New 470 Project

12 ECKFORD STREET
BROOKLYN, KINGS COUNTY, NEW YORK

SITE MANAGEMENT PLAN

NYSDEC Site Number: C224242

Prepared for:

New York State Department of Environmental Conservation
Division of Environmental Remediation, Remedial Bureau B
625 Broadway
Albany, New York 12233

Prepared on Behalf of:

New 470 LLC
58 Vanderbilt Motor Parkway, Suite 100
Commack, New York 11725

Prepared by:

AKRF, Inc.
440 Park Avenue South, 7th Floor
New York, New York 10016

Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

AUGUST 2019

CERTIFICATION STATEMENT

I, Michelle Lapin, P.E., certify that I am currently a NYS registered Professional Engineer as in defined in 6 NYCRR Part 375 and that this Site Management 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).

PE Stamp

Michelle Lapin, P.E.	08/01/2019	Draft
NYS Professional Engineer #073934-1	Date	Signature/Stamp

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LIST OF ACRONYMS

Acronym	Definition
ACM	Asbestos-Containing Material
ASTM	American Society of Testing Materials
AWQSGV	Ambient Water Quality Standards and Guidance Values
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
C & D	Construction and Demolition
CAMP	Community Air Monitoring Plan
CBS	Chemical Bulk Storage
COC	Certificate of Completion
CP	Commissioner Policy
CVOC	Chlorinated Volatile Organic Compound
DER	Division of Environmental Remediation
DUSR	Data Usability Summary Report
EC	Engineering Control
ECL	Environmental Conservation Law
EE	Environmental Easement
ELAP	Environmental Laboratory Approval Program
ESA	Environmental Site Assessment
EWP	Excavation Work Plan
FER	Final Engineering Report
GPA	Gas-Permeable Aggregate
HASP	Health and Safety Plan
IC	Institutional Control
LBP	Lead Based Paint
LUST	Leaking Underground Storage Tank
MTBE	Methyl Tert-Butyl Ether
NYCDOB	New York City Department of Buildings
NYCRR	New York Code of Rules and Regulations
NYCOER	New York City Office of Environmental Remediation
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	New York Codes, Rules, and Regulations
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
P&ID	Process and Instrumentation Diagram
PBS	Petroleum Bulk Storage
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethylene

Acronym	Definition
PID	Photoionization Detector
PRR	Periodic Review Report
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RA	Remedial Action
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
REC	Recognized Environmental Condition
RI	Remedial Investigation
RIR	Remedial Investigation Report
RSO	Remedial System Optimization
SCFM	Standard Cubic Feet Per Minute
SCG	Standards, Criteria, and Guidelines
SCO	Soil Cleanup Objective
SMP	Site Management Plan
SOP	Standard Operating Procedures
SOW	Statement of Work
SRI	Supplemental Remedial Investigation
SRIR	Supplemental Remedial Investigation Report
SSDS	Sub Slab Depressurization System
SVE	Soil Vapor Extraction
SVES	Soil Vapor Extraction System
SVOC	Semivolatile Organic Compounds
TAL	Target Analyte List
TCE	Trichloroethylene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leachate Procedure
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VCP	Voluntary Cleanup Program
VFD	Variable Frequency Drive
VMP	Vapor Monitoring Point
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

As required by this Site Management Plan (SMP) under the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) (Site No. C224242) (the Site), a summary of the controls implemented for the Site is included as In-Text Table 1; and a summary of the inspections, monitoring, maintenance, and reporting activities is included as In-Text Table 2.

In-Text Table 1 - Summary of Institutional Controls and Engineering Controls

Site Identification:	New 470 Project; BCP Site No. C224242 12 Eckford Street, Brooklyn, New York
Institutional Controls (ICs):	1. The property may be used for restricted residential, commercial, and industrial use. 2. Environmental Easement (EE)
Engineering Controls (ECs):	1. Composite Cover System 2. Vapor Barrier Membrane 3. Sub-Slab Depressurization System (SSDS) 4. Soil Vapor Extraction (SVE) System (SVES)

In-Text Table 2 - Summary of Inspections, Monitoring, and Reporting

Inspection	**Frequency**
Composite Cover System Inspection	First inspection no more than 18 months after Certificate of Completion (CoC), then at least annually thereafter.
Sub-Slab Depressurization System (SSDS)	Routine Inspections – Quarterly
	Detailed Inspections – Semi-Annually
Soil Vapor Extraction System (SVES)	Routine Inspections – Monthly
	Detailed Inspections – Quarterly
Reporting	**Frequency**
Letter Report With As-Builts	First quarter following SSDS/SVES startup
Letter Report Figures and Attachments	Semi-Annually
Letter Report With Figures and Attachments	Quarterly following SVES startup
Periodic Review Report (PRR)	Annually beginning 18 months after issuance of Certificate of Completion (COC) until termination of EE

Further descriptions of these requirements are provided in detail in the latter sections of this SMP.

1.0 INTRODUCTION

This Site Management Plan (SMP) is a required element of the remedial program for the New 470 Project located at 12 Eckford Street in Brooklyn, New York (hereinafter referred to as the Site). The Site is currently in the New York State (NYS) Brownfield Cleanup Program (BCP) (Site No. C224242), which is administered by the NYS Department of Environmental Conservation (NYSDEC).

1.1 General

New 470 LLC entered into a Brownfield Cleanup Agreement (BCA) on December 1, 2016 (BCA Index No. C224242-10-16) as a Volunteer with NYSDEC to remediate the Site. The Site is identified as Brooklyn Borough Block 2714, Lot 33 on the New York City Tax Map. The Site location and boundaries are shown on Figures 1 and 2, respectively. The boundaries of the Site are more fully described in the metes and bounds Site description that is part of the Environmental Easement (EE), provided as Appendix A.

1.2 Purpose

After completion of the remedial work, some contamination was left in the Site subsurface, which is hereafter referred to as "remaining contamination". Institutional and Engineering Controls (ICs and ECs) have been incorporated into the Site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. An EE granted to NYSDEC and recorded with the Kings County Clerk requires compliance with this SMP and all ECs and ICs placed on the Site, as required by this SMP.

This SMP was prepared to manage remaining contamination at the Site until the EE is extinguished in accordance with Environmental Conservation Law (ECL) Article 71, Title 36. This SMP has been approved by NYSDEC, and compliance with this SMP is required by the grantor of the EE and the grantor's successors and assigns. This SMP may be revised only with the approval of the NYSDEC or its successor agency managing environmental issues in New York State.

It is important to note that:

- This SMP details the Site-specific implementation procedures required by the EE. Failure to properly implement this SMP is a violation of the EE, which is grounds for revocation of the Certificate of Completion (COC).
- Failure to comply with this SMP is also a violation of ECL, 6 New York Code of Rules and Regulations (NYCRR) Part 375 and the BCA (Index No. C224242-10-16; Site No. C224242) for the Site, and thereby subject to applicable penalties.

All reports associated with the Site can be viewed by contacting NYSDEC or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the Site is provided in In-Text Table 3 in Section 1.4 of this SMP.

This SMP was prepared by AKRF, Inc. (AKRF), on behalf of New 470 LLC (the Volunteer), in accordance with the requirements of the NYSDEC's Division of Environmental Remediation (DER)-10 (Technical Guidance for Site Investigation and Remediation), dated May 3, 2010, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and ECs required by the EE for the Site.

1.3 Revisions

Any revisions to this SMP will be proposed in writing to the NYSDEC's project manager (or the project manager of NYSDEC's successor agency). Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or

shut-down of a remedial system; post-remedial removal of contaminated soil/fill underlying the composite cover system; or other significant change to the Site conditions. In accordance with the EE for the Site, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP retained in its files. Any changes will be documented on the cover page of this SMP.

1.4 Notifications

Notifications will be submitted by the property owner to the NYSDEC, as needed, in accordance with NYSDEC's DER – 10 for the following reasons:

- 60-day advance notice of any proposed changes in Site use that are required under the terms of the BCA, 6NYCRR Part 375 and/or ECL.
- 7-day advance notice of any field activity associated with the remedial program.
- 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan (EWP) (Appendix B).
- Notice within 48 hours of any damage or defect to the foundation, structures, or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.
- Verbal notice by noon of the following day of any emergency, such as a fire, flood or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the Site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/remedial party has been provided with a copy of the BCA and all approved work plans and reports, including this SMP.
- Within 15 days after the transfer of all or part of the Site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

In-Text Tables 3 and 4 include contact information for the above notification. The information on the following tables will be updated as necessary to provide accurate contact information.

In-Text Table 3 - Site Contact List

Company	Individual Name	Title	Contact Number
AKRF	Michelle Lapin, P.E.	Remedial Engineer	(646) 388-9520
	Marc S. Godick, LEP	Project Director	(914) 922-2356
	Amy Jordan	Project Manager	(646) 388-9864
New 470 LLC	Ronald Walker	Volunteer Representative	(631) 234-1600

In-Text Table 4 – Notifications

Company	Individual Name	Title	Contact Number
NYSDEC	Steven Walsh	Project Manager	(518) 402-9824
	Gerard Burke	Director, Remedial Bureau B	(518) 402-9824
	Jane O'Connell	Chief, Superfund and Brownfield Cleanup Section	(718) 482-4599
Note: Notifications are subject to change and will be updated as necessary.			

2.0 SITE BACKGROUND

2.1 Site Location and Description

The Site is located at 12 Eckford Street in the Williamsburg neighborhood in Brooklyn, Kings County, New York and is identified as Brooklyn Borough Block 2714, Lot 33 on the New York City Tax Map (see Figure 1). The Site is a 0.5123-acre parcel bounded by: a former commercial building currently being used as a construction office for the Site and residential buildings to the north; residential buildings to the east; Newton Street to the southeast; Eckford Street to the west; and Manhattan Avenue to the southwest (see Figure 2). The boundaries of the Site are more fully described in the Environmental Easement, included as Appendix A. The owner and Volunteer for the Site at the time of issuance of this SMP is New 470 LLC.

2.2 Physical Setting

2.2.1 Land Use

The Site is being developed with an 8-story building with mechanical space in the partial cellar on the southwestern portion of the Site, an at-grade parking garage with 37 tenant parking spaces and a lobby on the ground floor, and 108 residential units above. Twenty percent of the residential units consist of affordable housing. An open-air concrete dog run occupies the northwestern portion of the Site.

Surrounding uses include commercial, residential, educational, and open space properties.

2.2.2 Geology And Hydrogeology

Prior to development, the stratigraphy of the Site was documented to consist of between approximately 6 and 12 feet of urban fill characterized by sand, gravel, and silt with concrete, asphalt, brick, and ash. Below the fill was an apparent native sand, gravel, and silt stratum to the termination of each boring (approximately 20 feet below sidewalk grade). Groundwater was encountered between approximately 10 and 12.5 feet below grade during environmental investigations (detailed in Section 2.4). Based on the groundwater elevation measurements collected on June 6, 2016 from the Site and off-site portion of former Lot 1 (north-adjacent to the Site), groundwater flow is generally from east to west beneath the Site (Figure 3).

2.3 Site History

According to historic Sanborn fire insurance maps, the Site was undeveloped until prior to 1905. By 1916, former Lot 1 was developed with an unspecified factory building and former Lot 33 was developed with a barrel shed, a carriage garage, and a cooperage with an office. By 1942, former Lot 1 was developed with a sash and door storage facility and a woodworking shop associated with the north-adjacent I. Feldman & Son Inc. Sash & Door Manufacturer; former Lot 30 was developed with a two-story building used for window sash storage; former Lot 32 was labeled as "barrels, boxes, and automobile" with a gasoline tank on the southwestern portion; and former Lot 33 was developed with a cooperage and an office. By 1951, former Lot 1 was developed with a metal container manufacturer and an enameling works with a baking oven and spray booths and former Lot 30 was labeled "to be: garage". Former Lot 1 was developed with a new factory building in 1963 and with a spray booth and storage on the eastern portion by 1965. By 1965, former Lot 30 was developed as a garage and as a factory by 1978. By 1983, former Lot 32 was used for freight storage and motor freight storage between 1986 and 1991. The Site was vacant circa 2014-2016 and the former buildings were demolished in 2015 and 2016 to support the redevelopment. The

surrounding area was developed historically with residential, commercial, educational, manufacturing, automotive, and woodworking uses.

2.4 Investigation and Remedial History

The following environmental reports were prepared for the Site:

Phase I Environmental Site Assessment (ESA) Report, 470 Manhattan Avenue, Brooklyn, New York, URS Corporation (URS), April 2013

URS prepared a Phase I ESA Report of former Lot 33 in April 2013. The scope of the Phase I ESA included a Site inspection and an evaluation of readily available historical information, selected environmental databases, and electronic records. The assessment identified the following recognized environmental concerns (RECs):

- Former Lot 33 contained an E-Designation for hazardous materials listed in the Department of City Planning E-Designation database, which was established as part of the rezoning of Williamsburg and Greenpoint.
- The surrounding area was developed historically with manufacturing facilities, including an electroplating facility, dry cleaners, a steel company, and Mobil Oil Corporation. These properties were listed in multiple databases with open- and closed-status spills, hazardous waste generation, soil and groundwater contamination and remediation, chemical and petroleum bulk storage (CBS and PBS), and leaking underground storage tanks (LUSTs).

Phase I Environmental Site Assessment Report, 119-125 Newton Street, Brooklyn, New York, Hydrotech Environmental, Corp. (Hydrotech), April 2013

Hydrotech prepared a Phase I ESA Report of former Lots 30 and 32 in April 2013. The scope of the Phase I ESA included a Site inspection and an evaluation of readily available historical information, selected environmental databases, and electronic records. The assessment identified the following RECs:

- Former Lots 30 and 32 contained E-Designations for hazardous materials, established as part of the rezoning of Williamsburg and Greenpoint.
- Historical Sanborn maps dated between 1942 and 2007 identified underground storage tanks (USTs) on former Lot 32.
- Former Lots 30 and 32 were developed historically with a garage, a metal fabrication shop, and a scrap metal yard.

Environmental Summary Report, 470 Manhattan Avenue, Block 2714, Lots 1, 30, 32, and 33, Brooklyn, New York, AKRF, Inc., September 2015

AKRF prepared an Environmental Summary Report of the Site and an off-site portion of former Lot 1 in September 2015. The report included the findings of an inspection and an evaluation of historical Sanborn insurance maps and selected environmental databases. The assessment identified the following RECs:

- The former Site lots contained E-Designations for hazardous materials listed in the Department of City Planning E-Designation database, established as part of the rezoning of Williamsburg and Greenpoint.
- Historical uses of the Site included: unspecified manufacturing, sash and door storage, and a woodworking shop associated with the I. Feldman & Son Inc. Sash & Door Manufacturer, a metal container manufacturer, and an enameling works with a baking oven and spray booths

on former Lot 1; a garage and an unspecified factory on former Lot 30; a motor freight facility with a gasoline UST on former Lot 32; and a barrel shed, a carriage garage, and a cooperage on former Lot 33.

- An oil burner switch was observed on the wall of a former partially demolished Site building on former Lot 30; however, no tank was observed.
- The area surrounding the Site was developed historically with manufacturing, automotive, and woodworking uses, including: the Joseph Goetz Manhattan Cabinet Works, the I. Feldman Sash and Door Manufacturer, unspecified manufacturing and warehouses, textile printing, cloth combining, a wire spring manufacturer, a cabinet finisher, a tin smith, a fuel oil company, a blacksmith, the George N. Gardiner & Son Marine Paint Manufacturer, a beverage bottling, junk storage, Meisel Danowitz & Company with associated planning and molding facilities, lumber storage and yards, kilns, cooperages, Atlantic Hardwood Company, an iron pipe warehouse, a metal works, lacquer spraying, a machine shed and shop, a motor grinder, a motor freight station, garages with gasoline tanks, trucking and parking facilities, tractor storage, a truck bay, and automotive repair and washing, and gasoline filling stations. Additionally, several properties in the surrounding area were listed in the Resource Conservation and Recovery Act (RCRA), PBS, Spills, E-Designation, and LUST databases. A groundwater monitoring well was observed east of the Site in the Graham Avenue sidewalk. The purpose of the monitoring well was not able to be ascertained, but was noted to be possibly related to current or historical off-site uses. A vent pipe and a fill port for No. 2 fuel oil were observed on the northeastern exterior wall of an off-site, three-story residential building on former Lot 1, north-adjacent to the Site. Minor staining was observed around the fill port.

Phase II Work Plan (Short Form), 470 Manhattan Avenue, Block 2714, Lots 1, 30, 32, and 33, Brooklyn, New York, AKRF, Inc., September 2015

AKRF prepared a Phase II Work Plan and associated Health and Safety Plan (HASP) for the Site and an off-site portion of former Lot 1 (also owned by the Volunteer) in September 2015. The work plan proposed sampling locations and included the installation of 10 soil borings with the collection and laboratory analysis of 20 soil samples, the installation of five temporary groundwater monitoring wells with the collection and installation of five groundwater samples, and the installation of seven temporary soil vapor points with the collection and analysis of seven soil vapor points and 1 ambient air sample. The HASP provided Site-specific health and safety measures to be employed during implementation of the investigation. The scope of the investigation was based on the previous reports for the Site.

Remedial Investigation (RI) Report (RIR), 470 Manhattan Avenue, Block 2714, Lots 1, 30, 32, and 33, Brooklyn, New York, AKRF, Inc., October 2015

AKRF conducted an RI for the Site and an off-site portion of former Lot 1 (also owned by the Volunteer) and prepared an RIR in October 2015. The RI was conducted in accordance with the New York City Office of Environmental Remediation (NYCOER)-approved September 2015 Phase II Work Plan. Soil/fill beneath the Site consisted of approximately 12 feet of fill material characterized by sand, gravel, silt, concrete, asphalt, brick, and ash, underlain by apparent native sand, gravel, and silt. Groundwater was encountered between approximately 10 and 12 feet below surface grade.

The RIR concluded that some elevated concentrations of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, and polychlorinated biphenyls (PCBs) were detected in on- and off-site soil/fill samples. The VOC methyl tert-butyl ether (MTBE), SVOCs, and metals were detected in on-site groundwater at concentrations above their applicable standards

[Ambient Water Quality Standards and Guidance Values (AWQSGVs)]; and the VOC 1,1-dichloroethane (1,1-DCA), metals, and the pesticide chlordane were detected in groundwater beneath the off-site portion of former Lot 1 at concentrations above their respective AWQSGVs. VOCs associated with petroleum were detected at concentrations up to 279 micrograms per cubic meter (µg/m^3) and solvent-related VOCs were detected at concentrations up to 2,580 µg/m^3. The highest concentrations of both chlorinated solvent- and petroleum-related VOCs were detected in the soil vapor samples collected on-site.

Remedial Action Work Plan (RAWP), 470 Manhattan Avenue, Block 2714, Lots 1, 30, 32, and 33, Brooklyn, New York, AKRF Engineering, P.C., October 2015

AKRF prepared a RAWP for the Site and an off-site portion of former Lot 1 (also owned by the Volunteer) in October 2015. The RAWP outlined the remedial action objectives (RAOs) and established procedures and cleanup objectives for the protection of public health and the environment, Track 4 soil cleanup objectives (SCOs), and soil/fill handling procedures. The RAWP also required the installation of a vapor barrier and an active sub-slab depressurization system (SSDS) to address potential vapor intrusion into the Site building, a Site-wide composite cover system to prevent direct exposure to residual contamination in soil, and outlined a project schedule for construction. The RAWP and associated Stipulation List were approved by NYCOER in November 2015.

Delineation Sampling Work Plan, 470 Manhattan Avenue, Block 2714, Lots 1, 30, 32, and 33, Brooklyn, New York, AKRF, Inc., February 2016

AKRF prepared a Delineation Sampling Work Plan in February 2016 to establish a sampling protocol to delineate the solvent-related VOC contamination identified in soil vapor on the northeastern and eastern portions of the Site during the RI. The work plan was developed in response to AKRF's November 2015 RIR and a telephone conference with representatives of NYCOER. The work plan proposed sampling locations and included the installation of three soil borings with continuous sample collection and laboratory analysis of three soil samples, and the installation of four soil vapor points with collection and laboratory analysis of four soil vapor samples.

The results of the delineation sampling, which were submitted to NYCOER in an email dated April 20, 2016 and discussed in a conference call on May 3, 2016, did not identify elevated concentrations of VOCs in soil. Of note in soil vapor, tetrachloroethylene (PCE) was detected at concentrations up to 956 µg/m^3, trichloroethylene (TCE) was detected at concentrations up to 1,120 µg/m^3, 1,1-DCA was detected at concentrations up to 9,230 µg/m^3, and 1,1,1-trichlorethane (1,1,1-TCA) was detected at concentrations up to 37,300 µg/m^3.

Supplemental Remedial Investigation (SRI) and Soil Vapor Extraction (SVE) Pilot Test Work Plan, 12 Eckford Street (470 Manhattan Avenue), Brooklyn, New York, AKRF, Inc., May 2016

AKRF prepared an SRI and SVE Pilot Test Work Plan and associated HASP for the Site, an off-site portion of former Lot 1, and the east-adjacent lot (off-site Lot 29) in May 2016. The work plan proposed sampling locations and included: installation of eight soil borings with continuous sample collection and laboratory analysis of eight soil samples, installation of four temporary groundwater monitoring wells with collection and laboratory analysis of four groundwater samples, and installation of three temporary soil vapor points with collection and laboratory analysis of three soil vapor samples and one ambient air sample. The work plan also included the installation of two SVE wells and three clustered soil vapor points for use during an SVE pilot test, which was conducted to establish the necessary quantity and location of extraction wells, and optimize the design of a full-scale SVES. As part of the pilot test, six influent vapor samples were collected for laboratory analysis of VOCs. The associated HASP provided Site-specific health and safety

measures to be employed during implementation of the investigation. The scope of the investigation was based on the previous reports for the Site.

Supplemental Remedial Investigation Report (SRIR), 12 Eckford Street (470 Manhattan Avenue), Brooklyn, New York, AKRF, Inc., July 2016

AKRF conducted an SRI at the Site and off-site portion of former Lot 1 in June 2016. The SRI was conducted in accordance with the AKRF's May 2016 SRI and SVE Pilot Test Work Plan and associated HASP, with the exception of the following deviations: the east-adjacent Lot 29 was inaccessible at the time of the investigation; therefore, the soil vapor points proposed in the rear yard were relocated west of the proposed locations onto former Lot 33 on the eastern portion of the Site; and the sub-slab soil vapor point and indoor air sample were not collected and an indoor air quality survey was not conducted proposed on Lot 29 due to access issues. Soil/fill beneath the Site consisted of approximately 12 feet of fill material characterized by sand, gravel, silt, concrete, asphalt, brick, and ash, underlain by apparent native sand, gravel, and silt. Groundwater was encountered between approximately 10 and 12 feet below grade.

Soil and groundwater samples were analyzed for VOCs. The SRI did not identify elevated concentrations of VOCs in on- or off-site soil samples. The VOC methyl tert butyl ether (MTBE) was detected above its AWQSGV in one on-site groundwater sample, and several VOCs were detected above applicable standards in two off-site groundwater samples.

A review of the soil vapor sample analytical results identified 22 VOCs in the three soil vapor samples collected on-site and from an off-site portion of former Lot 1. VOCs associated with petroleum [including benzene, toluene, ethylbenzene, xylenes (collectively referred to as BTEX), 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, 2-butanone, 2-hexanone, cyclohexane, ethanol, tert-butyl alcohol, n-hexane, o-xylene, and 4-ethyltoluene] were detected at concentrations up to 1,680 µg/m^3 in the on-site soil vapor sample and chlorinated volatile organic compounds (CVOCs) (including PCE, 1,1,1-TCA, and 1,1-DCA) were detected at concentrations up to 92.8 µg/m^3 in an off-site soil vapor sample.

Soil Waste Classification Report, 12 Eckford Street (470 Manhattan Avenue), Brooklyn, New York, AKRF, October 2016

AKRF conducted waste classification sampling at the Site in October 2016 to gain off-site disposal acceptance for soil/fill excavated during development. The waste classification sampling included the excavation of three test pits to approximately 12 feet below grade at the location of the partial cellar, and four test pits to approximately four feet below grade at the location of the slab-on-grade portion of the Site building. Prior to test pit excavation, a geophysical survey was conducted across the entire Site to clear the proposed test pit locations of utilities and subsurface obstructions, and to locate potential USTs in the Site subsurface.

The geophysical survey identified an approximately 7-foot by 5-foot metallic anomaly on the southwestern portion of the Site at the approximate location of the gasoline UST shown on the historical Sanborn maps (see Section 2.3). The results of the waste classification sampling identified some elevated levels of SVOCs, pesticides, metals, and hexavalent chromium in Site soil/fill. One test pit excavated at the eastern portion of the partial cellar contained lead at concentrations exceeding the United States Environmental Protection Agency (USEPA) hazardous waste threshold.

Remedial Action Work Plan – New 470 Project, 12 Eckford Street (470 Manhattan Avenue), AKRF, November 2016

In 2016, the Site entered into the New York State BCP (BCP Site No. C224242). AKRF prepared a NYSDEC RAWP for the Site in November 2016. After the Site was accepted into the BCP,

NYSDEC became the primary agency overseeing remediation, with the NYSDEC RAWP superseding the October 2015 NYCOER-approved RAWP. The RAWP outlined the RAOs, which established procedures and cleanup objectives for the protection of public health and the environment. Similar to the October 2015 RAWP, the November 2016 RAWP established Track 4 SCOs and soil handling procedures, required the installation of a vapor barrier and active SSDS to address potential vapor intrusion into the Site building, a Site-wide composite cover system to prevent direct exposure to residual contamination in soil, and outlined a project schedule for construction. The November 2016 RAWP also required the installation of an SVES and noted that any petroleum storage tanks and/or soil exceeding hazardous waste criteria would be properly removed. The RAWP and associated Decision Document (DD) were approved by NYSDEC and New York State Department of Health (NYSDOH) in December 2016.

Soil Lead Delineation Report – 12 Eckford Street (470 Manhattan Avenue), Brooklyn, NY, AKRF, Inc., May 2018

AKRF conducted soil sampling at the Site to delineate the soil exceeding the hazardous waste criteria for lead, which was identified during soil waste classification sampling in 2016. The sampling included excavation of four test pits around the location where hazardous lead levels were previously detected, with the collection and laboratory analysis of 16 soil samples. Laboratory analysis indicated that none of the 2018 soil samples exceeded hazardous waste criteria, indicating that the limited hazardous lead hotspot had been delineated.

Phase I Environmental Site Assessment Report, 12 Eckford Street (470 Manhattan Avenue), Brooklyn, New York, AKRF, Inc., May 2018

AKRF prepared a Phase I ESA Report for the Site in May 2018. The scope of the Phase I ESA included a Site inspection and an evaluation of readily available historical information, selected environmental databases, and electronic records. The assessment identified the following RECs:

- Historical uses of the Site had affected subsurface conditions. Based on the potential for contamination identified during environmental review for a 2005 rezoning, the Property was assigned a hazardous materials and air quality E-Designation. Based on investigations conducted in 2015 and 2016, the Site entered into the BCP in 2016. Previous environmental investigations identified: fill materials containing elevated concentrations of various contaminants (primarily SVOCs and metals); groundwater containing elevated concentrations of the gasoline additive MTBE, SVOCs and metals; and VOCs, primarily those associated with chlorinated solvents, in soil vapor. In addition, a hotspot of soil exceeding hazardous waste criteria for lead was identified in 2016, and delineated in 2018.
- Computerized New York City Buildings Department (NYCDOB) records identified evidence of historical fuel oil use at the Site and a gasoline UST associated with a garage was identified on the southeastern portion of the Site on historical Sanborn maps.
- The surrounding area historically included factories, a tinsmith, a fuel oil facility, and garages and filling stations with gasoline USTs. Of note, the north-adjacent property was historically used for various factories, including a backing and coating factory, textile production and printing, lamp manufacturing, enameling, leather goods and purse production, woodcraft, and box dies manufacturing. Additionally, the regulatory database identified PBS facilities, a closed-status spill listing, and New York City Voluntary Cleanup Program (VCP) sites in close proximity to the Site.

The Phase I ESA Report also identified on-site concerns, including the potential presence of lead-based paint (LBP), suspect PCB-containing equipment and/or caulking, and/or suspect asbestos-containing materials (ACM) within the former building. The Phase I ESA Report identified a

potential for subsurface vapors, and thus a potential for vapor migration into future buildings at the Property. The Phase I ESA Report provided recommendations, including conducting remediation and development in accordance with the requirements of the NYSDEC-approved RAWP.

2.5 Remedial Action (RA) Objectives (RAOs)

The objectives for the remedial program were established through the remedy selection process stated in 6 NYCRR Part 375. A Track 4 RA was achieved. RA were performed at the Site in accordance with the NYSDEC-approved RAWP and DD, and applicable federal, state, and local rules and regulations. Detailed descriptions of the completed RA are included in the Final Engineering Report (FER). The RAOs for the Site, as listed in the DD dated December 2016, include:

Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of, volatiles from contaminated groundwater.

RAOs for Environmental Protection

- Restore groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Remove the source of groundwater contamination.

Soil/Fill

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil/fill.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil/fill.

RAO for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into the building at the Site.
- Prevent the off-site migration of contaminants.

Figures 4 and 5 show pre-remedial concentrations of soil/fill and groundwater samples above applicable UUSCOs and/or RRSCOs, and AWSQGVs. Figure 6 shows soil vapor sample concentrations.

2.6 Summary of Remedial Actions (RAs)

The following is a summary of the RAs conducted.

2.6.1 Underground Storage Tank (UST) Removal and Registration

One 550-gallon gasoline UST was encountered during remedial excavation on June 22, 2018. The UST was encountered on the south-central portion of the Site at approximately 5 feet below sidewalk grade. NYSDEC was immediately notified upon tank discovery and

was kept up to date on tank removal and associated sampling activities as they occurred. The tank was properly cleaned, removed, and disposed of off-site by a licensed tank remediation contractor. Five endpoint samples were collected from the bottom and sidewalls of the tank grave.

In July 2019, after remedial excavation concluded and no additional tanks were discovered, the Volunteer submitted a PBS Application to the NYSDEC to register and close the UST (PBS Facility ID 2-xxxxx). The location of the former UST is shown on Figure 2.

Tank endpoint sample analytical results are included in Attached Tables 1 and 2. Tank endpoint sample analytical results exceeding UUSCOs and/or RRSCOs are presented on Figure 7.

2.6.2 Soil/Fill Excavation and Off-Site Disposal

Excavation was conducted between July 2018 and February 2019. A total of 9,143.4 cubic yards of soil/fill were excavated and disposed of off-site in accordance with applicable federal, state, and local rules and regulations. Remedial excavation depths and locations are shown on Figure 8.

In accordance with the NYSDEC-approved RAWP and DD, post-excavation endpoint samples were collected to document concentrations of contaminants of concern left in place following the remedy. Samples were collected in accordance with the frequency outlined in the RAWP. Twenty-four post-excavation endpoint samples were collected to document concentrations of target compounds in soil/fill underlying the composite cover system at the Site. Site-wide endpoint sample analytical results are included in Attached Tables 3 through 7. Site-wide endpoint sample analytical results exceeding UUSCOs and/or RRSCOs are presented on Figure 9.

2.6.3 Material Import

Approximately 400 cubic yards of virgin gas-permeable aggregate (GPA) meeting the requirements of 6 NYCRR Part 375-6.8(a) and American Society of Testing Materials (ASTM) No. 5 were imported for use as part of the composite cover system, which is shown on Figure 10.

2.6.4 Engineering Controls (ICs)

Composite Cover System

A Track 4 remedy was achieved; therefore, exposure to remaining contamination in soil/fill at the Site is prevented by a composite cover system, which was constructed across the entire Site. The composite cover system is composed of the following components, as shown on Figure 9:

- *Partial Cellar and Elevator Pit:* 6 inches of concrete underlain by GCP Preprufe® 300R vapor barrier/waterproofing, underlain by compacted subgrade.
- *Exterior Foundation Walls:* concrete foundation wall adjacent to GCP Hydroduct 220 and Bituthene 4000 vapor barrier/waterproofing, adjacent to compacted subgrade.
- *Slab-On-Grade Building:* 6 inches of concrete underlain by Stego Wrap® 20 mil vapor barrier, underlain by 4-inch diameter PVC SSDS and SVES piping in a minimum 6 inches of GPA, underlain by non-woven geotextile fabric, underlain by prepared subgrade.

- *Exterior, Open-Air Dog Run:* 6 inches of concrete underlain by GPA, underlain by a demarcation barrier (snow fence), underlain by prepared subgrade.

The locations and cross-sections of the composite cover system components are shown on Figure 10.

Vapor Mitigation Measures – Vapor Barrier and SSDS

A Grace Preprufe® 300R and Bituthene® 4000 vapor barrier membrane that meets or exceeds the ASTM E-1745 standard was installed as a Site EC below the cellar slab and along subgrade cellar sidewalls, sumps, and pits. The Grace Preprufe® 300R and Bituthene® 4000 vapor barrier membranes also act as waterproofing, as the partial cellar construction extends into the water table; therefore, installation of an SSDS below the partial cellar slab was infeasible. Stego Wrap® 120R was installed under the slab-on-grade portion of the building. GCP Hydroduct 220 and Bituthene® 4000 were installed along the exterior vertical building walls to sidewalk grade. The membranes were installed in accordance with the manufacturer's installation specifications at the locations shown on Figure 10.

An active SSDS was installed to mitigate the potential for soil vapor intrusion into the new building. The SSDS maintains a negative pressure (vacuum) beneath the entire ground floor building slab, which will allow the vapors below the concrete slab to vent without entering the building. The SSDS consists of a minimum 6-inch thick layer of GPA and horizontal trenches filled with dedicated subsurface depressurization lines consisting of 0.002-inch slot 4-inch diameter [polyvinyl chloride (PVC)] piping connected to an aboveground piping manifold, suction fan, and a vertical riser that extends through the proposed building and above the 8th floor roof to a discharge stack, as shown on Figure 11.

Treatment System – Soil Vapor Extraction (SVE) System (SVES)

An SVES was installed to remediate the contaminated vadose zone soil beneath the building on the eastern and northeastern portions of the Site and to help prevent off-site migration of chlorinated VOCs in soil vapor. The SVES consists of four SVE extraction wells (SVE-01 through SVE-04) connected via a network of sub-slab piping that leads to an aboveground equipment room containing a blower and granular activated carbon (GAC) vessels. The contaminated vapor extracted from the SVE wells will be treated and discharged to the atmosphere in accordance with the emission requirements set forth in 6NYCRR Part 212.

An SVES pilot test was performed as part of the SRI in June 2016 to confirm the observed ROI for each extraction well and evaluate appropriate blower sizing and effluent treatment of the final system design. As detailed in the SRIR, 14 observations wells screened at intervals ranging between 3 and 12 feet below surface grade, were used as monitoring points for two SVE pilot test wells at the approximate locations of SVE-01 and SVE-02 to measure induced vacuum at varying distances from both SVE wells. A vacuum reading of 0.1 inches of water (inH_2O) column was established as the minimum induced vacuum target for the monitoring points during the SVE communication testing to establish the design ROI for the respective extraction well. Using 0.1 inH_2O as the minimum induced vacuum target and an applied vacuum of 30 inH_2O, the results of the pilot test showed observed ROIs of 25 and 35 feet for SVE-01 and SVE-02, respectively.

To ensure a continuous zone of extraction across the treatment area and adequate vacuum to mobilize contamination and prevent off-site migration of soil vapor, two additional extraction wells (SVE-03 and SVE-04) were installed as part of the final system design. It

is noted that as part of construction, the Site was capped with a concrete slab an active SSDS, and a vapor barrier. The vapor barrier and building slab act as impermeable barriers and the SSDS will create supplemental vacuum in the shallow subsurface beneath the Site to supplement the induced vacuum of the SVES.

The components and locations of the SVES are shown on Figure 11. SVES as-builts are provided in Appendix C.

2.6.5 Institutional Controls (ICs)

Environmental Easement (EE)

The imposition of an IC in the form of an EE for the Site; the Site has a series of ICs in the form of Site restrictions and requirements. The Site restrictions that apply to the Site are:

- In-ground vegetable gardens and farming on the Site are prohibited;
- Use of groundwater underlying the Site is prohibited without treatment rendering it safe for the intended purpose;
- All future activities on the Site that will disturb residual contaminated material are prohibited unless they are conducted in accordance with the soil management provisions in the SMP;
- The Site may be used for restricted residential, commercial, and industrial use only, provided the IC/ECs included in the SMP are employed;
- The Site may not be used for a higher level of use, such as unrestricted or unrestricted residential use without an amendment or extinguishment of this EE; and
- The Grantor agrees to submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (1) controls employed at the Site are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access the Site at any time to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow. This statement must be certified by an expert that the NYSDEC finds acceptable.

The EE is provided in Appendix A.

Site Management

Since post-remedial EC monitoring and sampling, and an EE were required following implementation of the remedy, this SMP, includes an IC/EC Plan and a Monitoring Plan to assess the performance and effectiveness of the remedy.

2.7 Remaining Contamination

2.7.1 Soil/Fill

Following excavation of soil/fill required to achieve a Track 4 cleanup and additional material required to install the new building foundation, 24 post-excavation endpoint samples were collected to document concentrations of compounds remaining at the Site after achievement of the remedy. The endpoint sample analytical results are included in Attached Tables 3 through 7. The endpoint sample locations and sample concentrations above respective UUSCOs and/or RRSCOs are shown on Figure 9.

2.7.2 Groundwater

Groundwater monitoring wells installed during the RI and SRI were removed during construction in accordance with applicable state regulations. Groundwater was not remediated as part of the RA and post-remedial groundwater monitoring was not required by NYSDEC. Therefore, on-site groundwater monitoring wells do not currently exist on-site.

Former RI and SRI groundwater monitoring well locations are shown on Figure 2. The RI and SRI groundwater sample analytical results collected from on- and off-site locations at concentrations above respective Ambient Water Quality Standards and Guidance Values (AWQSGVs) are shown on Figure 5.

2.7.3 Soil Vapor

Soil vapor is being mitigated and remediated as part of the RA through the ECs in place at the Site. A vapor mitigation system consisting of a vapor barrier and SSDS was installed to mitigate the potential for soil vapor intrusion into the new Site building. The SVES was installed to remediate the contaminated vadose zone soil beneath the building in the eastern and northeastern portions of the Site and to minimize the off-site migration of CVOCs in soil vapor. Post-remedial soil vapor monitoring is required under this SMP to determine the effectiveness of the ECs.

Former RI and SRI temporary soil vapor sampling point locations are shown on Figure 2. SI, RI, and SRI soil vapor sample concentrations are shown on Figure 6.

3.0 INSTITUTIONAL AND ENGINEERING CONTROL (IC AND EC) PLAN

3.1 Introduction

3.1.1 General

Since remaining contamination exists at the Site, ICs and ECs are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the Site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC.

3.1.2 Purpose

This plan provides:

- A description of all IC/ECs on the Site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs set forth in the EE;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of IC/ECs, such as the implementation of the EWP (Appendix B) for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the Site;
- Any other provisions necessary to identify or establish methods for implementing the IC and ECs required by the Site remedy, as determined by NYSDEC; and
- Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a HASP and associated CAMP prepared for the Site, which are provided in Appendix C.

3.2 Institutional Controls (ICs)

A series of ICs is required by the DD to: (1) implement, maintain and monitor ECs; (2) prevent future exposure to remaining contamination; and (3) limit the use and development of the Site to restricted residential, commercial, and industrial uses only. Adherence to these ICs on the Site is required by the EE and will be implemented under this SMP. ICs identified in the EE may not be discontinued without an amendment to or extinguishment of the EE. The IC boundaries are shown on Figure 2 and in the EE provided as Appendix A. The ICs are:

- The Site may be used for restricted-residential, commercial, or industrial use defined by Part 375-1.8(g), although land use is subject to local zoning laws;
- All ECs must be operated and maintained as specified in this SMP;
- All ECs must be inspected at a frequency and in a manner defined in this SMP;
- The use of groundwater underlying the Site is prohibited without necessary water quality treatment, as determined by NYSDOH and NYSDEC, to render it safe for use as drinking water or for industrial purposes and the user must first notify and obtain written approval to do so from the Department;

- Data and information pertinent to Site management must be reported at the frequency and in a manner as defined in this SMP;
- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP;
- Access to the Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the EE;
- The potential for vapor intrusion must be evaluated for any buildings developed in the area within the IC boundaries shown on Figure 2, and any potential impacts that are identified must be monitored or mitigated; and
- In-ground vegetable gardens and farming on the Site are prohibited.

3.3 Engineering Controls (ECs)

Remaining contamination at the Site is addressed by four ECs, which are:

1. A Site-wide composite cover system.
2. A vapor barrier membrane.
3. An SSDS.
4. An SVES.

3.3.1 Composite Cover System

Exposure to remaining contamination of soil/fill at the Site is prevented by an engineered composite cover system installed across the entire Site. The composite cover system is comprised of the following components:

- *Partial Cellar and Elevator Pit:* 6 inches of concrete underlain by Grace Preprufe® 300R vapor barrier/waterproofing, underlain by compacted subgrade.
- *Exterior Partial Cellar Foundation Walls:* concrete foundation wall adjacent to Grace Preprufe® 300R vapor barrier/waterproofing, adjacent to compacted subgrade.
- *Slab-On-Grade Building:* 6 inches of concrete underlain by Stego Wrap® 20 mil vapor barrier, underlain by 4-inch PVC SSDS and SVES piping in a minimum 6 inches of GPA, underlain by non-woven geotextile fabric, underlain by prepared subgrade.
- *Exterior, Open-Air Dog Run:* 6 inches of concrete underlain by GPA, underlain by a demarcation barrier (snow fence), underlain by prepared subgrade.

Cross-section details and locations of the composite cover system are shown on Figure 10.

The EWP provided in Appendix B outlines the procedures required in the event the composite cover system is breached, penetrated, and/or temporarily removed; and any underlying remaining contamination is disturbed. Procedures for the inspection of the Cover System are provided in the Monitoring and Sampling Plan included in Section 4.0

of this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and associated Community Air Monitoring Plan (CAMP) prepared for the Site, provided in Appendix D.

3.3.2 Vapor Barrier and Waterproofing Membranes

Waterproofing and vapor barrier membrane were installed beneath the Site building slabs. A Grace Preprufe® 300R and Bituthene® 4000 vapor barrier membrane that meets or exceeds the ASTM E-1745 standard was installed as a Site EC below the cellar slab and along subgrade cellar sidewalls, sumps, and pits. The Grace Preprufe® 300R and Bituthene® 4000 vapor barrier membranes also act as waterproofing, as the partial cellar construction extends into the water table; therefore, installation of an SSDS below the partial cellar slab was infeasible. Stego Wrap® 120R was installed under the slab-on-grade portion of the building. GCP Hydroduct 220 and Bituthene® 4000 were installed along the exterior vertical building walls to sidewalk grade. The membranes were installed in accordance with the manufacturer's installation specifications at the locations shown on Figure 10.

