solvent: A liquid that can dissolve other substances.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for xylenes (update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone:1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

METHYL *TERT*-BUTYL ETHER (MTBE) CAS # 1634-04-4

This fact sheet answers the most frequently asked health questions (FAQs) about methyl *tert*-butyl ether (MTBE). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Methyl *tert*-butyl ether (MTBE) is a flammable liquid which is used as an additive in unleaded gasoline. Drinking or breathing MTBE may cause nausea, nose and throat irritation, and nervous system effects. MTBE has been found in at least 11 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is methyl *tert*-butyl ether?

(Pronounced měth′əl tŭr′shē-ĕr′ē byo͞ot′l ē′thər)

Methyl *tert*-butyl ether (MTBE) is a flammable liquid with a distinctive, disagreeable odor. It is made from blending chemicals such as isobutylene and methanol, and has been used since the 1980s as an additive for unleaded gasolines to achieve more efficient burning.

MTBE is also used to dissolve gallstones. Patients treated in this way have MTBE delivered directly to their gall bladders through special tubes that are surgically inserted.

What happens to MTBE when it enters the environment?

- MTBE quickly evaporates from open containers and surface water, so it is commonly found as a vapor in the air.
- Small amounts of MTBE may dissolve in water and get into underground water.
- It remains in underground water for a long time.
- MTBE may stick to particles in water, which will cause it to eventually settle to the bottom sediment.
- MTBE may be broken down quickly in the air by sunlight.
- MTBE does not build up significantly in plants and animals.

How might I be exposed to MTBE?

- Touching the skin or breathing contaminated air while pumping gasoline.
- Breathing exhaust fumes while driving a car.
- Breathing air near highways or in cities.
- Drinking, swimming, or showering in water that has been contaminated with MTBE.
- Receiving MTBE treatment for gallstones.

How can MTBE affect my health?

Breathing small amounts of MTBE for short periods may cause nose and throat irritation. Some people exposed to MTBE while pumping gasoline, driving their cars, or working

in gas stations have reported having headaches, nausea, dizziness, and mental confusion. However, the actual levels of exposure in these cases are unknown. In addition, these symptoms may have been caused by exposure to other chemicals.

There are no data on the effects in people of drinking MTBE. Studies with rats and mice suggest that drinking MTBE may cause gastrointestinal irritation, liver and kidney damage, and nervous system effects.

How likely is MTBE to cause cancer?

There is no evidence that MTBE causes cancer in humans. One study with rats found that breathing high levels of MTBE for long periods may cause kidney cancer. Another study with mice found that breathing high levels of MTBE for long periods may cause liver cancer.

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have not classified MTBE as to its carcinogenicity.

Is there a medical test to show whether I've been exposed to MTBE?

MTBE and its breakdown product, butyl alcohol, can be detected in your breath, blood, or urine for up to 1 or 2 days after exposure. These tests aren't available at most doctors' offices, but can be done at special laboratories that have the right equipment. There is no other test specific to determining MTBE exposure.

Has the federal government made recommendations to protect human health?

The EPA has issued guidelines recommending that, to protect children, drinking water levels of MTBE not exceed 4 milligrams per liter of water (4 mg/L) for an exposure of 1-10 days, and 3 mg/L for longer-term exposures.

The American Conference of Governmental Industrial Hygienists (ACGIH) has recommended an exposure limit of 40 parts of MTBE per million parts of air (40 ppm) for an 8-hour workday, 40-hour workweek.

Glossary

Carcinogenicity: Ability to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or gas.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

Sediment: Mud and debris that have settled to the bottom of a body of water.

References

This ToxFAQs information is taken from the 1996 Toxicological Profile for Methyl *tert*-Butyl Ether produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)

Agency for Toxic Substances and Disease Registry ToxFAQs September 1996

This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl′ī-sī′klĭk ăr′ə-măt′ĭk hī′drə-kar′bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

What happens to PAHs when they enter the environment?

- PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.
- PAHs enter water through discharges from industrial and wastewater treatment plants.
- Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

How might I be exposed to PAHs?

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.

- Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

NAPHTHALENE
CAS # 91-20-3

1-METHYLNAPHTHALENE
CAS # 90-12-0

2-METHYLNAPHTHALENE
CAS # 91-57-6

Division of Toxicology ToxFAQs™ August 2005

This fact sheet answers the most frequently asked health questions (FAQs) about naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because these substances may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene happens mostly from breathing air contaminated from the burning of wood, tobacco, or fossil fuels, industrial discharges, or moth repellents. Exposure to large amounts of naphthalene may damage or destroy some of your red blood cells. Naphthalene has caused cancer in animals. Naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene have been found in at least 687, 36, and 412, respectively, of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

What are naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene?

Naphthalene is a white solid that evaporates easily. Fuels such as petroleum and coal contain naphthalene. It is also called white tar, and tar camphor, and has been used in mothballs and moth flakes. Burning tobacco or wood produces naphthalene. It has a strong, but not unpleasant smell. The major commercial use of naphthalene is in the manufacture of polyvinyl chloride (PVC) plastics. Its major consumer use is in moth repellents and toilet deodorant blocks.

1-Methylnaphthalene and 2-methylnaphthalene are naphthalene-related compounds. 1-Methylnaphthalene is a clear liquid and 2-methylnaphthalene is a solid; both can be smelled in air and in water at very low concentrations.

1-Methylnaphthalene and 2-methylnaphthalene are used to make other chemicals such as dyes and resins. 2-Methylnaphthalene is also used to make vitamin K.

What happens to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene when they enter the environment?

- Naphthalene enters the environment from industrial and domestic sources, and from accidental spills.
- Naphthalene can dissolve in water to a limited degree and may be present in drinking water from wells close to hazardous waste sites and landfills.
- Naphthalene can become weakly attached to soil or pass through soil into underground water.
- In air, moisture and sunlight break it down within 1 day. In water, bacteria break it down or it evaporates into the air.
- Naphthalene does not accumulate in the flesh of animals or fish that you might eat.
- 1-Methylnaphthalene and 2-methylnaphthalene are expected to act like naphthalene in air, water, or soil because they have similar chemical and physical properties.

How might I be exposed to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene?

- Breathing low levels in outdoor air.
- Breathing air contaminated from industrial discharges or smoke from burning wood, tobacco, or fossil fuels.
- Using or making moth repellents, coal tar products, dyes or inks could expose you to these chemicals in the air.
- Drinking water from contaminated wells.
- Touching fabrics that are treated with moth repellents containing naphthalene.
- Exposure to naphthalene, 1-methylnaphthalene and 2-methylnaphthalene from eating foods or drinking beverages is unlikely.

How can naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene affect my health?

Exposure to large amounts of naphthalene may damage or destroy some of your red blood cells. This could cause you to have too few red blood cells until your body replaces the destroyed cells. This condition is called hemolytic anemia. Some symptoms of hemolytic anemia are fatigue, lack of appetite, restlessness, and pale skin. Exposure to large amounts of naphthalene may also cause nausea, vomiting, diarrhea, blood in the urine, and a yellow color to the skin. Animals sometimes develop cloudiness in their eyes after swallowing high amounts of naphthalene. It is not clear whether this also develops in people. Rats and mice that breathed naphthalene vapors daily for a lifetime developed irritation and inflammation of their nose and lungs. It is unclear if naphthalene

causes reproductive effects in animals; most evidence says it does not.

There are no studies of humans exposed to 1-methylnaphthalene or 2-methylnaphthalene.

Mice fed food containing 1-methylnaphthalene and 2-methylnaphthalene for most of their lives had part of their lungs filled with an abnormal material.

How likely are naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene to cause cancer?

There is no direct evidence in humans that naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene cause cancer.

However, cancer from naphthalene exposure has been seen in animal studies. Some female mice that breathed naphthalene vapors daily for a lifetime developed lung tumors. Some male and female rats exposed to naphthalene in a similar manner also developed nose tumors.

Based on the results from animal studies, the Department of Health and Humans Services (DHHS) concluded that naphthalene is reasonably anticipated to be a human carcinogen. The International Agency for Research on Cancer (IARC) concluded that naphthalene is possibly carcinogenic to humans. The EPA determined that naphthalene is a possible human carcinogen (Group C) and that the data are inadequate to assess the human carcinogenic potential of 2-methylnaphthalene.