3.3.3 Sub-Slab Depressurization System (SSDS)

An active SSDS was installed below the slab-on-grade (parking garage) portion of the Site to mitigate the potential for soil vapor intrusion into the new Site building. The target area for the SSDS comprises the slab-on-grade portion of the proposed Site building, which excludes a narrow exterior concrete-paved area along the northwestern portion of the Site and the partial cellar on the southwestern portion of the Site, which was installed into the groundwater table. The SSDS maintains a negative pressure by inducing vacuum underneath the entire ground floor slab, allowing vapors to vent above the Site building roof without entering the building. The SSDS consists of a network of subgrade 4-inch, Schedule 40 slotted and solid PVC piping installed within a minimum 6-inch thick layer of GPA layer, all of which is underlain by non-woven geotextile fabric. The subgrade piping penetrates the slab within the ground floor, centrally-located mechanical room and is subsequently manifolded into a solid, 6-inch Schedule 40 chlorinated PVC (CPVC) solid riser, leading from a blower and vertically through the building to an exhaust stack located on the 8th floor roof.

The major components of the SSDS include:

- Four horizontal 4-inch diameter 0.020-inch slotted and solid PVC pipe runs;
- A minimum 6-inch layer of ¾-inch GPA stone bedding under, around, and above all SSDS piping;
- Three vacuum monitoring points (VMPs) (MP-01 through MP-03);
- A fan capable of operating at 10 in.H_2O and 300 standard cubic feet per minute (SCFM) air flow rate; and
- A 6-inch CPVC riser pipe extending from the ground floor parking garage to an exhaust stack on the 8th floor roof.

The location and components of the SSDS are shown on Figure 11. As-built drawings of the SSDS are provided in Appendix C. Procedures for monitoring the SSDS are documented in the Site Monitoring Plan (Section 4.0 of this SMP).

3.3.4 Soil Vapor Extraction (SVE) System (SVES)

An SVES was installed to remediate the vadose zone beneath the building on the eastern and northeastern portion of the Site and to help prevent the off-site migration of contaminated soil vapor. The target area for the SVES is the vadose zone, which is the unsaturated soil above the groundwater table, in an approximately 7,000-square foot area located on the eastern and northeastern portions of the Site. The SVES, in combination with the vapor barrier and SSDS, will help to prevent potential soil vapor intrusion into the new building. Based on the findings of the June 2016 pilot test, the SVES will be capable of operating the four SVE wells at an approximate maximum applied vacuum of 30 inches of water (inH_2O) and approximate air flow rate of 75 CFM per SVE well. The SVES maintains a negative pressure in a radius around each of the four SVE extraction wells to extract and treat contaminated vapors.

The major components of the SVES include:

- Four 4-inch diameter PVC SVE wells (SVE-01 through SVE-04), each constructed with 0.020-inch slotted well screen from 3.5 feet below grade to between 9 and 9.5 feet below the bottom of the concrete slab-on-grade; and
- Four runs of 4-inch diameter solid PVC piping connecting each individual SVE wells to enter into a mechanical room on the central portion of the Site.
- A blower capable of operating at 95 inH_2O and 400 SCFM;
- Two (2) 400-pound GAC vessels connected in series to treat vapors from the SVES; and
- A 6-inch CPVC riser pipe extending from the ground floor parking garage to an exhaust stack on the 8th floor roof.

The location and components of the SVES are shown on Figure 11. As-built drawings of the SVES are provided in Appendix C. Procedures for monitoring the SVES are documented in the Site Monitoring Plan (Section 4.0 of this SMP).

3.3.5 Criteria for Completion of Remediation/Termination of Engineering Controls

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the RAOs identified by the DD. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10. Disturbance of the composite cover system or EC components is prohibited by the EE.

3.3.5.1 Composite Cover System

The composite cover system is a permanent control and the quality and integrity of the system will be inspected at defined, regular intervals in accordance with this SMP in perpetuity.

3.3.5.2 Sub-Slab Depressurization System (SSDS)

Operation of the active SSDS will not be discontinued unless prior written approval is granted by the NYSDEC and NYSDOH. In the event that monitoring data indicates that the SSDS may no longer be required to operate actively, a proposal to operate the SSDS in a passive state will be submitted by the remedial party to the NYSDEC and NYSDOH, or their successor agencies handling environmental issues in NYS.

3.3.5.3 Soil Vapor Extraction System (SVES)

In the event that monitoring data indicates that the SVES may no longer be required, a proposal to discontinue the system will be submitted by the remedial party. Conditions that may warrant discontinuing the SVES include contaminant concentrations in soil vapor that: (1) have become asymptotic to a low level over an extended period of time, as accepted by NYSDEC; or (2) NYSDEC has determined that the SVES has reached the limit of its effectiveness. The SVES will remain in place and operational until permission to discontinue its use is granted in writing by NYSDEC and NYSDOH, or their successor agencies handling environmental issues in NYS.

3.4 Excavation Work Plan (EWP)

The Site has been remediated for restricted residential, commercial, and industrial use. Any future intrusive work that will penetrate the composite cover system, or encounter or disturb the remaining contamination, including any modifications or repairs to the existing composite cover system, will be performed in compliance with the EWP, provided as Appendix B. Any work conducted pursuant to the EWP must be conducted in accordance with the procedures defined in a HASP and CAMP (Appendix D), and will be included in the periodic inspection and certification reports for the Site.

3.5 Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP)

Any work conducted pursuant to the EWP must be conducted in accordance with the procedures defined in the HASP and CAMP prepared for the Site. The HASP was prepared in accordance with DER-10 and 29 CFR 1910, 29 CFR 1926, and all other applicable federal, state and local regulations. Based on future changes to state and federal health and safety requirements, and specific methods employed by future contractors, the HASP and CAMP would be updated and re-submitted with a notification to NYSDEC as detailed in the EWP.

The Site owner and associated parties preparing the remedial documents submitted to the state and parties performing the work are completely responsible for the safe performance of all intrusive work, the structural integrity of excavations, proper disposal of excavation dewatering, control of runoff from open excavations into remaining contamination, and for structures that may be affected by excavations (such as building foundations and footings). The Site owner will ensure that Site development activities will not interfere with, or otherwise impair or compromise, the ECs described in this SMP.

The HASP and CAMP are provided in Appendix D.

4.0 MONITORING AND SAMPLING PLAN

4.1 Introduction

4.1.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may be revised only with the approval of the NYSDEC. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of Site management for the Site are included in the QAPP provided as Appendix E.

4.1.2 Purpose and Schedule

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling locations, protocol and frequency;
- Information on all designed monitoring systems; and
- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7.0 of this SMP.

4.2 Site-Wide Inspection

Site-wide inspections will be performed at a minimum of once per year, beginning no more than 18 months after receipt of COC. Modification to the frequency or duration of the inspections will require approval from the NYSDEC. Site-wide inspections will be performed additionally after all severe weather conditions that may affect ECs or monitoring devices. During the inspections, an inspection form will be completed. The inspection form is provided in Appendix F – Site Management Forms. The form will compile sufficient information to assess the following:

- Compliance with all ICs, including Site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General Site conditions at the time of the inspection;
- The Site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection; and
- Confirm that Site records are up to date.

Inspections of all remedial components installed at the Site will be conducted. A comprehensive Site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the PRR. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the EE;
- Achievement of remedial performance criteria; and
- If Site records are complete and up to date.

Unscheduled inspections and/or sampling may take place when a suspected failure of the EC system has been reported or an emergency occurs that is deemed likely to affect the operation of

the system. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, verbal notice to the NYSDEC must be given by noon of the following day. In addition, an inspection of the Site will be conducted within five days of the event to verify the effectiveness of the IC/ECs implemented at the Site by a QEP, as determined by the NYSDEC. Written confirmation must be provided to the NYSDEC within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

Reporting requirements are outlined in Section 7.0 of this SMP. Inspections will also be performed in the event of an emergency.

4.3 Monitoring and Sampling Protocol

Since residual contaminated media exists in the Site subsurface, ECs and ICs are required to protect human health and the environment.

4.3.1 Composite Cover System

Monitoring of the composite cover system will occur on an annual basis as long as the EE is in effect to ensure the system's integrity. Monitoring will consist of a visual inspection to evaluate the structural integrity of the concrete slabs, support columns into the floors, and the wall joints. If any cracks or openings are identified, they will be screened for organic vapors with a photoionization detector (PID) and any readings will be noted. In addition, any cracks or openings in the floor will be properly sealed. The results of the inspection will be included in the PRR. In addition, the composite cover system must be inspected and certified any time a disturbance in the system occurs. The composite cover system does not require any special operation or maintenance activities.

If the system is breached during future construction activities, the system will be rebuilt by reconstructing the system according to the original design and tying newly constructed cover layers into existing cover layers to form a continuous layer(s).

The inspection frequency is subject to change with the approval of the NYSDEC. Unscheduled inspections and/or sampling may take place when a suspected failure of the composite cover system has been reported or an emergency occurs that is deemed likely to affect the operation of the system.

4.3.2 Sub-Slab Depressurization System (SSDS)

The operation of the SSDS will be confirmed by two different levels of inspections identified as "routine" or "detailed", to be performed by appropriate personnel. An inspection of the SSDS will be performed quarterly (following system startup) to confirm the system is operating within design specifications. A round of baseline monitoring will also be conducted following the complete installation of the system. SSDS system components to be monitored include, but are not limited to, the components shown in In-Text Table 5.

In-Text Table 5 – SSDS Monitoring Parameters

Remedial System	Inspection Schedule	Monitoring Parameter	Operating Range
SSDS	Quarterly	Flow Rate (individual Manifold legs)	50 to 90 CFM (to be updated post startup)
		Applied Vacuum Reading (blower)	1 to 7 inches of H_2O (to be updated post startup)
		Applied Vacuum Reading (individual manifold legs)	0.5 to 5 in H_2O (to be updated post startup)
		Induced Vacuum (vacuum monitoring points)	a minimum of 0.004 inches of H_2O (to be updated post startup)

Detailed SSDS inspection, monitoring, and reporting procedures are provided in Section 5.0 - Operation and Maintenance Plan. Unscheduled inspections and/or sampling may take place when a suspected failure of the SSDS has been reported or an emergency occurs that is deemed likely to affect the operation of the system.

If any equipment readings are not within their specified operation range, any equipment is observed to be malfunctioning, or the system is not performing within specifications, maintenance and repair will be conducted immediately in accordance with the O&M Plan.

4.3.3 Soil Vapor Extraction System (SVES)

The operation of the SVES will be confirmed by two different levels of inspections identified as "routine" or "detailed", to be performed by appropriate personnel. An inspection of the SVES will be performed monthly to confirm the system is operating within design specifications. A round of baseline monitoring will also be conducted following the complete installation of the system. SVES components to be monitored include, but are not limited to, the components shown in In-Text Table 6.

In-Text Table 6 – SVES Monitoring Parameters

Remedial System	Inspection Schedule	Monitoring Parameter	Operating Range
SVES	Monthly	Flow Rate (individual manifold legs)	50 to 90 CFM (to be updated post startup)
		Vacuum Reading (Blower)	35 to 60 inches of H_2O (to be updated post startup)
		Vacuum Reading (individual manifold legs)	25 to 40 inches of H_2O (to be updated post startup)
		Pre- and Post-GAC PID Reading	To be updated post start-up

Detailed SVES inspection, monitoring, and reporting procedures are provided in Section 5.0 - Operation and Maintenance Plan. Unscheduled inspections and/or sampling may take place when a suspected failure of the SVES has been reported or an emergency occurs that is deemed likely to affect the operation of the system.

If any equipment readings are not within their specified operation range, any equipment is observed to be malfunctioning or the system is not performing within specifications, maintenance and repair will be conducted immediately in accordance with the O&M Plan.

4.3.4

4.3.4 Sampling Frequency, and Sample Collection and Analysis

Samples will be collected from the influent and effluent of the SVES after system startup, quarterly for the first year, and annually thereafter to determine baseline VOC concentrations, monitor mass removal over time, and monitor the effectiveness of the GAC treatment vessels. SVES sampling information is provided in In-Text Table 7 – SVES Sampling Parameters and Schedule.

In-Text Table 7 – SVES Sampling Parameters and Schedule

Sampling Component	Sampling Schedule	Analytical Parameter
Influent and Effluent Vapor	Quarterly for 1 year, then annually thereafter	TO-15 VOCs, Tedlar® Bag

Any modification to the frequency or sampling requirements will require approval from the NYSDEC. All sampling activities will be recorded in a field book and associated sampling log. Samples will be submitted to a NYSDOH ELAP-certified laboratory for analysis of VOCs by EPA Method TO-15.

Field observations (e.g., potential VOC sources, etc.) will be noted on a sampling log, which will be subject to the reporting requirements and system checks. Complete vapor sampling procedures are detailed in the QAPP (Appendix E). All sampling activities and field observations (e.g., potential VOC sources, etc.) will be recorded in a field book and on field logs, which will be created after installation of the aboveground system components and included in the inaugural PRR.

Carbon Change Out and Disposal Protocol

Based on the pilot testing conducted prior to system design, it was conservatively estimated that the SVES will use approximately 353 pounds of carbon per month during initial operation and should decrease substantially with time.

All spent carbon will be disposed of or recycled off-site in accordance with all applicable state and federal regulations. Based on requirements of the disposal/recycling facility and waste disposal contractor, a carbon sample may need to be collected for facility acceptance purposes. If required, a representative grab sample of the spent carbon will be collected and submitted for laboratory analysis, as detailed in the QAPP provided as Appendix E.

4.4 Monitoring Reporting Requirements

All monitoring and sampling activities will be recorded in a field book and associated sampling log as provided in Appendix F – Site Management Forms. Other observations (e.g., SVE extraction well and VMP integrity, etc.) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network.

5.0 OPERATION AND MAINTENANCE (O&M) PLAN

5.1 Introduction

This O&M Plan provides a brief description of the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the Site, which include the SSDS and SVES. This O&M Plan:

- Includes the procedures necessary to allow individuals unfamiliar with the Site to operate and maintain the SSD/SVES; and
- Will be updated periodically to reflect changes in Site conditions or the manner in which the SSDS/SVES are operated and maintained.

The following sections provide a description of the O&M of the SSDS and SVES. Cut-sheets and as-built drawings, and maintenance and operating manuals for SSDS and SVES are included in Appendix D. A copy of this O&M Plan, along with the complete SMP, is to be maintained at the Site at all times. This O&M Plan is not to be used as a standalone document, but as a component of this SMP.

5.2 SSDS

Intrusion of contaminated soil vapor (if any) from the subsurface to the Site building's interior is prevented by an SSDS, which applies negative pressure (vacuum) beneath the slab-on-grade portion of the Site building to collect and discharge the vapor to the atmosphere above the roof of the 8th floor building roof. The Site-specific design for the SSDS was developed based on elevated concentrations of VOCs detected during previous soil vapor sampling events completed as part of the RI, delineation sampling, and SRI, and was designed to maintain a minimum 0.004 inH_2O.

The major components of the SSDS include:

- Four horizontal 4-inch diameter 0.020-inch slotted and solid PVC pipe runs;
- A minimum 6-inch layer of ¾-inch GPA stone bedding under, around, and above all SSDS piping;
- Three VMPs (MP-01 through MP-03);
- A fan capable of operating at 10 in.H_2O and 300 SCFM air flow rate; and
- A 6-inch CPVC riser pipe extending from the ground floor parking garage to an exhaust stack on the 8th floor roof.

The SSDS is designed to operate continuously, 24 hours a day, 7 days a week, 365 days a year, without any required adjustments or repairs, beyond the routine maintenance items discussed in this SMP. Manufacturer's specifications for each of the SSDS components are included in Appendix D. The SSDS as-built drawings are provided in Appendix D.

5.2.1 SSDS Start-Up and Testing

After installation of the aboveground components of the SSDS, system startup will occur. Startup shall comprise vacuum, temperature, and pressure gauge readings for the SSDS influent lines, blower accessory readings including variable frequency drive (VFD) settings, pre- and post-blower particulate filters vacuum and air flow rate readings, sample port VOC screening, vacuum balancing, and system alarm checks.

Specifically, the following inspections and testing will be performed to ensure the system is balanced:

- Confirmation of acceptable air flow rate from each of the SSDS pipe runs by a visual inspection of gauges affixed to each of the manifold legs;
- Confirmation of acceptable vacuum readings from each of the SSDS runs by a visual inspection of gauges affixed to each of the manifold legs and use of an appropriate manometer or portable vacuum gauging device; and
- Confirmation of acceptable induced vacuum beneath the entire ground floor slab from monitoring points MP-1 through MP-3 through the manual access of each point and use of an appropriate manometer or portable vacuum gauging device.

5.2.2 SSDS Routine System Inspection

The routine SSDS inspection check will consist of a visual inspection noting the individual flow rate and vacuum readings for each of the SSDS riser legs. The routine check will also note any alarms or unusual conditions (e.g., unusual odors, leaks, blower noise etc.). Typical routine maintenance items that should be addressed during these inspections include:

- Confirmation that the blower is operating and air is discharging through the exhaust piping to the roof;
- Confirmation that the gauges on each manifold leg are clean and within normal ranges; and
- Confirmation that the exterior of the SSDS control panel is clean.

In the event than an unusual condition is identified, a key contact listed in In-Text Table 3 of this SMP will be notified. Any maintenance completed for the SSDS should be documented in the Maintenance Log included as part of Appendix F.

5.2.3 SSDS Operation and Maintenance

Operation of the SSDS will be monitored in accordance with the frequency and detail set forth in In-Text Table 8. Monitoring of the SSDS will consist of a visual inspection of the complete system including checking to confirm that the SSDS blower is operating properly, observing all associated air flow and vacuum gauges and alarms to confirm system diagnostics, and identification and repair of any system malfunctions or problems (i.e., leaks, cracks, collection of condensation, etc.).

In-Text Table 8 – SSDS Routine and Detailed Inspection Schedule

Monitoring Inspection or Sampling Type	Frequency	Maintenance Task
SSDS Routine Operations Inspection	Quarterly	System Inspections
SSDS Detailed Operation Inspection	Semi-annually	System Components

The SSDS will operate continuously at the Site and not be discontinued without written approval by NYSDEC and NYSDOH. The SSDS will remain in place and operational until permission to discontinue use is granted in writing by NYSDEC and NYSDOH.

System Component Maintenance:

The detailed operations check will be performed to identify/rectify operations-based maintenance items, such as malfunctioning SSDS risers, piping runs, and/or other system

components. Typical detailed maintenance items that should be addressed during these inspections include:

- Confirm/assess blower performance and integrity;
- Assess blower and determine need for replacement;
- Confirm/assess the operating condition of vacuum monitoring points MP-1 though MP-3; and
- Confirm/assess the structural integrity of concrete floor slabs overlying constructed SSDS manifold and piping runs.

In the event that a condition warranting system component maintenance or repair is identified, the appropriate reporting and maintenance should be conducted immediately. Manufacturer's recommendations for system component maintenance and maintenance logs are included in Appendices C and F.

5.2.4 SSDS Non-Routine Checks and Equipment Maintenance

In most instances, non-routine maintenance will be required due to operating conditions that are governed by the SSDS alarms and system telemetry, which will operate on a dedicated internet connection connected to the building management system (BMS). The primary objective of system telemetry is to notify personnel when operating conditions are likely to reduce or otherwise compromise efficiency, which could lead to the uncontrolled intrusion contaminated soil vapor into the Site building.

In the event that low SSDS air flow rates or vacuum are observed anywhere in the system, further system balancing may be necessary following moisture removal, to ensure that the combined air flow rates and vacuum in a given area of the Site achieve the minimum design requirements. Throttling valves for individual SSDS lines are located on the manifold legs in Appendix C.

5.2.5 Monitoring Devices and Alarms

The SSDS has a warning alarm to indicate that the system is not operating properly (e.g., vacuum blower failure or a low vacuum condition at the blower). In the event that a warning alarm is activated, applicable maintenance and repairs will be conducted, as specified in this O&M Plan, and the SSDS will be restarted. Operational problems will be noted in the Periodic Review Report (PRR) prepared for that reporting period.

5.3 SVES

To ensure a continuous zone of extraction across the treatment area and adequate vacuum to mobilize contamination and prevent off-site migration of soil vapor, two additional extraction wells will be installed as part of the final system design. It is noted that as part of construction, the Site will be capped with a concrete slab and an active SSDS, and a vapor barrier. The vapor barrier and building slab will act as impermeable barriers and the SSDS will create supplemental vacuum in the shallow subsurface beneath the Site to supplement the induced vacuum of the SVES. Details of the SVE pilot test, data analysis, and design for the system inclusive of the final blower specifications, locations of the two additional extraction wells, and final system components will be established in the RAWP.

The major components of the SVES include:

- Four 4-inch diameter PVC SVE extraction wells (SVE-01 through SVE-04), each constructed with 0.020-inch slotted well screen from 3.5 feet below grade to between 9 and 9.5 feet below the bottom of the concrete slab-on-grade; and
- Four runs of 4-inch diameter solid PVC piping connecting each individual SVE wells to enter into a mechanical room on the central portion of the Site.
- A blower capable of operating at 95 inH_2O and 400 SCFM;
- Two (2) 400-pound GAC vessels connected in series to treat vapors from the SVES; and
- A 6-inch CPVC riser pipe extending from the ground floor parking garage to an exhaust stack on the 8th floor roof.

The SVES is designed to operate continuously, 24 hours a day, 7 days a week, 365 days a year, without any required adjustments or repairs, beyond the routine maintenance items discussed herein. Manufacturer's specifications for each of the SVES components are included in Appendix C.

5.3.1 SVES Start-Up and Testing

After installation of the aboveground components of the SVES, system startup will occur. Startup shall comprise vacuum, temperature, and pressure gauge readings for the SVES influent lines, blower accessory readings including variable frequency drive (VFD) settings, pre- and post-blower particulate filters vacuum and air flow rate readings, pre- and post-GAC treatment, and granular-activated carbon (GAC) VOC screening, and system alarm checks.

Specifically, the following inspections and testing will be performed to ensure the system is balanced:

- Confirmation of acceptable air flow rate from each of the SVES pipe runs by a visual inspection of gauges affixed to each of the manifold legs;
- Confirmation of acceptable vacuum readings from each of the SVES piping runs by a visual inspection of gauges affixed to each of the manifold legs and use of an appropriate manometer or portable vacuum gauging device; and
- Confirmation of acceptable induced vacuum at each of the SVE extraction wells (SVE-01 through SVE-04) through the manual access of each point and use of an appropriate manometer or portable vacuum gauging device.

5.3.2 SVES Routine System Inspection

The routine SVES inspection check will consist of a visual inspection noting the individual flow rate and vacuum readings for each of the SVES riser legs. The routine check will also note any alarms or unusual conditions (e.g., unusual odors, leaks, blower noise etc.). Typical routine maintenance items that should be addressed during these inspections include:

- Confirmation that the blower is operating and air is discharging through the exhaust piping to the roof;
- Confirmation that the gauges on each manifold leg are clean and within normal ranges; and

- Confirmation that the exterior of the SVES control panel is clean.

In the event than an unusual condition is identified, notify a key contact listed in In-Text Table 3 of this SMP. Any maintenance completed for the SSDS will be documented in the Maintenance Log included as part of Appendix F.

5.3.3 SVES Routine Operation and Maintenance

Operation of the SVES will be monitored in accordance with the frequency and detail set forth in In-Text Table 9. Monitoring of the SVES will consist of a visual inspection of the complete system including checking to confirm that the SVES blower is operating properly, observing all associated air flow and vacuum gauges and alarms to confirm system diagnostics, and identification and repair of any system malfunctions or problems (i.e., leaks, cracks, collection of condensation, etc.). If the PID screening and/or sampling show breakthrough of the GAC vessels, the media will be replace and the spent media will be properly recycled and/or disposed of off-site.

In-Text Table 9 – SVES Routine and Detailed Inspection Schedule

Monitoring Inspection or Sampling Type	Frequency	Maintenance Task
SVES Routine Operations Inspection	Monthly	System Inspections
SVES Detailed Operation Inspection	Quarterly	System Components

The SVES will operate continuously at the Site and not be discontinued without written approval by NYSDEC and NYSDOH. The SSDS will remain in place and operational until permission to discontinue use is granted in writing by NYSDEC and NYSDOH.

System Component Maintenance:

The detailed operations check will be performed to identify/rectify operations-based maintenance items, such as malfunctioning SSDS risers, piping runs, GAC breakthrough, and/or other system components. Typical detailed maintenance items that should be addressed during these inspections include:

- Confirm/assess blower performance and integrity;
- Assess blower and determine need for replacement;
- Assess GAC and determine need for replacement;
- Confirm/assess the operating condition of SVE extraction wells SVE-01 through SVE-04; and
- Confirm/assess the structural integrity of concrete floor slabs overlying constructed SVES manifold and piping runs.

In the event that a condition warranting system component maintenance or repair is identified, the appropriate reporting and maintenance will be conducted immediately. Manufacturer's recommendations for system component maintenance and maintenance logs are included in Appendices C and F.

5.3.4 SVES Non-Routine Checks and Equipment Maintenance

In most instances, non-routine maintenance will be required due to operating conditions that are governed by the SSDS alarms and system telemetry, which will operate on a dedicated internet connection connected to the building management system (BMS). The primary objective of system telemetry is to notify personnel when operating conditions are likely to reduce or otherwise compromise efficiency.

In the event that low SVES air flow rates or vacuum are observed anywhere in the system, further system balancing may be necessary following moisture removal, to ensure that the combined air flow rates and vacuum in a given area of the Site achieve the minimum design requirements. Throttling valves for individual SVES lines are located on the manifold legs.

5.3.5 Monitoring Devices and Alarms

The SVES has a warning alarm to indicate that the system is not operating properly (e.g., high temperature, vacuum blower failure, or a low vacuum condition at the blower). In the event that a warning alarm is activated, applicable maintenance and repairs will be conducted, as specified in this O&M Plan, and the SVES will be restarted. Operational problems will be noted in the PRR to be prepared for that reporting period.

6.0

6.0 PERIODIC ASSESSMENTS/EVALUATIONS

6.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given Site and associated remedial systems. Vulnerability assessments provide information so that the Site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

This section provides a summary of vulnerability assessments that will be conducted for the Site during periodic assessments, and briefly summarizes the vulnerability of the Site and/or ECs to severe storms/weather events and associated flooding.

- *Flood Plain:* The Site does not lie within the 100- or 500-year flood plain.
- *Site Drainage and Stormwater Management:* Stormwater in the Site vicinity flows to the NYC combined sewer system. Additionally, a stormwater detention system was installed beneath the Site building to manage excess stormwater during periods of heavy precipitation and/or snowmelt.
- *Erosion:* As the entire Site is capped with an impermeable concrete slab, erosion is not anticipated to be an issue of concern.
- *High Wind:* All components of the building are secured; therefore, high winds are not likely to affect the Site. In the event of high winds, proper precautions will be taken to secure any objects on-site that are not secured to the building.
- *Electricity:* Electricity to the building is supplied to the building via underground conduits; therefore, severe weather events are not likely to affect electricity service to the Site.
- *Spill Containment/Release:* Storage of large amounts of fuel oil, chemicals, etc. is not expected. Small amounts of cleaning chemicals will be stored in various locations throughout the building, but are not expected to be affected by storm-related damage to the building.

6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including Site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the SMP provides a summary of any green remediation evaluations to be completed for the Site during Site management, and as reported in the PRR.

6.2.1 Green Remediation Evaluation Building Operations

Structures on-site will be operated and maintained to provide for the most efficient operation of the remedy, while minimizing energy, waste generation, and water consumption.

6.2.2 Timing of Green Remediation Evaluations

For major remedial system components (SSDS and SVES), green remediation evaluations and corresponding modifications will be undertaken as part of a formal RSO, or at any time

that the NYSDEC project manager feels appropriate, e.g. during significant maintenance events or in conjunction with storm recovery activities.

Modifications resulting from green remediation evaluations will be implemented and scheduled to occur as requested by the NYSDEC project manager during planned/routine operation and maintenance activities. Reporting of these modifications will be presented in the PRR.

6.2.3 Remedial Systems

Remedial systems (SSDS and SVES) will be operated properly considering the current Site conditions to conserve materials and resources to the greatest extent possible. Consideration will be given to operating rates and use of reagents and consumables. Spent materials (i.e. spent activated carbon) will be sent for recycling, as appropriate.

6.2.4 Building Operations

On-Site structures will be operated and maintained to provide for the most efficient operation of the remedy, while minimizing energy, waste generation, and water consumption.

6.2.5 Frequency of System Checks, Sampling and Other Periodic Activities

Transportation to and from the Site and use of consumables in relation to visiting the Site in order to conduct system checks and or collect samples and shipping samples to a laboratory for analyses have direct and/or inherent energy costs. The schedule and/or means of these periodic activities have been prepared so that these tasks can be accomplished in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources.

6.3 Remedial System Optimization (RSO)

A RSO study will be conducted any time NYSDEC or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The RA have not met or are not expected to meet RAOs in the time frame estimated in the DD;
- The management and operation of the remedy is exceeding the estimated costs;
- The remedial system is not performing as expected or as designed;
- Previously unidentified source material may be suspected;
- Plume shift has potentially occurred;
- Site conditions change due to development, change of use, change in groundwater use, etc.;
- There is an anticipated transfer of the Site management to another remedial party or agency; and
- A new and applicable remedial technology becomes available.

An RSO will provide a critique of the Site conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the Site's cleanup goals, gather additional performance or media specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

The RSO study will focus on overall Site cleanup strategy, process optimization and management with the intent of identifying impediments to cleanup and improvements to Site operations to increase efficiency, cost effectiveness and remedial time frames. Green remediation technology and principals are to be considered when performing the RSO.

7.0 REPORTING REQUIREMENTS

7.1 Site Management Reports

Site management inspection, maintenance and monitoring events will be recorded on the appropriate Site management form provided in Appendix F. These forms are subject to NYSDEC revision.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the Site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements listed in In-Text Table 10 and included in the PRR:

In-Text Table 10 - Schedule of Interim Monitoring/Inspection Reports

Task/Report	Reporting Frequency[1, 2]
SSDS Inspection Report	Semi-Annually
SVES Inspection Report	Quarterly
Groundwater Monitoring Report	Annually
Site-Wide Cover System Inspection Report	Annually
Periodic Review Report	Annually, or as otherwise determined by the NYSDEC
SSDS Maintenance Report	Following Maintenance Event

[1] Reports will be submitted within 45 days of completion of the inspection, monitoring, and/or maintenance event (unless otherwise required by NYSDEC). Reports will be submitted to NYSDEC as a stand-alone report or included as an attachment in the PRR if an inspection/monitoring/maintenance event is completed with 45 days of a PRR submission.
[2] A baseline SSDS/SVES inspection will be conducted following systems startup. Post-remediation periodic monitoring and reporting will commence in accordance with the frequencies above (following the issuance of the COC).

All interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);
- Type of samples collected (e.g., SVES vapor);
- Copies of all field forms completed (e.g., sampling logs, chain-of-custody documentation, etc.);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting maintenance activities;
- Description of maintenance activities performed;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and,
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

Non-routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Description of non-routine activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC Environmental Quality Information System (EQuIS)™ database in accordance with the requirements found at http://www.dec.ny.gov/chemical/62440.html.

7.2 Periodic Review Report (PRR)

A PRR will be submitted to the Department beginning eighteen (18) months after the Certificate of Completion (CoC) is issued. After submittal of the initial PRR, the next PRR shall be submitted annually to the Department, or at another frequency as may be required by the Department. In the event that the Site is subdivided into separate parcels with different ownership, a single PRR will be prepared that addresses the Site described in Appendix A - Environmental Easement. The PRRs will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the PRR. The report will include:

- Identification, assessment, and certification of all ECs/ICs required by the remedy for the Site.
- Results of the required annual Site inspections and severe condition inspections, if applicable.
- All applicable Site management forms and other records generated for the Site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.
- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.

- Data summary tables and graphical representations of contaminants of concern by media (indoor air, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends.
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at the following link: http://www.dec.ny.gov/chemical/62440.html.
- A Site evaluation, which includes the following:
- The compliance of the remedy with the requirements of the Site-specific RAWP and DD;
- The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;
- Any new conclusions or observations regarding Site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;
- Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan;
- Trends in contaminant levels in the affected media will be evaluated to determine if the remedy continues to be effective in achieving remedial goals as specified by the DD; and
- The overall performance and effectiveness of the remedy.
- A performance summary for all treatment systems at the Site during the calendar year, including information such as:
- The number of days the system operated for the reporting period;
- The average, high, and low flows;
- The contaminant mass removed;
- A description of breakdowns and/or repairs along with an explanation for any significant downtime, if any;
- A description of the resolution of performance problems, if any;
- Alarm conditions, if any;
- Trends in equipment failure, if any;
- A summary of the performance, effluent and/or effectiveness monitoring; and
- Comments, conclusions, and recommendations based on data evaluation.

7.2.1 Certification of Institutional and Engineering Controls (ICs and ECs)

Following the last inspection of the reporting period, a Professional Engineer licensed to practice in New York State will prepare, and include in the PRR, the following certification as per the requirements of NYSDEC DER-10:

"*For each IC or EC identified for the Site, I certify that all of the following statements are true:*

- *The inspection of the Site to confirm the effectiveness of the ICs and ECs required by the remedial program was performed under my direction;*
- *The IC and/or EC employed at the Site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any Site management plan for this control;*
- *Access to the Site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the Site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the Site is compliant with the environmental easement;*
- *The EC systems are performing as designed and are effective;*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the Site remedial program and generally accepted engineering practices; and*
- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as Owner's/Remedial Party's Designated Site Representative."

The signed certification will be included in the PRR. The PRR will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the Site is located, and the NYSDOH Bureau of Environmental Exposure Investigation. The PRR may need to be submitted in hard-copy format, if requested by the NYSDEC project manager.

7.3 Corrective Measures Work Plan (CMWP)

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an IC and/or EC, a CMWP will be submitted to the NYSDEC for approval. The CMWP will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the CMWP until it has been approved by NYSDEC.

7.4 Remedial Site Optimization (RSO) Report

In the event that an RSO is to be performed (see Section 6.3), upon completion of an RSO, an RSO Report must be submitted to NYSDEC for approval. The RSO Report will document the research/investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual Site model, and present recommendations. RSO

recommendations are to be implemented upon approval from NYSDEC. Additional work plans, design documents, HASPs, etc., may still be required to implement the recommendations, based upon the actions that need to be taken. An FER and update to this SMP may also be required.

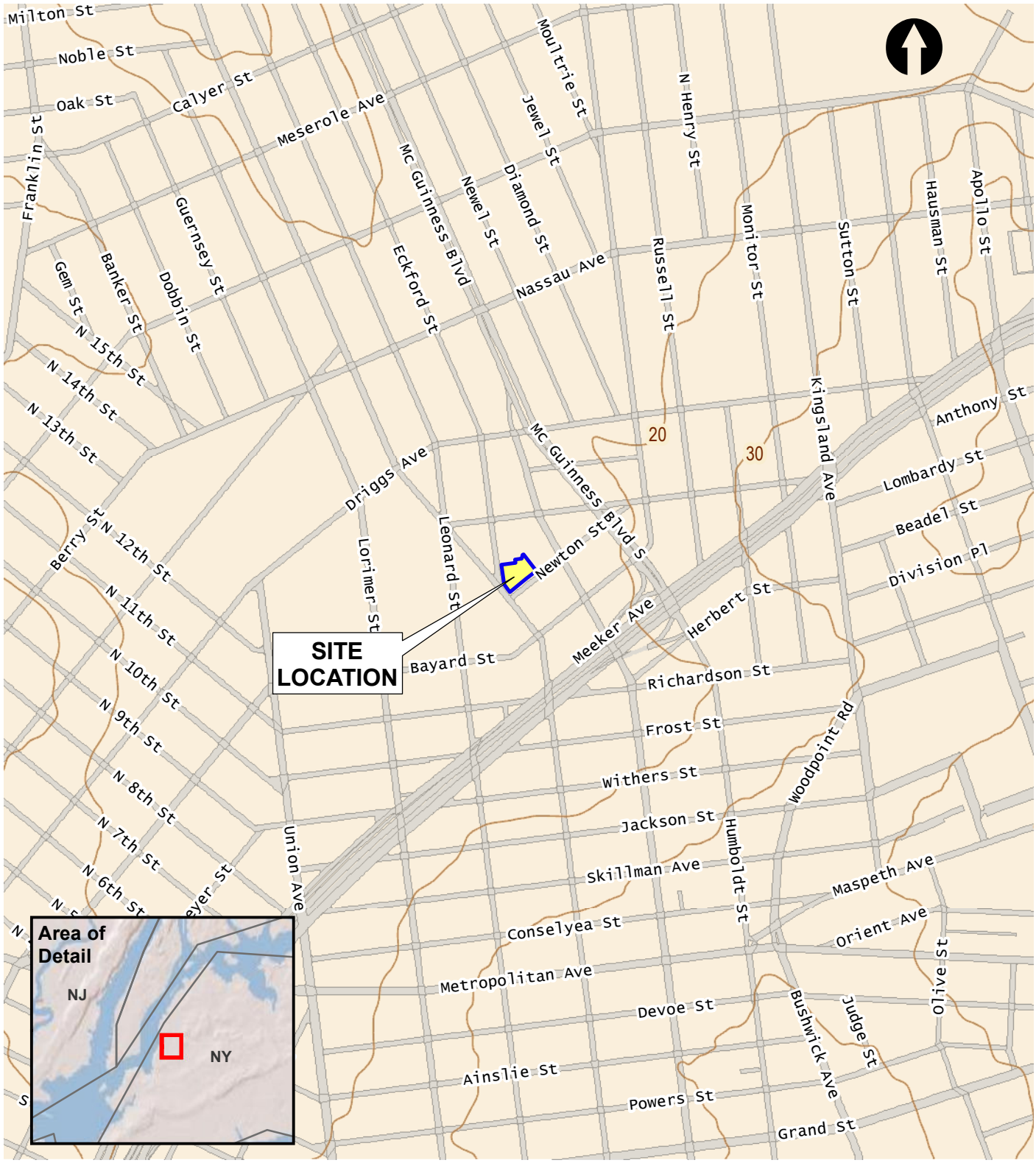
The RSO Report will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the Site is located, Site Control, and the NYSDOH Bureau of Environmental Exposure Investigation.

8.0 REFERENCES

1. 6NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.
2. NYSDEC DER-10 – "Technical Guidance for Site Investigation and Remediation".
3. NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).
4. Phase I Environmental Site Assessment (ESA) Report, 470 Manhattan Avenue, Brooklyn, New York, URS Corporation (URS), April 2013.
5. Phase I Environmental Site Assessment (ESA) Report, 119-125 Newton Street, Brooklyn, New York, Hydrotech Environmental, Corp. (Hydrotech), April 2013
6. Environmental Summary Report, 470 Manhattan Avenue, Block 2714, Lots 1, 30, 32, and 33, Brooklyn, New York, AKRF, Inc., September 2015
7. Phase II Work Plan (Short Form), 470 Manhattan Avenue, Block 2714, Lots 1, 30, 32, and 33, Brooklyn, New York, AKRF, Inc., September 2015
8. Remedial Investigation (RI) Report (RIR), 470 Manhattan Avenue, Block 2714, Lots 1, 30, 32, and 33, Brooklyn, New York, AKRF, Inc., October 2015
9. Remedial Action Work Plan (RAWP), 470 Manhattan Avenue, Block 2714, Lots 1, 30, 32, and 33, Brooklyn, New York, AKRF Engineering, P.C., October 2015
10. Delineation Sampling Work Plan, 470 Manhattan Avenue, Block 2714, Lots 1, 30, 32, and 33, Brooklyn, New York, AKRF, Inc., February 2016
11. Supplemental Remedial Investigation (SRI) and Soil Vapor Extraction (SVE) Pilot Test Work Plan, 12 Eckford Street (470 Manhattan Avenue), Brooklyn, New York, AKRF, Inc., May 2016
12. Supplemental Remedial Investigation Report (SRIR), 12 Eckford Street (470 Manhattan Avenue), Brooklyn, New York, AKRF, Inc., July 2016
13. Soil Waste Classification Report, 12 Eckford Street (470 Manhattan Avenue), Brooklyn, New York, AKRF, October 2016
14. Remedial Action Work Plan – New 470 Project, 12 Eckford Street (470 Manhattan Avenue), AKRF, November 2016
15. Decision Document – New 470 Project, 12 Eckford Street (470 Manhattan Avenue), AKRF, November 2016
16. Soil Lead Delineation Report – New 470 Project, 12 Eckford Street (470 Manhattan Avenue), Brooklyn, NY, AKRF, Inc., May 2018
17. Phase I Environmental Site Assessment Report – New 470 Project, 12 Eckford Street (470 Manhattan Avenue), Brooklyn, New York, AKRF, Inc., May 2018
18. Final Engineering Report – New 470 Project, 12 Eckford Street, Brooklyn, New York, AKRF, Inc., September 2019

TABLES

FIGURES



Service Layer Credits: USGS The National Map: 3d Elevation Program 2018

0 800 1,600

SCALE IN FEET

AKRF

440 Park Avenue South, New York, NY 10016

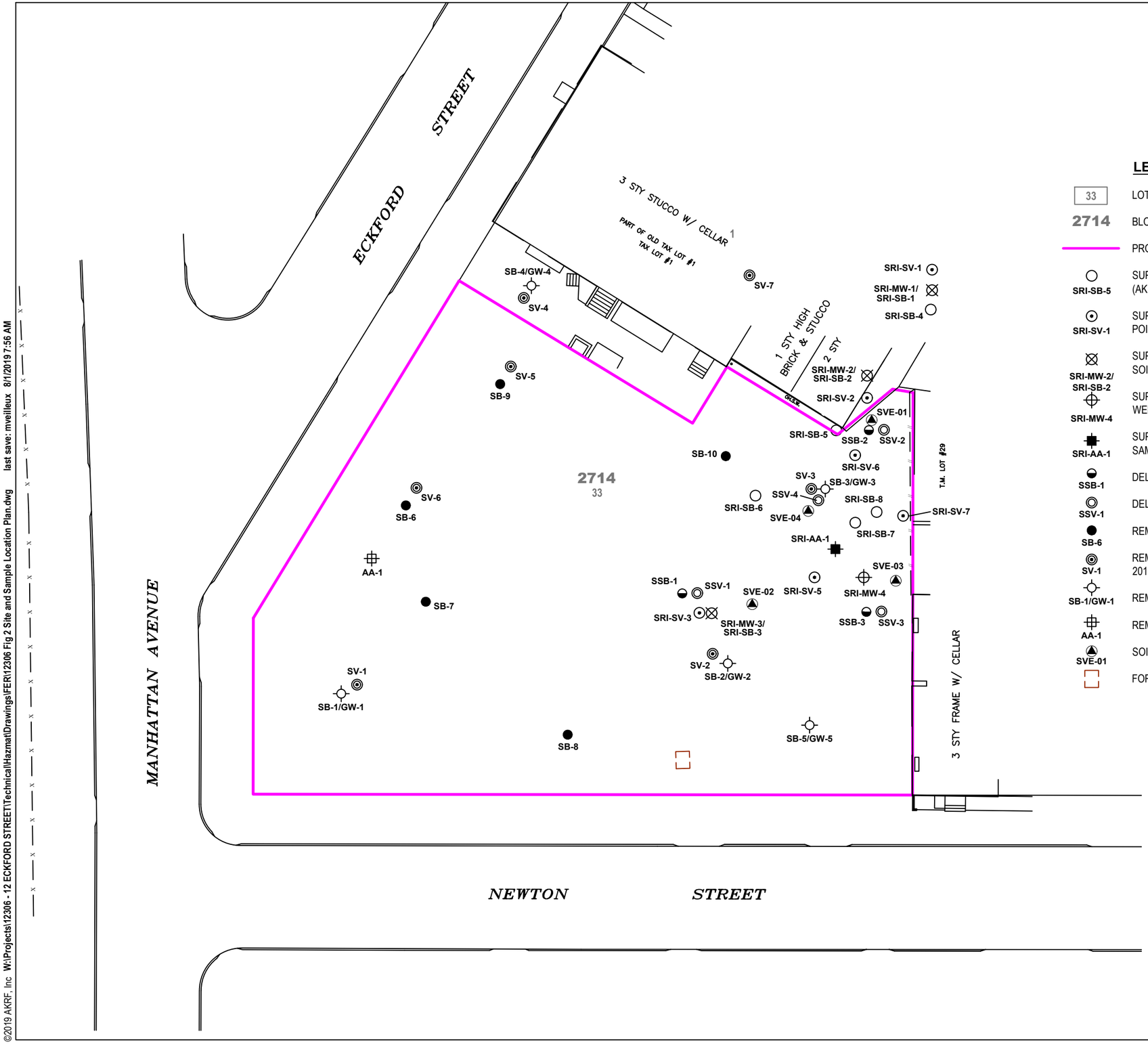
New 470 Project
12 Eckford Street
Brooklyn, New York

SITE LOCATION

DATE
7/10/2019

PROJECT NO.
12306

FIGURE
1



LEGEND

33	LOT BOUNDARY AND NUMBER
2714	BLOCK NUMBER
	PROJECT SITE BOUNDARY
SRI-SB-5	SUPPLEMENTAL REMEDIAL INVESTIGATION SOIL BORING LOCATION (AKRF, 2016)
SRI-SV-1	SUPPLEMENTAL REMEDIAL INVESTIGATION TEMPORARY SOIL VAPOR POINT LOCATION (AKRF, 2016)
SRI-MW-2/ SRI-SB-2	SUPPLEMENTAL REMEDIAL INVESTIGATION GROUNDWATER WELL/ SOIL BORING LOCATION (AKRF, 2016)
SRI-MW-4	SUPPLEMENTAL REMEDIAL INVESTIGATION GROUNDWATER WELL LOCATION (AKRF, 2016)
SRI-AA-1	SUPPLEMENTAL REMEDIAL INVESTIGATION AMBIENT AIR SAMPLE LOCATION (AKRF, 2016)
SSB-1	DELINEATION SAMPLING SOIL BORING LOCATION (AKRF, 2016)
SSV-1	DELINEATION SAMPLING TEMPORARY SOIL VAPOR POINT LOCATION (AKRF, 2016)
SB-6	REMEDIAL INVESTIGATION SOIL BORING LOCATION (AKRF, 2015)
SV-1	REMEDIAL INVESTIGATION TEMPORARY SOIL VAPOR POINT LOCATION (AKRF, 2015)
SB-1/GW-1	REMEDIAL INVESTIGATION SOIL BORING/GROUNDWATER LOCATION (AKRF, 2015)
AA-1	REMEDIAL INVESTIGATION AMBIENT AIR SAMPLE LOCATION (AKRF, 2015)
SVE-01	SOIL VAPOR EXTRACTION PILOT TEST WELL LOCATION
	FORMER 550-GALLON UNDERGROUND STORAGE TANK LOCATION

0 15 30 60

SCALE IN FEET

Map Source:
Geoland Land Surveying P.C. "Block 2714 New Lot 33", updated 04-29-2019.