How can naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene affect children?

Hospitals have reported many cases of hemolytic anemia in children, including newborns and infants, who either ate naphthalene mothballs or deodorants cakes or who were in close contact with clothing or blankets stored in naphthalene mothballs.

Naphthalene can move from a pregnant woman's blood to the unborn baby's blood. Naphthalene has been detected in some samples of breast milk from the general U.S. population, but not at levels that are expected to be of concern.

There is no information on whether naphthalene has affected development in humans. No developmental abnormalities were observed in the offspring from rats, mice, and rabbits fed naphthalene during pregnancy.

We do not have any information on possible health effects of 1-methylnaphthalene or 2-methylnaphthalene on children.

How can families reduce the risks of exposure to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene?

❑ Families can reduce the risks of exposure to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene by avoiding smoking tobacco, generating smoke during cooking, or using fireplaces or heating appliances in the their homes.

❑ If families use naphthalene-containing moth repellents, the material should be enclosed in containers that prevent vapors from escaping, and kept out of the reach from children.

❑ Blankets and clothing stored with naphthalene moth repellents should be aired outdoors to remove naphthalene odors and washed before they are used.

❑ Families should inform themselves of the contents of air deodorizers that are used in their homes and refrain from using deodorizers with naphthalene.

Is there a medical test to determine whether I've been exposed to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene?

Tests are available that measure levels of these chemicals and their breakdown products in samples of urine, feces, blood, maternal milk, or body fat. These tests are not routinely available in a doctor's office because they require special equipment, but samples can be sent to special testing laboratories. These tests cannot determine exactly how much naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene you were exposed to or predict whether harmful effects will occur. If the samples are collected within a day or two of exposure, then the tests can show if you were exposed to a large or small amount of naphthalene, 1-methylnaphthalene, or 2-methylnaphthalene.

Has the federal government made recommendations to protect human health?

The EPA recommends that children not drink water with over 0.5 parts per million (0.5 ppm) naphthalene for more than 10 days or over 0.4 ppm for any longer than 7 years. Adults should not drink water with more than 1 ppm for more than 7 years. For water consumed over a lifetime (70 years), the EPA suggests that it contain no more than 0.1 ppm naphthalene.

The Occupational Safety and Health Administration (OSHA) set a limit of 10 ppm for the level of naphthalene in workplace air during an 8-hour workday, 40-hour workweek. The National Institute for Occupational Safety and Health (NIOSH) considers more than 500 ppm of naphthalene in air to be immediately dangerous to life or health. This is the exposure level of a chemical that is likely to impair a worker's ability to leave a contaminate area and therefore, results in permanent health problems or death.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Naphthalene, 1-Methylnaphthalene, and 2-Methylnaphthalene (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Chromium - ToxFAQs™

CAS # 7440-47-3

This fact sheet answers the most frequently asked health questions (FAQs) about chromium. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to chromium occurs from ingesting contaminated food or drinking water or breathing contaminated workplace air. Chromium(VI) at high levels can damage the nose and cause cancer. Ingesting high levels of chromium(VI) may result in anemia or damage to the stomach or intestines. Chromium(III) is an essential nutrient. Chromium has been found in at least 1,127 of the 1,669 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is chromium?

Chromium is a naturally occurring element found in rocks, animals, plants, and soil. It can exist in several different forms. Depending on the form it takes, it can be a liquid, solid, or gas. The most common forms are chromium(0), chromium(III), and chromium(VI). No taste or odor is associated with chromium compounds.

The metal chromium, which is the chromium(0) form, is used for making steel. Chromium(VI) and chromium(III) are used for chrome plating, dyes and pigments, leather tanning, and wood preserving.

What happens to chromium when it enters the environment?

- Chromium can be found in air, soil, and water after release from the manufacture, use, and disposal of chromium-based products, and during the manufacturing process.
- Chromium does not usually remain in the atmosphere, but is deposited into the soil and water.
- Chromium can easily change from one form to another in water and soil, depending on the conditions present.
- Fish do not accumulate much chromium in their bodies from water.

How might I be exposed to chromium?