AKRF
440 Park Avenue South, New York, NY 10016

New 470 Project
12 Eckford Street
Brooklyn, New York

SITE AND INVESTIGATION SAMPLE LOCATION PLAN

DATE
8/1/2019

PROJECT NO.
12306

FIGURE
2

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LEGEND

33	LOT BOUNDARY AND NUMBER
2714	BLOCK NUMBER
	PROJECT SITE BOUNDARY
SRI-MW-2	SUPPLEMENTAL REMEDIAL INVESTIGATION GROUNDWATER WELL LOCATION (AKRF, 2016)
SRI-MW-4	SUPPLEMENTAL REMEDIAL INVESTIGATION GROUNDWATER WELL LOCATION (AKRF, 2016)
12.61	WATER TABLE ELEVATION IN FEET
10.0	GROUNDWATER ELEVATION CONTOUR IN FEET (DASHED WHERE INFERRED)
	GROUNDWATER FLOW DIRECTION

Groundwater Monitoring Well	Top of Casing Elevation (ft.)	Groundwater (ft. below Top of Casing)	Groundwater Elevation (ft.)
SRI-MW-1	22.34	9.73	12.61
SRI-MW-2	22.21	12.68	9.53
SRI-MW-3	20.52	10.21	10.31
SRI-MW-4	19.00	9.16	9.84

0 15 30 60
SCALE IN FEET

Map Source:
Geoland Land Surveying P.C. "Block 2714 New Lot 33", updated 04-29-2019.

AKRF
440 Park Avenue South, New York, NY 10016

New 470 Project
12 Eckford Street
Brooklyn, New York

INFERRED GROUNDWATER ELEVATION CONTOUR MAP
JUNE 6, 2016

DATE
8/1/2019

PROJECT NO.
12306

FIGURE
3

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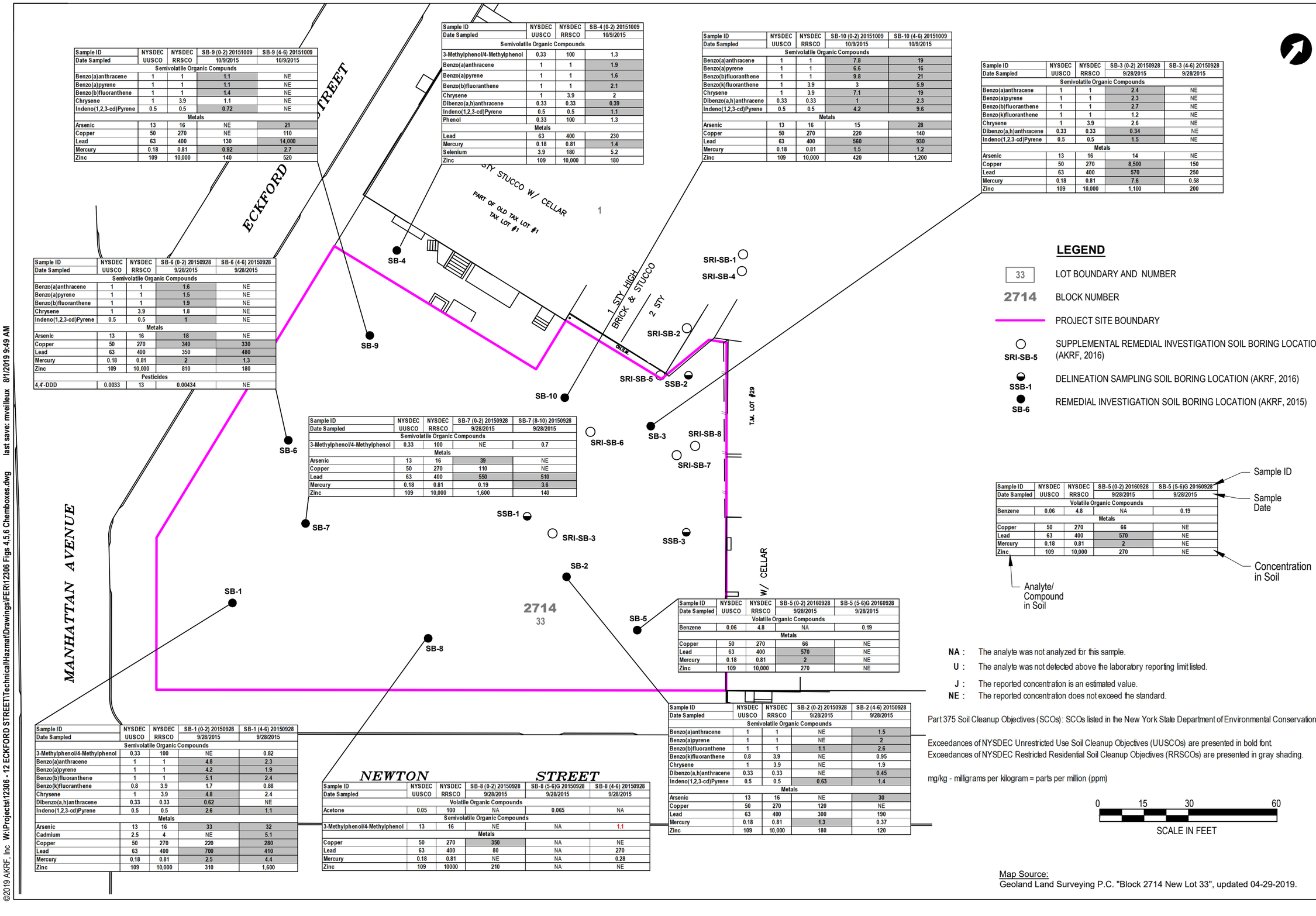


Sample ID	NYSDEC	NYSDEC	SB-9 (0-2) 20151009	SB-9 (4-6) 20151009
Date Sampled	UUSCO	RRSCO	10/9/2015	10/9/2015
Semivolatile Organic Compunds				
Benzo(a)anthracene	1	1	1.1	NE
Benzo(a)pyrene	1	1	1.1	NE
Benzo(b)fluoranthene	1	1	1.4	NE
Chrysene	1	3.9	1.1	NE
Indeno(1,2,3-cd)Pyrene	0.5	0.5	0.72	NE
Metals				
Arsenic	13	16	NE	21
Copper	50	270	NE	110
Lead	63	400	130	14,000
Mercury	0.18	0.81	0.92	2.7
Zinc	109	10,000	140	520

Sample ID	NYSDEC	NYSDEC	SB-4 (0-2) 20151009
Date Sampled	UUSCO	RRSCO	10/9/2015
Semivolatile Organic Compounds			
3-Methylphenol/4-Methylphenol	0.33	100	1.3
Benzo(a)anthracene	1	1	1.9
Benzo(a)pyrene	1	1	1.6
Benzo(b)fluoranthene	1	1	2.1
Chrysene	1	3.9	2
Dibenzo(a,h)anthracene	0.33	0.33	0.39
Indeno(1,2,3-cd)Pyrene	0.5	0.5	1.1
Phenol	0.33	100	1.3
Metals			
Lead	63	400	230
Mercury	0.18	0.81	1.4
Selenium	3.9	180	5.2
Zinc	109	10,000	180

Sample ID	NYSDEC	NYSDEC	SB-10 (0-2) 20151009	SB-10 (4-6) 20151009
Date Sampled	UUSCO	RRSCO	10/9/2015	10/9/2015
Semivolatile Organic Compounds				
Benzo(a)anthracene	1	1	7.8	19
Benzo(a)pyrene	1	1	6.6	16
Benzo(b)fluoranthene	1	1	9.8	21
Benzo(k)fluoranthene	1	3.9	3	5.9
Chrysene	1	3.9	7.1	19
Dibenzo(a,h)anthracene	0.33	0.33	1	2.3
Indeno(1,2,3-cd)Pyrene	0.5	0.5	4.2	9.6
Metals				
Arsenic	13	16	15	28
Copper	50	270	220	140
Lead	63	400	560	930
Mercury	0.18	0.81	1.5	1.2
Zinc	109	10,000	420	1,200

Sample ID	NYSDEC	NYSDEC	SB-3 (0-2) 20150928	SB-3 (4-6) 20150928
Date Sampled	UUSCO	RRSCO	9/28/2015	9/28/2015
Semivolatile Organic Compounds				
Benzo(a)anthracene	1	1	2.4	NE
Benzo(a)pyrene	1	1	2.3	NE
Benzo(b)fluoranthene	1	1	2.7	NE
Benzo(k)fluoranthene	1	1	1.2	NE
Chrysene	1	3.9	2.6	NE
Dibenzo(a,h)anthracene	0.33	0.33	0.34	NE
Indeno(1,2,3-cd)Pyrene	0.5	0.5	1.5	NE
Metals				
Arsenic	13	16	14	NE
Copper	50	270	8,500	150
Lead	63	400	570	250
Mercury	0.18	0.81	7.6	0.58
Zinc	109	10,000	1,100	200

Sample ID	NYSDEC	NYSDEC	SB-6 (0-2) 20150928	SB-6 (4-6) 20150928
Date Sampled	UUSCO	RRSCO	9/28/2015	9/28/2015
Semivolatile Organic Compounds				
Benzo(a)anthracene	1	1	1.6	NE
Benzo(a)pyrene	1	1	1.5	NE
Benzo(b)fluoranthene	1	1	1.9	NE
Chrysene	1	3.9	1.8	NE
Indeno(1,2,3-cd)Pyrene	0.5	0.5	1	NE
Metals				
Arsenic	13	16	18	NE
Copper	50	270	340	330
Lead	63	400	350	480
Mercury	0.18	0.81	2	1.3
Zinc	109	10,000	810	180
Pesticides				
4,4'-DDD	0.0033	13	0.00434	NE

Sample ID	NYSDEC	NYSDEC	SB-7 (0-2) 20150928	SB-7 (8-10) 20150928
Date Sampled	UUSCO	RRSCO	9/28/2015	9/28/2015
Semivolatile Organic Compounds				
3-Methylphenol/4-Methylphenol	0.33	100	NE	0.7
Metals				
Arsenic	13	16	39	NE
Copper	50	270	110	NE
Lead	63	400	550	510
Mercury	0.18	0.81	0.19	3.6
Zinc	109	10,000	1,600	140

Sample ID	NYSDEC	NYSDEC	SB-5 (0-2) 20160928	SB-5 (5-6)G 20160928
Date Sampled	UUSCO	RRSCO	9/28/2015	9/28/2015
Volatile Organic Compounds				
Benzene	0.06	4.8	NA	0.19
Metals				
Copper	50	270	66	NE
Lead	63	400	570	NE
Mercury	0.18	0.81	2	NE
Zinc	109	10,000	270	NE

Sample ID	NYSDEC	NYSDEC	SB-1 (0-2) 20150928	SB-1 (4-6) 20150928
Date Sampled	UUSCO	RRSCO	9/28/2015	9/28/2015
Semivolatile Organic Compounds				
3-Methylphenol/4-Methylphenol	0.33	100	NE	0.82
Benzo(a)anthracene	1	1	4.8	2.3
Benzo(a)pyrene	1	1	4.2	1.9
Benzo(b)fluoranthene	1	1	5.1	2.4
Benzo(k)fluoranthene	0.8	3.9	1.7	0.88
Chrysene	1	3.9	4.8	2.4
Dibenzo(a,h)anthracene	0.33	0.33	0.62	NE
Indeno(1,2,3-cd)Pyrene	0.5	0.5	2.6	1.1
Metals				
Arsenic	13	16	33	32
Cadmium	2.5	4	NE	5.1
Copper	50	270	220	280
Lead	63	400	700	410
Mercury	0.18	0.81	2.5	4.4
Zinc	109	10,000	310	1,600

Sample ID	NYSDEC	NYSDEC	SB-8 (0-2) 20150928	SB-8 (5-6)G 20150928	SB-8 (4-6) 20150928
Date Sampled	UUSCO	RRSCO	9/28/2015	9/28/2015	9/28/2015
Volatile Organic Compounds					
Acetone	0.05	100	NA	0.065	NA
Semivolatile Organic Compounds					
3-Methylphenol/4-Methylphenol	13	16	NE	NA	1.1
Metals					
Copper	50	270	350	NA	NE
Lead	63	400	80	NA	270
Mercury	0.18	0.81	NE	NA	0.28
Zinc	109	10000	210	NA	NE

Sample ID	NYSDEC	NYSDEC	SB-2 (0-2) 20150928	SB-2 (4-6) 20150928
Date Sampled	UUSCO	RRSCO	9/28/2015	9/28/2015
Semivolatile Organic Compounds				
Benzo(a)anthracene	1	1	NE	1.5
Benzo(a)pyrene	1	1	NE	2
Benzo(b)fluoranthene	1	1	1.1	2.6
Benzo(k)fluoranthene	0.8	3.9	NE	0.95
Chrysene	1	3.9	NE	1.9
Dibenzo(a,h)anthracene	0.33	0.33	NE	0.45
Indeno(1,2,3-cd)Pyrene	0.5	0.5	0.63	1.4
Metals				
Arsenic	13	16	NE	30
Copper	50	270	120	NE
Lead	63	400	300	190
Mercury	0.18	0.81	1.3	0.37
Zinc	109	10,000	180	120

LEGEND

- 33 — LOT BOUNDARY AND NUMBER
- 2714 — BLOCK NUMBER
- PROJECT SITE BOUNDARY
- SRI-SB-5 — SUPPLEMENTAL REMEDIAL INVESTIGATION SOIL BORING LOCATION (AKRF, 2016)
- SSB-1 — DELINEATION SAMPLING SOIL BORING LOCATION (AKRF, 2016)
- SB-6 — REMEDIAL INVESTIGATION SOIL BORING LOCATION (AKRF, 2015)

NA : The analyte was not analyzed for this sample.

U : The analyte was not detected above the laboratory reporting limit listed.

J : The reported concentration is an estimated value.

NE : The reported concentration does not exceed the standard.

Part 375 Soil Cleanup Objectives (SCOs): SCOs listed in the New York State Department of Environmental Conservation

Exceedances of NYSDEC Unrestricted Use Soil Cleanup Objectives (UUSCOs) are presented in bold font.
Exceedances of NYSDEC Restricted Residential Soil Cleanup Objectives (RRSCOs) are presented in gray shading.

mg/kg - milligrams per kilogram = parts per million (ppm)

0 15 30 60
SCALE IN FEET

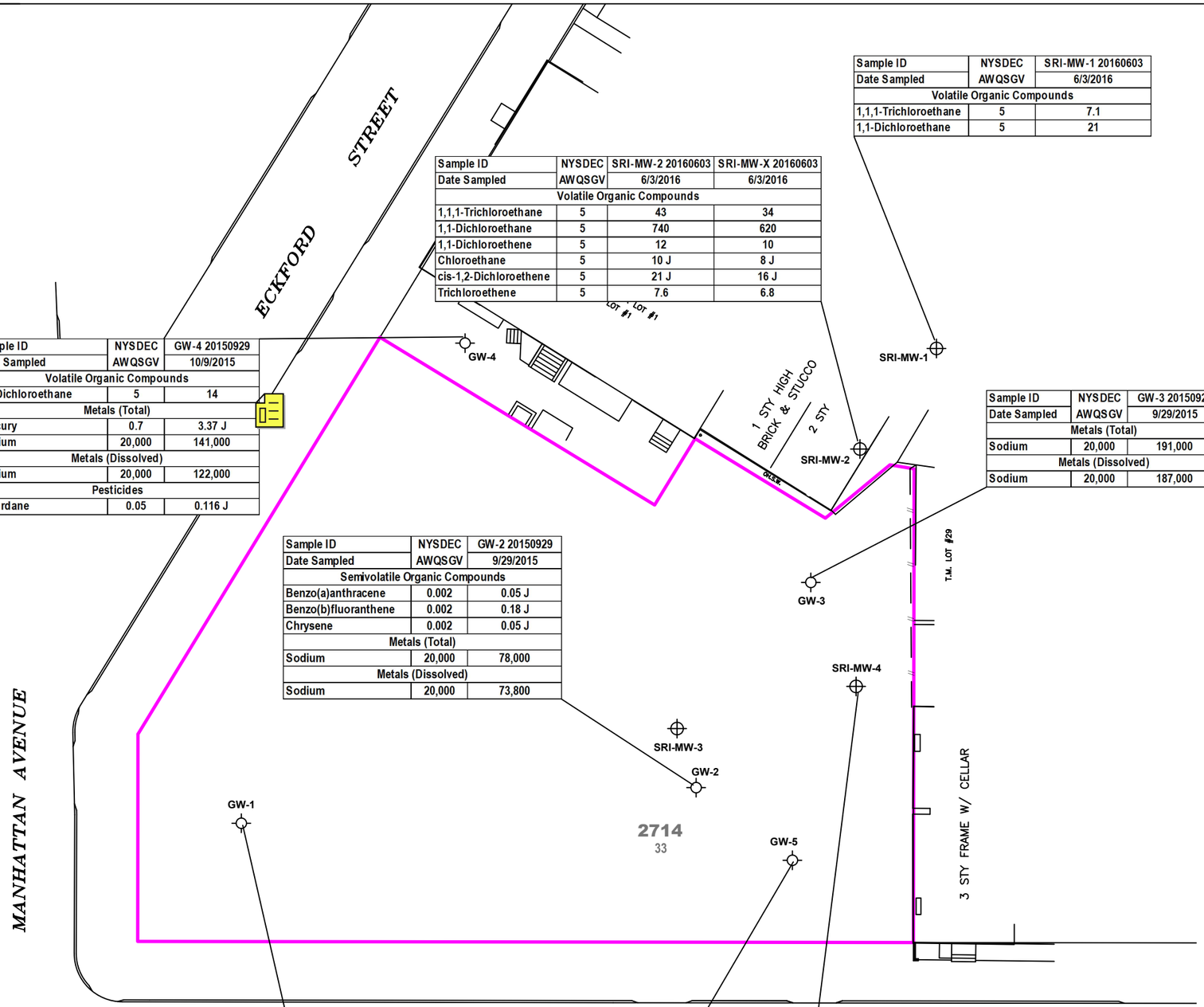
Map Source:
Geoland Land Surveying P.C. "Block 2714 New Lot 33", updated 04-29-2019.

AKRF
440 Park Avenue South, New York, NY 10016

New 470 Project
12 Eckford Street
Brooklyn, New York

DELINEATION SAMPLING, RI AND SRI SOIL/FILL SAMPLE CONCENTRATIONS ABOVE NYSDEC UUSCOS AND/OR RRSCOS

DATE **8/1/2019**
PROJECT NO. **12306**
FIGURE **4**



Sample ID	NYSDEC	GW-4 20150929
Date Sampled	AWQSGV	10/9/2015
Volatile Organic Compounds		
1,1-Dichloroethane	5	14
Metals (Total)		
Mercury	0.7	3.37 J
Sodium	20,000	141,000
Metals (Dissolved)		
Sodium	20,000	122,000
Pesticides		
Chlordane	0.05	0.116 J

Sample ID	NYSDEC	SRI-MW-2 20160603	SRI-MW-X 20160603
Date Sampled	AWQSGV	6/3/2016	6/3/2016
Volatile Organic Compounds			
1,1,1-Trichloroethane	5	43	34
1,1-Dichloroethane	5	740	620
1,1-Dichloroethene	5	12	10
Chloroethane	5	10 J	8 J
cis-1,2-Dichloroethene	5	21 J	16 J
Trichloroethene	5	7.6	6.8

Sample ID	NYSDEC	SRI-MW-1 20160603
Date Sampled	AWQSGV	6/3/2016
Volatile Organic Compounds		
1,1,1-Trichloroethane	5	7.1
1,1-Dichloroethane	5	21

Sample ID	NYSDEC	GW-3 20150929
Date Sampled	AWQSGV	9/29/2015
Metals (Total)		
Sodium	20,000	191,000
Metals (Dissolved)		
Sodium	20,000	187,000

Sample ID	NYSDEC	GW-2 20150929
Date Sampled	AWQSGV	9/29/2015
Semivolatile Organic Compounds		
Benzo(a)anthracene	0.002	0.05 J
Benzo(b)fluoranthene	0.002	0.18 J
Chrysene	0.002	0.05 J
Metals (Total)		
Sodium	20,000	78,000
Metals (Dissolved)		
Sodium	20,000	73,800

Sample ID	NYSDEC	SRI-MW-4 20160602
Date Sampled	AWQSGV	6/2/2016
Volatile Organic Compounds		
Methyl tert butyl ether	10	21

Sample ID
Sample Date
Concentration in Groundwater
Compound in Groundwater

Sample ID	NYSDEC	GW-1 20150929
Date Sampled	AWQSGV	9/29/2015
Volatile Organic Compounds		
Methyl tert butyl ether	10	20
Metals (Total)		
Lead	25	954.2
Magnesium	35,000	41,200
Nickel	100	104.1
Sodium	20,000	202,000
Metals (Dissolved)		
Magnesium	35,000	38,700
Sodium	20,000	202,000

Sample ID	NYSDEC	GW-5 20150929
Date Sampled	AWQSGV	9/29/2015
Volatile Organic Compounds		
Methyl tert butyl ether	10	48
Metals (Total)		
Sodium	20,000	146,000
Metals (Dissolved)		
Sodium	20,000	127,000

Sample ID	NYSDEC	SRI-MW-4 20160602
Date Sampled	AWQSGV	6/2/2016
Volatile Organic Compounds		
Methyl tert butyl ether	10	21

LEGEND

- 33 — LOT BOUNDARY AND NUMBER
- 2714 — BLOCK NUMBER
- PROJECT SITE BOUNDARY
- SRI-MW-4 — SUPPLEMENTAL REMEDIAL INVESTIGATION GROUNDWATER WELL LOCATION (AKRF, 2016)
- GW-1 — REMEDIAL INVESTIGATION GROUNDWATER LOCATION (AKRF, 2015)

J : The reported concentration is an estimated value.

Only Exceedances of Ambient Water Quality Standards and Guidance Values (AWQSGVS) are shown.

0 15 30 60
SCALE IN FEET

Map Source:
Geoland Land Surveying P.C. "Block 2714 New Lot 33", updated 04-29-2019.

AKRF
440 Park Avenue South, New York, NY 10016

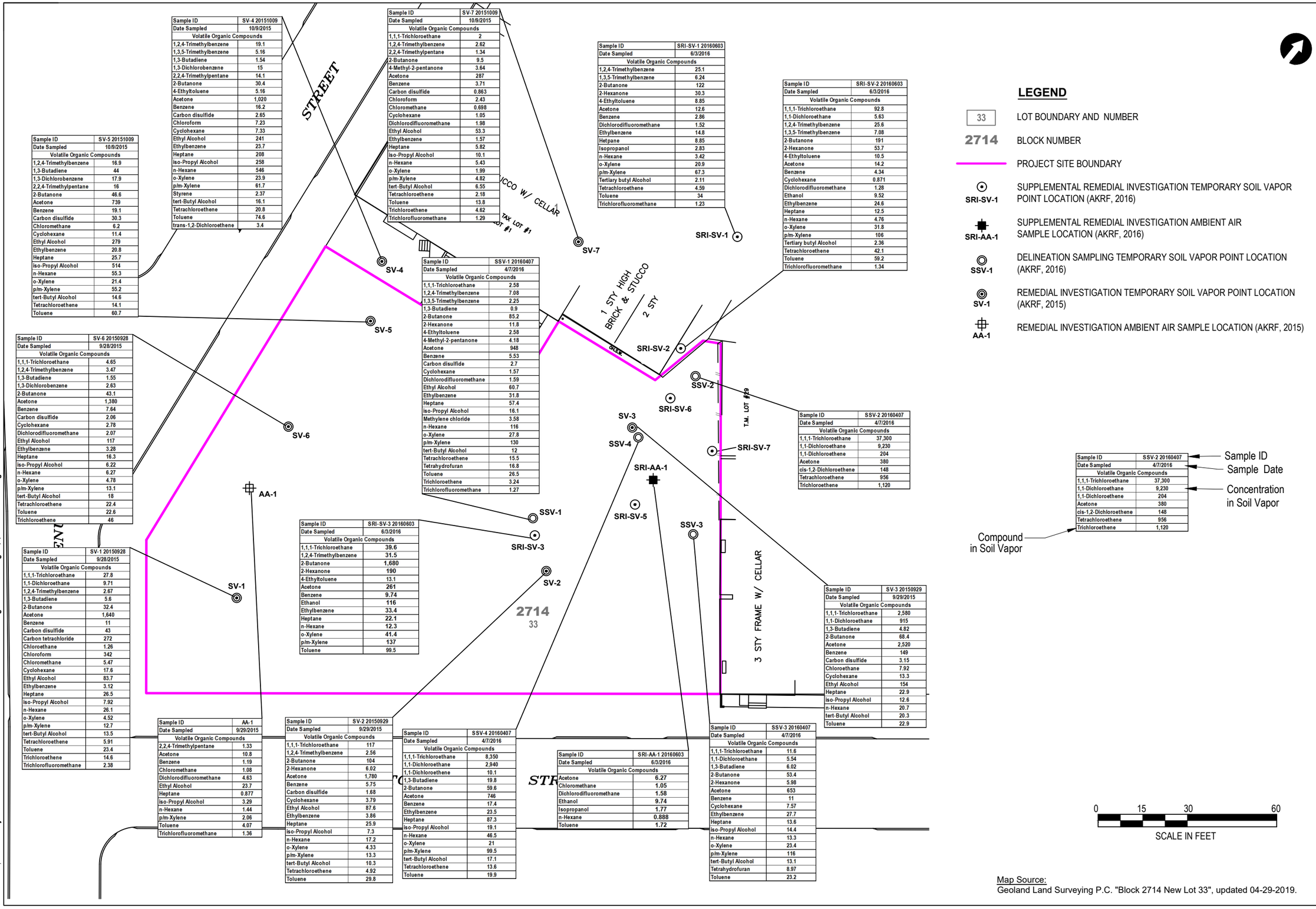
New 470 Project
12 Eckford Street
Brooklyn, New York

SI, RI, AND SRI GROUNDWATER SAMPLE CONCENTRATIONS ABOVE NYSDEC AWQSGVS

DATE
8/1/2019

PROJECT NO.
12306

FIGURE
5



Sample ID	SV-4 20151009
Date Sampled	10/9/2015
Volatile Organic Compounds	
1,2,4-Trimethylbenzene	19.1
1,3,5-Trimethylbenzene	5.16
1,3-Butadiene	1.54
1,3-Dichlorobenzene	15
2,2,4-Trimethylpentane	14.1
2-Butanone	30.4
4-Ethyltoluene	5.16
Acetone	1,020
Benzene	16.2
Carbon disulfide	2.65
Chloroform	7.23
Cyclohexane	7.33
Ethyl Alcohol	241
Ethylbenzene	23.7
Heptane	208
iso-Propyl Alcohol	258
n-Hexane	546
o-Xylene	23.9
p/m-Xylene	61.7
Styrene	2.37
tert-Butyl Alcohol	16.1
Tetrachloroethene	20.8
Toluene	74.6
trans-1,2-Dichloroethene	3.4

Sample ID	SV-7 20151009
Date Sampled	10/9/2015
Volatile Organic Compounds	
1,1,1-Trichloroethane	2
1,2,4-Trimethylbenzene	2.62
2,2,4-Trimethylpentane	1.34
2-Butanone	9.5
4-Methyl-2-pentanone	3.64
Acetone	287
Benzene	3.71
Carbon disulfide	0.863
Chloroform	2.43
Chloromethane	0.698
Cyclohexane	1.05
Dichlorodifluoromethane	1.98
Ethyl Alcohol	53.3
Ethylbenzene	1.57
Heptane	5.82
iso-Propyl Alcohol	10.1
n-Hexane	5.43
o-Xylene	1.99
p/m-Xylene	4.82
tert-Butyl Alcohol	6.55
Tetrachloroethene	2.18
Toluene	13.8
Trichloroethene	4.62
Trichlorofluoromethane	1.29

Sample ID	SRI-SV-1 20160603
Date Sampled	6/3/2016
Volatile Organic Compounds	
1,2,4-Trimethylbenzene	25.1
1,3,5-Trimethylbenzene	6.24
2-Butanone	122
2-Hexanone	30.3
4-Ethyltoluene	8.85
Acetone	12.6
Benzene	2.86
Dichlorodifluoromethane	1.52
Ethylbenzene	14.8
Hetpane	8.85
Isopropanol	2.83
n-Hexane	3.42
o-Xylene	20.9
p/m-Xylene	67.3
Tertiary butyl Alcohol	2.11
Tetrachloroethene	4.59
Toluene	34
Trichlorofluoromethane	1.23

Sample ID	SRI-SV-2 20160603
Date Sampled	6/3/2016
Volatile Organic Compounds	
1,1,1-Trichloroethane	92.8
1,1-Dichloroethane	5.63
1,2,4-Trimethylbenzene	25.6
1,3,5-Trimethylbenzene	7.08
2-Butanone	191
2-Hexanone	53.7
4-Ethyltoluene	10.5
Acetone	14.2
Benzene	4.34
Cyclohexane	0.871
Dichlorodifluoromethane	1.28
Ethanol	9.52
Ethylbenzene	24.6
Heptane	12.5
n-Hexane	4.76
o-Xylene	31.8
p/m-Xylene	106
Tertiary butyl Alcohol	2.36
Tetrachloroethene	42.1
Toluene	59.2
Trichlorofluoromethane	1.34

Sample ID	SV-5 20151009
Date Sampled	10/9/2015
Volatile Organic Compounds	
1,2,4-Trimethylbenzene	16.9
1,3-Butadiene	44
1,3-Dichlorobenzene	17.9
2,2,4-Trimethylpentane	16
2-Butanone	46.6
Acetone	739
Benzene	19.1
Carbon disulfide	30.3
Chloromethane	6.2
Cyclohexane	11.4
Ethyl Alcohol	279
Ethylbenzene	20.8
Heptane	25.7
iso-Propyl Alcohol	514
n-Hexane	55.3
o-Xylene	21.4
p/m-Xylene	55.2
tert-Butyl Alcohol	14.6
Tetrachloroethene	14.1
Toluene	60.7

Sample ID	SSV-1 20160407
Date Sampled	4/7/2016
Volatile Organic Compounds	
1,1,1-Trichloroethane	2.58
1,2,4-Trimethylbenzene	7.08
1,3,5-Trimethylbenzene	2.25
1,3-Butadiene	0.9
2-Butanone	85.2
2-Hexanone	11.8
4-Ethyltoluene	2.58
4-Methyl-2-pentanone	4.18
Acetone	948
Benzene	5.53
Carbon disulfide	2.7
Cyclohexane	1.57
Dichlorodifluoromethane	1.59
Ethyl Alcohol	60.7
Ethylbenzene	31.8
Heptane	57.4
iso-Propyl Alcohol	16.1
Methylene chloride	3.58
n-Hexane	116
o-Xylene	27.8
p/m-Xylene	130
tert-Butyl Alcohol	12
Tetrachloroethene	15.5
Tetrahydrofuran	16.8
Toluene	26.5
Trichloroethene	3.24
Trichlorofluoromethane	1.27

Sample ID	SSV-2 20160407
Date Sampled	4/7/2016
Volatile Organic Compounds	
1,1,1-Trichloroethane	37,300
1,1-Dichloroethane	9,230
1,1-Dichloroethene	204
Acetone	380
cis-1,2-Dichloroethene	148
Tetrachloroethene	956
Trichloroethene	1,120

Sample ID	SV-6 20150928
Date Sampled	9/28/2015
Volatile Organic Compounds	
1,1,1-Trichloroethane	4.65
1,2,4-Trimethylbenzene	3.47
1,3-Butadiene	1.55
1,3-Dichlorobenzene	2.63
2-Butanone	43.1
Acetone	1,380
Benzene	7.64
Carbon disulfide	2.06
Cyclohexane	2.78
Dichlorodifluoromethane	2.07
Ethyl Alcohol	117
Ethylbenzene	3.28
Heptane	16.3
iso-Propyl Alcohol	6.22
n-Hexane	6.27
o-Xylene	4.78
p/m-Xylene	13.1
tert-Butyl Alcohol	18
Tetrachloroethene	22.4
Toluene	22.6
Trichloroethene	46

Sample ID	SRI-SV-3 20160603
Date Sampled	6/3/2016
Volatile Organic Compounds	
1,1,1-Trichloroethane	39.6
1,2,4-Trimethylbenzene	31.5
2-Butanone	1,680
2-Hexanone	190
4-Ethyltoluene	13.1
Acetone	261
Benzene	9.74
Ethanol	116
Ethylbenzene	33.4
Heptane	22.1
n-Hexane	12.3
o-Xylene	41.4
p/m-Xylene	137
Toluene	99.5

Sample ID	SV-1 20150928
Date Sampled	9/28/2015
Volatile Organic Compounds	
1,1,1-Trichloroethane	27.8
1,1-Dichloroethane	9.71
1,2,4-Trimethylbenzene	2.67
1,3-Butadiene	5.6
2-Butanone	32.4
Acetone	1,640
Benzene	11
Carbon disulfide	43
Carbon tetrachloride	272
Chloroethane	1.26
Chloroform	342
Chloromethane	5.47
Cyclohexane	17.6
Ethyl Alcohol	83.7
Ethylbenzene	3.12
Heptane	26.5
iso-Propyl Alcohol	7.92
n-Hexane	26.1
o-Xylene	4.52
p/m-Xylene	12.7
tert-Butyl Alcohol	13.5
Tetrachloroethene	5.91
Toluene	23.4
Trichloroethene	14.6
Trichlorofluoromethane	2.38

Sample ID	AA-1
Date Sampled	9/29/2015
Volatile Organic Compounds	
2,2,4-Trimethylpentane	1.33
Acetone	10.8
Benzene	1.19
Chloromethane	1.08
Dichlorodifluoromethane	4.63
Ethyl Alcohol	23.7
Heptane	0.877
iso-Propyl Alcohol	3.29
n-Hexane	1.44
p/m-Xylene	2.06
Toluene	4.07
Trichlorofluoromethane	1.36

Sample ID	SV-2 20150929
Date Sampled	9/29/2015
Volatile Organic Compounds	
1,1,1-Trichloroethane	117
1,2,4-Trimethylbenzene	2.56
2-Butanone	104
2-Hexanone	6.02
Acetone	1,780
Benzene	5.75
Carbon disulfide	1.68
Cyclohexane	3.79
Ethyl Alcohol	87.6
Ethylbenzene	3.86
Heptane	25.9
iso-Propyl Alcohol	7.3
n-Hexane	17.2
o-Xylene	4.33
p/m-Xylene	13.3
tert-Butyl Alcohol	10.3
Tetrachloroethene	4.92
Toluene	29.8

Sample ID	SSV-4 20160407
Date Sampled	4/7/2016
Volatile Organic Compounds	
1,1,1-Trichloroethane	8,350
1,1-Dichloroethane	2,940
1,1-Dichloroethene	10.1
1,3-Butadiene	19.8
2-Butanone	59.6
Acetone	746
Benzene	17.4
Ethylbenzene	23.5
Heptane	87.3
iso-Propyl Alcohol	19.1
n-Hexane	46.5
o-Xylene	21
p/m-Xylene	99.5
tert-Butyl Alcohol	17.1
Tetrachloroethene	13.6
Toluene	19.9

Sample ID	SRI-AA-1 20160603
Date Sampled	6/3/2016
Volatile Organic Compounds	
Acetone	6.27
Chloromethane	1.05
Dichlorodifluoromethane	1.58
Ethanol	9.74
Isopropanol	1.77
n-Hexane	0.888
Toluene	1.72

Sample ID	SSV-3 20160407
Date Sampled	4/7/2016
Volatile Organic Compounds	
1,1,1-Trichloroethane	11.6
1,1-Dichloroethane	5.54
1,3-Butadiene	6.02
2-Butanone	53.4
2-Hexanone	5.98
Acetone	653
Benzene	11
Cyclohexane	7.57
Ethylbenzene	27.7
Heptane	13.6
iso-Propyl Alcohol	14.4
n-Hexane	13.3
o-Xylene	23.4
p/m-Xylene	116
tert-Butyl Alcohol	13.1
Tetrahydrofuran	8.97
Toluene	23.2

Sample ID	SV-3 20150929
Date Sampled	9/29/2015
Volatile Organic Compounds	
1,1,1-Trichloroethane	2,580
1,1-Dichloroethane	915
1,3-Butadiene	4.82
2-Butanone	68.4
Acetone	2,520
Benzene	149
Carbon disulfide	3.15
Chloroethane	7.92
Cyclohexane	13.3
Ethyl Alcohol	154
Heptane	22.9
iso-Propyl Alcohol	12.6
n-Hexane	20.7
tert-Butyl Alcohol	20.3
Toluene	22.9

LEGEND

- 33 — LOT BOUNDARY AND NUMBER
- 2714 — BLOCK NUMBER
- PROJECT SITE BOUNDARY
- SRI-SV-1 — SUPPLEMENTAL REMEDIAL INVESTIGATION TEMPORARY SOIL VAPOR POINT LOCATION (AKRF, 2016)
- SRI-AA-1 — SUPPLEMENTAL REMEDIAL INVESTIGATION AMBIENT AIR SAMPLE LOCATION (AKRF, 2016)
- SSV-1 — DELINEATION SAMPLING TEMPORARY SOIL VAPOR POINT LOCATION (AKRF, 2016)
- SV-1 — REMEDIAL INVESTIGATION TEMPORARY SOIL VAPOR POINT LOCATION (AKRF, 2015)
- AA-1 — REMEDIAL INVESTIGATION AMBIENT AIR SAMPLE LOCATION (AKRF, 2015)

Sample ID	SSV-2 20160407
Date Sampled	4/7/2016
Volatile Organic Compounds	
1,1,1-Trichloroethane	37,300
1,1-Dichloroethane	9,230
1,1-Dichloroethene	204
Acetone	380
cis-1,2-Dichloroethene	148
Tetrachloroethene	956
Trichloroethene	1,120

Sample ID
Sample Date
Concentration in Soil Vapor
Compound in Soil Vapor

0 15 30 60
SCALE IN FEET

Map Source:
Geoland Land Surveying P.C. "Block 2714 New Lot 33", updated 04-29-2019.

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DELINEATION SAMPLING, RI, AND SRI SOIL VAPOR SAMPLE CONCENTRATIONS

New 470 Project
12 Eckford Street
Brooklyn, New York

DATE
8/1/2019

PROJECT NO.
12306

FIGURE
6

LEGEND

33	LOT BOUNDARY AND NUMBER
2714	BLOCK NUMBER
	PROJECT SITE BOUNDARY
	EXTENT OF EXCAVATION TO 2 FEET BELOW SURFACE GRADE
	EXTENT OF EXCAVATION TO 4 FEET BELOW SURFACE GRADE
	EXTENT OF EXCAVATION TO 12 FEET BELOW SURFACE GRADE

0 15 30 60

SCALE IN FEET

Map Source:
Geoland Land Surveying P.C. "Block 2714 New Lot 33", updated 04-29-2019.

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REMEDIAL EXCAVATION PLAN

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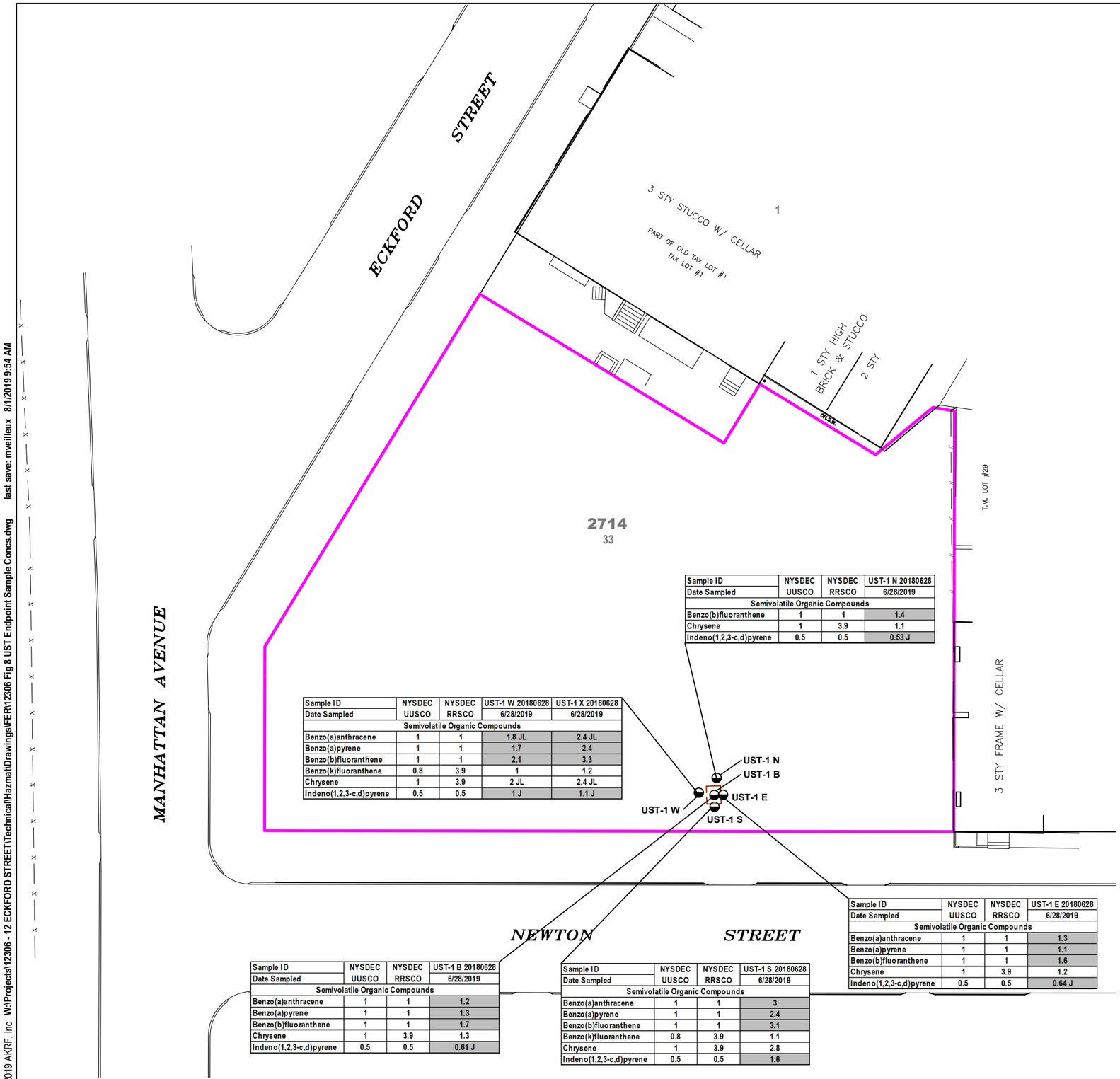
FIGURE
7

W:\Projects\12306 - 12 ECKFORD STREET\Technical\Hazmat\Drawings\FER\12306 Fig 7 Remedial Excav Plan.dwg last save: mveilleux 8/1/2019 9:51 AM



Sample ID	NYSDEC	NYSDEC	UST-1 N 20180628
Date Sampled	UUSCO	RRSCO	6/28/2019
Semivolatile Organic Compounds			
Benzo(b)fluoranthene	1	1	1.4
Chrysene	1	3.9	1.1
Indeno(1,2,3-c,d)pyrene	0.5	0.5	0.53 J

Sample ID	NYSDEC	NYSDEC	UST-1 W 20180628	UST-1 X 20180628
Date Sampled	UUSCO	RRSCO	6/28/2019	6/28/2019
Semivolatile Organic Compounds				
Benzo(a)anthracene	1	1	1.8 JL	2.4 JL
Benzo(a)pyrene	1	1	1.7	2.4
Benzo(b)fluoranthene	1	1	2.1	3.3
Benzo(k)fluoranthene	0.8	3.9	1	1.2
Chrysene	1	3.9	2 JL	2.4 JL
Indeno(1,2,3-c,d)pyrene	0.5	0.5	1 J	1.1 J

Sample ID	NYSDEC	NYSDEC	UST-1 E 20180628
Date Sampled	UUSCO	RRSCO	6/28/2019
Semivolatile Organic Compounds			
Benzo(a)anthracene	1	1	1.3
Benzo(a)pyrene	1	1	1.1
Benzo(b)fluoranthene	1	1	1.6
Chrysene	1	3.9	1.2
Indeno(1,2,3-c,d)pyrene	0.5	0.5	0.64 J

Sample ID	NYSDEC	NYSDEC	UST-1 B 20180628
Date Sampled	UUSCO	RRSCO	6/28/2019
Semivolatile Organic Compounds			
Benzo(a)anthracene	1	1	1.2
Benzo(a)pyrene	1	1	1.3
Benzo(b)fluoranthene	1	1	1.7
Chrysene	1	3.9	1.3
Indeno(1,2,3-c,d)pyrene	0.5	0.5	0.61 J

Sample ID	NYSDEC	NYSDEC	UST-1 S 20180628
Date Sampled	UUSCO	RRSCO	6/28/2019
Semivolatile Organic Compounds			
Benzo(a)anthracene	1	1	3
Benzo(a)pyrene	1	1	2.4
Benzo(b)fluoranthene	1	1	3.1
Benzo(k)fluoranthene	0.8	3.9	1.1
Chrysene	1	3.9	2.8
Indeno(1,2,3-c,d)pyrene	0.5	0.5	1.6

LEGEND

- 33 — LOT BOUNDARY AND NUMBER
- 2714 — BLOCK NUMBER
- PROJECT SITE BOUNDARY
- FORMER 550-GALLON UNDERGROUND STORAGE TANK LOCATION
- UST ENDPOINT SAMPLE LOCATION

Sample ID	NYSDEC	NYSDEC	UST-1 N 20180628	← Sample ID
Date Sampled	UUSCO	RRSCO	6/28/2019	← Sample Date
Semivolatile Organic Compounds				
Benzo(b)fluoranthene	1	1	1.4	
Chrysene	1	3.9	1.1	
Indeno(1,2,3-c,d)pyrene	0.5	0.5	0.53 J	← Concentration

Analyte/Compound

J - The reported concentration is a value above the method detection limit, but is estimated and may be imprecise.
L - The reported concentration is a value above the method detection limit, but is estimated and is biased low.

UST-1 X 20180628 is a blind duplicate of sample UST-1 W 20180628.

Part 375 Soil Cleanup Objectives (SCOs): SCOs listed in the New York State Department of Environmental Conservation (NYSDEC) "Part 375" Regulations (6 NYCRR Part 375).

Exceedances of NYSDEC Unrestricted Use Soil Cleanup Objectives (UUSCOs) are presented in bold font
Exceedances of NYSDEC Restricted Residential Soil Cleanup Objectives (RRSCOs) are presented in gray shading.

mg/kg - milligrams per kilogram = parts per million (ppm)

0 15 30 60
SCALE IN FEET

Map Source:
Geoland Land Surveying P.C. "Block 2714 New Lot 33", updated 04-29-2019.

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New 470 Project
12 Eckford Street
Brooklyn, New York

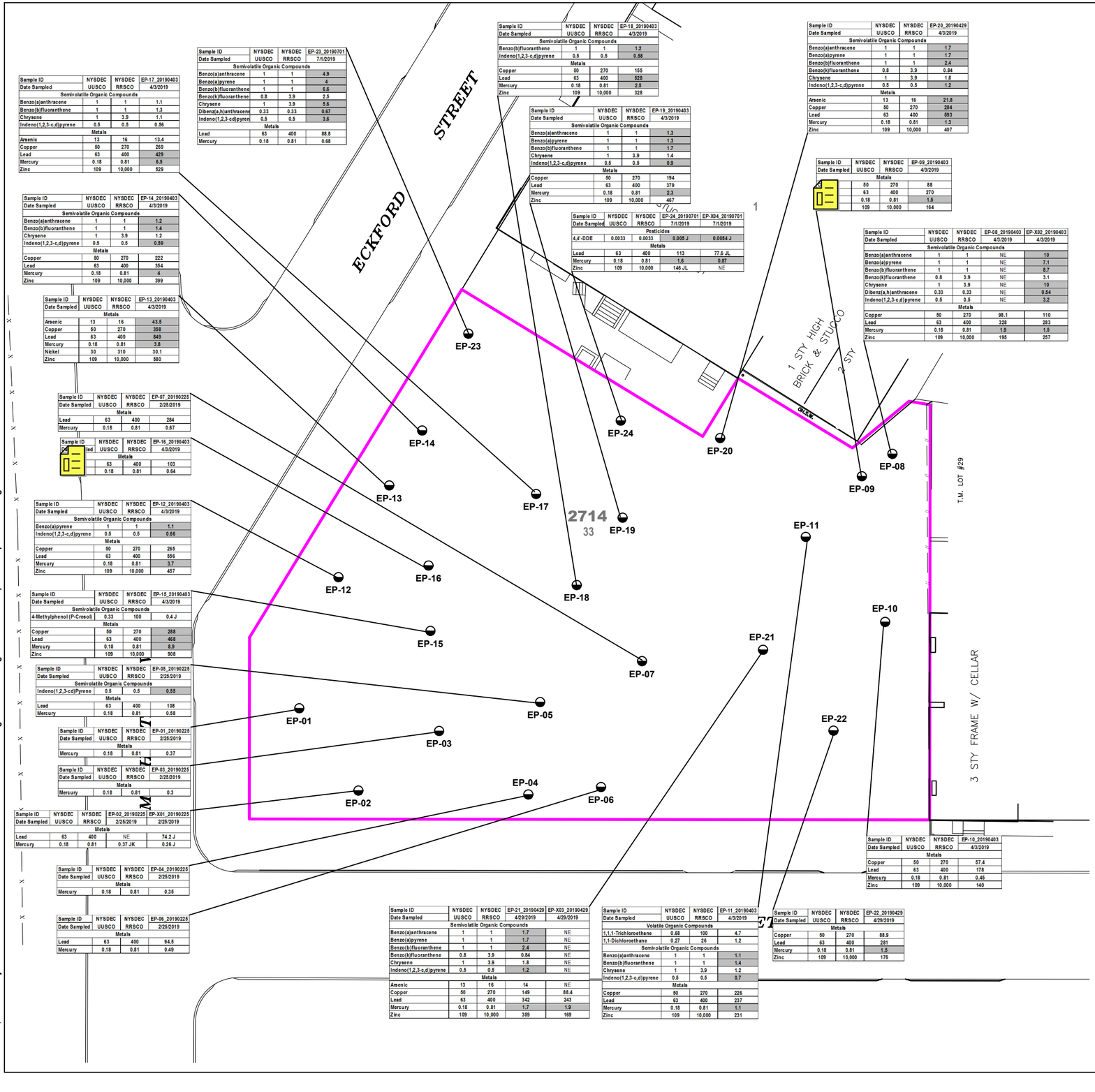
UST ENDPOINT SAMPLE CONCENTRATIONS ABOVE NYSDEC UUSCOs AND/OR RRSCOs

DATE
8/1/2019

PROJECT NO.
12306

FIGURE
8

 W:\Projects\12306 - 12 ECKFORD STREET\Technical\Hazmat\Drawings\FER\12306 Fig 8 UST Endpoint Sample Concs.dwg last save: mveilleux 8/1/2019 9:54 AM



Sample ID	NYSDEC	NYSDEC	EP-17_20190403
Date Sampled	UUSCO	RRSCO	4/3/2019
Semivolatile Organic Compounds			
Benzo(a)anthracene	1	1	1.1
Benzo(b)fluoranthene	1	1	1.3
Chrysene	1	3.9	1.1
Indeno(1,2,3-c,d)pyrene	0.5	0.5	0.56
Metals			
Arsenic	13	16	13.4
Copper	50	270	269
Lead	63	400	429
Mercury	0.18	0.81	6.5
Zinc	109	10,000	929

Sample ID	NYSDEC	NYSDEC	EP-23_20190701
Date Sampled	UUSCO	RRSCO	7/1/2019
Semivolatile Organic Compounds			
Benzo(a)anthracene	1	1	4.9
Benzo(a)pyrene	1	1	4
Benzo(b)fluoranthene	1	1	6.6
Benzo(k)fluoranthene	0.8	3.9	2.6
Chrysene	1	3.9	5.6
Dibenz(a,h)anthracene	0.33	0.33	0.67
Indeno(1,2,3-cd)pyrene	0.5	0.5	3.6
Metals			
Lead	63	400	88.8
Mercury	0.18	0.81	0.68

Sample ID	NYSDEC	NYSDEC	EP-14_20190403
Date Sampled	UUSCO	RRSCO	4/3/2019
Semivolatile Organic Compounds			
Benzo(a)anthracene	1	1	1.2
Benzo(b)fluoranthene	1	1	1.4
Chrysene	1	3.9	1.2
Indeno(1,2,3-c,d)pyrene	0.5	0.5	0.59
Metals			
Copper	50	270	222
Lead	63	400	354
Mercury	0.18	0.81	4
Zinc	109	10,000	399

Sample ID	NYSDEC	NYSDEC	EP-13_20190403
Date Sampled	UUSCO	RRSCO	4/3/2019
Metals			
Arsenic	13	16	43.5
Copper	50	270	358
Lead	63	400	849
Mercury	0.18	0.81	3.8
Nickel	30	310	30.1
Zinc	109	10,000	580

Sample ID	NYSDEC	NYSDEC	EP-07_20190225
Date Sampled	UUSCO	RRSCO	2/25/2019
Metals			
Lead	63	400	284
Mercury	0.18	0.81	0.67

Sample ID	NYSDEC	NYSDEC	EP-16_20190403
Date Sampled	UUSCO	RRSCO	4/3/2019
Metals			
	63	400	103
	0.18	0.81	0.64

Sample ID	NYSDEC	NYSDEC	EP-12_20190403
Date Sampled	UUSCO	RRSCO	4/3/2019
Semivolatile Organic Compounds			
Benzo(a)pyrene	1	1	1.1
Indeno(1,2,3-c,d)pyrene	0.5	0.5	0.66
Metals			
Copper	50	270	265
Lead	63	400	556
Mercury	0.18	0.81	3.7
Zinc	109	10,000	457

Sample ID	NYSDEC	NYSDEC	EP-15_20190403
Date Sampled	UUSCO	RRSCO	4/3/2019
Semivolatile Organic Compounds			
4-Methylphenol (P-Cresol)	0.33	100	0.4 J
Metals			
Copper	50	270	288
Lead	63	400	468
Mercury	0.18	0.81	8.9
Zinc	109	10,000	908

Sample ID	NYSDEC	NYSDEC	EP-05_20190225
Date Sampled	UUSCO	RRSCO	2/25/2019
Semivolatile Organic Compounds			
Indeno(1,2,3-cd)Pyrene	0.5	0.5	0.55
Metals			
Lead	63	400	108
Mercury	0.18	0.81	0.58

Sample ID	NYSDEC	NYSDEC	EP-01_20190225
Date Sampled	UUSCO	RRSCO	2/25/2019
Metals			
Mercury	0.18	0.81	0.37

Sample ID	NYSDEC	NYSDEC	EP-03_20190225
Date Sampled	UUSCO	RRSCO	2/25/2019
Metals			
Mercury	0.18	0.81	0.3

Sample ID	NYSDEC	NYSDEC	EP-02_20190225	EP-X01_20190225
Date Sampled	UUSCO	RRSCO	2/25/2019	2/25/2019
Metals				
Lead	63	400	NE	74.2 J
Mercury	0.18	0.81	0.37 JK	0.26 J

Sample ID	NYSDEC	NYSDEC	EP-04_20190225
Date Sampled	UUSCO	RRSCO	2/25/2019
Metals			
Mercury	0.18	0.81	0.35

Sample ID	NYSDEC	NYSDEC	EP-06_20190225
Date Sampled	UUSCO	RRSCO	2/25/2019
Metals			
Lead	63	400	94.5
Mercury	0.18	0.81	0.49

Sample ID	NYSDEC	NYSDEC	EP-18_20190403
Date Sampled	UUSCO	RRSCO	4/3/2019
Semivolatile Organic Compounds			
Benzo(b)fluoranthene	1	1	1.2
Indeno(1,2,3-c,d)pyrene	0.5	0.5	0.58
Metals			
Copper	50	270	155
Lead	63	400	528
Mercury	0.18	0.81	2.5
Zinc	109	10,000	328

Sample ID	NYSDEC	NYSDEC	EP-19_20190403
Date Sampled	UUSCO	RRSCO	4/3/2019
Semivolatile Organic Compounds			
Benzo(a)anthracene	1	1	1.3
Benzo(a)pyrene	1	1	1.3
Benzo(b)fluoranthene	1	1	1.7
Chrysene	1	3.9	1.4
Indeno(1,2,3-c,d)pyrene	0.5	0.5	0.9
Metals			
Copper	50	270	194
Lead	63	400	379
Mercury	0.18	0.81	2.3
Zinc	109	10,000	467

Sample ID	NYSDEC	NYSDEC	EP-24_20190701	EP-X04_20190701
Date Sampled	UUSCO	RRSCO	7/1/2019	7/1/2019
Pesticides				
4,4'-DDE	0.0033	0.0033	0.005 J	0.0054 J
Metals				
Lead	63	400	113	77.5 JL
Mercury	0.18	0.81	1.6	0.87
Zinc	109	10,000	146 JL	NE

Sample ID	NYSDEC	NYSDEC	EP-20_20190429
Date Sampled	UUSCO	RRSCO	4/3/2019
Semivolatile Organic Compounds			
Benzo(a)anthracene	1	1	1.7
Benzo(a)pyrene	1	1	1.7
Benzo(b)fluoranthene	1	1	2.4
Benzo(k)fluoranthene	0.8	3.9	0.84
Chrysene	1	3.9	1.8
Indeno(1,2,3-c,d)pyrene	0.5	0.5	1.2
Metals			
Arsenic	13	16	21.8
Copper	50	270	284
Lead	63	400	593
Mercury	0.18	0.81	1.3
Zinc	109	10,000	407

Sample ID	NYSDEC	NYSDEC	EP-09_20190403
Date Sampled	UUSCO	RRSCO	4/3/2019
Metals			
	50	270	88
	63	400	270
	0.18	0.81	1.5
	109	10,000	164

Sample ID	NYSDEC	NYSDEC	EP-08_20190403	EP-X02_20190403
Date Sampled	UUSCO	RRSCO	4/3/2019	4/3/2019
Semivolatile Organic Compounds				
Benzo(a)anthracene	1	1	NE	10
Benzo(a)pyrene	1	1	NE	7.1
Benzo(b)fluoranthene	1	1	NE	8.7
Benzo(k)fluoranthene	0.8	3.9	NE	3.1
Chrysene	1	3.9	NE	10
Dibenz(a,h)anthracene	0.33	0.33	NE	0.84
Indeno(1,2,3-c,d)pyrene	0.5	0.5	NE	3.2
Metals				
Copper	50	270	98.1	110
Lead	63	400	328	283
Mercury	0.18	0.81	1.9	1.5
Zinc	109	10,000	195	257

Sample ID	NYSDEC	NYSDEC	EP-10_20190403
Date Sampled	UUSCO	RRSCO	4/3/2019
Metals			
Copper	50	270	57.4
Lead	63	400	178
Mercury	0.18	0.81	0.45
Zinc	109	10,000	140

Sample ID	NYSDEC	NYSDEC	EP-21_20190429	EP-X03_20190429
Date Sampled	UUSCO	RRSCO	4/29/2019	4/29/2019
Semivolatile Organic Compounds				
Benzo(a)anthracene	1	1	1.7	NE
Benzo(a)pyrene	1	1	1.7	NE
Benzo(b)fluoranthene	1	1	2.4	NE
Benzo(k)fluoranthene	0.8	3.9	0.84	NE
Chrysene	1	3.9	1.8	NE
Indeno(1,2,3-c,d)pyrene	0.5	0.5	1.2	NE
Metals				
Arsenic	13	16	14	NE
Copper	50	270	149	88.4
Lead	63	400	342	243
Mercury	0.18	0.81	1.7	1.3
Zinc	109	10,000	359	169

Sample ID	NYSDEC	NYSDEC	EP-11_20190403
Date Sampled	UUSCO	RRSCO	4/3/2019
Volatile Organic Compounds			
1,1,1-Trichloroethane	0.68	100	4.7
1,1-Dichloroethane	0.27	26	1.2
Semivolatile Organic Compounds			
Benzo(a)anthracene	1	1	1.1
Benzo(b)fluoranthene	1	1	1.4
Chrysene	1	3.9	1.2
Indeno(1,2,3-c,d)pyrene	0.5	0.5	0.7
Metals			
Copper	50	270	226
Lead	63	400	237
Mercury	0.18	0.81	1.1
Zinc	109	10,000	231

Sample ID	NYSDEC	NYSDEC	EP-22_20190429
Date Sampled	UUSCO	RRSCO	4/29/2019
Metals			
Copper	50	270	88.9
Lead	63	400	281
Mercury	0.18	0.81	1.5
Zinc	109	10,000	176

LEGEND

- 33 — LOT BOUNDARY AND NUMBER
- 2714 — BLOCK NUMBER
- PROJECT SITE BOUNDARY
- SITE-WIDE ENDPOINT SAMPLE LOCATION

Sample ID	NYSDEC	NYSDEC	EP-22_20190429
Date Sampled	UUSCO	RRSCO	4/29/2019
Metals			
Copper	50	270	88.9
Lead	63	400	281
Mercury	0.18	0.81	1.5
Zinc	109	10,000	176

Sample ID
Sample Date
Concentration
Analyte/Compound

J - The reported concentration is a value above the method detection limit, but is estimated and may be imprecise.
JL - The reported concentration is a value above the method detection limit, but is estimated low and may be imprecise.
K - The reported concentration is proportional to dilution factor and may be exaggerated.
NE - The reported concentration does not exceed the UUSCO or RRSCO.

EP-X01_20190225 is a blind duplicate of sample EP-02_20190225.
EP-X02_20190403 is a blind duplicate of sample EP-08_20190403.
EP-X03_20190429 is a blind duplicate of sample EP-22_20190429.
EP-X04_20190701 is a blind duplicate of sample EP-24_20190701.

Part 375 Soil Cleanup Objectives (SCOs): SCOs listed in the New York State Department of Environmental Conservation (NYSDEC) "Part 375" Regulations (6 NYCRR Part 375).

Exceedances of NYSDEC Unrestricted Use Soil Cleanup Objectives (UUSCOs) are presented in bold font.
Exceedances of NYSDEC Restricted Residential Soil Cleanup Objectives (RRSCOs) are presented in gray shading.

mg/kg - milligrams per kilogram = parts per million (ppm)

0 15 30 60
SCALE IN FEET

Map Source:
Geoland Land Surveying P.C. "Block 2714 New Lot 33", updated 04-29-2019.

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New 470 Project
12 Eckford Street
Brooklyn, New York

POST-EXCAVATION SITE-WIDE ENDPOINT SAMPLE CONCENTRATIONS ABOVE NYSDEC UUSCOs AND/OR RRSCOs

DATE
8/1/2019

PROJECT NO.
12306

FIGURE
9

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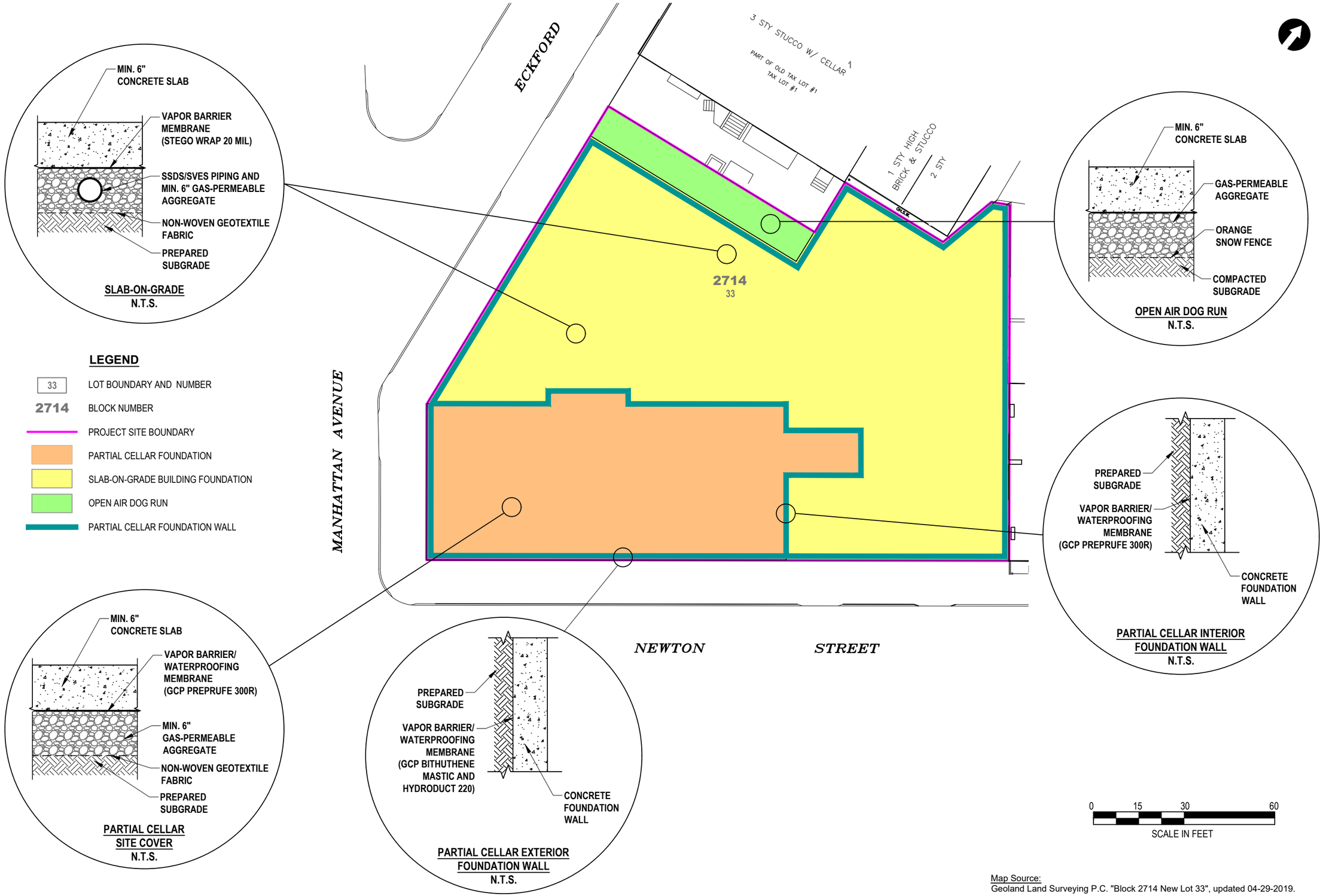

Map Source:
Geoland Land Surveying P.C. "Block 2714 New Lot 33", updated 04-29-2019.

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New 470 Project
12 Eckford Street
Brooklyn, New York

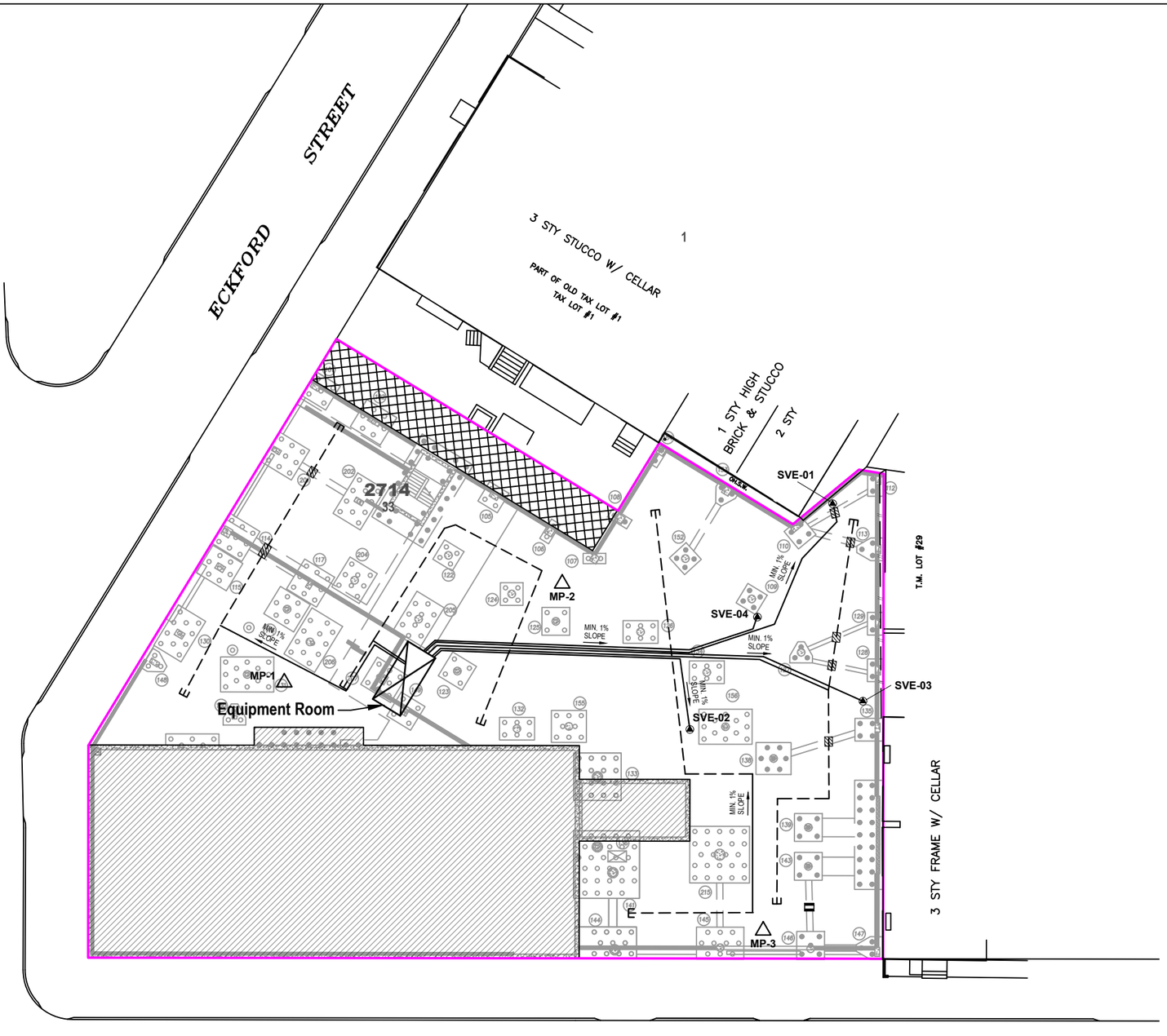
COMPOSITE COVER SYSTEM PLAN

DATE
8/1/2019

PROJECT NO.
12306

FIGURE
10

 W:\Projects\12306 - 12 ECKFORD STREET\Technical\Hazmat\Drawings\FER\12306 Fig 10 Composite Cover System Plan.dwg last save: mveilleux 8/1/2019 8:00 AM



LEGEND

33	LOT BOUNDARY AND NUMBER
2714	BLOCK NUMBER
	PROJECT SITE BOUNDARY
	EXTENT OF SLAB-ON-GRADE BUILDING
	EXTENT OF PARTIAL CELLAR
	EXTENT OF OPEN AIR DOG RUN
E	0.002-INCH SLOTTED 4" Ø SCHEDULE 40 PVC PIPING WITH ENDCAP
	SOLID 4" Ø PVC PIPING
	PIPE SLEEVE THROUGH GRADE BEAM
	COMMUNICATION SLEEVE THROUGH FOUNDATION ELEMENT
	SOIL VAPOR EXTRACTION WELL LOCATION
MP-1	VAPOR MONITORING POINT LOCATION

0 15 30 60

SCALE IN FEET

Map Source:
Geoland Land Surveying P.C. "Block 2714 New Lot 33", updated 04-29-2019.

AKRF
440 Park Avenue South, New York, NY 10016

New 470 Project
12 Eckford Street
Brooklyn, New York

SSDS AND SVES PLAN

DATE
8/1/2019

PROJECT NO.
12306

FIGURE
11

W:\Projects\12306 - 12 ECKFORD STREET\Technical\Hazmat\Drawings\FER\12306 Fig 11 SSDS and SVES Plan.dwg last save: mveilleux 8/1/2019 2:29 PM

APPENDIX A
ENVIRONMENTAL EASEMENT (EE)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Office of the General Counsel
625 Broadway, 14th Floor, Albany, New York 12233-1500
P: (518) 402-9185 | F: (518) 402-9018
www.dec.ny.gov

July 11, 2019

SENT VIA CERTIFIED MAIL
RETURN RECEIPT REQUESTED
AND ELECTRONIC MAIL bcohen@certilmanbalin.com

Barry S. Cohen, Esq.
Partner
Certilman Balin Adler & Hyman, LLP
90 Merrick Avenue, 9th Floor
East Meadow, NY 11554

RE: Environmental Easement Package
Site Name: New 470 Project
Site No.: C224242

Dear Mr. Cohen:

Enclosed, please find a fully executed Environmental Easement, TP-584 and NYC RPT tax forms referencing the site located at 12 Eckford Street, Brooklyn, County of Kings, New York.

Once the Environmental Easement is recorded, the local municipality will need to be notified via Certified Mail, Return Receipt Requested.

Please return a copy of the recorded easement marked by the County Clerk's Office with the date and location of recording, and a certified copy of the municipal notice. The information from the recorded easement and notices are necessary to process the Certificate of Completion.

If you have any further questions or concerns relating to this matter, please contact our office at (518) 408-0409.

Sincerely,

Jennifer Andaloro, Esq.
Section Chief A
Remediation Bureau

ec: B. Burns, Esq., NYSDEC

ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

THIS INDENTURE made this 3rd day of July, 2019 between Owner(s) New 470 LLC, having an office at 58 Vanderbilt Motor Parkway, Suite 100, Commack, New York 11725, County of Suffolk, State of New York (the "Grantor"), and The People of the State of New York (the "Grantee."), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property located at the address of 12 Eckford Street (a/k/a 470 Manhattan Avenue) in the City of New York, County of Kings and State of New York, known and designated on the tax map of the New York City Department of Finance as tax map parcel number: Block 2714 Lot 33, being the same as that property conveyed to Grantor by deed dated May 7, 2018 and recorded in the City Register of the City of New York as CRFN # 2018000158471. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 0.5123 +/- acres, and is hereinafter more fully described in the Land Title Survey dated January 20, 2017 and last revised April 29, 2019 prepared by Pawel Kopcinski, L.L.S. of GeoLand Land Surveying P.C., which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation

established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Brownfield Cleanup Agreement Index Number: C224242-10-16, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement").

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Restricted Residential as described in 6 NYCRR Part 375-1.8(g)(2)(ii), Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv)

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation

pursuant to Title 36 of Article 71 of the Environmental Conservation Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to:

Site Number: C224242
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and

communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

11. Consistency with the SMP. To the extent there is any conflict or inconsistency between the terms of this Environmental Easement and the SMP, regarding matters specifically addressed by the SMP, the terms of the SMP will control.

Remainder of Page Intentionally Left Blank

IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

New 470 LLC:

By: _____

Print Name: Douglas Partrick

Title: Member Date: 6/20/19

Grantor's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF)

On the 20th day of June, in the year 20 19 before me, the undersigned, personally appeared Douglas S. Partrick, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public - State of New York

Katie Ann Donaldson
Notary Public, State of New York
Registration No. 01DO6362228
Qualified in Suffolk County
Commission Expires 07/31/2021

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting By and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: _____
Michael J. Ryan, Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the 3rd day of July, in the year 2019, before me, the undersigned, personally appeared Michael J. Ryan, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

_____
Notary Public - State of New York

David J. Chiusano
Notary Public, State of New York
No. 01CH5032146
Qualified in Schenectady County
Commission Expires August 22, 20

SCHEDULE "A" PROPERTY DESCRIPTION

Metes and Bounds Description
Block 2714
New Lot #33 and Environmental Easement

ALL that certain plot, piece or parcel of land, situate, lying and being in the Borough of Brooklyn, County of Kings, City and State of New York, bounded and described as follows:

BEGINNING at the corner formed by the intersection of the northeasterly side of Manhattan Avenue with the northerly side of Newton Street;

RUNNING THENCE along the northeasterly side of Manhattan Avenue 51 feet 6 inches to the easterly side of Eckford Street;

THENCE along the easterly side of Eckford Street 115 feet 6-3/8 inches;

THENCE easterly at 90 degree angles to Eckford Street 80 feet;

THENCE northerly at 90 degree angles to the last course 19 feet 3-3/4 inches;

THENCE at easterly at 90 degree angles to the last course 37 feet 1 1-1/4 inches;

THENCE northerly formerly an interior angle of 109 degrees 5 minutes 21 seconds, 20 feet 9-7/8 inches;

THENCE easterly 6 feet 1 inch;

THENCE southerly at 90 degree angles to Newton Street 117 feet 8-1/2 inches to the northerly side of Newton Street;

THENCE westerly along the northerly side of Newton Street 192 feet 10-1/2 inches to the point or place of BEGINNING.

Total Area 22,317.4 square feet (.5123 acres)

TP-584 (4/13)

New York State Department of Taxation and Finance

Combined Real Estate Transfer Tax Return, Credit Line Mortgage Certificate, and Certification of Exemption from the Payment of Estimated Personal Income Tax

Recording office time stamp

See Form TP-584-I, Instructions for Form TP-584, before completing this form. Print or type.

Schedule A – Information relating to conveyance

Grantor/Transferor	Name *(if individual, last, first, middle initial)* (☐ *check if more than one grantor)*			Social security number
☐ Individual	NEW 470 LLC			
☐ Corporation	Mailing address			Social security number
☐ Partnership	c/o Heatherwood Organization, 58 Vanderbilt Parkway, Suite 100			
☐ Estate/Trust	City	State	ZIP code	Federal EIN
☐ Single member LLC	Commack	NY	11725	81-0931645
☒ Other	Single member's name if grantor is a single member LLC *(see instructions)*			Single member EIN or SSN

Grantee/Transferee	Name *(if individual, last, first, middle initial)* (☐ *check if more than one grantee)*			Social security number
☐ Individual	PEOPLE OF THE STATE OF NEW YORK			
☐ Corporation	Mailing address			Social security number
☐ Partnership	625 Broadway			
☐ Estate/Trust	City	State	ZIP code	Federal EIN
☐ Single member LLC	Albany	NY	12233	14-6013200
☒ Other	Single member's name if grantee is a single member LLC *(see instructions)*			Single member EIN or SSN

Location and description of property conveyed

Tax map designation – Section, block & lot *(include dots and dashes)*	SWIS code (six digits)	Street address	City, town, or village	County
Block 2714 Lot 33		470 Manhattan Avenue	Brooklyn	Kings

Type of property conveyed *(check applicable box)*

1 ☐ One- to three-family house
2 ☐ Residential cooperative
3 ☐ Residential condominium
4 ☐ Vacant land
5 ☒ Commercial/Industrial
6 ☐ Apartment building
7 ☐ Office building
8 ☐ Other _____

Date of conveyance: 07 (month) 03 (day) 2019 (year)

Percentage of real property conveyed which is residential real property 0 % *(see instructions)*

Condition of conveyance *(check all that apply)*

a. ☐ Conveyance of fee interest
b. ☐ Acquisition of a controlling interest (state percentage acquired _____ %)
c. ☐ Transfer of a controlling interest (state percentage transferred _____ %)
d. ☐ Conveyance to cooperative housing corporation
e. ☐ Conveyance pursuant to or in lieu of foreclosure or enforcement of security interest *(attach Form TP-584.1, Schedule E)*
f. ☐ Conveyance which consists of a mere change of identity or form of ownership or organization *(attach Form TP-584.1, Schedule F)*
g. ☐ Conveyance for which credit for tax previously paid will be claimed *(attach Form TP-584.1, Schedule G)*
h. ☐ Conveyance of cooperative apartment(s)
i. ☐ Syndication
j. ☐ Conveyance of air rights or development rights
k. ☐ Contract assignment
l. ☐ Option assignment or surrender
m. ☐ Leasehold assignment or surrender
n. ☐ Leasehold grant
o. ☒ Conveyance of an easement
p. ☐ Conveyance for which exemption from transfer tax claimed *(complete Schedule B, Part III)*
q. ☐ Conveyance of property partly within and partly outside the state
r. ☐ Conveyance pursuant to divorce or separation
s. ☐ Other *(describe)* _____

For recording officer's use	Amount received	Date received	Transaction number
	Schedule B., Part I $ _____ Schedule B., Part II $		

Schedule B — Real estate transfer tax return (Tax Law, Article 31)

Part I – Computation of tax due

1	Enter amount of consideration for the conveyance *(if you are claiming a total exemption from tax, check the exemption claimed box, enter consideration and proceed to Part III)* ☐ **Exemption claimed**	1.	0 00
2	Continuing lien deduction *(see instructions if property is taken subject to mortgage or lien)*	2.	
3	Taxable consideration *(subtract line 2 from line 1)*	3.	
4	Tax: $2 for each $500, or fractional part thereof, of consideration on line 3	4.	
5	Amount of credit claimed for tax previously paid *(see instructions and attach Form TP-584.1, Schedule G)*	5.	
6	Total tax due* *(subtract line 5 from line 4)*	6.	0 00

Part II – Computation of additional tax due on the conveyance of residential real property for $1 million or more

1	Enter amount of consideration for conveyance *(from Part I, line 1)*	1.	0 00
2	Taxable consideration *(multiply line 1 by the percentage of the premises which is residential real property, as shown in Schedule A)*	2.	
3	Total additional transfer tax due* *(multiply line 2 by 1% (.01))*	3.	0 00

Part III – Explanation of exemption claimed on Part I, line 1 *(check any boxes that apply)*

The conveyance of real property is exempt from the real estate transfer tax for the following reason:

a. Conveyance is to the United Nations, the United States of America, the state of New York, or any of their instrumentalities, agencies, or political subdivisions (or any public corporation, including a public corporation created pursuant to agreement or compact with another state or Canada) ..... a ☐

b. Conveyance is to secure a debt or other obligation ..... b ☐

c. Conveyance is without additional consideration to confirm, correct, modify, or supplement a prior conveyance ..... c ☐

d. Conveyance of real property is without consideration and not in connection with a sale, including conveyances conveying realty as bona fide gifts ..... d ☐

e. Conveyance is given in connection with a tax sale ..... e ☐

f. Conveyance is a mere change of identity or form of ownership or organization where there is no change in beneficial ownership. (This exemption cannot be claimed for a conveyance to a cooperative housing corporation of real property comprising the cooperative dwelling or dwellings.) Attach Form TP-584.1, Schedule F ..... f ☐

g. Conveyance consists of deed of partition ..... g ☐

h. Conveyance is given pursuant to the federal Bankruptcy Act ..... h ☐

i. Conveyance consists of the execution of a contract to sell real property, without the use or occupancy of such property, or the granting of an option to purchase real property, without the use or occupancy of such property ..... i ☐

j. Conveyance of an option or contract to purchase real property with the use or occupancy of such property where the consideration is less than $200,000 and such property was used solely by the grantor as the grantor's personal residence and consists of a one-, two-, or three-family house, an individual residential condominium unit, or the sale of stock in a cooperative housing corporation in connection with the grant or transfer of a proprietary leasehold covering an individual residential cooperative apartment ..... j ☐

k. Conveyance is not a conveyance within the meaning of Tax Law, Article 31, section 1401(e) *(attach documents supporting such claim)* ..... k ☐

*The total tax (from Part I, line 6 and Part II, line 3 above) is due within 15 days from the date conveyance. Please make check(s) payable to the county clerk where the recording is to take place. If the recording is to take place in the New York City boroughs of Manhattan, Bronx, Brooklyn, or Queens, make check(s) payable to the ***NYC Department of Finance***. If a recording is not required, send this return and your check(s) made payable to the ***NYS Department of Taxation and Finance***, directly to the NYS Tax Department, RETT Return Processing, PO Box 5045, Albany NY 12205-0045.