- Eating food containing chromium(III).
- Breathing contaminated workplace air or skin contact during use in the workplace.
- Drinking contaminated well water.
- Living near uncontrolled hazardous waste sites containing chromium or industries that use chromium.

How can chromium affect my health?

Chromium(III) is an essential nutrient that helps the body use sugar, protein, and fat.

Breathing high levels of chromium(VI) can cause irritation to the lining of the nose, nose ulcers, runny nose, and breathing problems, such as asthma, cough, shortness of breath, or wheezing. The concentrations of chromium in air that can cause these effects may be different for different types of chromium compounds, with effects occurring at much lower concentrations for chromium(VI) compared to chromium(III).

The main health problems seen in animals following ingestion of chromium(VI) compounds are irritation and ulcers in the stomach and small intestine and anemia. Chromium(III) compounds are much less toxic and do not appear to cause these problems.

Sperm damage and damage to the male reproductive system have also been seen in laboratory animals exposed to chromium(VI).

Skin contact with certain chromium(VI) compounds can cause skin ulcers. Some people are extremely sensitive tochromium(VI) or chromium(III). Allergic reactions consisting of severe redness and swelling of the skin have been noted.

Chromium

CAS # 7440-47-3

How likely is chromium to cause cancer?

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have determined that chromium(VI) compounds are known human carcinogens.

In workers, inhalation of chromium(VI) has been shown to cause lung cancer. Chromium(VI) also causes lung cancer in animals. An increase in stomach tumors was observed in humans and animals exposed to chromium(VI) in drinking water.

How can chromium affect children?

It is likely that health effects seen in children exposed to high amounts of chromium will be similar to the effects seen in adults.

We do not know if exposure to chromium will result in birth defects or other developmental effects in people. Some developmental effects have been observed in animals exposed to chromium(VI).

How can families reduce the risk of exposure to chromium?

- Children should avoid playing in soils near uncontrolled hazardous waste sites where chromium may have been discarded.
- Chromium is a component of tobacco smoke. Avoid smoking in enclosed spaces like inside the home or car in order to limit exposure to children and other family members.
- Although chromium(III) is an essential nutrient, you should avoid excessive use of dietary supplements containing chromium.

Is there a medical test to determine whether I've been exposed to chromium?

Since chromium(III) is an essential element and naturally occurs in food, there will always be some level of chromium in your body. Chromium can be measured in hair, urine, and blood.

Higher than normal levels of chromium in blood or urine may indicate that a person has been exposed to chromium. However, increases in blood and urine chromium levels cannot be used to predict the kind of health effects that might develop from that exposure.

Has the federal government made recommendations to protect human health?

The EPA has established a maximum contaminant level of 0.1 mg/L for total chromium in drinking water.

The FDA has determined that the chromium concentration in bottled drinking water should not exceed 0.1 mg/L.

The Occupational Health and Safety Administration (OSHA) has limited workers' exposure to an average of 0.005 mg/m^3 chromium(VI), 0.5 mg/m^3 chromium(III), and 1.0 mg/m^3 chromium(0) for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2012. Toxicological Profile for Chromium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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LEAD
CAS # 7439-92-1

This fact sheet answers the most frequently asked health questions (FAQs) about lead. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to lead can happen from breathing workplace air or dust, eating contaminated foods, or drinking contaminated water. Children can be exposed from eating lead-based paint chips or playing in contaminated soil. Lead can damage the nervous system, kidneys, and reproductive system. Lead has been found in at least 1,026 of 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is lead?

(Pronounced lĕd)

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing.

Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays.

Because of health concerns, lead from gasoline, paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years.

What happens to lead when it enters the environment?

- Lead itself does not break down, but lead compounds are changed by sunlight, air, and water.
- When lead is released to the air, it may travel long distances before settling to the ground.
- Once lead falls onto soil, it usually sticks to soil particles.
- Movement of lead from soil into groundwater will depend on the type of lead compound and the characteristics of the soil.
- Much of the lead in inner-city soils comes from old houses painted with lead-based paint.

How might I be exposed to lead?

- Eating food or drinking water that contains lead.
- Spending time in areas where lead-based paints have been used and are deteriorating.
- Working in a job where lead is used.
- Using health-care products or folk remedies that contain lead.
- Engaging in certain hobbies in which lead is used (for example, stained glass).