Schedule C – Credit Line Mortgage Certificate (Tax Law, Article 11)

Complete the following only if the interest being transferred is a fee simple interest.
I (we) certify that: *(check the appropriate box)*

1. ☐ The real property being sold or transferred is not subject to an outstanding credit line mortgage.

2. ☐ The real property being sold or transferred is subject to an outstanding credit line mortgage. However, an exemption from the tax is claimed for the following reason:
   - ☐ The transfer of real property is a transfer of a fee simple interest to a person or persons who held a fee simple interest in the real property (whether as a joint tenant, a tenant in common or otherwise) immediately before the transfer.
   - ☐ The transfer of real property is (A) to a person or persons related by blood, marriage or adoption to the original obligor or to one or more of the original obligors or (B) to a person or entity where 50% or more of the beneficial interest in such real property after the transfer is held by the transferor or such related person or persons (as in the case of a transfer to a trustee for the benefit of a minor or the transfer to a trust for the benefit of the transferor).
   - ☐ The transfer of real property is a transfer to a trustee in bankruptcy, a receiver, assignee, or other officer of a court.
   - ☐ The maximum principal amount secured by the credit line mortgage is $3,000,000 or more, and the real property being sold or transferred is **not** principally improved nor will it be improved by a one- to six-family owner-occupied residence or dwelling.

     Please note: for purposes of determining whether the maximum principal amount secured is $3,000,000 or more as described above, the amounts secured by two or more credit line mortgages may be aggregated under certain circumstances. See TSB-M-96(6)-R for more information regarding these aggregation requirements.
   - ☐ Other *(attach detailed explanation)*.

3. ☐ The real property being transferred is presently subject to an outstanding credit line mortgage. However, no tax is due for the following reason:
   - ☐ A certificate of discharge of the credit line mortgage is being offered at the time of recording the deed.
   - ☐ A check has been drawn payable for transmission to the credit line mortgagee or his agent for the balance due, and a satisfaction of such mortgage will be recorded as soon as it is available.

4. ☐ The real property being transferred is subject to an outstanding credit line mortgage recorded in _____ (insert liber and page or reel or other identification of the mortgage). The maximum principal amount of debt or obligation secured by the mortgage is _____. No exemption from tax is claimed and the tax of _____ is being paid herewith. *(Make check payable to county clerk where deed will be recorded or, if the recording is to take place in New York City but not in Richmond County, make check payable to the **NYC Department of Finance.**)*

Signature (both the grantor(s) and grantee(s) must sign)

The undersigned certify that the above information contained in schedules A, B, and C, including any return, certification, schedule, or attachment, is to the best of his/her knowledge, true and complete, and authorize the person(s) submitting such form on their behalf to receive a copy for purposes of recording the deed or other instrument effecting the conveyance.

Grantor signature	Title	Grantee signature	Title
BUCCINO REALTY, LLC Douglas S. Patrick	Member-Manager		DEC Attorney

Reminder: Did you complete all of the required information in Schedules A, B, and C? Are you required to complete Schedule D? If you checked *e*, *f*, or *g* in Schedule A, did you complete Form TP-584.1? Have you attached your check(s) made payable to the county clerk where recording will take place or, if the recording is in the New York City boroughs of Manhattan, Bronx, Brooklyn, or Queens, to the ***NYC Department of Finance***? If no recording is required, send your check(s), made payable to the ***Department of Taxation and Finance,*** directly to the NYS Tax Department, RETT Return Processing, PO Box 5045, Albany NY 12205-0045.

Schedule D - Certification of exemption from the payment of estimated personal income tax (Tax Law, Article 22, section 663)

Complete the following only if a fee simple interest or a cooperative unit is being transferred by an individual or estate or trust.

If the property is being conveyed by a referee pursuant to a foreclosure proceeding, proceed to Part II, and check the second box under *Exemptions for nonresident transferor(s)/seller(s)* and sign at bottom.

Part I - New York State residents

If you are a New York State resident transferor(s)/seller(s) listed in Schedule A of Form TP-584 (or an attachment to Form TP-584), you must sign the certification below. If one or more transferors/sellers of the real property or cooperative unit is a resident of New York State, **each** resident transferor/seller must sign in the space provided. If more space is needed, please photocopy this Schedule D and submit as many schedules as necessary to accommodate all resident transferors/sellers.

Certification of resident transferor(s)/seller(s)

This is to certify that at the time of the sale or transfer of the real property or cooperative unit, the transferor(s)/seller(s) as signed below was a resident of New York State, and therefore is not required to pay estimated personal income tax under Tax Law, section 663(a) upon the sale or transfer of this real property or cooperative unit.

Signature	Print full name	Date
Signature	Print full name	Date
Signature	Print full name	Date
Signature	Print full name	Date

Note: A resident of New York State may still be required to pay estimated tax under Tax Law, section 685(c), but not as a condition of recording a deed.

Part II - Nonresidents of New York State

If you are a nonresident of New York State listed as a transferor/seller in Schedule A of Form TP-584 (or an attachment to Form TP-584) but are not required to pay estimated personal income tax because one of the exemptions below applies under Tax Law, section 663(c), check the box of the appropriate exemption below. If any one of the exemptions below applies to the transferor(s)/seller(s), that transferor(s)/seller(s) is not required to pay estimated personal income tax to New York State under Tax Law, section 663. **Each** nonresident transferor/seller who qualifies under one of the exemptions below must sign in the space provided. If more space is needed, please photocopy this Schedule D and submit as many schedules as necessary to accommodate all nonresident transferors/sellers.

If none of these exemption statements apply, you must complete Form IT-2663, *Nonresident Real Property Estimated Income Tax Payment Form*, or Form IT-2664, *Nonresident Cooperative Unit Estimated Income Tax Payment Form*. For more information, see *Payment of estimated personal income tax*, on page 1 of Form TP-584-I.

Exemption for nonresident transferor(s)/seller(s)

This is to certify that at the time of the sale or transfer of the real property or cooperative unit, the transferor(s)/seller(s) (grantor) of this real property or cooperative unit was a nonresident of New York State, but is not required to pay estimated personal income tax under Tax Law, section 663 due to one of the following exemptions:

☐ The real property or cooperative unit being sold or transferred qualifies in total as the transferor's/seller's principal residence (within the meaning of Internal Revenue Code, section 121) from _____ (Date) to _____ (Date) *(see instructions)*.

☐ The transferor/seller is a mortgagor conveying the mortgaged property to a mortgagee in foreclosure, or in lieu of foreclosure with no additional consideration.

☐ The transferor or transferee is an agency or authority of the United States of America, an agency or authority of the state of New York, the Federal National Mortgage Association, the Federal Home Loan Mortgage Corporation, the Government National Mortgage Association, or a private mortgage insurance company.

Signature	Print full name	Date
Signature	Print full name	Date
Signature	Print full name	Date
Signature	Print full name	Date

Department of Taxation and Finance

Change in Mailing Address for Certain Real Estate Transfer Tax Forms if Using a Private Delivery Service

TP-39
(9/15)

There has been a change to the address that must be used when submitting certain forms through a private delivery service rather than by U.S. Mail.

Send **Form TP-584**, *Combined Real Estate Transfer Tax Return, Credit Line Mortgage Certificate, and Certification of Exemption from the Payment of Estimated Personal Income Tax*, to:

NYS TAX DEPARTMENT
DEPOSIT RESOLUTION UNIT
90 COHOES AVE
GREEN ISLAND NY 12183-1515

Send **Form TP-588**, *Cooperative Housing Corporation Information Return*, to:

NYS TAX DEPARTMENT
TDAB – TRANSFER TAX
90 COHOES AVE
GREEN ISLAND NY 12183-1515

See Publication 55, *Designated Private Delivery Services*, for information about establishing the date you filed, and for the address to use for other forms.

FINANCE NEW • YORK
THE CITY OF NEW YORK DEPARTMENT OF FINANCE

NYC RPT

NEW YORK CITY DEPARTMENT OF FINANCE

REAL PROPERTY TRANSFER TAX RETURN

(Pursuant to Title 11, Chapter 21, NYC Administrative Code)

TYPE OR PRINT LEGIBLY

If the transfer involves more than one grantor or grantee or a partnership, the names, addresses and Social Security Numbers or Employer Identification Numbers of all grantors or grantees and general partners must be provided on Schedule 3, page 3.

R

GRANTOR

● Name

NEW 470 LLC

● Grantor is a(n) (check one) ☐ individual ☐ partnership (must complete Schedule 3) ☐ corporation ☑ other LLC

Telephone Number

● Permanent mailing address after transfer (number and street)

c/o Heatherwood Organization, 58 Vanderbilt Parkway, Suite 100

● City and State

Commack, New York

Zip Code

11725

● EMPLOYER IDENTIFICATION NUMBER

8 1 - 0 9 3 1 6 4 5

OR

● SOCIAL SECURITY NUMBER

- -

DO NOT WRITE IN THIS SPACE
FOR OFFICE USE ONLY

● RETURN NUMBER ▲

● DEED SERIAL NUMBER ▲

● NYS REAL ESTATE TRANSFER TAX PAID ▲

GRANTEE

● Name

PEOPLE OF THE STATE OF NEW YORK

● Grantee is a(n) (check one) ☐ individual ☐ partnership (must complete Schedule 3) ☐ corporation ☑ other

Telephone Number

● Permanent mailing address after transfer (number and street)

625 Broadway

● City and State

Albany, New York

Zip Code

12233

● EMPLOYER IDENTIFICATION NUMBER

1 4 - 6 0 1 3 2 0 0

OR

● SOCIAL SECURITY NUMBER

- -

PROPERTY LOCATION

LIST EACH LOT SEPARATELY. ATTACH A RIDER IF ADDITIONAL SPACE IS REQUIRED

● Address (number and street)	Apt. No.	Borough	Block	Lot	# of Floors	Square Feet	● Assessed Value of Property
470 Manhattan Avenue		Kings	2714	33		22,317.4	

● DATE OF TRANSFER TO GRANTEE: _____

● PERCENTAGE OF INTEREST TRANSFERRED: 100 %

CONDITION OF TRANSFER ▼ See Instructions

● Check (✓) all of the conditions that apply and fill out the appropriate schedules on pages 5-11 of this return. Additionally, Schedules 1 and 2 must be completed for all transfers.

a. ☐ .....Arms length transfer
b. ☐ .....Transfer in exercise of option to purchase
c. ☐ .....Transfer from cooperative sponsor to cooperative corporation
d. ☐ .....Transfer by referee or receiver (complete Schedule A, page 5)
e. ☐ .....Transfer pursuant to marital settlement agreement or divorce decree
f. ☐ .....Deed in lieu of foreclosure (complete Schedule C, page 6)
g. ☐ .....Transfer pursuant to liquidation of an entity (complete Schedule D, page 6)
h. ☐ .....Transfer from principal to agent, dummy, strawman or conduit or vice-versa (complete Schedule E, page 7)
i. ☐ .....Transfer pursuant to trust agreement or will (attach a copy of trust agreement or will)
j. ☐ .....Gift transfer not subject to indebtedness
k. ☐ .....Gift transfer subject to indebtedness
l. ☐ .....Transfer to a business entity in exchange for an interest in the business entity (complete Schedule F, page 7)
m. ☐ .....Transfer to a governmental body
n. ☐ .....Correction deed
o. ☐ .....Transfer by or to a tax exempt organization (complete Schedule G, page 8)
p. ☐ .....Transfer of property partly within and partly without NYC
q. ☐ .....Transfer of successful bid pursuant to foreclosure
r. ☐ .....Transfer by borrower solely as security for a debt or a transfer by lender solely to return such security
s. ☐ .....Transfer wholly or partly exempt as a mere change of identity or form of ownership. Complete Schedule M, page 9)
t. ☐ .....Transfer to a REIT or to a corporation or partnership controlled by a REIT. (Complete Schedule R, pages 10 and 11)
u. ☐ .....Other transfer in connection with financing (describe): _____
v. ☑ .....Other (describe): Environmental Easement

TYPE OF PROPERTY (✓)

a. ☐ 1-3 family house
b. ☐ Individual residential condominium unit
c. ☐ Individual cooperative apartment
d. ☐ Commercial condominium unit
e. ☐ Commercial cooperative
f. ☐ Apartment building
g. ☐ Office building
h. ☐ Industrial building
i. ☐ Utility
j. ☑ OTHER. (describe): Commercial Real Estate

TYPE OF INTEREST (✓)

Check box at LEFT if you intend to record a document related to this transfer. Check box at RIGHT if you do not intend to record a document related to this transfer.

REC.		NON REC.
a. ☐	Fee	☐
b. ☐	Leasehold Grant	☐
c. ☐	Leasehold Assignment or Surrender	☐
d. ☐	Easement	☑
e. ☐	Development Rights	☐
f. ☐	Stock	☐
g. ☐	Partnership Interest	☐
h. ☐	OTHER. (describe):	☐

SCHEDULE 1 - DETAILS OF CONSIDERATION

COMPLETE THIS SCHEDULE FOR ALL TRANSFERS AFTER COMPLETING THE APPROPRIATE SCHEDULES ON PAGES 5 THROUGH 11. ENTER "ZERO" ON LINE 11 IF THE TRANSFER REPORTED WAS WITHOUT CONSIDERATION.

1. Cash	1.	0 00
2. Purchase money mortgage	2.	0 00
3. Unpaid principal of pre-existing mortgage(s)	3.	0 00
4. Accrued interest on pre-existing mortgage(s)	4.	0 00
5. Accrued real estate taxes	5.	0 00
6. Amounts of other liens on property	6.	0 00
7. Value of shares of stock or of partnership interest received	7.	0 00
8. Value of real or personal property received in exchange	8.	0 00
9. Amount of Real Property Transfer Tax and/or other taxes or expenses of the grantor which are paid by the grantee	9.	0 00
10. Other (describe):	10.	0 00
11. **TOTAL CONSIDERATION** (add lines 1 through 10 - must equal amount entered on line 1 of Schedule 2) (see instructions)	11.	0 00

See instructions for special rules relating to transfers of cooperative units, liquidations, marital settlements and transfers of property to a business entity in return for an interest in the entity.

SCHEDULE 2 - COMPUTATION OF TAX

A. **Payment** Pay amount shown on line 14 - *See Instructions*

		Payment Enclosed
1 Total Consideration (from line 11, above)	1.	0 00
2. Excludable liens (see instructions)	2.	0 00
3. Consideration (Line 1 less line 2)	3.	0 00
4. Tax Rate (see instructions)	4.	0 %
5. Percentage change in beneficial ownership *(see instructions)*	5.	100 %
6. Taxable consideration (multiply line 3 by line 5)	6.	0 00
7. Tax (multiply line 6 by line 4)	7.	0 00
8. Credit (see instructions)	8.	0 00
9. Tax due (line 7 less line 8) (if the result is negative, enter zero)	9.	0 00
10. Interest (see instructions)	10.	0 00
11. Penalty (see instructions)	11.	0 00
12. Total tax due (add lines 9, 10 and 11)	12.	0 00
13. Filing Fee	13.	50 00
14. **Total Remittance Due** (line 12 plus line 13)	14.	50 00

SCHEDULE 3 - TRANSFERS INVOLVING MULTIPLE GRANTORS AND/OR GRANTEES OR A PARTNERSHIP ▼

NOTE If additional space is needed, attach copies of this schedule or an addendum listing all of the information required below.

GRANTOR(S)/PARTNER(S)

NAME

PERMANENT MAILING ADDRESS AFTER TRANSFER

CITY AND STATE | ZIP CODE

SOCIAL SECURITY NUMBER ___ - ___ - ___

OR

EMPLOYER IDENTIFICATION NUMBER ___ - ___

NAME

PERMANENT MAILING ADDRESS AFTER TRANSFER

CITY AND STATE | ZIP CODE

SOCIAL SECURITY NUMBER ___ - ___ - ___

OR

EMPLOYER IDENTIFICATION NUMBER ___ - ___

NAME

PERMANENT MAILING ADDRESS AFTER TRANSFER

CITY AND STATE | ZIP CODE

SOCIAL SECURITY NUMBER ___ - ___ - ___

OR

EMPLOYER IDENTIFICATION NUMBER ___ - ___

NAME

PERMANENT MAILING ADDRESS AFTER TRANSFER

CITY AND STATE | ZIP CODE

SOCIAL SECURITY NUMBER ___ - ___ - ___

OR

EMPLOYER IDENTIFICATION NUMBER ___ - ___

GRANTEE(S)/PARTNER(S)

NAME

PERMANENT MAILING ADDRESS AFTER TRANSFER

CITY AND STATE | ZIP CODE

SOCIAL SECURITY NUMBER ___ - ___ - ___

OR

EMPLOYER IDENTIFICATION NUMBER ___ - ___

NAME

PERMANENT MAILING ADDRESS AFTER TRANSFER

CITY AND STATE | ZIP CODE

SOCIAL SECURITY NUMBER ___ - ___ - ___

OR

EMPLOYER IDENTIFICATION NUMBER ___ - ___

NAME

PERMANENT MAILING ADDRESS AFTER TRANSFER

CITY AND STATE | ZIP CODE

SOCIAL SECURITY NUMBER ___ - ___ - ___

OR

EMPLOYER IDENTIFICATION NUMBER ___ - ___

NAME

PERMANENT MAILING ADDRESS AFTER TRANSFER

CITY AND STATE | ZIP CODE

SOCIAL SECURITY NUMBER ___ - ___ - ___

OR

EMPLOYER IDENTIFICATION NUMBER ___ - ___

GRANTOR'S ATTORNEY

Name of Attorney			Telephone Number
Barry Cohen, Esq.			(516) 296-7000
Address (number and street) Certilman Balin Adler & Hyman, LLP 90 Merrick Avenue, 9th Floor		City and State East Meadow, New York	Zip Code 11554
EMPLOYER IDENTIFICATION NUMBER	OR	SOCIAL SECURITY NUMBER	

GRANTEE'S ATTORNEY

Name of Attorney			Telephone Number
Office of the General Counsel			518 408-0409
Address (number and street) 625 Broadway, 14th Floor		City and State Albany, New York	Zip Code 12233-1500
EMPLOYER IDENTIFICATION NUMBER	OR	SOCIAL SECURITY NUMBER	

CERTIFICATION

I swear or affirm that this return, including any accompanying schedules, affidavits and attachments, has been examined by me and is, to the best of my knowledge, a true and complete return made in good faith, pursuant to Title 11, Chapter 21 of the Administrative Code and the regulations issued thereunder.

GRANTOR

Sworn to and subscribed to

before me on this _____ day

of _____

81-0931645
EMPLOYER IDENTIFICATION NUMBER OR SOCIAL SECURITY NUMBER

New 470 LLC
Name of Grantor

Signature of Notary

Signature of Grantor
Douglas S. Patrick, Member-Manager

Notary's stamp or seal

GRANTEE

Sworn to and subscribed to

before me on this 8th day

of July 2019

14-6013200
EMPLOYER IDENTIFICATION NUMBER OR SOCIAL SECURITY NUMBER

People of the State of New York
Name of Grantee

Signature of Notary

Signature of Grantee
Bradford D. Burns,
Associate Attorney

Notary's stamp or seal

COLLEEN A. McCARTHY
Notary Public, State of New York
Qualified in Albany County
No. 02MC5046480
Commission Expires July 17, 2021

GRANTEE: To ensure that your property and water/sewer tax bills are sent to the proper address you must complete the Registration forms included in this packet. Owner's Registration Cards can also be obtained by calling the Department of Finance at (718) 935-8500

APPENDIX B
EXCAVATION WORK PLAN (EWP)

New 470 Project

12 ECKFORD STREET
BROOKLYN, KINGS COUNTY, NEW YORK

EXCAVATION WORK PLAN

NYSDEC Site Number: C224242

Prepared for:

New York State Department of Environmental Conservation
Division of Environmental Remediation, Remedial Bureau B
625 Broadway
Albany, New York 12233

Prepared on Behalf of:

New 470 LLC
58 Vanderbilt Motor Parkway, Suite 100
Commack, New York 11725

Prepared by:

AKRF, Inc.
440 Park Avenue South, 7th Floor
New York, New York 10016

AUGUST 2019

TABLE OF CONTENTS

TABLES

LIST OF ACRONYMS

Acronym	Definition
CAMP	Community Air Monitoring Plan
CFR	Code of Federal Regulations
COC	Contaminants of Concern; Constituents of Concern; Chain of Custody; Certificate of Occupancy; Certificate of Completion
DER	Discrete Emission Reduction; Division of Environmental Remediation
EE	Environmental Easement
EPA	United States Environmental Protection Agency
EWP	Excavation Work Plan
HASP	Health and Safety Plan
NYCRR	New York Codes, Rules and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
PCBs	Polychlorinated biphenyls
PID	Photoionization detector
PRR	Periodic Review Report
QEP	Qualified Environmental Professional
RE	Remedial Engineer
SCOs	Soil Cleanup Objectives
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SVOCs	Semivolatile Organic Compounds
TAL	Target Analyte List
TCL	Target Compound List
VOCs	Volatile Organic Compounds

1.0 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination, the Site owner or their representative will notify the New York State Department of Environmental Conservation (NYSDEC). Table 1 includes contact information for any notifications.

Table 1: Notifications

Company	Individual Name	Title	Contact Number
NYSDEC	Steve Walsh	Project Manager	(518) 402-9824
	Gerard Burke	NYSDEC Site Control	(518) 402-9824
	Jane O'Connell	Chief, Superfund and Brownfield Cleanup Section	(718) 482-4599
AKRF	Michelle Lapin, P.E.	Remedial Engineer	(646) 388-9520
	Marc S. Godick, LEP	Project Director	(914) 922-2356
	Amy Jordan	Project Manager	(646) 388-9864
New 470 LLC	Ronald Walker	Volunteer Representative	(631) 234-1600

The information provided in the table above will be updated as necessary to provide accurate contact information. The notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for Site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated and any work that may impact an engineering control;
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the proposed start and completion of all intrusive work;
- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and 29 Code of Federal Regulation (CFR) 1910.120;
- A copy of the contractor's Health and Safety Plan (HASP), in electronic format, if it differs from the HASP provided in Appendix C of the SMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

1.1 Soil Screening Methods

Visual, olfactory and instrument-based [e.g. photoionization detector (PID)] soil screening will be performed by a qualified environmental professional (QEP) during any excavation into known or potentially contaminated material (remaining contamination). Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the COC.

Soil will be segregated as needed based on previous environmental data and screening results into material that requires off-site disposal and material that requires testing to determine if the material can be reused on-site as soil beneath a cover or if the material can be used as cover soil. Further

discussion of off-site disposal of materials and on-site reuse is provided in Section [X] of this Appendix.

1.2 Soil Staging Methods

Any soil excavated from the Site will be placed in separate designated stockpiles based on the results of field screening and/or laboratory analysis. Soil stockpiles will be staged at locations based on security, ease of loading onto trucks for off-site disposal, or ease of reuse as backfill.

Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters, and other discharge points. Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced. Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC.

Soil that exhibits evidence of contamination [i.e., elevated photoionization detector (PID) readings, staining, odors, etc.] will be separately staged for off-site disposal. Information on staged soil will be tracked in the Site field log book and updated at the end of each workday.

1.3 Materials Excavation and Load-Out

A qualified environmental professional (QEP) or person under supervision of a QEP will oversee all invasive work and the excavation and load-out of all excavated material. The owner of the Site and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this EWP. The presence of utilities and easements on the Site will be investigated. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the Site.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate federal, state, local, and NYSDOT requirements (and all other applicable transportation requirements). A truck wash will be operated on-site, as appropriate. The QEP will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the Site until the activities performed under this section are complete. Truck wash waters will be collected and disposed of off-site in an appropriate manner. Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-Site soil tracking. The QEP will be responsible for ensuring that all egress points for truck and equipment transport from the Site are clean of dirt and other materials derived from the Site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

1.4 Materials Transport Off-Site

All transport of materials will be performed by licensed haulers in accordance with appropriate local, state, and federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

Truck transport routes are as follows:

Westbound Traffic

1. Head north on Manhattan Avenue toward Eckford Street
2. Turn slightly right onto Eckford Street.
3. Turn right onto Engert Avenue.
4. Turn right onto Humbolt Street.
5. Turn left onto McGuiness Boulevard South.
6. Turn slightly right to merge onto I-278 Westbound.

Eastbound Traffic

1. Head north on Manhattan Avenue toward Eckford Street
2. Turn slightly right onto Eckford Street.
3. Turn right onto Engert Avenue.
4. Turn right onto Graham Avenue.
5. Turn left onto Meeker Avenue, which becomes Cherry Street.
6. Take the ramp on the left to merge onto I-278 Eastbound.

All trucks loaded with Site materials will exit the vicinity of the Site using only these approved truck routes. These are the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport; and (g) community input.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project Site. Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during Site remediation and development. Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited.

1.5 Materials Disposal Off-Site

All material excavated and removed from the Site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, state (including 6NYCRR Part 360), and federal regulations. If disposal of material from this Site is proposed for unregulated off-Site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-site management of materials from the Site will not occur without formal NYSDEC approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, construction and demolition (C&D) recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report (PRR). This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Unrestricted SCOs

is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

1.6 Materials Reuse On-Site

Contaminated soil, or any material in direct contact with the contaminated soil, may not be separated for reuse on-site and will be disposed of as described in Section 1.6. Soil that does not exhibit evidence of contamination during field screening and is free of debris will be stockpiled and tested at a frequency of one sample per 500 cubic yards and characterized for reuse below the Site cap. Chemical criteria for on-site reuse of material will meet the lower of the NYSDEC Part 375 protection of groundwater or the protection of public health for restricted residential use soil cleanup objectives (SCOs) and can only be used as backfill beneath the composite cover system for the approved use of the Site consistent with the Environmental Easement (EE).

The QEP will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-site. Contaminated on-site material, including historic fill and contaminated soil, that is acceptable for reuse on-site will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-Site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the Site will not be reused on-site.

1.7 Fluids Management

Any liquids to be removed from the Site, including but not limited to, excavation dewatering, decontamination waters and groundwater monitoring well purge, and development waters, will be handled, transported and disposed in accordance with applicable local, state, and federal regulations. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the Site, and will be managed off-site, unless prior approval is obtained from NYSDEC.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a State Pollutant Discharge Elimination System (SPDES) permit.

1.8 Composite Cover System Restoration

After the completion of soil removal and any other invasive activities the composite Site cover system will be restored in a manner that complies with the SMP. The demarcation layer will be replaced to provide a visual reference to the top of the residual management zone, the zone that requires adherence to special conditions for disturbance of remaining contaminated soils defined in this SMP. If the type of cover system changes from that which exists prior to the excavation (i.e., a soil cover is replaced by asphalt), this will constitute a modification of the cover element of the remedy and the upper surface of the remaining contamination. A figure showing the modified surface will be included in the subsequent PRR and in an updated SMP.

1.9 Backfill From Off-Site Sources

All materials proposed for import onto the Site will be approved by the QEP and will be in compliance with provisions in this SMP prior to receipt at the Site. A Request to Import/Reuse Fill or Soil form, which can be found at http://www.dec.ny.gov/regulations/67386.html, will be

prepared and submitted to the NYSDEC project manager, allowing a minimum of 5 business days for review.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the Site.

All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d). Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria, the resulting soil quality standards are listed in In-Text Table B1. Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC. Solid waste will not be imported onto the Site.

Native material from a New York State Department of Transportation (NYSDOT)-designated virgin quarry source will not be sampled prior to use as backfill on the Site. Non-NYSDOT designated virgin quarry sources, or non-virgin imported material that does not have an approved NYSDEC Beneficial Use Determination will be tested at the originating facility in accordance with Section 5.4(e) 10 of NYSDEC DER 10, and at a frequency identified in Table 2:

Table 2
Soil/Fill Sampling Requirements for Import/Export

	VOCs (EPA Method 8260)	SVOCs (EPA Method 8270), PCBs (EPA Method 8082), Pesticides (EPA Method 8081), and TAL Metals (EPA Method 600/7000series)	
Soil Quantity (cubic yards)	Discrete Samples	Composite Samples	Sample Protocol
0-50	1	1	1 discrete sample from one locations exhibiting the highest PID reading or from the middle of the stockpile will comprise a discrete sample for analysis; and 1 composited sample from 5 different locations will comprise a composite sample for analysis
50-100	2	1	
100-200	3	1	
200-300	4	1	
300-400	4	2	
400-500	5	2	
500-800	6	2	
800-1000	7	2	
>1000	Add an additional 2 discrete and 1 composite for each additional 1,000 cubic yards or consult with NYSDEC		

Trucks entering the Site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

1.10 Stormwater Pollution Prevention

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by the NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. All undercutting or erosion of the silt fence toe anchor shall be repaired immediately

with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Silt fencing or hay bales will be installed around the entire perimeter of the construction area, as necessary.

1.11 Excavation Contingency Plan

If underground tanks or other previously unidentified contaminant sources are found during any future post-remedial subsurface excavation or development, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment and surrounding soils, etc., as necessary, to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes [Target Analyte List (TAL) metals; Target Compound List (TCL) volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs), TCL pesticides, and polychlorinated biphenyls (PCBs)], unless the Site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive Site work will be promptly communicated by phone to NYSDEC's project manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline, as necessary. All findings will be included in the PRR.

1.12 Community Air Monitoring Plan (CAMP)

Work zone monitoring will be performed for the health and safety of workers during interior intrusive work activities in accordance with action levels and guidance outlined in the Site-specific CAMP, which is included in Appendix C of the SMP.

1.13 Odor Control Plan

This odor control plan is capable of controlling emissions of nuisance odors off-site and on-site. Specific odor control methods to be used on a routine basis will include monitoring by the on-site QEP. If nuisance odors are identified at the Site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the remedial party's Remediation Engineer (RE), and any measures that are implemented will be discussed in the PRR.

All necessary means will be employed to prevent on- and off-site nuisances. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to

sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

1.14 Other Nuisances

A plan for rodent control will be developed and utilized by the contractor prior to and during Site clearing and Site grubbing, and during all remedial work.

A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

APPENDIX C

SSDS AND SVES AS-BUILT, DRAWINGS, AND MANUFACTURER'S SPECIFICATIONS

APPENDIX D

HEALTH AND SAFETY PLAN (HASP) & COMMUNITY AIR MONITORING PROGRAM (CAMP)

NEW 470 PROJECT

12 ECKFORD STREET

BROOKLYN, KINGS COUNTY, NEW YORK

Health and Safety Plan

AKRF Project Number: 12306
NYSDEC BCP Site Number: C224242

Prepared for:

New York State Department of Environmental Conservation
Remedial Bureau B
625 Broadway
Albany, New York 12233

Prepared On Behalf of:

New 470 LLC
58 Vanderbilt Motor Parkway, Suite 100
Commack, New York 11725

Prepared by:

AKRF, Inc.
440 Park Avenue South, 7th Floor
New York, New York 10016
(212) 696-0670

AUGUST 2019

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1.0 INTRODUCTION

1.1 Purpose

This Health and Safety Plan (HASP) was prepared by AKRF, Inc. (AKRF) on behalf of New 470 LLC (the Volunteer) for the Site located at 12 Eckford Street in the Brooklyn, New York, identified on the New York City Tax Map as Brooklyn Borough Block 2714, Lot 33. The approximately 0.5123-acre Site enrolled in the New York State (NYS) Brownfield Cleanup Program (BCP) (Site No. C224242), which is administered by New York State Department of Environmental Conservation (NYSDEC). The Site location is shown on Figure 1.

The Site was investigated and remediated as a Track 4 cleanup in accordance with Brownfield Cleanup Agreement (BCA) Index No. C224242-10-16, which was executed on December 1, 2016. A BCA Amendment Application was submitted to NYSDEC in July 2019 to document the changes to the BCA, including: (1) the alteration of the northern Site boundary, which resulted in an acreage increase from 0.497 acre to 0.5123 acre; and (2) the merger of former Lot 3 and the portion of former Lot 1 comprising the Site into Lot 33. As of the date of this report, the BCA Amendment Application has not yet been approved by NYSDEC.

The Site was remediated to restricted residential soil cleanup objectives (RRSCOs) (Track 4 cleanup) in general accordance with the November 2016 NYSDEC-approved Remedial Action Work Plan (RAWP) and Decision Document (DD). A Site Management Plan (SMP) was prepared to manage remaining contamination at the Site, as required by the Environmental Easement (EE). The EE is an Institutional Control (IC) restricting the type of use at the Site after completion of the remedial program under the RAWP. Details on the Site environmental history and remedial activities performed under the RAWP are provided in the SMP.

ECs have been incorporated into the Site remedy to control exposure to remaining contamination during the use of the Site to ensure protection of public health and the environment. The following ECs were installed at the Site: (1) a composite cover system; (2) a vapor barrier; (3) an active sub-slab depressurization system (SSDS); and (4) a soil vapor extraction (SVE) system (SVES). An EE granted to the NYSDEC and recorded with the Kings County Clerk requires compliance with the SMP, and all ECs and ICs placed on the Site.

The ICs place restrictions on Site use and mandate operation, maintenance, monitoring, and reporting measures for all ECs and ICs. The SMP specifies the methods necessary to ensure compliance with all ECs and ICs required by the EE for contamination that may remain at the Site. The SMP has been approved by the NYSDEC, and compliance with the plan is required by the grantor of the EE and the grantor's successors and assigns. The SMP may be revised only with the approval of the NYSDEC.

This HASP is an appendix to the SMP, which details the procedures required to manage known or potential residual contamination following completion of the remedial action (RA) at the Site. The purpose of this HASP is to assign responsibilities, establish personnel protection standards and mandatory safety practices and procedures, and provide contingency plans for situations that may arise during Site management inspections, O&M, periodic sampling activities, and any soil/fill disturbance activities conducted at the Site. This HASP takes into account the specific hazards inherent to the Site, and presents procedures to be followed by AKRF and contractors to avoid, and if necessary, protect against health and/or safety hazards. Application of this HASP should be considered on a task-by-task basis, as not all measures are applicable or necessary for all activities on-site. On-site work activities should comply with applicable parts of Occupational Safety and Health Administration (OSHA) Regulations, primarily 29 Code of Federal

Regulations (CFR) Parts 1910 and 1926. A copy this HASP will be maintained on-site during work performed under the SMP.

All workers who participate in activities at the Site that are under the direction of AKRF or the Site owner are required to comply with the provisions specified in this HASP. All Site visitors who enter designated work zones must also comply with this HASP. Refusal or failure to comply with this HASP or violation of any safety procedures by field personnel and/or subcontractors performing work covered by this HASP may result in immediate removal from the Site following consultation with the Site owner's representative. No personnel are permitted to enter permit confined spaces under this HASP.

1.2 Scope

This HASP has been developed to address the health and safety concerns during Site operations and maintenance, monitoring, and inspections after completion of the Site remedy, under the direction of AKRF and any of AKRF's sub-contractor(s), as specified in the SMP. Although this HASP addresses all activities listed herein, work at the individual locations may include all or only some of these tasks. On-site work anticipated under the SMP includes the following tasks:

- Assessing achievement of the remedial performance criteria (e.g., inspections of SSDS, SVES, and the composite cover system);
- Sampling and analysis of appropriate media (e.g., soil vapor or indoor air); and
- Operation and maintenance of the engineering controls (SSDS, SVES, and composite cover system), which may include disturbance and handling of Site soil/fill.

1.3 Application

This HASP applies to all personnel involved in the above tasks under the direction of the Site owner or AKRF who wish to gain access to active intrusive work areas. These tasks include, but are not limited to, the following:

- Owner's representatives, contractors, and subcontractors performing tasks under the direction of AKRF, the owner, and/or the owner's representative;
- Federal, state, or local representatives;
- AKRF or the contractor's employees or subcontractors; and
- AKRF and its subcontractors.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

This section specifies the project team's project organization.

2.1 Project Director

The project director is Mr. Marc Godick, LEP of AKRF. Mr. Godick's responsibilities include the following:

- Plans, schedules, and manages implementation of remediation activities;
- Coordinates with the Site Manager (SM), Site Supervisor (SS), and Project Environmental Safety Manager (PESM) to ensure that health and safety requirements are met;
- Ensures that field work is scheduled with adequate personnel and equipment resources to complete the job safely and enforce Site health and safety rules;
- Conducts periodic inspections;
- Participates in incident investigations;
- Ensures this HASP has all of the required approvals before any Site work is conducted;
- Ensures that the SM is informed of project changes that require modifications of this HASP; and
- Has overall project responsibility for project health and safety.

2.2 Site Manager (SM)

The SM is Mr. Victor Chang of AKRF. The SM responsibilities include the following:

- Manages day-to-day implementation of the Site safety measures specified in this HASP;
- Ensures that adequate communication between field crews, health and safety monitoring personnel, and emergency response personnel is maintained;
- Confirms that field Site personnel are adequately trained and qualified to work at the Site and that proper personal protective equipment (PPE) is utilized by field teams;
- Investigates and report all accidents/incidents to the PM and PESM;
- Conducts and documents periodic safety briefings;
- Stops work if necessary based on health and safety monitoring;
- Acts as the primary point of contact for Site-related activities and coordination with non-project-related Site operations;
- Identifies operational changes that require potential modifications to health and safety procedures and Site safety plans, and reports such changes to the PM and PESM;
- Conducts health and safety monitoring activities;
- Determines upgrades or downgrades of PPE based on Site conditions and/or real-time monitoring results;
- Ensures that monitoring instruments are calibrated; and
- Reports to the project director and PESM to provide summaries of field operations and progress.

2.3 Project Environmental and Safety Manager (PESM)

The PESM is a qualified health and safety professional with experience in hazardous waste Site remediation activities. The PESM is Ms. Amy Jordan of AKRF. The PESM responsibilities include the following:

- Provides for the development and approval of the HASP;

- Serves as the primary contact to review health and safety matters that may arise;
- Approves revised or new safety protocols for field operations;
- Coordinates revisions of this HASP with field personnel;
- Coordinates upgrading or downgrading of personal protective equipment with the SM;
- Assists in the investigation of all accidents/incidents; and
- Enforces work stoppage following reporting of on-site activities from the PM and SM.

2.4 Site Supervisor (SS)

The SS will be appointed from the owner's contractor. If work is being performed solely by AKRF, the Site Supervisor tasks would be performed by the SM (Section 2.2). The SS responsibilities include the following:

- Provides for the necessary training of field crews in accordance with OSHA regulations and provides proof of training to the SM prior to entering the Site;
- Conducts routine safety inspections of their work areas;
- Conducts incident investigations and together with the SM, prepares appropriate reports;
- Enforces health and safety rules and compliance with this HASP; and
- Plans field work using appropriate safe procedures and equipment.

2.5 Site Personnel

The Site Personnel responsibilities include the following:

- Report any unsafe or potentially hazardous conditions to the SM;
- Maintain knowledge of the information, instructions and emergency response actions contained in the HASP;
- Comply with rules, regulations and procedures as set forth in this HASP and any revisions;
- Prevent admittance to work Sites by unauthorized personnel; and
- Inspect all tools and equipment, including PPE, prior to use.

3.0 SITE HISTORY AND BACKGROUND

According to historic Sanborn fire insurance maps, the Site was undeveloped between 1887 and 1905. By 1916, former Lot 1 was developed with an unspecified factory building and former Lot 33 was developed with a barrel shed, a carriage garage, and a cooperage with an office. By 1942, former Lot 1 was developed with a sash and door storage and a woodworking shop associated with the north-adjacent I. Feldman & Son Inc. Sash & Door Manufacturer. Former Lot 30 was developed with a two-story building used for window sash storage. A gasoline tank was shown on the southwestern portion of former Lot 32. Former Lot 32 was labeled as "barrels, boxes, and automobile". Former Lot 33 was developed with a cooperage and an office. By 1951, Lot 1 was developed with a metal container manufacturer and an enameling works with a baking oven and spray booths and former Lot 30 was labeled "to be: garage". Former Lot 1 was developed with a new factory building in 1963 and with a spray booth and storage on the eastern portion by 1965. By 1965, former Lot 30 was developed as a garage and as a factory by 1978. By 1983, former Lot 32 was used for freight storage and for motor freight storage between 1986 and 1991.

Between June 2018 and May 2019, the Site was remediated in accordance with the NYSDEC-approved RAWP. The remedial elements performed consisted of the following:

1. Excavation and off-site disposal of approximately 740 cubic yards of soil/fill exceeding RRSCOs across the upper 2 feet of the entire Site for the installation of the composite cover system. Additionally, source areas including 1,738.15 tons of soil/fill exceeding the United States Environmental Protection Agency (USEPA) and 6 New York Codes, Rules, and Regulations (NYCRR) Part 371 hazardous criteria for lead; and removal of one underground storage tank (UST) and its contents were disposed of off-site in accordance with applicable federal, state, and local regulations.
2. Screening for indications of contamination [by visual means, odor, and monitoring with photoionization detector (PID) equipped with an 11.7 electron Volt (eV) lamp] of all excavated soil/fill during intrusive Site work.
3. Appropriate off-site disposal of all material removed from the Site in accordance with all federal, state, and local regulations for handling, transport, and disposal. Waste disposal facilities will be selected based on the data that has been collected to date and waste classification sampling. Based on the requirements of the selected facility(ies), additional soil waste characterization samples may be collected and analyzed as needed to obtain an approval for soil disposal.
4. Collection and laboratory analysis of 24 Site-wide endpoint samples to document concentrations of contaminants of concern remaining after excavation for the new building foundation for the purposes of Site management. Five tank endpoint samples were also collected from the tank grave following its removal.
5. Installation of a vapor barrier/waterproofing membrane beneath the cellar slab and outside of the sub-grade foundation sidewalls of the cellar to grade to mitigate soil vapor migration into the building where the SSDS could not be installed due to excavation below the groundwater table. The vapor barrier systems consists of GCP Preprufe® 300R and Bituthene® 4000 beneath the cellar, other sumps/pits, along subgrade walls, and elevator pits (or engineer-approved equivalent) that meets or exceeds American Society for Testing and Materials (ASTM) E-1745 standard. Additionally, as part of green remediation techniques, a vapor barrier membrane consisting of Stego® Wrap 20 mil was installed beneath slab-on-grade portion of the building.

6. Installation of an active SSDS beneath the slab-on-grade portion of the Site to prevent vapor intrusion into the proposed building.
7. Installation of an SVES to extract and treat contaminated vapors beneath the northeastern and eastern portions of the Site prior to discharge to the atmosphere.
8. Construction and maintenance of an engineered composite cover system consisting of concrete building foundations, a minimum two-foot clean fill buffer with demarcation barrier in all landscaped and non-covered areas, and sidewalks/pathways to prevent human exposure to residual contaminated soil/fill remaining under the Site.
9. Recording of an EE, including ECs and ICs, to prevent future exposure to any residual contamination remaining at the Site.
10. Preparation of an SMP for long-term management of residual contamination as required by the EE, including plans for: (1) ICs and ECs, (2) monitoring, (3) operation and maintenance, and (4) reporting.

Full documentation of remedial activities is provided in the Final Engineering Report (FER).

4.0 POTENTIAL HAZARDS AT THE SITE

This section presents an assessment of the chemical, biological, and physical hazards that may be encountered.