How can lead affect my health?

Lead can affect almost every organ and system in your body. The most sensitive is the central nervous system, particularly in children. Lead also damages kidneys and the reproductive system. The effects are the same whether it is breathed or swallowed.

At high levels, lead may decrease reaction time, cause weakness in fingers, wrists, or ankles, and possibly affect the memory. Lead may cause anemia, a disorder of the blood. It can also damage the male reproductive system. The connection between these effects and exposure to low levels of lead is uncertain.

How likely is lead to cause cancer?

The Department of Health and Human Services has determined that lead acetate and lead phosphate may reasonably

be anticipated to be carcinogens based on studies in animals. There is inadequate evidence to clearly determine lead's carcinogenicity in people.

How can lead affect children?

Small children can be exposed by eating lead-based paint chips, chewing on objects painted with lead-based paint, or swallowing house dust or soil that contains lead.

Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomachache, muscle weakness, and brain damage. A large amount of lead might get into a child's body if the child ate small pieces of old paint that contained large amounts of lead. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth.

Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead.

How can families reduce the risk of exposure to lead?

Avoid exposure to sources of lead. Do not allow children to chew or mouth painted surfaces that may have been painted with lead-based paint (homes built before 1978). Run your water for 15 to 30 seconds before drinking or cooking with it. This will get rid of lead that may have leached out of pipes. Some types of paints and pigments that are used as make-up or hair coloring contain lead. Keep these kinds of products away from children. Wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

Is there a medical test to show whether I've been exposed to lead?

A blood test is available to measure the amount of lead in your blood and to estimate the amount of your exposure to lead. Blood tests are commonly used to screen children for lead poisoning. Lead in teeth and bones can be measured with X-rays, but this test is not as readily available. Medical treatment may be necessary in children if the lead concentration in blood is higher than 45 micrograms per deciliter (45 µg/dL).

Has the federal government made recommendations to protect human health?

The Centers for Disease Control and Prevention (CDC) recommends that children ages 1 and 2 be screened for lead poisoning. Children who are 3 to 6 years old should be tested for lead if they have never been tested for lead before and if they receive services from public assistance programs; if they live in or regularly visit a building built before 1950; if they live in or visit a home built before 1978 that is being remodeled; or if they have a brother, sister, or playmate who has had lead poisoning. CDC considers children to have an elevated level of lead if the amount in the blood is 10 µg/dL.

The EPA requires lead in air not to exceed 1.5 micrograms per cubic meter (1.5 $\mu g/m^3$) averaged over 3 months. EPA limits lead in drinking water to 15 µg per liter.

The Occupational Health and Safety Administration (OSHA) develops regulations for workers exposed to lead. The Clean Air Act Amendments of 1990 banned the sale of leaded gasoline. The Federal Hazardous Substance Act bans children's products that contain hazardous amounts of lead.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for lead. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Mercury - ToxFAQs™

CAS # 7439-97-6

This fact sheet answers the most frequently asked health questions (FAQs) about mercury. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to mercury occurs from breathing contaminated air, ingesting contaminated water and food, and having dental and medical treatments. Mercury, at high levels, may damage the brain, kidneys, and developing fetus. This chemical has been found in at least 714 of 1,467 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is mercury?

Mercury is a naturally occurring metal which has several forms. The metallic mercury is a shiny, silver-white, odorless liquid. If heated, it is a colorless, odorless gas.

Mercury combines with other elements, such as chlorine, sulfur, or oxygen, to form inorganic mercury compounds or "salts," which are usually white powders or crystals. Mercury also combines with carbon to make organic mercury compounds. The most common one, methylmercury, is produced mainly by microscopic organisms in the water and soil. More mercury in the environment can increase the amounts of methylmercury that these small organisms make.

Metallic mercury is used to produce chlorine gas and caustic soda, and is also used in thermometers, some dental fillings, and batteries. Mercury salts are sometimes used in skin lightening creams and as antiseptic creams and ointments.

What happens to mercury when it enters the environment?

- Inorganic mercury (metallic mercury and inorganic mercury compounds) enters the air from mining ore deposits, burning coal and waste, and from manufacturing plants.
- It enters the water or soil from natural deposits, disposal of wastes, and volcanic activity.
- Methylmercury may be formed in water and soil by small organisms called bacteria.
- Methylmercury builds up in the tissues of fish. Larger and older fish tend to have the highest levels of mercury.

How might I be exposed to mercury?

- Eating fish or shellfish contaminated with methylmercury.
- Breathing vapors in air from spills, incinerators, and industries that burn mercury-containing fossil fuels.
- Release of mercury from dental work and medical treatments.
- Breathing contaminated workplace air or skin contact during use in the workplace.
- Practicing rituals that include mercury.

How can mercury affect my health?

The nervous system is very sensitive to all forms of mercury. Methylmercury and metallic mercury vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems.

Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea, vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation.

Mercury

CAS # 7439-97-6

How likely is mercury to cause cancer?

There are inadequate human cancer data available for all forms of mercury. Mercuric chloride has caused increases in several types of tumors in rats and mice, and methylmercury has caused kidney tumors in male mice. The EPA has determined that mercuric chloride and methylmercury are possible human carcinogens.

How can mercury affect children?

Very young children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and may accumulate there, possibly causing damage to the developing nervous system. It can also pass to a nursing infant through breast milk. However, the benefits of breast feeding may be greater than the possible adverse effects of mercury in breast milk.

Mercury's harmful effects that may affect the fetus include brain damage, mental retardation, incoordination, blindness, seizures, and inability to speak. Children poisoned by mercury may develop problems of their nervous and digestive systems, and kidney damage.

How can families reduce the risk of exposure to mercury?

Carefully handle and dispose of products that contain mercury, such as thermometers or fluorescent light bulbs. Do not vacuum up spilled mercury, because it will vaporize and increase exposure. If a large amount of mercury has been spilled, contact your health department. Teach children not to play with shiny, silver liquids.

Properly dispose of older medicines that contain mercury. Keep all mercury-containing medicines away from children.

Pregnant women and children should keep away from rooms where liquid mercury has been used.

Learn about wildlife and fish advisories in your area from your public health or natural resources department.

Is there a medical test to determine whether I've been exposed to mercury?

Tests are available to measure mercury levels in the body. Blood or urine samples are used to test for exposure to metallic mercury and to inorganic forms of mercury. Mercury in whole blood or in scalp hair is measured to determine exposure to methylmercury. Your doctor can take samples and send them to a testing laboratory.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 2 parts of mercury per billion parts of drinking water (2 ppb).

The Food and Drug Administration (FDA) has set a maximum permissible level of 1 part of methylmercury in a million parts of seafood (1 ppm).

The Occupational Safety and Health Administration (OSHA) has set limits of 0.1 milligram of organic mercury per cubic meter of workplace air (0.1 mg/m^3) and 0.05 mg/m^3 of metallic mercury vapor for 8-hour shifts and 40-hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for mercury. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636.

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATTACHMENT B
REPORT FORMS

WEEKLY SAFETY REPORT FORM

Week Ending: _____ Project Name/Number: _____

Report Date: _____ Project Manager Name: _____

Summary of any violations of procedures occurring that week:

_____

_____

_____

Summary of any job related injuries, illnesses, or near misses that week:

_____

_____

_____

_____

Summary of air monitoring data that week (include and sample analyses, action levels exceeded, and actions taken):

_____

_____

_____

Comments:

_____

_____

_____

Name: _____ Company: _____

Signature: _____ Title: _____

INCIDENT REPORT FORM

Date of Report: _____

Injured: _____

Employer: _____

Site: _____ Site Location: _____

Report Prepared By: _____ _____
Signature Title

ACCIDENT/INCIDENT CATEGORY (check all that applies)

__Injury	___ Illness	___ Near Miss
__ Property Damage	___ Fire	___ Chemical Exposure
__ On-site Equipment	___ Motor Vehicle	___ Electrical
__ Mechanical	___ Spill	___ Other

DATE AND TIME OF ACCIDENT/INCIDENT: Narrative report of Accident/Incident: Identify: 1) actions leading to or contributing to the accident/incident; 2) the accident/incident occurrence; and 3) actions following the accident/incident.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