4.1 Hazard Potential

The remediation has been completed; however, some residual contamination remains in the Site subsurface. Exposure to residual contamination is being prevented by the Site-wide composite cover system, which is designed to remain intact long-term. Disturbance of the concrete slabs, vapor barrier, SSDS and/or SVES without prior NYSDEC approval is prohibited by the EE. In the unlikely event of an unanticipated, accidental, or required disturbance of the composite cover system, or if any cracks or openings in the floor occur, they shall be properly sealed immediately and NYSDEC or its successor agency shall be notified.

4.2 Properties of Chemical Contamination

4.2.1 Chemical Hazards in Soil/Fill, Groundwater, and/or Soil Vapor

Potential chemical pathways that may be encountered include: dermal contact, inhalation, and/or ingestion hazards associated with contaminated soil/fill and/or soil vapor.

The potential health effects from on-site contamination are summarized in Table 1 and detailed in the US Department of Health and Human Services Agency for Toxic Substances and Disease Registry (ATSDR) fact sheets attached in Appendix A.

Table 1
Potential Health Effects from Remaining On-Site Contamination

Chemicals	REL/PEL/STEL (ppm)	Health Hazards
1,1,1-Trichloroethane	REL = 350 ppm PEL = 350 ppm	Irritation eyes, skin; headache, lassitude (weakness, exhaustion), central nervous system depression, poor equilibrium; dermatitis; cardiac arrhythmias; liver damage.
1,1-Dichloroethane	REL = 100 ppm PEL = 100 ppm	Irritation skin; central nervous system depression; liver, kidney, lung damage.
2-Butanone (MEK)	REL = 200 ppm PEL = 200 ppm	Irritation eyes, skin, nose; headache; dizziness; vomiting; dermatitis.
Arsenic	REL = 0.002 mg/m^3 PEL = 0.01 mg/m^3	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin; potential occupational carcinogen.
Copper	REL = 0.1 mg/m^3 PEL = 0.1 mg/m^3	Irritation eyes, upper respiratory system; metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough, lassitude (weakness, exhaustion); metallic or sweet taste; discoloration skin, hair.
Lead	REL = 0.05 mg/m^3 PEL = 0.05 mg/m^3	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles;

Table 1
Potential Health Effects from Remaining On-Site Contamination

Chemicals	REL/PEL/STEL (ppm)	Health Hazards
		encephalopathy; kidney disease; irritation eyes; hypertension.
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.
Nickel	REL = 0.015 mg/m^3 PEL = 1 mg/m^3	Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen].
Polycyclic Aromatic Hydrocarbons (PAHs)	PEL = 5 mg/m^3	Harmful effects to skin, bodily fluids, and ability to fight disease, reproductive problems; [potential occupational carcinogen].
PCBs	PCB-1242: REL = 1 mg/m^3 PEL = 0.001 mg/m^3 PCB-1254: REL = 0.5 mg/m^3 PEL = 0.001 mg/m^3	Rash; anemia, liver, stomach, thyroid damage; reduced ability to fight disease; impaired reproduction.
Vinyl Chloride	PEL = 1 ppm (TWA) PEL = 5 ppm (15-minute)	Lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen].
Zinc	REL = 5 mg/m^3 PEL = 5 mg/m^3	Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function.
Particulate	PEL = 15 mg/m^3 (total) PEL = 5 mg/m^3 (respirable)	Irritation eyes, skin, throat, upper respiratory system.

Notes:
REL - National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit
PEL - Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit
STEL - OSHA Short Term Exposure Limit
ppm - parts per million
mg/m^3 - milligrams per cubic meter

4.2.2 Other Chemical Hazards

Although not anticipated, chemicals not identified in this HASP may be used or encountered during Site work. Prior to the initiation of these tasks, Material Safety Data Sheets (MSDS) will be obtained for each of the chemicals to be used and all Site workers and visitors who may potentially be exposed will be made aware of the hazards.

4.3 Physical Hazards

Physical hazards will be addressed as necessary. More detailed safety procedures are provided as appendices to this HASP, where applicable.

4.3.1 Cold Stress

At certain times of the year, workers may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include frostbite, trench/immersion foot, and hypothermia as well as slippery surfaces and brittle equipment. A Cold Stress Program is provided as Appendix B.

4.3.2 Heat Stress

Heat stress is a significant potential hazard, which is greatly exacerbated with the use of PPE in hot environments. The potential hazards of working in hot environments include dehydration, cramps, heat rash, heat exhaustion, and heat stroke. A heat stress prevention program will be implemented when ambient temperatures exceed 70 ºF for personnel wearing impermeable clothing. A Heath Stress Program is provided as Appendix C.

4.3.3 Noise

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps, and generators. Operations that require the use of hearing protection include operation of heavy equipment, generators, jackhammers, chain saws, sheetpile drivers, dewatering equipment, and pressure washers. Site workers who will perform suspected high noise tasks and operations will be provided with earplugs. Workers not performing those tasks but working in close proximity to that equipment will also be required to wear hearing protection. If deemed necessary by the SM, the PESM will be consulted on the need for additional hearing protection and the need to monitor sound levels for Site activities.

4.3.4 Hand and Power Tools

To complete the various tasks for the proposed scope of work, personnel may be required to use hand and/or power tools. The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. Work gloves, safety glasses, and hard hats will be worn by the operating personnel at all times when using hand and power tools, and ground fault interrupter (GFI)-equipped circuits will be used for all power tools.

4.3.5 Slips, Trips, and Falls

Working in and around the Site will pose slip, trip and fall hazards due to slippery surfaces that may be oil covered, or from surfaces that are wet from rain or ice. Excavation at the Sites will cause uneven footing in the trenches and around the spoil piles. Care should be exercised when walking at the Site, especially when carrying equipment.

4.3.6 Fire and Explosion

The use of cutting/grinding tools which may spark in the vicinity of flammable building materials, use of gasoline-or diesel-powered instruments could present the possibility of encountering fire and explosion hazards. Care should be exercised and fire extinguishers available during work which presents fire or explosion hazard.

4.3.7 Manual Lifting

Manual lifting of heavy objects such as sections of pipe or blower supplies may be required. Failure to follow proper lifting technique can result in back injuries and strains.

Site workers will be instructed to use power equipment to lift heavy loads whenever possible and to evaluate loads before trying to lift them (i.e., they should be able to easily tip the load and then return it to its original position). Heavy loads should be carried with a buddy and the following proper lifting techniques will be stressed: 1) make sure footing is solid, 2) make back straight with no curving or slouching, 3) center body over feet, 4) grasp the object firmly and as close to your body as possible, 5) lift with legs, and 6) turn with your feet, don't twist. Back injuries are a serious concern as they are the most common workplace injury, often resulting in lost or restricted work time, and long treatment and recovery periods.

4.3.8 Utilities (Electrocution and Fire Hazards)

Underground utilities at the Site pose fire, explosion, and electrocution hazards. Potential adverse effects of electrical hazards include burns and electrocution, which could result in death. Underground utilities, facilities, equipment, and structures will be located prior to start of any intrusive activities. The Underground Utilities Call Center will be notified a minimum of three days before any subsurface disturbance. Care shall be exercised to avoid damage to utilities beneath the surface slab. As-builts will be consulted and a geophysical survey shall be completed, if needed.

4.4 Task Hazard Analysis

The scope of work described in Section 1.2 will be accomplished with the following tasks:

1. Mobilization/Demobilization: mobilize equipment; establish Site security, work zones, and staging areas.
2. Site Preparation: locate utilities, construct decontamination pad, construct negative pressure environmental enclosure around excavation area, if required.
3. Sampling: use of appropriate PPE (e.g., nitrile gloves, safety glasses, ear plugs, hard hats).
4. Soil/Fill Excavation and Loading: in the event soil/fill removal is necessary, remove floor slab in designated area, excavate material and segregate dissimilar materials, load dump trucks or drums, decontaminate heavy equipment, and backfill excavations.
5. Site Restoration Activities: restore flooring in excavation area and any damaged adjacent floors/walls to original condition.

All of these tasks include the potential for the chemical and physical hazards, and care should be taken within the work zone to avoid these hazards, as described above. There is a higher potential for chemical hazards to occur during activities that involve the removal and handling of contaminated material; however, exposure to vapors may occur to a lesser degree as soon as the top concrete slab is removed. All tasks should be conducted using the appropriate PPE for the associated exposure, as described in Section 6.0.

5.0 PROCESS SAFETY MANAGEMENT

Process safety management is a systematic way of identifying the potential health and safety hazards associated with major phases of work on the project and the methods to avoid, control and mitigate those hazards. Process safety management guidelines will be developed for all activities as necessary, prior to start-up. Process safety management will be used to train work crews in proper safety procedures during phase preparatory meetings.

6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

The PPE required for various remediation tasks are based on 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response (HAZWOPER), Appendix B, "General Description and Discussion of the Levels of Protection and Protective Gear." All on-site personnel shall wear, at a minimum, Level D PPE. The protection will be based on the air monitoring described in Section 7.0. Table 2 lists the required PPE for the anticipated remediation tasks:

Table 2

Personal Protection Equipment (PPE) Selection

Level of Protection and PPE Required		Work Conditions
Level D (x) Steel Toe Boots (x) Hard Hat (as needed) (x) Work Gloves (as needed) (x) Reflective Vest (as needed)	(x) Safety Glasses or Face Shield (x) Ear Plugs (as needed) (x) Latex or nitrile Gloves (as needed)	• All activities except those noted under Levels D modified and C
Level D – Modified ***(in addition to Level D)*** (x) Nitrile Gloves (x) Overboots	(x) Tyvek Coveralls (as needed) -or- (x) Saranex/Polyethylene-coated Tyvek Coveralls (as needed)	• Activities with potential for contact with grossly contaminated material
Level C – ***(in addition to Level D – Modified)*** (x) Half-Face Respirator ( ) Full Face Respirator ( ) Full-Face PAPR	( ) Particulate Cartridge (P100) ( ) Organic Cartridge (x) Dual Organic/Particulate Cartridge	• If PID > 10 ppm and/or • If PM_{10} > 5.0 mg/m^3
Level C - Modified ***(in addition to Level D – Modified)*** ( ) Half-Face Respirator (x) Full Face Respirator ( ) Full-Face PAPR	( ) Particulate Cartridge (P100) ( ) Organic Cartridge (x) Dual Organic/Particulate Cartridge	• If PID >50 ppm; or • Eye irritation occurs
Note: Vapor (PID) and particulate (PM_{10}) measurements are work zone action levels sustained for 15 minutes or greater.		

The PPE specified in Table 2 reflects the hazard analysis presented in Section 4.0 and PPE selection required by 29 CFR 1910.132. For the purposes of PPE selection, the PESM and SM are considered competent persons. The signatures in this HASP constitute certification of the hazard assessment. For any activities not covered by Table 2, the SM will conduct the hazard assessment and select the appropriate required PPE in consultation with the PESM.

6.1 OSHA Requirements for PPE

All PPE used must meet the OSHA standards presented in Table 3.

Table 3
PPE OSHA Standards

Type of Protection	Regulation	Source
Eye and Face	29 CFR 1910.133	ANSI Z87.1 1968
Respiratory	29 CFR 1910.134	ANSI Z88.1 1980
Head	29 CFR 1910.135	ANSI Z89.1 1969
Foot	29 CFR 1910.136	ANSI Z41.1 1967
Note: ANSI - American National Standards Institute		

7.0 AIR MONITORING

7.1 Monitoring Requirements

Environmental health and safety monitoring will be performed during all soil disturbance activities in accordance with this section.

7.1.1 Work Zone Monitoring

The following monitoring instruments will be available for use during field operation as necessary:

- Photoionization detector (PID) - MiniRAE 3000 with 11.7 eV lamp, or equivalent
- Particulate meter - TSI DustTrak II/SidePak AM 520, or equivalent

All air monitoring equipment will be calibrated and maintained in accordance with manufacturer's requirements and will be recorded by the SM in the daily log.

Organic vapor concentrations shall be measured using the PID during excavating and other intrusive activities. During intrusive operations, organic vapor concentrations shall be taken at least once every hour. Organic vapor concentrations shall be measured upwind of the work zone to determine background concentrations at least twice a day, (once in the morning and once in the afternoon). The SM will interpret monitoring results using professional judgment.

A particulate meter will be used to measure airborne particulate matter during intrusive activities. Monitoring will be at least once per hour and readings will be averaged over a 15-minute period for comparison with the action levels. Monitoring personnel will make a best effort to collect airborne particulate monitoring data from downwind of the intrusive activity. If off-site sources are considered to be the source of the measured particulate, upwind readings will also be collected.

Any trenches and excavations will be monitored before potential entry at the beginning of each shift. Trenches are not expected to be entered on a regular basis.

Measurements will be taken prior to commencement of work and periodically or continuously during the work, depending on the contaminant being monitored, as outlined in Table 4. Measurements will be made as close to the workers as practicable and at the breathing height of the workers.

The SM 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 Table 4:

Table 4
Work Zone Air Monitoring Action Levels

Air Monitoring Instrument	Monitoring Location	Action Level	Site Action
PID	Breathing Zone	0 - 10 ppm	No respiratory protection is required
		10 - 50 ppm	Upgrade to Level C PPE. or Stop work, withdraw from work area.
		> 50 ppm	Stop Work. Resume work when readings are less than 50 ppm.
Particulate Meter	Excavation	< 5 mg/m^3	No respiratory protection is required Implement work practices to reduce/minimize airborne dust generation, e.g., spray/misting of soil with water
		Between 5 mg/m^3 and 125 mg/m^3	Upgrade to Level C PPE. Apply additional dust suppression measures. If < 2.5 mg/m^3 resume work using Level D. Otherwise, use Level C.
		> 125 mg/m^3	Stop Work. Apply additional dust suppression measures. Resume work when less than 125 mg/m^3.
Notes: ppm - parts per million mg/m^3 - milligrams per cubic meter Action levels are for sustained readings for 15 minutes or more.			

8.0 ZONES, PROTECTION, AND COMMUNICATION

8.1 Site Control

Site zones are intended to control the potential spread of contamination and to assure that only authorized individuals are permitted into potentially hazardous areas. A three-zone approach will be utilized and will include: an Exclusion Zone (EZ), Contamination Reduction Zone (CRZ) and a Support Zone (SZ). These zones will be established prior to beginning work for each task requiring such delineation (i.e., intrusive work beneath the Site cover or handling of contaminated materials). For larger scale subgrade work, the work zones will be sketched out and maps delineating the various work zones will be available at the Site and used during initial Site-specific training.

The project is being conducted under the requirements of 29 CFR 1910.120, and any personnel working in an area where the potential for exposure to Site contaminants exists, will only be allowed access after proper training and medical documentation is provided to the SM. These records will be maintained by the SM and copies should be provided to the SM prior to mobilization for project activities.

The following will be used for guidance in revising these preliminary zone designations, if necessary:

- Support Zone (SZ) - The SZ is an uncontaminated area that will be the field support area for most operations. The SZ provides for field team communications and staging for emergency response. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated personnel/materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples.
- Contamination Reduction Zone (CRZ) - The CRZ is established between the EZ and the SZ. The CRZ contains the contamination reduction corridor and provides an area for decontamination of personnel and portable hand-held equipment, tools and heavy equipment. A personnel decontamination area will be prepared at each exclusion zone. The CRZ will be used for Exclusion Zone entry and egress in addition to access for heavy equipment and emergency support services.
- Exclusion Zone (EZ) - All activities that may involve exposure to Site contaminants, hazardous materials and/or conditions should be considered an exclusion zone. This zone will be clearly delineated by cones, tapes or other means. The SM may establish more than one EZ where different levels of protection may be employed or different hazards exist. The size of the EZ shall be determined by the Site SM allowing adequate space for the activity to be completed, field members and emergency equipment.

8.2 Contamination Control

8.2.1 Personnel Decontamination Station

Personnel hygiene, coupled with diligent decontamination, will significantly reduce the potential for exposure.

8.2.2 Minimization of Contact With Contaminants

During completion of all Site activities, personnel should attempt to minimize the degree of contact with contaminated materials. This involves a conscientious effort to keep "clean" during Site activities. All personnel should minimize physical contact with contamination to ultimately minimize the degree of decontamination required and the generation of waste materials from Site operations.

Field procedures will be developed to control over spray and runoff and to ensure that unprotected personnel working nearby are not affected.

8.2.3 Personnel Decontamination Sequence

Consideration will be given to prevailing wind directions so that the decontamination line, the SZ, and CRZ exit is upwind from the exclusion zone and the first station of the decontamination line. Decontamination will be performed by removing all PPE used in EZ and placing in drums/trash cans within the CRZ. Baby wipes will be available for washing hands and face after PPE removal. In addition, brushes will be available for removing soil/fill from boots.

8.2.4 Emergency Decontamination

If circumstances dictate that contaminated clothing cannot be readily removed, then remove gross contamination and wrap injured personnel with clean garments/blankets to avoid contaminating other personnel or transporting equipment.

If the injured person can be moved, he/she will be moved to the EZ boundary and decontaminated by Site personnel, as previously described, before emergency responders handle the victim. If the person cannot be moved because of the extent of the injury (a back or neck injury) provisions shall be made to ensure that emergency response personnel will be able to respond to victim without being exposed to potentially hazardous atmospheric conditions. If the potential for inhalation hazards exist, such as with open excavation, this area will be covered with poly to eliminate any potential inhalation hazards. All emergency personnel are to be immediately informed of the injured person's condition, potential contaminants, and provided with all pertinent chemical data.

8.2.5 Heavy Equipment Decontamination

Decontamination of chemically contaminated heavy equipment will be accomplished using high-pressure steam or dry decontamination with brushes and shovels. Decontamination shall take place on a decontamination pad and all liquids used in the decontamination procedure will be collected. Vehicles or equipment brought into an exclusion zone will be treated as contaminated, and will be decontaminated prior to removal. All liquids used in the decontamination procedure will be collected, stored and disposed of in accordance with federal, state, and local regulations. Personnel performing this task will wear the proper PPE as described in Table 2.

8.3 Communications

The following communications equipment shall be specified as appropriate:

- Telephones - A cellular telephone will be located in the SZ for communication with emergency support services/facilities and the home office. Personnel in the EZ can carry cellular telephones for communication as well if Level D PPE has been determined to be appropriate.
- Hand Signals - Hand signals shall be used by field teams along with the buddy system. They shall be known by the entire field team before operations commence and their use covered during Site-specific training. Typical hand signals are described in Table 5.

Table 5
Hand Signals

Signal	Meaning
Hand gripping throat	Out of air, can't breathe
Grip on a partner's wrist or placement of both hands around a partner's waist	Leave area immediately/no debate
Hands on top of head	Need assistance
Thumbs up	Okay/I’m all right/I understand
Thumbs down	No/negative

9.0 MEDICAL SURVEILLANCE PROCEDURES

All personnel performing field work where potential exposure to contaminants exists at the Site are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120(f) and, where applicable, expanded health standards.

9.1 Medical Surveillance Requirements

A physician's medical release for work will be confirmed by the SM before a worker can enter the exclusion zone. The medical release shall consider the type of work to be performed and the required PPE. The examination will be conducted annually at a minimum. Additional medical testing may be required by the PESM in consultation with the SM if an over-exposure or accident occurs, if an employee exhibits symptoms of exposure, or if other Site conditions warrant further medical surveillance.

10.0 SAFETY CONSIDERATIONS

10.1 Excavation and Trenching

The safety requirements for each excavation must be determined by a competent person who is capable of identifying existing and predictable hazards and work conditions that are unsanitary, hazardous, or dangerous to employees. The competent person must also have the authorization to take prompt corrective measures to eliminate unsatisfactory conditions.

The following are general requirements for work activities in and around excavations:

- Prior to initiation of any excavation activity, the location of underground utilities, obstruction, etc. will be determined. The New York State one-call center will be contacted by the excavation subcontractor a minimum of 72 hours prior to excavation activities.
- All excavations will be inspected daily and after each period of rain by the competent person prior to commencement of work activities. Evidence of cave-ins, slides, sloughing, or surface cracks or excavations will be cause for work to cease until necessary precautions are taken to safeguard employees.
- Excavated and other materials or equipment that could fall or roll into the excavation shall be placed at least 5 feet from the edge of the excavation.
- Each employee in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with CFR 1926.652 (b) or (c) except when excavations are less than 5 feet in depth and examination of the ground by a competent person provides no indication of a potential cave-in or excavation is made entirely in stable rock.
- Ladders will be positioned no further than 25 feet from any individual working in the trench.

11.0 DISPOSAL PROCEDURES

All discarded materials, waste materials, or other objects shall be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard, or causing litter to be left on-site. All potentially contaminated materials, e.g., clothing, gloves, etc., will be bagged or drummed as necessary, labeled, and segregated for disposal. All non-contaminated materials shall be collected and bagged for appropriate disposal. The waste management procedures will be conducted in accordance with applicable local, state, and federal regulations.

12.0 EMERGENCY RESPONSE/CONTINGENCY PLAN

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly, and require an immediate response; therefore, contingency planning and advanced training of staff are essential. Specific elements of emergency support procedures addressed in the following subsections include communications, local emergency support units, preparation for medical emergencies, first aid for injuries incurred on-site, record keeping, and emergency Site evacuation procedures.

12.1 Responsibilities

12.1.1 Project Environmental and Safety Manager (PESM)

The PESM is responsible for overseeing and approving the Emergency Response/Contingency Plan, and performing audits to determine that the plan is in effect and that all pre-emergency requirements are met. The PESM acts as a liaison to applicable regulatory agencies and notifies OSHA of reportable accidents.

12.1.2 Site Manager (SM)

The SM is responsible for ensuring that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. The SM is required to immediately notify the PM and PESM of any fatalities or catastrophes (three or more workers injured and hospitalized) so that the PESM can notify OSHA within the required time frame. The PESM will be notified of all OSHA recordable injuries, fires, spills, releases or equipment damage in excess of $500 within 24 hours. The SM also serves as the Alternate Emergency Coordinator.

12.1.3 Emergency Coordinator (EC)

In the event of an emergency, the Emergency Coordinator, shall make contact with local emergency response personnel. In these contacts, the EC will inform response personnel about the nature of work on the Site, the type of contaminants and associated health or safety effects, and the nature of the emergency, particularly if it is related to exposure to contaminants.

The EC shall review this plan and verify emergency phone numbers and identify hospital routes prior to beginning work on-site. The EC shall make necessary arrangements to be prepared for any emergencies that could occur.

The EC shall implement the Emergency Response/Contingency Plan whenever conditions at the Site warrant such action.

12.1.4 Site Personnel

Site personnel are responsible for knowing the Emergency Response/Contingency Plan and the procedures contained herein. Personnel are expected to notify the Emergency Coordinator of situations that could constitute a Site emergency.

12.2 Communications

A variety of communication systems may be utilized during emergency situations. These are discussed in the following sections.

The primary form of communication during an emergency between field groups in the exclusion zone and the Emergency Coordinator will be verbal communications. During an emergency situation, the lines will be kept clear so that instructions can be received by all field teams.

12.2.1 Telephone Communications

A cellular telephone will be available on-site.

12.2.2 Hand Signals

Hand signals will be employed by downrange field teams where necessary for communication during emergency situations. Hand signals are presented in Table 5 in Section 8.3.

12.3 Pre-Emergency Planning

Before the field activities begin, the local emergency response personnel may be notified by the Site owner's representative or contractor of the schedule for field activities and about the materials that are thought to exist on the Site so that they will be able to respond quickly and effectively in the event of a fire, explosion, or other emergency.

To be able to deal with any emergency that might occur during remedial activities at the Site, emergency telephone numbers will be readily available in the SM vehicle or the Site office. These telephone numbers are presented Section 12.16. The Emergency phone numbers listed are preliminary and will be updated as needed prior to the start of work. Immediately prior to mobilization the SM shall verify all numbers, and document any changes in the Site logbook. Hospital route maps will also be readily available in the SM vehicle and/or Site office.

12.4 Emergency Medical Treatment

The procedures and rules in this HASP are designed to prevent employee injury. However, should an injury occur, no matter how slight, it will be reported to the SM immediately. First-aid equipment such as a first aid kit and disposable eye washes will be available on-site.

During the Site safety briefing, project personnel will be informed of the location of the first aid station(s) that have been set up. In the case of a medical emergency, the SM 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 a hospital by on-site personnel. Directions to the hospital with a hospital route map are provided in Section 12.15/Table 7. Unless they are in immediate danger, severely injured persons will not be moved until paramedics can attend to them. Some injuries, such as severe cuts and lacerations or burns, may require immediate treatment. Any first aid instructions that can be obtained from doctors or paramedics before an emergency-response squad arrives at the Site or before the injured person can be transported to the hospital, will be followed closely.

12.5 Emergency Site Evacuation Routes and Procedures

In the event of a Site emergency that would require the evacuation of personnel, the EC will immediately contact the Site owner or owner's representative (this person may or may not be on-site). All project personnel will be instructed on proper emergency response procedures and locations of emergency telephone numbers during the initial Site safety meeting. If an emergency occurs at the work area, including but not limited to fire, explosion or significant release of toxic gas into the atmosphere, immediate evacuation of all personnel is necessary due to an immediate or impending danger. The following evacuation procedures will be used:

- The field team leader will initiate evacuation procedures by signaling to leave the Site or exclusion zone. The signal for Site evacuation will consist of three long blasts on an air horn.
- All heavy equipment will be shut down and all personnel will evacuate the work areas and assemble at a pre-determined meeting location. The designated meeting location for the Site will be at the sidewalk along the west side of West Street.
- All personnel suspected to be in or near the contract work area should be accounted for and the whereabouts or missing persons determined immediately.
- The field team leader will then give further instruction.

If any task covered under this HASP has the potential for significant hazards, evacuation drills will be performed as deemed necessary by the SM and PESM.

12.6 Fire Prevention and Protection

In the event of a fire or explosion, the work area will be evacuated immediately and the EC will notify the local fire and police departments. No personnel will fight a fire beyond the stage where it can be put out with a portable extinguisher (incipient stage).

Fires will be prevented by adhering to the following precautions:

- Good housekeeping and storage of materials.
- Storage of flammable liquids and gases will be stored in flammable storage cabinets away from oxidizers when not in use.
- Oxygen will be stored at least 25 feet away from acetylene cylinders when not in use. Oxygen and acetylene may not be stored on welding carts.
- No smoking in the exclusion zone or any work area.
- No hot work without a properly executed hot work permit.
- Shutting off engines to refuel.
- Grounding and bonding metal containers during transfer of flammable liquids.
- Use of UL approved flammable storage cans.
- Fire extinguishers rated at least 10 pounds Class A, B, and C located on all heavy equipment, in all trailers and near all hot work activities.
- Monthly inspections of all fire extinguishers.

The contractor is responsible for the maintenance of fire prevention and/or control equipment and the control of fuel source hazards.

12.7 Overt Chemical Exposure

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the MSDS will be followed as necessary. If first aid or emergency medical treatment is necessary, the Emergency Coordinator will contact the appropriate emergency facilities. All chemical exposure incidents must be reported in writing to the PESM. If a member of the field crew demonstrates symptoms of chemical exposure, another team member (buddy) should remove the individual from the immediate area of contamination. The buddy should communicate to the SM (via voice and hand signals) of the chemical exposure. The SM should contact the appropriate emergency response agency. The procedures outlined in Table 6 should be followed.

Table 6
Chemical Exposure Treatment Procedures

Exposure Pathway	Treatment Procedure
Skin and Eye Contact	Use copious amounts of soap and water. Wash/rinse affected areas thoroughly, and then provide appropriate medical attention. Eyes should be rinsed for 15 minutes upon chemical contamination. Skin should also be rinsed for 15 minutes if contact with caustics, acids or hydrogen peroxide occurs.
Inhalation	Move to fresh air. Decontaminate and transport to hospital or local medical provider.
Ingestion	Decontaminate and transport to emergency medical facility.
Puncture Wound or Laceration	Decontaminate and transport to emergency medical facility.

12.8 Personal Injury

In case of personal injury at the Site, the following procedures should be followed:

- Another team member (buddy) should signal the field team leader that an injury has occurred.
- A field team member trained in first aid can administer treatment to an injured worker.
- If deemed necessary, the victim should then be transported to the nearest hospital or medical center. If necessary, an ambulance should be called to transport the victim.
- The field team leader or field safety officer (FSO) is responsible for making certain that an Incident Report Form (provided as Appendix D) is completed. This form is to be submitted to the AKRF health and safety officer (HSO). Follow-up action should be taken to correct the situation that caused the accident.
- Any incident (near miss, property damage, first aid, medical treatment, etc.) must be reported.
- A first-aid kit and an eye-wash will be kept on-site during the field activities.

12.9 Decontamination During Medical Emergencies

If emergency life-saving first aid and/or medical treatment are required, normal decontamination procedures may need to be abbreviated or postponed. The SM or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination, when necessary. The outer garments can be removed if they do not cause delays, interfere with

treatment or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed on Site, a plastic barrier between the injured individual and clean surfaces should be used to help prevent contamination of the inside of ambulances and/or medical personnel. Outer garments may then be removed at the medical facility. No attempt will be made to wash or rinse the victim if his/her injuries are life threatening, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed.

12.10 Accident/Incident Reporting

Written confirmation of verbal reports of injuries or other emergencies are to be submitted to the PESM within 24 hours. The Incident Report Form is provided as Appendix D.

In addition to the incident reporting procedures and actions described in this HASP, the SM will coordinate with the owner's representative for reporting and notification for all environmental, safety, and other incidents.

If necessary, a Site safety briefing will be held to discuss accidents/incidents and any findings from the investigation of the incident. This HASP will be modified if deemed necessary by the PESM.

12.11 Spill Control and Response

All small hazardous spills/environmental releases shall be contained as close to the source as possible. Whenever possible, the MSDS will be consulted to assist in determining the best means of containment and cleanup. For small spills, absorbent materials such as sand, sawdust or commercial sorbents should be placed directly on the substance to contain the spill and aid recovery. Any acid spills should be diluted or neutralized carefully prior to attempting recovery. Berms of earthen or sorbent materials can be used to contain the leading edge of the spills. Drains or drainage areas should be blocked. All spill containment materials will be properly disposed. An exclusion zone of 50-100 feet around the spill area should be established depending on the size and type of the spill.

The following steps should be taken by the EC:

1. Determine the nature, identity and amounts of major spill components;
2. Make sure all unnecessary persons are removed from the spill area;
3. Notify appropriate response teams and authorities;
4. Use proper PPE in consultation with the SM;
5. If a flammable liquid, gas or vapor is involved, remove all ignition sources and use non-sparking and/or explosive proof equipment to contain or clean up the spill (diesel only vehicles, air operated pumps, etc.);
6. If possible, try to stop the leak with appropriate material;
7. Remove all surrounding materials that can react or compound with the spill; and
8. Notify the Site owner and determine who will report the spill to the NYSDEC Hotline, as applicable.

12.12 Emergency Equipment

The following minimum emergency equipment shall be kept and maintained on-site:

- Industrial first aid kit

- Portable eye washes
- Fire extinguishers (one per vehicle and heavy equipment)
- Absorbent material

12.13 Postings

The following information shall be posted or be readily visible and available at conspicuous locations throughout the Site:

- Emergency telephone numbers
- Hospital Route Map (Figure 1)

12.14 Restoration and Salvage

After an emergency, prompt restoration of utilities, fire protection equipment, medical supplies, and other equipment will reduce the possibility of further losses. Some of the items that may need to be addressed are:

- Refilling fire extinguishers
- Refilling medical supplies
- Recharging eyewashes and/or showers
- Replenishing spill control supplies
- Replacing used air horns

12.15 Hospital Directions

The address and directions to the nearest hospital to the project Site are provided in Table 7:

Table 7
Hospital Directions

Hospital Name	NYC Health and Hospitals - Woodhull
Phone Number	(718) 963-8000
Address/Location	760 Broadway, Brooklyn, New York 11206
Directions	Head northeast on Newton Street towards Graham Avenue. Turn right onto Graham Street. Turn left onto Richardson Street. Turn right onto Humboldt Street. Continue straight onto Sumner Place. Turn right onto Park Avenue. The emergency room will be on the right.

A map showing the Site evacuation meeting point and driving route to the hospital is provided as Figure 1.

12.16 Emergency Contacts

Table 8
Emergency Contacts

Company	Individual Name	Title	Contact Number
AKRF	Michelle Lapin, P.E.	Remedial Engineer	(646) 388-9520 (office)
	Marc Godick	Project Director	(914) 922-2356 (office)
	Amy Jordan	Project Manager	(646) 388-9864 (office)
New 470 LLC	Ronald Walker	Client Representative	(631) 234-1600 (office)
Ambulance, Fire Department & Police Department	-	-	911
NYSDEC Spill Hotline	-	-	(800) 457-7362

The emergency contact list will be updated as needed.

13.0 TRAINING

13.1 General Health and Safety Training

In accordance with 29 CFR 1910.120, hazardous waste Site workers shall, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste Site operations unless otherwise noted in the above reference. At a minimum, the training will have consisted of instruction in the topics outlined in the standard. Personnel who have not met the requirements for initial training shall not be allowed to work in any Site activities during which they may be exposed to hazards (chemical or physical). Proof of training shall be submitted to the SM prior to the start of field activities. Other personnel involved in ancillary, or support activities, including transportation of material for disposal, shall have the proper training as required by federal, state, and local regulations.

13.2 Annual Eight-Hour Refresher Training

Annual eight-hour refresher training will be required of hazardous waste Site field personnel working in the work zone to maintain their qualifications for fieldwork. The training will cover a review of 29 CFR 1910.120 requirements and related company programs and procedures.

13.3 Supervisor Training

Personnel acting in a supervisory capacity shall have received 8 hours of instruction in addition to the initial 40 hours training.

13.4 Site-Specific Training

Prior to commencement of field activities, all field personnel assigned to the project will have completed training that will specifically address the activities, procedures, monitoring, and equipment used in the Site operations. The training will cover Site and facility layout, hazards

and emergency services, and all provisions contained within this HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity. The training should include the following topics:

- General requirements of this HASP;
- Review of the scope of work;
- Names of personnel responsible for Site safety and health;
- Potential hazards and acute effects of compounds present at the Site;
- Air monitoring procedures;
- Proper use of personal protective equipment;
- Safe use of engineering controls and equipment on the Site;
- Decontamination procedures; and
- Work practices by which the employee can minimize risk from hazards. This may include a specific review of heavy equipment safety, safety during inclement weather, changes in common escape rendezvous point, Site security measures, or other Site-specific issues that need to be addressed before work begins.

Personnel that have not received Site-specific training will not be allowed in the work zone.

13.5 On-Site Safety Briefings

Project personnel working in designated work zones on-site will be given health and safety briefings periodically by the SM to assist Site personnel in safely conducting their work activities. The briefings will include information on new operations to be conducted, changes in work practices or changes in the Site's environmental conditions, as well as periodic reinforcement of previously discussed topics. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety inspections. The meetings will also be an opportunity to periodically update the crews on monitoring results.

14.0 LOGS, REPORTS, AND RECORD KEEPING

The following is a summary of required health and safety logs, reports, and record keeping.

14.1 Medical and Training Records

Copies or verification of training (40 hour, 8 hour, supervisor, and Site-specific training) and medical clearance for hazardous waste Site work and respirator use will be maintained by the SM.

14.2 On-Site Log

A log of personnel on-site each day will be kept by the SM in a field logbook.

14.3 Exposure Records

The SM will periodically notify the PESM of exposure monitoring results that require workers to upgrade to Level C. All personal monitoring results, laboratory reports, calculations and air sampling data sheets will be maintained by the SM during Site work.

14.4 Accident/Incident Reports

The incident reporting and investigation during Site work will be completed using an Incident Report Form, provided as Appendix D.

14.5 Hazard Communication Program/Material Safety Data Sheets (MSDS)

MSDS will be obtained for applicable substances and included in the Site hazard communication file. The hazard communication program will be maintained on-Site in accordance with 29 CFR 1910.1200.

14.6 Work Permits

All work permits, including lockout/tagout, sidewalk permits, and debris container permits (if necessary) will be maintained in the project files. Copies of the work permits shall also be provided to the SM, and the Site owner's representative.

15.0 FIELD PERSONNEL REVIEW

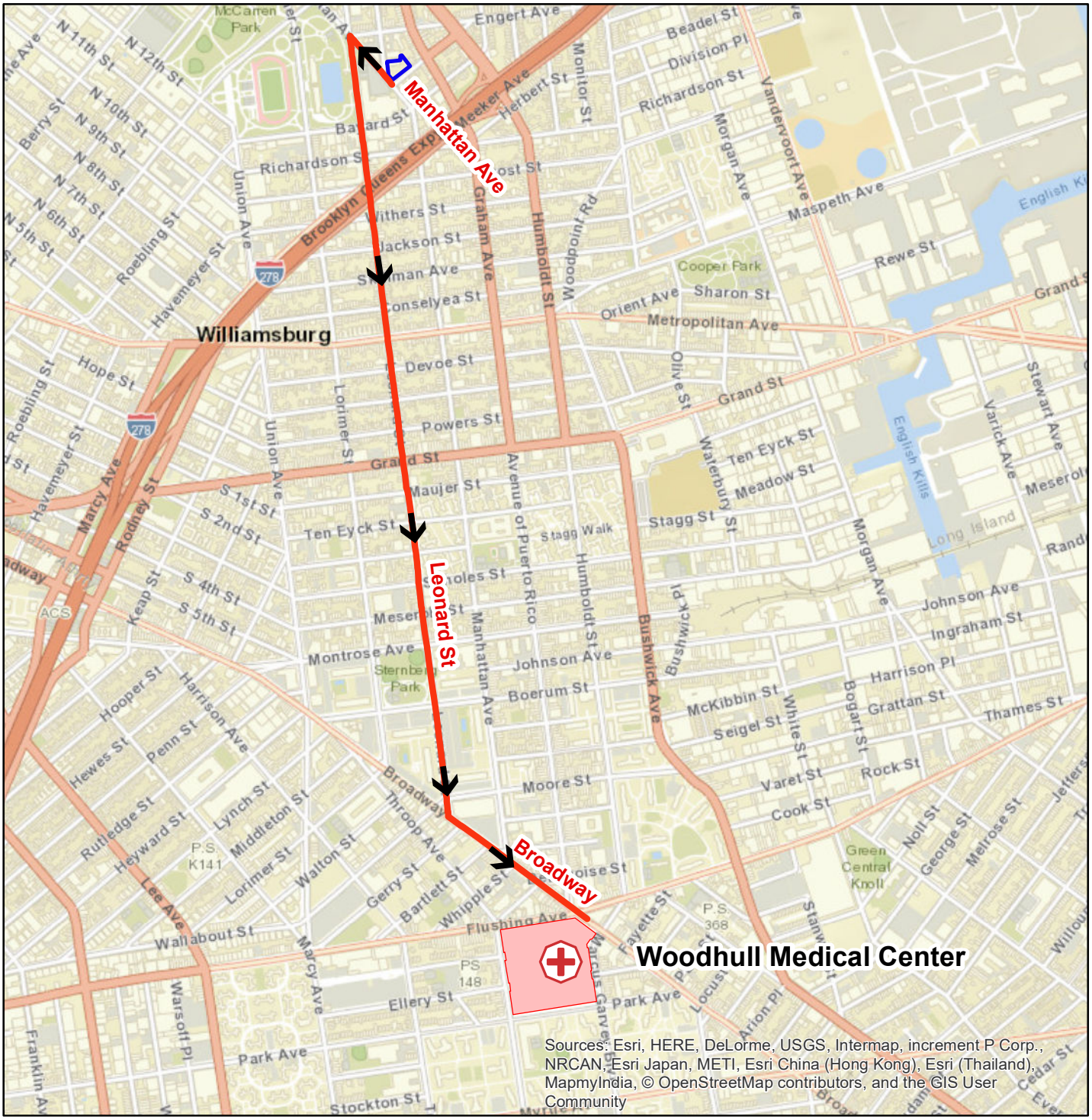
This form serves as documentation that field personnel have read, or have been informed of, and understand the provisions of this HASP for the Site at 12 Eckford Street, Brooklyn, New York. It is maintained on-site by the SM as a project record. Each field team member shall sign this section after training in the contents of this HASP has been completed. Site workers must sign this form after Site-specific training is completed and before being permitted to work on-site.

AFFIDAVIT

I have read, or have been informed of, this Health and Safety Plan and understand the information presented. I have also completed Site-specific training for the work detailed in the project specifications. I will comply with the provisions contained therein.

Name (Print and Sign) and Company	Date

FIGURE 1



Legend

- Route to Hospital
- Project Site Location
- Hospital Location

0 1,200 2,400 Feet

Woodhull Medical Center
760 Broadway
Brooklyn, NY 11206

AKRF
440 Park Avenue South, New York, NY 10016

New 470 Project
12 Eckford Street
Brooklyn, New York

HOSPITAL ROUTE MAP

DATE **8/1/2019**
PROJECT NO. **12306**
FIGURE **1**

APPENDIX A
ASTDR CHEMICAL FACT SHEETS

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

2-BUTANONE
CAS # 78-93-3

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1995**

This fact sheet answers the most frequently asked health questions (FAQs) about 2-butanone. 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 2-butanone occurs in the workplace or from using consumer products containing it. Mild irritations of the eyes, nose, and throat were seen in people who breathed 2-butanone. This chemical has been found in at least 472 of 1,416 National Priorities List sites identified by the Environmental Protection Agency.

What is 2-butanone?

(Pronounced 2-by$\bar{o}\bar{o}$′tə-n$\bar{o}$n)

2-Butanone is a manufactured chemical but it is also present in the environment from natural sources. It is a colorless liquid with a sharp, sweet odor. It is also known as methyl ethyl ketone (MEK).

2-Butanone is produced in large quantities. Nearly half of its use is in paints and other coatings because it will quickly evaporate into the air and it dissolves many substances. It is also used in glues and as a cleaning agent.

2-Butanone occurs as a natural product. It is made by some trees and found in some fruits and vegetables in small amounts. It is also released to the air from car and truck exhausts.

What happens to 2-butanone when it enters the environment?

- 2-Butanone enters the air during production, use and transport, and from hazardous waste sites.
- In air, one-half of it will break down from sunlight in 1 day or less.
- It dissolves in water and is broken down more slowly to a simpler chemical form in about 2 weeks.
- It does not stick to soil and will travel through the soil to the groundwater.
- Some of the 2-butanone in soil or water will evaporate into the air.
- It does not deposit in the bottom of rivers or lakes.
- It is not expected to concentrate in fish or increase in the tissues of animals further up the food chain.

How might I be exposed to 2-butanone?

- Breathing contaminated air from the production or use of paints, glues, coatings, or cleaning agents containing it.
- Breathing contaminated air near hazardous waste sites.
- Breathing cigarette smoke.
- Sniffing glues.
- Drinking contaminated water from wells near manufacturing or hazardous waste sites.
- Skin contact with the liquid during production or use.

How can 2-butanone affect my health?

The known health effects to people from exposure to 2-butanone are irritation of the nose, throat, skin, and eyes. No one has died from breathing 2-butanone alone. If 2-butanone is breathed along with other chemicals that damage health, it can increase the amount of damage that occurs.

Serious health effects in animals have been seen only at very high levels. When breathed, these effects included birth defects, loss of consciousness, and death.

When swallowed, rats had nervous system effects including drooping eyelids and uncoordinated muscle movements. There was no damage to the ability to reproduce.

Mice who breathed low levels for a short time showed temporary behavioral effects. Mild kidney damage was seen in animals that drank water with lower levels of 2-butanone for a short time.