WITNESS TO ACCIDENT/INCIDENT:

Name:	_____	Company:	_____
Address:	_____	Address:	_____
Phone No.:	_____	Phone No.:	_____
Name:	_____	Company:	_____
Address:	_____	Address:	_____
Phone No.:	_____	Phone No.:	_____

INJURED - ILL:

Name: _____ SSN: _____

Address: _____ Age: _____

Length of Service: _____ Time on Present Job: _____

Time/Classification: _____

SEVERITY OF INJURY OR ILLNESS:

____ Disabling ___ Non-disabling ___ Fatality

____ Medical Treatment ___ First Aid Only

ESTIMATED NUMBER OF DAYS AWAY FROM JOB: _____

NATURE OF INJURY OR ILLNESS: _____

_____

_____

_____

CLASSIFICATION OF INJURY:

__ Abrasions
__ Bites
__ Blisters
__ Bruises
__ Chemical Burns
__ Cold Exposure
__ Concussion
__ Lacerations
____ Dislocations
____ Faint/Dizziness
____ Fractures
____ Frostbite
____ Heat Burns
____ Heat Exhaustion
____ Heat Stroke
____ Punctures
____ Radiation Burns
____ Respiratory Allergy
____ Sprains
____ Toxic Resp. Exposure
____ Toxic Ingestion
____ Dermal Allergy

Part of Body Affected: _____

Degree of Disability: _____

Date Medical Care was Received: _____

Where Medical Care was Received: _____

Address (if off-site): _____

(If two or more injuries, record on separate sheets)

PROPERTY DAMAGE:

Description of Damage: _____

_____

Cost of Damage: $ _____

ACCIDENT/INCIDENT LOCATION: _____

ACCIDENT/INCIDENT ANALYSIS: Causative agent most directly related to accident/incident (Object, substance, material, machinery, equipment, conditions)

_____

_____

_____

_____

Was weather a factor?: _____

_____

Unsafe mechanical/physical/environmental condition at time of accident/incident (Be specific):

_____

_____

_____

Personal factors (Attitude, knowledge or skill, reaction time, fatigue):

_____

_____

ON-SITE ACCIDENTS/INCIDENTS:

Level of personal protection equipment required in Site Safety Plan:

_____

_____

Modifications:

_____

Was injured using required equipment?:

_____

_____

If not, how did actual equipment use differ from plan?:

_____

_____

ACTION TAKEN TO PREVENT RECURRENCE: (Be specific. What has or will be done? When will it be done? Who is the responsible party to insure that the correction is made?

_____

_____

_____

_____

_____

ACCIDENT/INCIDENT REPORT REVIEWED BY:

_____ _____

SSO Name Printed SSO Signature

OTHERS PARTICIPATING IN INVESTIGATION:

_____ _____

Signature Title

_____ _____

Signature Title

_____ _____

Signature Title

ACCIDENT/INCIDENT FOLLOW-UP: Date: _____

Outcome of accident/incident: _____

_____

_____

_____

Physician's recommendations: _____

_____

_____

_____

Date injured returned to work: _____

Follow-up performed by:

_____ _____

Signature Title

ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM

ATTACHMENT C
EMERGENCY HAND SIGNALS

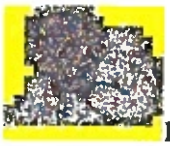
EMERGENCY SIGNALS

In most cases, field personnel will carry portable radios for communication. If this is the case, a transmission that indicates an emergency will take priority over all other transmissions. All other site radios will yield the frequency to the emergency transmissions.

Where radio communications is not available, the following air-horn and/or hand signals will be used:

EMERGENCY HAND SIGNALS

OUT OF AIR, CAN'T BREATHE!



Hand gripping throat

LEAVE AREA IMMEDIATELY, NO DEBATE!

(No Picture) Grip partner's wrist or place both hands around waist

NEED ASSISTANCE!

Hands on top of head

OKAY! – I'M ALL RIGHT!

- I UNDERSTAND!

Thumbs up

NO! - NEGATIVE!

Thumbs down

APPENDIX C

PREVIOUS INVESTIGATION REPORTS