There are no long-term studies with animals either breathing or drinking 2-butanone.

How likely is 2-butanone to cause cancer?

The Department of Health and Human Services has not classified 2-butanone as to its human carcinogenicity.

The International Agency for Research on Cancer and the Environmental Protection Agency (EPA) have also not classified 2-butanone as to its human carcinogenicity.

Two studies of workers exposed to 2-butanone and other chemicals did not find an increase in cancer. No animal studies are available that examine the potential for 2-butanone to cause cancer.

Is there a medical test to show whether I've been exposed to 2-butanone?

Tests are available to measure 2-butanone or its breakdown products in blood, breath, and urine. These tests are useful only to measure recent exposures because 2-butanone and its breakdown products leave the body rapidly. These tests are not usually performed at your doctor's office, but your doctor can take blood or urine samples and send them to a testing laboratory.

Has the federal government made recommendations to protect human health?

The EPA requires that discharges or spills into the environment of 5,000 pounds of more of 2-butanone be reported.

The Occupational Safety and Health Administration (OSHA) set an occupational exposure limit of 200 parts of 2-butanone per million parts of workplace air (200 ppm) for an 8-hour workday, 40-hour workweek.

The American Conference of Governmental Industrial Hygienists (ACGIH) and the National Institute for Occupational Safety and Health (NIOSH) have established the same guidelines as OSHA for the workplace.

Glossary

Carcinogenicity: Ability to cause cancer.

Evaporate: To change into a vapor or a gas.

ppm: Parts per million.

Long-term: Lasting one year or longer.

Short time: Lasting 14 days or less.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1992. Toxicological profile for 2-butanone. 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

ACETONE
CAS # 67-64-1

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1995**

This fact sheet answers the most frequently asked health questions (FAQs) about acetone. 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 acetone results mostly from breathing air, drinking water, or coming in contact with products or soil that contain acetone. Exposure to moderate-to-high amounts of acetone can irritate your eyes and respiratory system, and make you dizzy. Very high exposure may cause you to lose consciousness. This chemical has been found in at least 572 of 1,416 National Priorities List sites identified by the Environmental Protection Agency.

What is acetone?

(Pronounced ăs′ĭ-tōn′)

Acetone is a manufactured chemical that is also found naturally in the environment. It is a colorless liquid with a distinct smell and taste. It evaporates easily, is flammable, and dissolves in water. It is also called dimethyl ketone, 2-propanone, and beta-ketopropane.

Acetone is used to make plastic, fibers, drugs, and other chemicals. It is also used to dissolve other substances.

It occurs naturally in plants, trees, volcanic gases, forest fires, and as a product of the breakdown of body fat. It is present in vehicle exhaust, tobacco smoke, and landfill sites. Industrial processes contribute more acetone to the environment than natural processes.

What happens to acetone when it enters the environment?

- A large percentage (97%) of the acetone released during its manufacture or use goes into the air.
- In air, about one-half of the total amount breaks down from sunlight or other chemicals every 22 days.
- It moves from the atmosphere into the water and soil by rain and snow. It also moves quickly from soil and water back to air.
- Acetone doesn't bind to soil or build up in animals.
- It's broken down by microorganisms in soil and water.
- It can move into groundwater from spills or landfills.
- Acetone is broken down in water and soil, but the time required for this to happen varies.

How might I be exposed to acetone?

- Breathing low background levels in the environment.
- Breathing higher levels of contaminated air in the workplace or from using products that contain acetone (for example, household chemicals, nail polish, and paint).
- Drinking water or eating food containing acetone.
- Touching products containing acetone.
- For children, eating soil at landfills or hazardous waste sites that contain acetone.
- Smoking or breathing secondhand smoke.

How can acetone affect my health?

If you are exposed to acetone, it goes into your blood which then carries it to all the organs in your body. If it is a small amount, the liver breaks it down to chemicals that are not harmful and uses these chemicals to make energy for normal body functions. Breathing moderate- to-high levels

of acetone for short periods of time, however, can cause nose, throat, lung, and eye irritation; headaches; light-headedness; confusion; increased pulse rate; effects on blood; nausea; vomiting; unconsciousness and possibly coma; and shortening of the menstrual cycle in women.

Swallowing very high levels of acetone can result in unconsciousness and damage to the skin in your mouth. Skin contact can result in irritation and damage to your skin.

The smell and respiratory irritation or burning eyes that occur from moderate levels are excellent warning signs that can help you avoid breathing damaging levels of acetone.

Health effects from long-term exposures are known mostly from animal studies. Kidney, liver, and nerve damage, increased birth defects, and lowered ability to reproduce (males only) occurred in animals exposed long-term. It is not known if people would have these same effects.

How likely is acetone to cause cancer?

The Department of Health and Human Services, the International Agency for Research on Cancer, and the Environmental Protection Agency (EPA) have not classified acetone for carcinogenicity.

Acetone does not cause skin cancer in animals when applied to the skin. We don't know if breathing or swallowing acetone for long periods will cause cancer. Studies of workers exposed to it found no significant risk of death from cancer.

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

Methods are available to measure the amount of acetone in your breath, blood, and urine. The test can tell you how much acetone you were exposed to, although the amount that people have naturally in their bodies varies with each person. The tests can't tell you if you will experience any health effects from the exposure.

The test must be performed within 2-3 days after exposure because acetone leaves your body within a few days. These tests are not routinely performed at your doctor's office, but your doctor can take blood or urine samples and send them to a testing laboratory.

Has the federal government made recommendations to protect human health?

The EPA requires that spills of 5,000 pounds or more of acetone be reported.

The Occupational Safety and Health Administration (OSHA) has set a maximum concentration limit in workplace air of 1,000 parts of acetone per million parts of air (1,000 ppm) for an 8-hour workday over a 40-hour week to protect workers. The National Institute for Occupational Safety and Health (NIOSH) recommends an exposure limit of 250 ppm in workplace air for up to a 10-hour workday over a 40-hour workweek.

Glossary

Carcinogenicity: Ability to cause cancer.
Evaporate: To change into a vapor or a gas.
Ingesting: Taking food or drink into your body.
Long-term: Lasting one year or longer.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1994. Toxicological profile for acetone. 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.

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ARSENIC
CAS # 7440-38-2

Division of Toxicology ToxFAQs™ December 2003

This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. 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 higher than average levels of arsenic occurs mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found at 1,014 of the 1,598 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Organic arsenic compounds are used as pesticides, primarily on cotton plants.

What happens to arsenic when it enters the environment?

❑ Arsenic cannot be destroyed in the environment. It can only change its form.
❑ Arsenic in air will settle to the ground or is washed out of the air by rain.
❑ Many arsenic compounds can dissolve in water.
❑ Fish and shellfish can accumulate arsenic, but the arsenic in fish is mostly in a form that is not harmful.

How might I be exposed to arsenic?

❑ Eating food, drinking water, or breathing air containing arsenic.
❑ Breathing contaminated workplace air.
❑ Breathing sawdust or burning smoke from wood treated with arsenic.
❑ Living near uncontrolled hazardous waste sites containing arsenic.
❑ Living in areas with unusually high natural levels of arsenic in rock.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs. Ingesting high levels of inorganic arsenic can result in death. Lower levels of arsenic can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the

appearance of small "corns" or "warts" on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

Organic arsenic compounds are less toxic than inorganic arsenic compounds. Exposure to high levels of some organic arsenic compounds may cause similar effects as inorganic arsenic.

How likely is arsenic to cause cancer?

Several studies have shown that inorganic arsenic can increase the risk of lung cancer, skin cancer, bladder cancer, liver cancer, kidney cancer, and prostate cancer. The World Health Organization (WHO), the Department of Health and Human Services (DHHS), and the EPA have determined that inorganic arsenic is a human carcinogen.

How can arsenic affect children?

We do not know if exposure to arsenic will result in birth defects or other developmental effects in people. Birth defects have been observed in animals exposed to inorganic arsenic.

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

How can families reduce the risk of exposure to arsenic?

❑ If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protective clothing to decrease exposure to sawdust.
❑ If you live in an area with high levels of arsenic in water or soil, you should use cleaner sources of water and limit contact with soil.

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

There are tests to measure the level of arsenic in blood, urine, hair, or fingernails. The urine test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels or arsenic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict how the arsenic levels in your body will affect your health.

Has the federal government made recommendations to protect human health?

EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or canceled many uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration has set limits of 10 μg arsenic per cubic meter of workplace air (10 $\mu g/m^3$) for 8 hour shifts and 40 hour work weeks.

Source of Information

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for Arsenic. 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

COPPER

CAS # 7440-50-8

Division of Toxicology ToxFAQs™ September 2002

This fact sheet answers the most frequently asked health questions (FAQs) about copper. 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 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: Copper is a reddish metal that occurs naturally in the environment. It also occurs naturally in plants and animals. Low levels of copper are essential for maintaining good health. High levels can cause harmful effects such as irritation of the nose, mouth and eyes, vomiting, diarrhea, stomach crumps, and nausea. Copper has been found in at least 884 of the 1,613 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is copper?

Copper is a reddish metal that occurs naturally in rocks, soil, water, and air. Copper also occurs naturally in plants and animals.

Metallic copper can be easily molded or shaped. Metallic copper can be found in the U.S. penny, electrical wiring, and some water pipes. Metallic copper is also found in mixtures (called alloys) with other metals such as brass and bronze. Copper is also found as part of other compounds forming salts. Copper salts occur naturally, but are also manufactured. The most common copper salt is copper sulfate. Most copper compounds are blue-green in color. Copper compounds are commonly used in agriculture to treat plant diseases like mildew, for water treatment and, as preservatives for wood, leather, and fabrics.

What happens to copper when it enters the environment?

❑ Copper can enter the environment from the mining of copper and other metals and from factories that make or use metallic copper or copper compounds.

❑ It can also enter the environment through domestic waste water, combustion of fossil fuels and wastes, wood production, phosphate fertilizer production, and natural sources (e.g., windblown dust from soils, volcanoes, decaying vegetation, forest fires, and sea spray).

❑ Copper in soil strongly attaches to organic material and minerals.

❑ Copper that dissolves in water becomes rapidly bound to particles suspended in the water.

❑ Copper does not typically enter groundwater.

❑ Copper carried by particles emitted from smelters and ore processing plants is carried back to the ground by gravity or in rain or snow.

❑ Copper does not break down in the environment.

How might I be exposed to copper?

❑ Breathing air, drinking water, eating food, and by skin contact with soil, water, or other copper-containing substances.

❑ Some copper in the environment can be taken up by plants and animals.

❑ Higher exposure may occur if your water is corrosive and you have copper plumbing and brass water fixtures. ❑ You may be exposed to higher amounts of copper if you drink water or swim in lakes or reservoirs recently treated with copper to control algae or receive cooling water from a power plant that may have high amounts of dissolved copper.

❑ Using some garden products (e.g., fungicides) to control plant diseases.

❑ Living near bronze and brass production facilities may expose you to higher copper levels in soil.

❑ You may breathe copper-containing dust or have skin contact if you work in the industry of mining copper or

processing the ore. You may breathe high levels if you grind or weld copper metal.

How can copper affect my health?

Copper is essential for good health, but high amounts can be harmful. Long-term exposure to copper dust can irritate your nose, mouth, and eyes, and cause headaches, dizziness, nausea, and diarrhea.

Drinking water with higher than normal levels of copper may cause vomiting, diarrhea, stomach cramps, and nausea. Intentionally high intakes of copper can cause liver and kidney damage and even death.

How likely is copper to cause cancer?

We do not know whether copper can cause cancer in humans. The EPA has determined that copper is not classifiable as to carcinogenicity.

How can copper affect children?

Exposure to high levels of copper will result in the same type of effects in children and adults. Studies in animals suggest that the young children may have more severe effects than adults; we do not know if this would also be true in humans. There is a very small percentage of infants and children who are unusually sensitive to copper.

We do not know if copper can cause birth defects or other developmental effects in humans. Studies in animals suggest that ingestion of high levels of copper may cause a decrease in fetal growth.

How can families reduce the risk of exposure to copper?

❑ The greatest potential source of copper exposure is through drinking water, especially in water that is first drawn in the morning after sitting in copper pipes and brass faucets overnight.

❑ To reduce exposure, run the water for at least 15-30 seconds before using it.

❑ If you are exposed to copper at work, you may carry copper home on your skin, clothes, or tools. You can avoid this by showering, and changing clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

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

Copper is normally found in all tissues of the body, blood, urine, feces, hair, and nails. High levels of copper in these samples can show that you have been exposed to higher than normal levels of copper. Tests to measure copper levels in the body are not routinely available at the doctor's office because they require special equipment. These tests cannot tell the extent of exposure or whether you will experience harmful effects.

Has the federal government made recommendations to protect human health?

The EPA has determined that drinking water should not contain more than 1.3 milligrams of copper per liter of water (1.3 mg/L).

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.1 mg per cubic meter (0.1 mg/m^3) of copper fumes (vapor generated from heating copper) and 1 mg/m^3 of copper dusts (fine metallic copper particles) and mists (aerosol of soluble copper) in workroom air during an 8-hour work shift, 40-hour workweek.

The Food and Nutrition Board of the Institute of Medicine recommends dietary allowances (RDAs) of 340 micrograms (340 µg) of copper per day for children aged 1-3 years, 440 µg/day for children aged 4-8 years, 700 µg/day for children aged 9-13 years, 890 µg/day for children aged 14-18 years, and 900 µg/day for adults.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for Copper (Draft for Public Comment). 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

LEAD

CAS # 7439-92-1

Division of Toxicology and Environmental Medicine ToxFAQs™ **August 2007**

This fact sheet answers the most frequently asked health questions (FAQs) about lead. For more information, call the ATSDR 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 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 1,272 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is lead?

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 paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years. The use of lead as an additive to gasoline was banned in 1996 in the United States.

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.

How might I be exposed to lead?

- ❏ Eating food or drinking water that contains lead. Water pipes in some older homes may contain lead solder. Lead can leach out into the water.
- ❏ Spending time in areas where lead-based paints have been used and are deteriorating. Deteriorating lead paint can contribute to lead dust.
- ❏ Working in a job where lead is used or engaging in certain hobbies in which lead is used, such as making stained glass.
- ❏ Using health-care products or folk remedies that contain lead.

How can lead affect my health?

The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system. It may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anemia. Exposure to high lead levels can severely damage the brain and kidneys in adults or children and ultimately cause death. In pregnant women, high levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production.

How likely is lead to cause cancer?

We have no conclusive proof that lead causes cancer in humans. Kidney tumors have developed in rats and mice that had been given large doses of some kind of lead compounds. The Department of Health and Human Services

(DHHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens and the EPA has determined that lead is a probable human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

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. 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. Some of these effects may persist beyond childhood.

How can families reduce the risks of exposure to lead?

❏ Avoid exposure to sources of lead.

❏ Do not allow children to chew or mouth surfaces that may have been painted with lead-based paint.

❏ If you have a water lead problem, run or flush water that has been standing overnight before drinking or cooking with it.

❏ 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

❏ If your home contains lead-based paint or you live in an area contaminated with lead, 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 determine 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 recent exposure to lead. Blood tests are commonly used to screen children for lead poisoning. Lead in teeth or bones can be measured by X-ray techniques, but these methods are not widely available. Exposure to lead also can be evaluated by measuring erythrocyte protoporphyrin (EP) in blood samples. EP is a part of red blood cells known to increase when the amount of lead in the blood is high. However, the EP level is not sensitive enough to identify children with elevated blood lead levels below about 25 micrograms per deciliter (μg/dL). These tests usually require special analytical equipment that is not available in a doctor's office. However, your doctor can draw blood samples and send them to appropriate laboratories for analysis.

Has the federal government made recommendations to protect human health?

The Centers for Disease Control and Prevention (CDC) recommends that states test children at ages 1 and 2 years. Children should be tested at ages 3–6 years if they have never been tested for lead, if they receive services from public assistance programs for the poor such as Medicaid or the Supplemental Food Program for Women, Infants, and Children, if they live in a building or frequently visit a house built before 1950; if they visit a home (house or apartment) built before 1978 that has been recently remodeled; and/or if they have a brother, sister, or playmate who has had lead poisoning. CDC considers a blood lead level of 10 μg/dL to be a level of concern for children.

EPA limits lead in drinking water to 15 μg per liter.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for lead (Update). Atlanta, GA: U.S. Department of Public 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 Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, 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

MERCURY
CAS # 7439-97-6

This fact sheet answers the most frequently asked health questions (FAQs) about mercury. 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 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 sites identified by the Environmental Protection Agency.

What is mercury?

(Pronounced mŭr′kyə-rē)

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, 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 fuels.
- Release of mercury from dental work and medical treatments.
- Breathing contaminated workplace air or skin contact during use in the workplace (dental, health services, chemical, and other industries that use mercury).
- 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.

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. It can also can 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 be passed from the mother to 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 show 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, 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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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′ĭ-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.

ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html

- 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.

Vinyl Chloride - ToxFAQs™

CAS # 75-01-4

This fact sheet answers the most frequently asked health questions (FAQs) about vinyl chloride. 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 vinyl chloride occurs mainly in the workplace. Breathing high levels of vinyl chloride for short periods of time can cause dizziness, sleepiness, unconsciousness, and at extremely high levels can cause death. Breathing vinyl chloride for long periods of time can result in permanent liver damage, immune reactions, nerve damage, and liver cancer. This substance has been found in at least 616 of the 1,662 National Priority List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is vinyl chloride?

Vinyl chloride is a colorless gas. It burns easily and it is not stable at high temperatures. It has a mild, sweet odor. It is a manufactured substance that does not occur naturally. It can be formed when other substances such as trichloroethane, trichloroethylene, and tetrachloroethylene are broken down. Vinyl chloride is used to make polyvinyl chloride (PVC). PVC is used to make a variety of plastic products, including pipes, wire and cable coatings, and packaging materials.

Vinyl chloride is also known as chloroethene, chloroethylene, and ethylene monochloride.

What happens to vinyl chloride when it enters the environment?

- Liquid vinyl chloride evaporates easily. Vinyl chloride in water or soil evaporates rapidly if it is near the surface.
- Vinyl chloride in the air breaks down in a few days to other substances, some of which can be harmful.
- Small amounts of vinyl chloride can dissolve in water.
- Vinyl chloride is unlikely to build up in plants or animals that you might eat.

How might I be exposed to vinyl chloride?

- Breathing vinyl chloride that has been released from plastics industries, hazardous waste sites, and landfills.
- Breathing vinyl chloride in air or during contact with your skin or eyes in the workplace.
- Drinking water from contaminated wells.

How can vinyl chloride affect my health?

Breathing high levels of vinyl chloride can cause you to feel dizzy or sleepy. Breathing very high levels can cause you to pass out, and breathing extremely high levels can cause death.

Some people who have breathed vinyl chloride for several years have changes in the structure of their livers. People are more likely to develop these changes if they breathe high levels of vinyl chloride. Some people who work with vinyl chloride have nerve damage and develop immune reactions. The lowest levels that produce liver changes, nerve damage, and immune reaction in people are not known. Some workers exposed to very high levels of vinyl chloride have problems with the blood flow in their hands. Their fingers turn white and hurt when they go into the cold.

The effects of drinking high levels of vinyl chloride are unknown. If you spill vinyl chloride on your skin, it will cause numbness, redness, and blisters.

Animal studies have shown that long-term exposure to vinyl chloride can damage the sperm and testes.

Vinyl Chloride

CAS # 75-01-4

How likely is vinyl chloride to cause cancer?

The U.S. Department of Health and Human Services (DHHS) has determined that vinyl chloride is a known carcinogen. Studies in workers who have breathed vinyl chloride over many years showed an increased risk of liver, brain, lung cancer, and some cancers of the blood have also been observed in workers.

How can vinyl chloride affect children?

It has not been proven that vinyl chloride causes birth defects in humans, but studies in animals suggest that vinyl chloride might affect growth and development. Animal studies also suggest that infants and young children might be more susceptible than adults to vinyl chloride-induced cancer.

How can families reduce the risk of exposure to vinyl chloride?

Tobacco smoke contains low levels of vinyl chloride, so limiting your family's exposure to cigarette or cigar smoke may help reduce their exposure to vinyl chloride.

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

The results of several tests can sometimes show if you have been exposed to vinyl chloride. Vinyl chloride can be measured in your breath, but the test must be done shortly after exposure. This is not helpful for measuring very low levels of vinyl chloride.

The amount of the major breakdown product of vinyl chloride, thiodiglycolic acid, in the urine may give some information about exposure. However, this test must be done shortly after exposure and does not reliably indicate the level of exposure.

Has the federal government made recommendations to protect human health?

Vinyl chloride is regulated in drinking water, food, and air. The EPA requires that the amount of vinyl chloride in drinking water not exceed 0.002 milligrams per liter (mg/L) of water.

The Occupational Safety and Health Administration (OSHA) has set a limit of 1 part vinyl chloride per 1 million parts of air (1 ppm) in the workplace.

The Food and Drug Administration (FDA) regulates the vinyl chloride content of various plastics. These include plastics that carry liquids and plastics that contact food. The limits for vinyl chloride content vary depending on the nature of the plastic and its use.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2006. Toxicological Profile for Vinyl Chloride (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 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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1,1,1-TRICHLOROETHANE

CAS # 71-55-6

Division of Toxicology and Environmental Medicine ToxFAQs™ **July 2006**

This fact sheet answers the most frequently asked health questions (FAQs) about 1,1,1-trichloroethane. 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 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 1,1,1-trichloroethane usually occurs by breathing contaminated air. It is found in building materials, cleaning products, paints, and metal degreasing agents. You are not likely to be exposed to large enough amounts to cause adverse health effects. Inhaling high levels of 1,1,1-trichloroethane can cause you to become dizzy and lightheaded. Exposure to much higher levels can cause unconsciousness and other effects. This substance has been found in at least 823 of the 1,662 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is 1,1,1-trichloroethane?

1,1,1-Trichloroethane is a synthetic chemical that does not occur naturally in the environment. It also is known as methylchloroform, methyltrichloromethane, trichloromethylmethane, and α–trichloromethane. Its registered trade names are chloroethene NU® and Aerothene TT®.

No 1,1,1-trichloroethane is supposed to be manufactured for domestic use in the United States after January 1, 2002 because it affects the ozone layer. 1,1,1-Trichloroethane had many industrial and household uses, including use as a solvent to dissolve other substances, such as glues and paints; to remove oil or grease from manufactured metal parts; and as an ingredient of household products such as spot cleaners, glues, and aerosol sprays.

What happens to 1,1,1-trichloroethane when it enters the environment?

❑ Most of the 1,1,1-trichloroethane released into the environment enters the air, where it lasts for about 6 years.

❑ Once in the air, it can travel to the ozone layer where sunlight can break it down into chemicals that may reduce the ozone layer.

❑ Contaminated water from landfills and hazardous waste sites can contaminate surrounding soil and nearby surface water or groundwater.

❑ From lakes and rivers, most of the 1,1,1-trichloroethane evaporates quickly into the air.

❑ Water can carry 1,1,1-trichloroethane through the soil and into the groundwater where it can evaporate and pass through the soil as a gas, then be released to the air.

❑ Organisms living in soil or water may also break down 1,1,1-trichloroethane.

❑ It will not build up in plants or animals.

How might I be exposed to 1,1,1-trichloroethane?

❑ Breathing 1,1,1-trichloroethane in contaminated outdoor and indoor air. Because 1,1,1-trichloroethane was used so frequently in home and office products, you are likely to be exposed to higher levels indoors than outdoors or near hazardous waste sites. However, since 2002, 1,1,1-trichloroethane is not expected to be commonly used, and therefore, the likelihood of being exposed to it is remote.

❑ In the workplace, you could have been exposed to 1,1,1-trichloroethane while using some metal degreasing agents, paints, glues, and cleaning products.

❑ Ingesting contaminated drinking water and food.

How can 1,1,1-trichloroethane affect my health?

If you breathe air containing high levels of 1,1,1-trichloroethane for a short time, you may become dizzy and lightheaded and possibly lose your coordination. These effects rapidly disappear after you stop breathing contaminated air. If you breathe in much higher levels, you may become unconscious, your blood pressure may decrease, and your heart may stop beating. Whether breathing low levels of 1,1,1-trichloroethane for a long

time causes harmful effects is not known. Studies in animals show that breathing air that contains very high levels of 1,1,1-trichloroethane damages the breathing passages and causes mild effects in the liver, in addition to affecting the nervous system. There are no studies in humans that determine whether eating food or drinking water contaminated with 1,1,1-trichloroethane could harm health. Placing large amounts of 1,1,1-trichloroethane in the stomachs of animals has caused effects on the nervous system, mild liver damage, unconsciousness, and even death. If your skin contacts 1,1,1-trichloroethane, you might feel some irritation. Studies in animals suggest that repeated exposure of the skin might affect the liver and that very large amounts may cause death. These effects occurred only when evaporation was prevented.

How likely is 1,1,1-trichloroethane to cause cancer?

Available information does not indicate that 1,1,1-trichloroethane causes cancer. The International Agency for Research on Cancer (IARC) and the EPA have determined that 1,1,1-trichloroethane is not classifiable as to its carcinogenicity in humans.

How can 1,1,1-trichloroethane affect children?

Children exposed to large amounts of 1,1,1-trichloroethane probably would be affected in the same manner as adults. In animals, it has been shown that 1,1,1-trichloroethane can pass from the mother's blood into a fetus. When pregnant mice were exposed to high levels of 1,1,1-trichloroethane in air, their babies developed more slowly than normal and had some behavioral problems. However, whether similar effects occur in humans has not been demonstrated.

How can families reduce the risk of exposure to 1,1,1-trichloroethane?

Children can be exposed to 1,1,1-trichloroethane in household products, such as adhesives and cleaners. Parents should store household chemicals out of reach of young children to prevent accidental poisonings or skin irritation. Always store household chemicals in their original labeled containers. Never store household chemicals in containers that children would find attractive to eat or drink from, such as old soda bottles. Keep your Poison Control Center's number near the phone.

Sometimes older children sniff household chemicals in an attempt to get high. Your children may be exposed to 1,1,1-trichloroethane by inhaling products containing it. Talk with your children about the dangers of sniffing chemicals.

Is there a medical test to show whether I've been exposed to 1,1,1-trichloroethane?

Samples of your breath, blood, and urine can be tested to determine if you have recently been exposed to 1,1,1-trichloroethane. In some cases, these tests can estimate how much 1,1,1-trichloroethane has entered your body. To be of any value, samples of your breath or blood have to be taken within hours after exposure, and samples of urine have to be taken within 2 days after exposure. However, these tests will not tell you whether your health will be affected by exposure to 1,1,1-trichloroethane. The exposure tests are not routinely available in hospitals and clinics because they require special analytical equipment.

Has the federal government made recommendations to protect human health?

EPA regulates the levels of 1,1,1-trichloroethane that are allowable in drinking water. The highest level of 1,1,1-trichloroethane allowed in drinking water is 0.2 parts 1,1,1,-trichloroethane per 1 million parts of water (0.2 ppm).

The Occupational Safety and Health Administration (OSHA) has set a limit of 350 parts 1,1,1-trichloroethane per 1 million parts of air (350 ppm) in the workplace.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2006. Toxicological Profile for 1,1,1-Trichloroethane (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 and Environmental Medicine, 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.

1,1-Dichloroethane - ToxFAQs™

CAS # 75-34-3

This fact sheet answers the most frequently asked health questions (FAQs) about 1,1-dichloroethane. 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 1,1-dichloroethane occurs mainly from eating contaminated food, but may also occur from skin contact, breathing contaminated air, or drinking contaminated water. 1,1-Dichloroethane affects the function of the nervous system. 1,1-Dichloroethane has been found in at least 673 of the 1,699 National Priorities List sites identified by the Environmental Protection Agency (EPA)..

What is 1,1-dichloroethane?

1,1-Dichloroethane is a colorless, oily liquid with a sweet odor. It evaporates easily at room temperature and burns easily. It does not occur naturally in the environment.

1,1-Dichloroethane is used mostly as an intermediate in the manufacture of 1,1,1-trichloroethane (1,1,1-TCE). It is also used in limited amount as a solvent for cleaning and degreasing, and in the manufacture of plastic wrap, adhesives, and synthetic fiber.

What happens to 1,1-dichloroethane when they enter the environment?

- 1,1-Dichloroethane breaks down slowly in air and has the potential for long-range transport.
- 1,1-Dichloroethane does not dissolve easily in water.
- 1,1-Dichloroethane does not degrade rapidly in water. It can evaporate from the water into the air.
- 1,1-Dichloroethane does not bind strongly to soil particles, unless the organic content of the soil is high.
- Small amounts of 1,1-dichloroethane released to soil can evaporate into the air or move into ground water.
- 1,1-Dichloroethane is not expected to build up in the body tissues of animals.

How might I be exposed to 1,1-dichloroethane?

- Breathing air containing 1,1-dichloroethane from industrial releases or hazardous waste sites.
- Drinking contaminated water if you live near industrial facilities or hazardous waste sites.
- Touching contaminated soil, but little will enter the body due to 1,1-dichloroethane's high volatility.

How can 1,1-dichloroethane affect my health?

High levels of 1,1-dichloroethane that cause anesthesia can cause irregular heartbeats, which is why its use as a surgical anesthetic was discontinued.

Kidney effects have been observed in cats exposed to 1,1 dichloroethane in air for long periods. However, kidney effects have not been observed in other animal species following long-term inhalation or oral exposure.

How likely is 1,1-dichloroethane to cause cancer?

A study in rats and mice found suggestive evidence that 1,1-dichloroethane may cause cancer. However, the study had several flaws and the results are not conclusive. Another long-term study in mice drinking water containing 1,1-dichloroethane did not find cancer.

1,1-Dichloroethane

CAS # 75-34-3

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC) have not evaluated the carcinogenic potential of 1,1-dichloroethane. The EPA has determined that 1,1-dichloroethane is a possible human carcinogen.

How can 1,1-dichloroethane affect children?

There are no data that describe the effects of exposure to 1,1-dichloroethane on children or young animals. Although it is likely that children would show the same health effects as adults, we don't know whether children are more susceptible than are adults to 1,1-dichloro-ethane effects.

We do not know whether 1,1-dichloroethane can produce birth defects in humans. Minor skeletal problems were observed in the fetuses of rats breathing 1,1-dichloro-ethane; decreases in body weight were also observed in the mothers.

How can families reduce the risk of exposure to 1,1-dichloroethane?

- Prevent children from playing in soil contaminated with 1,1-dichloroethane, as it may occur near a hazardous waste site that contains this substance.
- If you use drinking well water and live near a hazardous site, it may be a good idea to have the water tested for 1,1-dichloroethane and other contaminants.
- If you use bottled water, you should contact the bottler with specific questions on potential contaminants. Bottled water may be less subject to 1,1-dichloroethane contamination than tap water.

Is there a medical test to show whether I've been exposed to 1,1-dichloro-ethane?

1,1-Dichloroethane and its breakdown products (metabolites) can be measured in blood and urine. But the detection of 1,1-dichoroethane or its metabolites cannot predict the kind of health effects that might develop from that exposure. Because 1,1-dichloroethane and its metabolites leave the body fairly rapidly, the tests need to be conducted within days after exposure. These tests are not available at most doctors' offices, but can be done at a special laboratory.

Has the federal government made recommendations to protect human health?

The EPA has included 1,1-dichloroethane as a priority contaminant in the drinking water program.

The Occupational Safety and Health Administration (OSHA) set a legal limit of 100 ppm 1,1-dichloroethane in workplace air averaged over an 8-hour workday.

The National Institute for Occupational Safety and Health (NIOSH) recommends a limit of 100 ppm 1,1-dichloro-ethane in workplace air averaged over a 10-hour work day.

References

This ToxFAQs™ information is taken from the 2015 Toxicological Profile for 1,1 Dichloroethane 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 and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636.

ToxFAQs™ on the web: www.atsdr.cdc.gov/toxFAQs

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.

1,4-Dioxane - ToxFAQs™

CAS # 123-91-1

This fact sheet answers the most frequently asked health questions (FAQs) about 1,4-dioxane. 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 1,4-dioxane occurs from breathing contaminated air, ingestion of contaminated food and drinking water, and dermal contact with products such as cosmetics that may contain small amounts of 1,4-dioxane. Exposure to high levels of 1,4-dioxane in the air can result in nasal cavity, liver, and kidney damage. Ingestion or dermal contact with high levels of 1,4-dioxane can result in liver and kidney damage. 1,4-Dioxane has been found in at least 31 of 1,689 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is 1,4-dioxane?

1,4-Dioxane is a clear liquid that easily dissolves in water. It is used primarily as a solvent in the manufacture of chemicals and as a laboratory reagent. 1,4-Dioxane is a trace contaminant of some chemicals used in cosmetics, detergents, and shampoos. However, manufacturers now reduce 1,4-dioxane from these chemicals to low levels before these chemicals are made into products used in the home.

What happens to 1,4-dioxane when it enters the environment?

- 1,4-Dioxane can be released into the air, water, and soil at places where it is produced or used as a solvent.
- In air, 1,4-dioxane rapidly breaks down into different compounds.
- In water, 1,4-dioxane is stable and does not break down.
- In soil, 1,4-dioxane does not stick to soil particles, so it can move from soil into groundwater.
- Fish and plants will not accumulate 1,4-dioxane in their tissues.

How might I be exposed to 1,4-dioxane?

- Breathing air, drinking water, or eating foods that contain 1,4-dioxane. During showering, bathing, or laundering, 1,4-dioxane in tap water may volatilize and you can be exposed to 1,4-dioxane vapors.
- Your skin may contact 1,4-dioxane when you use cosmetics, detergents, bubble baths, and shampoos containing 1,4-dioxane.

How can 1,4-dioxane affect my health?

Few studies are available that provide information about the effects of 1,4-dioxane in humans. Exposure to very high levels of 1,4-dioxane can result in liver and kidney damage and death. Eye and nose irritation was reported by people inhaling low levels of 1,4-dioxane vapors for short periods (minutes to hours).

Studies in animals have shown that breathing vapors of 1,4-dioxane affects mainly the nasal cavity, liver, and kidneys. Ingesting 1,4-dioxane or having skin contact with 1,4-dioxane also affects the liver and kidneys.

How likely is 1,4-dioxane to cause cancer?

The limited number of studies available does not show whether 1,4-dioxane causes cancer in humans. Laboratory rats that breathed vapors of 1,4-dioxane during most of their lives developed cancer inside the nose and abdominal cavity. Laboratory rats and mice that drank water containing 1,4-dioxane during most of their lives developed liver cancer; the rats also developed cancer inside the nose. Scientists are debating the degree to which the findings in rats and mice apply to exposure situations commonly encountered by people.

The (DHHS) U.S. Department of Health and Human Services considers 1,4-dioxane as reasonably anticipated to be a human carcinogen.

1,4-Dioxane

CAS # 123-91-1

How can 1,4-dioxane affect children?

There are no studies of children exposed to 1,4-dioxane. However, children might experience health problems similar to those in adults if they were exposed to high concentrations of 1,4-dioxane.

Scientists do not know whether exposure of pregnant women to 1,4-dioxane can harm the unborn child.

How can families reduce the risk of exposure to 1,4-dioxane?

1,4-Dioxane may be a contaminant in cosmetics, detergents, bath products, shampoos, and some pharmaceuticals. 1,4-Dioxane is not intentionally added, but may occur as an unintentional byproduct in some ingredients that may be listed on the product label, including: PEG, polyethylene, polyethylene glycol, polyethoxyethylene,-eth or -oxynol . Many products on the market today (foods, pharmaceuticals, cosmetic products, detergents, etc.) contain 1,4-dioxane in very small amounts. However, some cosmetics, detergents, and shampoos may contain 1,4-dioxane at levels higher than recommended by the FDA for other products. Families wishing to avoid cosmetics containing the ingredients listed above may do so by reviewing the ingredient statement that is required to appear on the outer container label of cosmetics offered for retail sale.

1,4-Dioxane has been detected in some drinking water supplies. Bottled water may be less likely to be contaminated with 1,4-dioxane, and consumers should contact the bottler with specific questions on potential contaminants.

Is there a medical test to determine whether I've been exposed to 1,4-dioxane?

1,4-Dioxane and its breakdown products can be measured in your blood and urine, and positive results indicate you have been exposed to 1,4-dioxane. These tests do not predict whether exposure to 1,4-dioxane will produce harmful health effects. The tests are not routinely available at your doctor's office because they require special equipment, but the doctor can collect the samples and send them to a special laboratory. The tests need to be conducted within days after the exposure because 1,4-dioxane and its breakdown products leave the body fairly rapidly.

Has the federal government made recommendations to protect human health?

EPA has determined that exposure to 1,4-dioxane in drinking water at concentrations of 4 milligrams per liter (4 mg/L) for one day or 0.4 mg/L for 10 days is not expected to cause any adverse effects in children.

The Occupational Safety and Health Administration (OSHA) has set a limit for of 100 parts 1,4-dioxane per 1 million parts of air (100 ppm) in the workplace.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2012. Toxicological Profile for 1,4-Dioxane. 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.

APPENDIX B

COLD STRESS PROGRAM

1.0 PURPOSE & INTRODUCTION

The purpose of this document is to educate the employee about exposure to cold environments and the effects of hypothermia and other cold-related injuries. Through proper use of personal protective equipment (PPE); engineering and administrative controls; and education, cold injury, both to the extremities and the body's core temperature, can be prevented.

2.0 SCOPE

The program described herein is intended for use by employees engaged in work with the potential for exposure to cold environments. Training will be provided annually to all those potentially affected prior to the start of field work potentially involving cold exposure.

3.0 WORKING IN COLD ENVIRONMENTS

3.1 Metabolic Responses

The human body is designed to function best at a rectal temperature of 99-100 ºF. The body maintains this temperature in two ways: by gaining heat from food and muscular work; or, by losing it through radiation and sweating. By constricting blood vessels of the skin and/or shivering, the body uses its first line of cold defense.

Temperature control of the body is better understood by dividing the body into two main parts: the shell; and the core. The shell is comprised of the skin, capillaries, nerves, muscles and fat. Other internal organs such as the heart, lungs, brain and kidneys make up the core.

During exposure to cold, the skin is first affected. Blood in the peripheral capillaries is cooled, sending a signal to a portion of the brain called the hypothalamus. Regulating body temperature is one of the many basic body functions of the hypothalamus. Acting like a thermostat, adjustments are performed to maintain normal body temperatures. When a chill signal is received, two processes are begun by the hypothalamus: conserve heat already in the body and generate new heat.

Heat conservation is performed through constriction of the blood vessels in the skin (shell), thus reducing heat loss from the shell and acting as an insulator for the core. Sweat glands are also inhibited, thus preventing heat loss by evaporation.

Additional fuel for the body is provided in the form of glucose. Glucose causes the heart to beat faster, sending oxygen and glucose-rich blood to the tissue where needed. In an attempt to produce heat, the muscles rapidly contract. This process is better known as "shivering", and generates heat similarly to that created by strenuous activity, raising the body's metabolic rate.

During physical activity and fatigue, the body is more prone to heat loss. As exhaustion approaches, blood vessels can suddenly enlarge, resulting in rapid loss of heat. Exposure to extreme cold causes nerve pulses to be slowed, resulting in fumbling, sluggish and clumsy reactions.

4.0 COLD INJURIES

Cold injuries are classified into two categories: local and general. Local injuries include frostbite, frostnip, chilblain, and trenchfoot. General injuries include hypothermia and blood vessel abnormalities (genetically or chemically induced). Factors contributing to cold injury include: exposure to humidity and high winds; contact with wetness or metal; inadequate clothing; age; and general health. Allergies, vascular disease, excessive smoking and/or drinking, and certain drugs and medicines are physical conditions that can compound the effects of exposure to a cold environment.

4.1 Hypothermia

Hypothermia is a condition of reduced body temperature. Most cases develop in air temperatures between 30-50 °F, not taking wind-chill factor in consideration.

Symptoms of hypothermia are uncontrolled shivering and the sensation of cold. The heartbeat slows and sometimes becomes irregular, weakening the pulse and changing blood pressure. Changes in the body chemistry cause severe shaking or rigid muscles; vague or slow slurred speech; memory lapses; incoherence; and drowsiness. Cool skin, slow irregular breathing, low blood pressure, apparent exhaustion, and fatigue after rest can be seen before complete collapse.

As the core temperature drops, the victim can become listless, confused, and make little or no effort to keep warm. Pain in the extremities can be the first warning of dangerous exposure to cold. Severe shivering must be taken as a sign of danger. At a core body temperature of about 85 °F, serious problems develop due to significant drops in blood pressure, pulse rate, and respiration. In some cases, the victim may die.

Sedative drugs and alcohol increase the risk of hypothermia. Sedative drugs interfere with the transmission of impulses to the brain. Alcohol dilates blood vessels near the skin's surface, increasing heat loss and lowering body temperature.

Table B1 provides information on the onset of hypothermia and metabolic responses at different body temperatures.

4.2 Raynaud's Phenomenon

Raynaud's Phenomenon is the abnormal constriction of the blood vessels of the fingers on exposure to cold temperatures, resulting in blanching of the ends of the fingers. Numbness, itching, tingling, or a burning sensation may occur during related attacks. The disease is also associated with the use of vibrating hand tools in a condition sometimes called White Finger Disease. Persistent cold sensitivity, ulceration, and amputations can occur in severe cases.

4.3 Acrocyanosis

Acrocyanosis is caused by exposure to the cold and reduces the level of hemoglobin in the blood, resulting in a slightly blue, purple or gray coloring of the hands and/or feet.

4.4 Thromboangitis Obliterans

Thromboangitis obliterans is clotting of the arteries due to inflammation and fibrosis of connective tissue surrounding medium-sized arteries and veins. This is one of the many disabling diseases that can also result from tobacco use. Gangrene of the affected limb often requires amputation.

4.5 Frostbite

Frostbite is the freezing of the body tissues due to exposure to extremely low temperatures, resulting in damage to and loss of tissue. Frostbite occurs because of inadequate circulation and/or insulation, resulting in freezing of fluids around the cells of the body tissues. Most vulnerable parts of the body are the nose, cheeks, ears, fingers, and toes.

Frostbite can affect outer layers of skin or can include the tissues beneath. Damage can be serious, with permanent loss of movement in the affected parts, scarring, necrotic tissue, and amputation are all possibilities. Skin and nails that slough off can grow back.

The freezing point of the skin is about 30 °F. As wind velocity increases, heat loss is greater and frostbite will set in more rapidly.

There are three degrees of frostbite: first degree, freezing without blistering and peeling; second degree, freezing with blistering and peeling; and third degree, freezing with death of skin tissues and possibly the deeper tissues.

The following are symptoms of frostbite:

1. Skin changes color to white or grayish-yellow, progresses to reddish-violet, and finally turns black as the tissue dies;
2. Pain may be felt at first, but subsides;
3. Blisters may appear; and
4. Affected part is cold and numb.

The first symptom of frostbite is usually an uncomfortable sensation of coldness followed by numbness. Tingling, stinging, cramping, and aching feelings will be experienced by the victim. Frostbite of the outer layer of the skin has a waxy or whitish look and is firm to the touch. Cases of deep frostbite cause severe injury. The tissues are cold, pale and solid. The victim is often unaware of the frostbite until someone else observes these symptoms. It is therefore important to use the "buddy system" when working in cold environments, so that any symptoms of overexposure can be noted.

Table B2 describes the cooling power of wind on exposed flesh. This information can be used as a guide for determining equivalent chill temperatures when the wind is present in cold environments.

4.6 Trench Foot and Chilblains

Trench foot is swelling of the foot caused by long, continuous exposure to cold without freezing, combined with persistent dampness or immersion in water. Edema (swelling), tingling, itching and severe pain occurs, followed by blistering, necrotic tissue and ulcerations. Chilblains have similar symptoms as trench foot, except that other areas of the body are affected.

4.7 Frostnip

Frostnip occurs when the face or extremities are exposed to a cold wind, causing the skin to turn white.

5.0 PREVENTION OF COLD STRESS

Cold stress can be prevented through a combination of various factors: acclimation; water and salt displacement; medical screening; proper clothing selection; and training and education. Through the use of engineering controls, work practices, work/rest schedules, environmental monitoring and consideration of the wind-chill temperature, the employee can be protected.

5.1 Acclimation

Acclimation can be achieved to some degree. Sufficient exposure to cold causes the body to undergo changes to increase comfort and reduce the risk of injury. However, these changes are minor and require repeated exposure to cold and uncomfortable temperatures to induce them.

5.2 Dehydration

The dryness of cold air causes the body to lose a significant amount of water through the skin and lungs. It is essential that caffeine-free, non-alcoholic beverages be available at the worksite for fluid replacement. Dehydration also increases the risk of injury due to cold and affects blood flow to the extremities.

5.3 Diet

A well-balanced diet is important for employees working in cold environments. Diets restricted only to certain foods may not provide the necessary elements for the body to withstand cold stress, leaving the worker vulnerable.

5.4 Control Measures

When the wind chill factor results in an equivalent temperature of -26 °F, continuous exposure of the skin will not be permitted. Any worker exposed to temperatures of 36 °F or less who becomes immersed in water will be given dry clothing immediately and treated for hypothermia at the local hospital if any symptoms of hyperthermia are present. Notification of this incident will be provided to the Health and Safety Division immediately after sending the worker to the hospital.

5.5 Environmental Controls

The following are some ways that environmental controls can be used to reduce the effects of a cold environment:

1. General or spot heating should be used to increase temperature in certain areas in the workplace;
2. Warm air jets, radiant heaters or contact warm plates can be used to warm the worker's hands if fine work is to be performed with bare hands for 10 to 20 minutes or more;
3. Shield the work area if air velocity at the work Site is increased by wind, draft, or ventilating equipment;
4. Metal handles of tools and control bars should be covered with thermal insulating material at temperatures below 30 °F;
5. Unprotected metal chair seats will not be used in cold environments;
6. When appropriate and feasible, equipment and processes will be substituted, isolated, relocated, or redesigned;
7. Power tools, hoists, cranes, or lifting aids will be used to reduce the metabolic workload;

8. Heated warming shelters will be made available for continuous work being performed in an equivalent temperature of 20 °F or below and workers will be encouraged to use the shelters regularly; and
9. Administrative work practice controls.

Work practices and guidelines can be designed and developed to reduce exposure to cold stress. Some of these may include:

1. Work-rest schedules to reduce the peak of cold stress;
2. Enforce scheduled breaks;
3. Enforce intake of caffeine-free, non-alcoholic beverages;
4. Schedule work that has potential exposure to cold stress for the warmest part of the day;
5. Move work to warmer areas, whenever possible;
6. Assign extra workers for high-demand tasks;
7. Provide relief workers for other workers needing breaks;
8. Teach basic principles of recognizing and preventing cold stress;
9. Use the buddy system for work at 10 °F or below, and keep within eyeshot;
10. Allow new employees to adjust to the conditions before they work full-time in cold environments;
11. Minimize sitting and standing in one place for long periods of time; and
12. Include weight and bulkiness of clothing when estimating work performance requirements and weights to be lifted;

Table B3 provides a work/warm-up schedule for cold environments, with wind chill taken into account.

5.6 Special Considerations

Older workers and workers with circulatory problems should be extra careful in cold environments. Sufficient sleep and good nutrition are important preventive measures for maintenance tolerance to the cold. Double shifts and overtime work should be avoided when working in cold environments.

If any of the following symptoms are observed on-site, the affected worker will immediately go to warm shelter:

- Onset of heavy shivering;
- Frostnip;
- Feeling of excessive fatigue;
- Drowsiness; and
- Euphoria.

After entering the warm shelter, the outer layer of clothing should be removed. If the clothing is wet from sweat and perspiration, dry clothing should be provided. If this is not feasible, then the clothing should be loosened to allow sweat to evaporate.

Anyone working in cold environments and on prescribed medication should consult their physician concerning any possible side effects due to cold stress. Those individuals suffering from diseases and/or taking medication that interferes with normal body temperature regulation or reduces the tolerance to cold will not be allowed to work in temperatures of 30 °F or below.

6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

In choosing PPE for cold environments, it is important to maintain airspace between the body and outer layer of clothing to retain body heat. The more air pockets, the better the insulation. The clothing should also allow for the evaporation of sweat if the skin is wet.

The most important parts of the body to protect are the feet, hands, head and face. Hands and feet become cooled most easily, because of their distance from the heart. Keeping the head covered is equally important. As much as 40% of body heat loss is through the head when it is exposed.

Ideal clothing for exposure to cold environments is made of wool, polypropylene, or other wicking fabrics. Loosely fitted clothing also aids in sweat evaporation. Recommended clothing may include the following:

1. Polypropylene under shirt and shorts under thermal underwear (preferably two-piece);
2. Wool socks;
3. Wool or thermal pants, lapped over boot tops to keep out snow and water;
4. Suspenders (belts can constrict and reduce circulation);
5. Insulated work boots, preferably waterproof. Safety toe, if necessary;
6. Wool or cotton shirt;
7. Parka;
8. Knit cap/hard hat liner;
9. Wool mittens or gloves (depending on the dexterity required); and
10. Face mask or scarf.

Dirty or greasy clothing loses much of its insulation value. Dirty clothing crushes air pockets, allowing air to escape more easily. Also, denim is not a good protective fabric. It is loosely woven and allows water to penetrate and wind to blow away body heat.

Table B1
Progressive Clinical Presentation of Hypothermia

Core Temperature		Clinical Signs
°C	°F	
37.6	99.6	"Normal" Rectal Temperature
37	98.6	"Normal" Oral Temperature
36	96.8	Metabolic rate increases in an attempt to compensate for heat loss.
35	95.0	Maximum shivering.
34	93.2	Victim conscious and responsive, with normal blood pressure.
33	91.4	Severe hypothermia below this temperature.
32	89.6	Consciousness clouded, blood pressure becomes difficult to obtain, Pupils dilated but react to light, shivering ceases.
31	87.8	
30	86.0	Progressive loss of consciousness, muscular rigidity increases, Pulse and blood pressure difficult to obtain, respiratory rate decreases
29	84.2	
28	82.4	Ventricular fibrillation possible with myocardial irritability.

Table B1
Progressive Clinical Presentation of Hypothermia

Core Temperature		Clinical Signs
°C	°F	
27	80.6	Voluntary motion ceases, pupils non-reactive to light, deep tendon and superficial reflexes absent.
26	78.8	
25	77.0	Ventricular fibrillation may occur spontaneously.
24	75.2	Pulmonary edema.
22	71.6	Maximum risk of ventricular fibrillation.
20	68.0	Cardiac standstill.
18	64.4	Lowest accidental hypothermia victim to recover.
17	62.6	Isoelectric electroencephalogram.
9	48.2	Lowest artificially cooled hypothermia patient to recover.
Presentations approximately related to core temperature. Reprinted from the January 1982 issue of American Family Physician, published by the American Academy of Family Physicians.		

Table B2

Cooling Power of Wind on Exposed Flesh as Equivalent Temperature

Estimated Wind Speed (mph)	Actual Temperature Reading (Degrees Fahrenheit)											
	50	**40**	**30**	**20**	**10**	**0**	**-10**	**-20**	**-30**	**-40**	**-50**	**-60**
	Equivalent Chill Temperature (°F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140

Table B2

Cooling Power of Wind on Exposed Flesh as Equivalent Temperature

Estimated Wind Speed (mph)	Actual Temperature Reading (Degrees Fahrenheit)											
	50	**40**	**30**	**20**	**10**	**0**	**-10**	**-20**	**-30**	**-40**	**-50**	**-60**
	Equivalent Chill Temperature (°F)											
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.			GREAT DANGER Flesh may freeze within 30 seconds.				

Developed by the U.S. Army Research Institute of Environmental Medicine, Natick, MA.

Wind speeds greater than 40 mph have little additional effect.

Trenchfoot and immersion foot may occur at any point.

Table B3
Threshold Limit Values Work/Warm-up Schedule for 4-Hour Shift

Air Temp. Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
˚C (approx)	**˚F (approx)**	**Max. Work Period**	**No. of Breaks**	**Max. Work Period**	**No. of Breaks**	**Max. Work Period**	**No. of Breaks**	**Max. Work Period**	**No. of Breaks**	**Max. Work Period**	**No. of Breaks**
-26˚ to -28˚	-15˚ to -19˚	(Norm. Breaks)	1	(Norm.Breaks)	1	75 min.	2	55 min.	3	40 min.	4
-29˚ to -	-20˚ to -	(Norm. Breaks)	1	75 min	2	55 min.	3	40 min.	4	30 min.	5

Table B3
Threshold Limit Values Work/Warm-up Schedule for 4-Hour Shift

Air Temp. Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
˚C (approx)	˚F (approx)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
31˚	24˚										
-32˚ to -34˚	-25˚ to -29˚	75 min	2	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease	
-35˚ to -37˚	-30˚ to -34˚	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease			
-38˚ to -39˚	-35˚ to -39˚	40 min.	4	30 min.	5	Non-emergency work should cease					
-40˚ to -42˚	-40˚ to -44˚	30 min.	5	Non-emergency work should cease							
-43˚ & below	-45˚ & below	Non-emergency work should cease									

Notes:

Schedule applies to moderate to heavy work activity with warm-up breaks of 10 minutes in a warm location. For light to moderate work (limited physical motion), apply the schedule one step lower. For example, at -30 °F with no noticeable wind (step 4, a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4 hour period.

The following is suggested as a guide for estimating wind velocity if accurate information is not available: 5 mph, light flag moves; 10 mph, light flag fully extended; 15 mph, raises newspaper sheet; 20 mph, blowing drifting snow.

If only the wind chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be: 1) special warm-up breaks should be initiated at a wind-chill cooling rate of about 17 watts per square meter (W/m^2); 2) all non-emergency work should have ceased at or before a wind-chill of 2250 W/m^2. In general the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart over-compensates for the actual temperatures in the colder ranges, since windy conditions prevail at extremely low temperatures.

Threshold limit values (TLVs) apply only for workers in dry clothing.

Adapted from Occupational Health and Safety Division, Saskatchewan Department of Labor.

APPENDIX C
HEAT STRESS PROGRAM

1.0 INTRODUCTION

Heat stress is one of the most common (and potentially serious) illnesses at job sites. Although it is caused by a number of interacting factors, donning the proper personal protective equipment (PPE) puts the worker at a much higher risk during warmer environmental conditions. The results of heat stress range from fatigue to serious illness or death. Through regular fluid replacement and other preventive measures, heat stress can be controlled, leading to increased efficiency and a higher level of safety on the job.

2.0 PURPOSE

The purpose of this document is to create an awareness among employees concerning the body's physiologic responses to heat, different types of heat stress that can affect the body, recognition of signs and symptoms, first aid treatment, and preventive measures.

3.0 SOURCES OF HEAT

There are two sources of heat that are important to anyone working in a hot environment:

- Internally generated metabolic heat
- Externally imposed environmental heat

4.0 PHYSIOLOGIC RESPONSES TO HEAT

The human body maintains a fairly constant internal temperature, even though it is exposed to varying environmental temperatures. To keep internal body temperatures within safe limits, the body must get rid of its excess heat, primarily through varying the rate and amount of blood circulation through the skin and the release of fluid onto the skin by the sweat glands. These automatic responses usually occur when the temperature of the blood exceeds 98.6 °F and are kept in balance and controlled by the brain. In this process of lowering internal body temperature, the heart begins to pump more blood, blood vessels expand to accommodate the increased flow, and the microscopic blood vessels (capillaries) which thread through the upper layers of the skin begin to fill with blood. The blood circulates closer to the surface of the skin, and the excess heat is lost to the cooler environment.

If the heat loss from increased blood circulation through the skin is not adequate, the brain continues to sense overheating and signals the sweat glands in the skin to release large quantities of sweat onto the skin surface. Evaporation of sweat cools the skin, eliminating large quantities of heat from the body.

As environmental temperatures approach normal skin temperature, cooling of the body becomes more difficult. If air temperature is as warm as or warmer than the skin, blood brought to the body surface cannot lose its heat. Under these conditions, the heart continues to pump blood to the body surface, the sweat gland pour liquids containing electrolytes onto the surface of the skin, and the evaporation of the sweat becomes the principal effective means of maintaining a constant body temperature. Sweating does not cool the body unless the moisture is removed from the skin by evaporation. In high humidity, the evaporation of sweat from the skin is decreased and the body's efforts to maintain an acceptable body temperature may be significantly impaired. These conditions adversely affect an individual's ability to work in the hot environment. With so much blood going to the external surface of the body, relatively less goes to the active muscles, the brain, and other internal organs; strength declines; and fatigue occurs

sooner than it would otherwise. Alertness and mental capacity also may be affected. Workers who must perform delicate or detailed work may find their accuracy suffering, and others may find their comprehension and retention of information lowered.

When temperature differences exist between two or more bodies, heat can be transferred. Net heat transfer is always from the body (or object) of higher temperature to that of lower temperature and occurs by one or more of the following mechanisms:

- Conduction. The transfer of heat from one point to another within the body, or from one body to another when both bodies are in physical contact. Conduction can be a localized source of discomfort from direct physical contact with a hot or cold surface, it is normally not a significant factor to total heat stress.
- Convection. The transfer of heat from one place to another by moving gas or liquid. Natural convection results from differences in density caused by temperature differences. Thus warm air is less dense than cool air.
- Radiation. The process by which energy, electromagnetic (visible and infrared), is transmitted through space without the presence or movement of matter in or through this space.

5.0 PREDISPOSING FACTORS TO HEAT STRESS

Factors that may predispose an individual to heat stress vary according to the individual. These factors include:

- Lack of physical fitness;
- Lack of acclimatization;
- Age;
- Dehydration;
- Obesity;
- Drug/alcohol abuse;
- Infection;
- Sunburn;
- Diarrhea; and
- Chronic disease.

Predisposing factors and an increased risk of excessive heat stress are both directly influenced by the type and amount of PPE worn. PPE adds weight and bulk, reduces the body's access to normal heat exchange mechanisms (evaporation, convection and radiation) and increases energy expenditure.

6.0 FORMS OF HEAT STRESS AND FIRST AID

The following excerpts were taken from NIOSH Publication No. 86-112, Working in Hot Environments:

"Excessive exposure to a hot work environment can bring about a variety of heat-induced disorders. Among the most common are heat stroke, heat exhaustion, heat cramps, fainting and heat rash.

6.1 Heat Stroke

Heat Stroke is the most serious of health problems associated with working in hot environments. It occurs when the body's temperature regulatory system fails and sweating becomes inadequate.

The body's only effective means of removing excess heat is compromised with little warning to the victim that a crisis stage has been reached.

A heat stroke victim's skin is hot, usually dry, red or spotted. Body temperature is usually 105 °F or higher, and the victim is mentally confused, delirious perhaps in convulsions, or unconscious. Unless the victim receives quick and appropriate treatment, death can occur.

Individuals with signs or symptoms of heat stroke require immediate hospitalization. First aid should be immediately administered. This includes removing the victim to a cool area, thoroughly soaking the clothing with water, and vigorously fanning the body to increase cooling. Further treatment, at a medical facility, should be directed to the continuation of the cooling process and the monitoring of complications that often accompany heat stroke. Early recognition and treatment are the only means of preventing permanent brain damage or death.

6.2 Heat Exhaustion

Heat exhaustion includes several clinical disorders having symptoms that may resemble the early symptoms of heat stroke. Heat exhaustion is caused by the loss of large amounts of fluid by sweating, sometimes with excessive loss of salt. A worker suffering from heat exhaustion still sweats but experiences weakness or fatigue, giddiness, nausea or headache. In more serious cases, the victim may vomit or lose consciousness. The skin is clammy and moist, the complexion is pale or flushed, and the body temperature is normal or only slightly elevated.

In most cases, treatment involves having the victim rest in a cool place and drink plenty of liquids. Victims with mild cases of heat exhaustion usually recover spontaneously with this treatment. Those with severe cases may require extended care for several days. There are no known permanent effects.

6.3 Heat Cramps

Heat cramps are painful spasms of the muscles that occur among those who sweat profusely in heat, drink large quantities of water, but do not adequately replace the body's salt loss. The drinking of large amounts of water tends to dilute the body's fluids, while the body continues to lose salt. Shortly after, the low salt level in the muscles causes painful cramps. The affected muscles may be part of the arms, legs, or abdomen; but tired muscles (those used in performing the work) are usually the ones most susceptible to cramps. Cramps may occur during or after work hours and may be relieved by taking salted liquids by mouth.

6.4 Fainting

Fainting occurs in workers not accustomed to hot environments and who stand erect and immobile in the heat.

With enlarged blood vessels in the skin and in the lower part of the body due to the body's attempts to control internal temperature, blood may pool there rather than return to the heart to be pumped to the brain. Upon lying down, the worker should soon recover. By moving around, and thereby preventing blood from pooling, the patient can prevent further fainting.

6.5 Heat Rash (Prickly Heat)

Heat rash, also known as prickly heat, is likely to occur in hot, humid environments where sweat is not as easily removed from the surface of the skin by evaporation and the skin remains wet most of the time. The sweat ducts become plugged, and a skin rash soon appears. When the rash

is extensive or when it is complicated by infection, prickly heat can be very uncomfortable and may reduce a worker's performance. The worker can prevent this condition by resting in a cool place part of each day and by regularly bathing and drying the skin."

7.0 SELECTION OF PERSONAL PROTECTIVE EQUIPMENT (PPE)

During work periods where the increased risk of heat stress exists, each item's benefit will be carefully evaluated. Once the PPE is chosen, safe work durations/rest periods will be determined based on the following conditions:

- Anticipated work rate;
- Ambient temperature and humidity; and
- Level of protection.

8.0 PREVENTION OF HEAT STRESS

Prevention of heat stress will be addressed in the following manner:

- Adjustment of work schedules.
- Modify work/rest schedules.
    1. Enforce work slowdowns, as needed.
    2. Rotate personnel to minimize overstress or overexertion.
    3. When possible, work will be scheduled and performed during cooler hours.
- Provide shelter or shaded areas to protect personnel during rest periods.
- Maintain worker's body fluids at normal levels.
    1. Drink approximately 12 to 16 ounces of non-caffeinated liquid (preferably water, Gatorade or equivalent) prior to the start of work. Caffeinated fluids act to dehydrate the worker.
    2. Workers will be urged to drink a cup or two every 15 to 20 minutes, or at each break. A total of 1 to 1.5 gallons of water per individual per day are recommended for fluid replacement under heat stress conditions, but more may be required.
- Encourage physical fitness among the workers.
- Gradually acclimatize workers on Site to help build up an "immunity" to the conditions.
    1. Heat acclimatization can usually be induced in 5 to 7 days of exposure at a hot job. For workers with previous experience with the job, acclimatization will include exposures of 50% for day 1, 60% for day 2, 80% for day 3, and 100% for the remaining additional days.
- Provide cooling devices during prolonged work or severe heat exposure.
    1. Supply field showers or hose down areas.
    2. Supply personnel with cooling jackets, vests, and suits.
- Train workers in recognition and treatment of heat stress.
- Use of the buddy system that depends on the recognition of signs and symptoms of heat stress.
- Identification of heat-intolerant individuals through medical screening.

APPENDIX D
INCIDENT REPORT FORM

Incident Report Form

Supervisor's Name: _____

Basic Rules for Accident Investigation

- Find the cause to prevent future accidents - Use an unbiased approach during investigation.
- Interview witnesses & injured employees at the scene - conduct a walkthrough of the accident.
- Conduct interviews in private - Interview one witness at a time.
- Get signed statements from all involved.
- Take photos or make a sketch of the accident scene.
- What hazards are present - what unsafe acts contributed to accident?
- Ensure hazardous conditions are corrected immediately.

Date & Time		**Location**	
Task Performed		**Witnesses**	
Resulted In	___ **Injury** ___ **Fatality** ___ **Property Damage**	**Property Damage**	
Injured		**Injured**	
Describe Accident Facts & Events			

Supervisors Root Cause Analysis (Check ALL that apply to the accident)			
Unsafe Act		**Unsafe Conditions**	
Improper work technique		Poor workstation design	
Safety rule violation		Unsafe operation method	
Improper PPE or PPE not used		Improper maintenance	
Operating without authority		Lack of direct supervision	
Failure to warn or secure		Insufficient training	
Operating at improper speeds		Lack of experience	
By-passing Safety device		Insufficient knowledge of job	

Protective equipment not in use		Slippery conditions	
Improper loading or placement		Excessive noise	
Improper lifting		Inadequate guarding of hazards	
Servicing Machinery in motion		Defective tools/equipment	
Horseplay		Poor housekeeping	
Drug or alcohol use		Insufficient lighting	

Unsafe Acts require a written warning and re-training before the employee resumes work.

Date		**Date**	
Retraining Assigned		**Unsafe Condition Guarded**	
Retraining Completed		**Unsafe Condition Corrected**	
Supervisor Signature		**Supervisor Signature**	

NEW 470 PROJECT

12 ECKFORD STREET

BROOKLYN, KINGS COUNTY, NEW YORK

Community Air Monitoring Plan

AKRF Project Number: 12306
NYSDEC Site Number: C224242

Prepared for:

New York State Department of Environmental Conservation
Remedial Bureau B
625 Broadway
Albany, New York 12233

On Behalf Of:

New 470 LLC
100 Comac Street
Ronkonkoma, New York 11779

Prepared by:

AKRF, Inc.
440 Park Avenue South, 7th Floor
New York, New York 10016
(212) 696-0670

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1.0 INTRODUCTION

This Community Air Monitoring Plan (CAMP) provides details for the work zone perimeter air monitoring during the implementation of field activities that may be conducted at the New 470 Project site, hereinafter referred to as the Site. The Site is located at 12 Eckford Street in Brooklyn, New York and is identified on the New York City Tax Map as Brooklyn Borough Block 2714, Lot 33. The 0.5123-acre Site is currently enrolled in the New York State (NYS) Brownfield Cleanup Program (BCP) (Site No. C224242), which is administered by New York State Department of Environmental Conservation (NYSDEC). The Site was investigated and remediated as a Track 4 cleanup in accordance with Brownfield Cleanup Agreement (BCA) Index No. C224242-10-16, which was executed on December 1, 2016. A BCA Amendment Application was submitted to NYSDEC in July 2019 to document the changes to the BCA, including: (1) the alteration of the northern Site boundary, which resulted in an acreage increase from 0.497 acre to 0.5123 acre; and (2) the merger of former Lot 3 and the portion of former Lot 1 comprising the Site into Lot 33. As of the date of this report, the BCA Amendment Application has not yet been approved by NYSDEC.

Details on the Site environmental history and remedial activities performed are provided in the Site Management Plan (SMP). Engineering Controls (ECs) have been incorporated into the Site remedy to control exposure to remaining contamination during the use of the Site to ensure protection of public health and the environment. The following ECs have been implemented: (1) a composite cover system; (2) a vapor barrier; (3) an active sub-slab depressurization system (SSDS); and (4) a soil vapor extraction (SVE) system (SVES).

An Environmental Easement (EE) granted to the NYSDEC, and recorded with the Kings County Clerk, requires compliance with the SMP and all ECs and Institutional Controls (ICs) placed on the Site. The ICs place restrictions on Site use, and mandate operation, maintenance, monitoring and reporting measures for all ECs and ICs. The SMP specifies the methods necessary to ensure compliance with all ECs and ICs required by the EE for contamination that remains at the Site. The SMP has been approved by NYSDEC, and compliance with the SMP is required by the grantor of the EE and the grantor's successors and assigns. The SMP may be revised only with the approval of the NYSDEC. This CAMP is an appendix to the SMP.

1.1 Purpose and Objectives

The principal purpose of this CAMP is to monitor air quality in the vicinity of any intrusive activities (i.e., below the Site composite cover system). This CAMP consists of monitoring airborne particulates, vapors, and nuisance odors on a periodic/roving basis. Monitoring at the Site will include real-time air monitoring for airborne particulate matter and volatile organic compounds (VOCs), observations for visible emissions and odors, inspection and monitoring of the contractor's work practices, and reporting to the NYSDEC and the New York State Department of Health (NYSDOH). Monitoring will be performed during any slab-intrusive activities.

Principal objectives of this CAMP are as follows:

- Monitor VOC vapors such that vapors associated with the remedial actions are maintained below action levels.
- Monitor airborne particulate concentrations of particulate matter 10 micrometers of less in diameter (PM_{10}), such that concentrations are maintained below action levels.
- Monitor VOCs and visible emissions so that vapors and particulates from the excavation operations do not leave the Site.

- Monitor for nuisance odors to prevent odors that could impact the surrounding community.
- Notify construction personnel and make corrective actions in the event that an exceedance of the monitoring parameter(s) occurs.

1.2 Operations to be Monitored

The remedial actions to be performed under this CAMP consist of air monitoring to address the community health and safety concerns during any intrusive activities after completion of the Site remedy, under the direction of AKRF. The locations and frequency of monitoring will be established on a task-by-task basis depending on the extent and location of the intrusive relative work to publicly-accessible areas.

2.0 COMMUNITY AIR MONITORING PROCEDURES

Work zone air monitoring will be performed continuously during all invasive work in accordance with the Health and Safety Plan (HASP). Community air monitoring will be performed periodically (at a minimum once per hour) on a roving basis around any active intrusive work areas. Community air monitoring will be upgraded to continuous monitoring using permanent stations if action levels are encountered within the work zone or during roving periodic community air monitoring.

The action levels specified herein require increased monitoring, corrective actions to abate emissions (see Sections 3.0 and 4.0), and/or work shutdown. A community air monitoring summary, including action levels and appropriate response actions for exceedances of action levels, is provided as Table 1.

2.1 Volatile Organic Compound (VOC) Direct Reading Monitoring

VOC monitoring equipment will consist of a photoionization detector (PID) capable of detecting potential VOCs found in disturbed soil. The monitoring equipment will be calibrated on a daily basis and documented in a dedicated field log book. The instrument will be capable of calculating 15-minute running average concentrations, which will be compared to the prescribed action levels.

Readings will be subtracted from the background concentrations, to be measured each day prior to the start of work, to establish concentrations reflective of work activities during the periods between collection of background readings.

The 15-minute average concentrations will be compared to the following:

- If the ambient air concentration of total organic vapors exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with measures taken to reduce vapors and continue monitoring.
- If total organic vapor levels persist at levels in excess of 5 ppm over background, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. If the organic vapor level is repeatedly over 25 ppm above background, activities must be shutdown and the engineering controls and the Site work plan re-evaluated.

2.2 Particulate (Dust) Direct Reading Monitoring

Particulate monitoring will be performed using real-time aerosol or particulate monitoring equipment capable of measuring PM_{10} and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level established below. The dust monitor will be equipped with an alarm to indicate exceedance of the action level, and will be zeroed on a daily basis (and more frequently as needed) in accordance with the manufacturer's operating instructions and documented in a dedicated logbook. In addition, fugitive dust migration will be visually assessed during all work activities.

The action level will be established at 0.15 milligram per cubic meter (mg/m^3) above background, over 15-minute time weighted average (TWA). While conservative, this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety.

The 15-minute average concentrations will be compared to the following:

- If the particulate measurement is between 0.1 mg/m^3 and 0.15 mg/m^3 above the background level, additional dust suppression techniques will be implemented to reduce the generation of fugitive dust and corrective action taken to protect Site personnel and reduce the potential for contaminant migration.
- If the dust suppression measures being utilized at the Site do not lower particulates to an acceptable level (e.g., below 0.15 mg/m^3 above the background level, and no visible dust from the work area), work will be suspended until appropriate corrective measures are implemented to remedy the situation.

2.3 Odor Monitoring

Subsurface excavation work exposing contaminated materials may cause odors to be detectable. This may cause concern among the on-site workers, visitors to the Site, and the nearby community regarding potential health risks. Health risks or the potential for health risks do not rely strictly on detectable odors. However, controlling odor emissions from a site can allay public fears about health risks and provide additional means of controlling nuisance emissions. Periodic walk-around monitoring will be performed to observe perceptible odor that may be a nuisance to nearby sensitive receptors. If perceptible odors are noted adjacent to a nearby receptor or a complaint is received, work will be suspended until appropriate corrective measures are implemented to remedy the situation.

2.4 Equipment Operational Requirements

The air monitoring equipment must be operated by trained and qualified personnel. Personnel who perform air monitoring functions described in this section shall be experienced in the use of field air monitoring equipment, as well as the air monitoring procedures described above. There must also be appropriate staff (chemist, industrial hygienist, engineer or environmental scientist) for assessing the results of air monitoring and advising field personnel of air quality considerations.

3.0 ENHANCED MONITORING/CONTROL PROCEDURES

The following enhanced procedures would be implemented in the event that the building is occupied during intrusive work to minimize exposure to potential sub-slab or intra-slab vapors:

1. Prior to the start of any intrusive work inside the Site building, the total VOC concentration will be measured from perimeter air monitoring zones within the site building as a background reading.
2. If a PID reading of 5 ppm or less is registered in the perimeter air monitoring zones and 10 ppm or less in the work zone, the intrusive work will proceed with no further engineering controls unless further monitoring during the intrusive work results in a PID reading greater than 5 ppm. Continuous work zone and periodic community air monitoring will be performed in accordance with the HASP and as described in Section 2.1 and the work area will be cordoned off with cones, caution tape, or similar barriers to pedestrians.
3. If a PID reading of greater than 5ppm is measured during the initial Site background reading, the source of the elevated concentration will be pursued. Inspections of the aboveground components of the SVES and SSDS will be conducted to identify and repair any system malfunctions or problems (i.e., leaks, cracks, collection of condensation, etc.). Non-routine maintenance will be performed to repair any problems or incidents, or make adjustments to the system.
4. If intrusive, subsurface work occurs during times the buildings are occupied and elevated readings are noted during work zone or community air monitoring, engineering controls to control vapors would be implemented, as described below, for the areas with elevated vapors measured during the baseline monitoring or during monitoring of the invasive work.
    a. Access to work zones will be temporarily limited to workers with Hazardous Waste Operations and Emergency Response (HAZWOPER) training and site-specific briefing in accordance with the HASP. Any open wall penetrations will be sealed using products such as caulk or expandable foam.
    b. All personnel entering the work zone will upgrade personal protective equipment (PPE) to Level C when appropriate in accordance with the HASP. Penetrations to the surface slab would be repaired with concrete, caulk, caps or other construction materials to seal the opening, as appropriate.

These procedures will be repeated at each intrusive work area and will be documented in accordance with Section 5.0.

4.0 VOLATILE ORGANIC COMPOUND (VOC), PARTICULATE, AND ODOR CONTROLS

The information and procedures presented in this section will be used for VOC, particulate, and odor control during activities summarized in Section 1.1. The construction manager for the project will be responsible for implementing these procedures based on the air monitoring results and required action levels described in Table 1. The information and procedures that are to be used for VOC, particulate, and odor control are presented in the following sub-sections.

4.1 Volatile Organic Compound (VOC) Controls

Control of VOCs during excavation work or other soil disturbance activities will consist of the construction manager implementing one or more of the following methods or measures:

- Covering stockpile or other material staging areas;
- Covering the exposed excavation/exposed subsurface areas;
- Backfilling or capping the exposed area;
- Wetting exposed contaminated material; and
- Isolating heating, ventilation and air conditioning (HVAC) system in the active work area.

4.2 Airborne Particulate Controls

The primary measure of preventing exposure to dust during excavation or other soil/fill disturbance activities will be wetting techniques. The Contractor will provide the controls (wet techniques) or other techniques (e.g., covering exposed soil surfaces, limiting active work areas) to control particulate generation during work tasks that have the potential for generating airborne particulates. Particulate controls involving the use of water (wetting or water spraying) will be employed at potential particulate generating activity areas as follows:

- Before each task is initiated;
- During the tasks to keep the materials damp; and
- When air monitoring results dictate the need for particulate control.

4.3 Odor Controls

Control of odors during excavation work or other subsurface disturbance activities will consist of one or more of the following measures:

- Covering stockpile or other material staging areas;
- Covering the exposed excavation/removal areas;
- Wetting exposed material; and
- Backfilling the excavation.

5.0 COMMUNITY AIR MONITORING RECORDKEEPING

The qualified safety officer or technician will ensure that all air monitoring data is logged in a book or on daily field log sheets to document observations as part of the community air monitoring program. Documentation shall be made clear, concise, and provide the date, time of entry, location, personnel, weather conditions, and measured concentrations. Documentation will also include all observational data that has potential for impacting results, such as potential off-site interferences, on-site public interferences, damage to instruments, Site equipment problems, and/or weather related interferences.

All pages must be numbered; no lines shall be left blank (or put a line through it), and must be initialed on each page in ink. The last entry page for the shift or day that has blank space left at the bottom shall have a line drawn diagonally across it and signed at the bottom of the page. All corrections must be made with a single line, initialed, and dated.

Copies of the log book or field log sheets documenting community air monitoring will be submitted to NYSDEC with the Periodic Review Report (PRR). The Site owner and NYSDEC will be notified promptly via phone and electronic mail of any exceedance of an action level and of the corrective actions taken in connection with the exceedance. If an exceedance occurs, the environmental consultant will ensure corrective actions are taken the actions and results will be documented in the PRR.

All monitoring equipment must be calibrated on a daily basis in accordance with the manufacturer's operating instructions. The date, time, calibration gas, or other standard, and name of person performing the calibration will be documented in a log book.

TABLE

Table 1
Community Air Monitoring Summary

Monitoring Device	Monitoring Location	Monitoring Frequency	Action Level	Response Action
PID	Perimeter of Work Area	Continuous during intrusive work with work zone exceedances Periodic during all other disturbance activities [Background is the most recent upwind/ambient 15-minute average reading]	< 5 ppm above background at the downwind perimeter of the work zone (15-min TWA) > 5 ppm but < 25 ppm above background at the downwind perimeter of the work zone (15-min TWA) > 25 ppm above background at the downwind perimeter of the work zone (15-min TWA)	Continue normal operations Suspend operations until readings indicate < 5 ppm for 15-minute TWA. Take steps to abate emissions* Shut down operations and reevaluate work and controls
PM_{10} Aerosol/ Particulate Air Monitoring Unit	Perimeter of Work Area	Periodic during all disturbance activities Continuous during intrusive work with work zone exceedances [Background is the most recent upwind/ambient 15-minute average reading]	< 0.1 mg/m^3 above background at the downwind perimeter of the work zone (15-min TWA) > 0.1 mg/m^3 above background at the downwind perimeter of the work zone (15-min TWA), or visible dust leaving the excavation area > 0.15 mg/m^3 above upwind background level downwind perimeter of the work zone (15-min TWA)	Continue normal operations Implement particulate control measures* Halt all soil disturbance work until downwind perimeter of excavation area reading is <150 $\mu g/m^3$ above background (upwind perimeter).
Olfactory	Perimeter of Work Area	Periodic during all disturbance activities	Perceptible odors outside work zone, adjacent to receptor, or complaint	Suspend operations until odor condition abated. Take steps to abate odor*

Notes:
*See control measures in Sections 3.0 and 4.0.
TWA – time weighted average
PID – photoionization detector
mg/m^3 – milligrams per cubic meter
ppm – parts per million

APPENDIX E

QUALITY ASSURANCE PROJECT PLAN (QAPP)

NEW 470 PROJECT

12 ECKFORD STREET

BROOKLYN, KINGS COUNTY, NEW YORK

Quality Assurance Project Plan

AKRF Project Number: 12306
NYSDEC BCP Site Number: C224242

Prepared for:

New York State Department of Environmental Conservation
Division of Environmental Remediation, Remedial Bureau B
625 Broadway
Albany, New York 12233

On Behalf Of:

New 470 LLC
58 Vanderbilt Motor Parkway, Suite 100
Commack, New York 11725

Prepared by:

AKRF, Inc.
440 Park Avenue South, 7th Floor
New York, New York 10016
(212) 696-0670

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ATTACHMENT

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) describes the protocols and procedures that will be followed during implementation of the Site Management Plan (SMP) and associated appendices at the New 470 Project site, hereinafter referred to as the "Site". The Site is located at 12 Eckford Street in the Brooklyn, New York and is identified on the New York City Tax Map as Brooklyn Borough Block 2714, Lot 33. The Site was remediated under the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) (New 470 Project; Site No. C224242).

The objective of this QAPP is to provide for Quality Assurance (QA) and maintain Quality Control (QC) during sampling performed to evaluate the performance and effectiveness of the remedy to reduce or mitigate contamination at the Site. Adherence to the QAPP will ensure that defensible data will be obtained to confirm the successful operation and maintenance of remedial systems.

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 Code of Federal Regulation (CFR) Part 1910. The following sections describe the key project personnel and their responsibilities.

2.1 Project Director

The project director will be responsible for the general oversight of all aspects of the project, including scheduling, budgeting, data management, and decision-making regarding the field program. The project director will communicate regularly with all members of the AKRF project team and the New York State Department of Environmental Conservation (NYSDEC) to ensure a smooth flow of information between involved parties. Mr. Marc Godick, LEP will serve as the project director for the SMP. Mr. Godick's resume is included in Attachment A.

2.2 Project Manager

The project manager will be responsible for directing and coordinating all elements of the SMP. The project manager will prepare reports and participate in meetings with the Site owner and/or the NYSDEC. Ms. Amy Jordan will serve as the project manager for the SMP. Ms. Jordan's resume is included in Attachment A.

2.3 Field Team Leader

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 Site Management Plan (SMP). The field team leader will report to the project manager on a regular basis regarding daily progress and any deviations from the SMP. The field team leader will be a qualified, responsible person, able to act professionally and promptly during required activities. The field team leader will be established for each task; however, Mr. Victor Chang is expected to be a field team leader for much of the work under the SMP. Mr. Chang's resume is included in Attachment A.

2.4 Project Quality Assurance/Quality Control (QA/QC) Officer

The QA/QC Officer will be responsible for adherence to this QAPP. The QA/QC officer will review the procedures with all personnel prior to commencing any fieldwork and will assess implementation of the required procedures. Ms. Michelle Lapin, P.E. will serve as the QA/QC officer for the SMP. Ms. Lapin's resume is included in Attachment A.

2.5 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. He/She will track the movement of samples from the time they are checked in at the laboratory to the time that analytical results are issued. The laboratory QA/QC officer will conduct a final check on the analytical calculations and sign off on the laboratory reports. The laboratory QA/QC officer will be determined upon selection of a contract laboratory(s) for the SMP.

3.0 STANDARD OPERATING PROCEDURES (SOPS)

The following sections describe the SOPs for the monitoring activities included in the SMP. During these operations, all field personnel will wear appropriate personal protective equipment (PPE) and safety monitoring will be performed as described in the Site-specific Health and Safety Plan (HASP) provided as Appendix C of the SMP. SMP implementation will include sampling associated with the operation and maintenance (O&M) of the sub-slab depressurization system (SSDS) and soil vapor extraction (SVE) system (SVES). The SMP also includes inspections of the SSDS, SVES, and the Site composite cover system, and an Excavation Work Plan (EWP) and other provisions and appropriate actions to be taken in the event that future renovation or redevelopment of the Site requires the breaching of the composite cover system and excavation/removal of underlying soil/fill.

In all instances, any atypical or unexpected findings noted during inspections, sampling events, or SMP-governed field work will be communicated immediately to the environmental professional managing the Site work and, as necessary, to the NYSDEC project manager or NYSDEC's successor agency.

3.1 Excavation and/or Site Composite Cover System Disturbance

The procedures for excavation and/or other invasive work that may disturb remaining contamination beneath the Site composite cover system will be as follows:

- Soil removal and/or other invasive activities will be completed as needed in accordance with the SMP and EWP.
- Following invasive work, the demarcation layer will be replaced to provide a visual reference to the top of the residual management zone (RMZ).
- The composite cover system will be replaced to restore the condition to that which existed prior to the excavation. In general, the restoration types must match or exceed the existing material and thickness conditions of the Site cover types presented in the SMP to maintain Site composite cover system integrity across the entire Site.
- Decontaminate all equipment used in composite cover system disturbance as described in Sections 3.2 and 3.3 of this QAPP.

3.2 Decontamination of Sampling Equipment

All sampling equipment (drilling rods and casing, macrocore samplers, probe rods, etc.) will be either dedicated or decontaminated between sampling locations. The decontamination procedure will be as follows:

1. Scrub using tap water/Alconox™ mixture and bristle brush.
2. Rinse with tap water.
3. Scrub again with tap water/Alconox™ and bristle brush.
4. Rinse with distilled water.

5. Air-dry the equipment, if possible.

Decontamination will be conducted within 55-gallon drums or on plastic sheeting (or equivalent) that is bermed to prevent discharge to the ground or drains.

3.3 Heavy Equipment Decontamination

Decontamination of chemically-contaminated heavy equipment (e.g., augers, excavator buckets) will be accomplished using high-pressure steam or dry decontamination with brushes and shovels. Decontamination will take place on a decontamination pad and all liquids used in the decontamination procedure will be collected. Vehicles or equipment brought into an exclusion zone will be treated as contaminated and will be decontaminated prior to removal. All liquids used in the decontamination procedure will be collected, stored and disposed of in accordance with federal, state, and local regulations. Personnel performing this task will wear the proper PPE as prescribed in the Site-Specific Health and Safety Plan (HASP).

A decontamination area will be established around the planned excavation area, adjacent to the environmental enclosure. The floor of the decontamination area will be covered with 6-mil plastic sheeting, as necessary, and bermed to prevent spreading of decontamination fluids or potential discharge to the ground surface.

All equipment in direct contact with known or potentially contaminated material will be either dedicated or decontaminated prior to handling less contaminated material or removal from the Site. Decontamination of chemically contaminated heavy equipment will be accomplished using high-pressure steam or by dry decontamination with brushes and shovels. All liquids used in the decontamination procedure will be collected, stored, and disposed of in accordance with federal, state, and local regulations.

3.4 Management of Investigation-Derived Waste (IDW) and Remedial Operation and Maintenance (O&M) Waste

Any IDW and remedial O&M waste will be containerized in New York State Department of Transportation (NYSDOT)-approved 55-gallon drums or other appropriate containers. 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, development water or purge water) and the name of an AKRF point-of-contact. Drums will be staged in secure areas, away from public access to the extent practicable.

Soil/fill samples collected from soil boring or excavation activities will be used for waste characterization of soil/fill, since such data would be biased towards areas which are expected to be most contaminated. Additional waste characterization soil or other samples may be collected, if requested by the disposal facility. All IDW and remedial waste will be disposed of or treated according to applicable local, state, and federal regulations.

4.0 SAMPLING AND LABORATORY PROCEDURES

4.1 Import Soil/Fill Sampling

Prior to importing soil/fill for use as backfill, the intended imported material will be evaluated using the following procedures:

- A segregated stockpile of the intended imported material will be made available for sampling at a frequency and for the required parameters as outlined in Section 5.4(e) 10 of NYSDEC DER-10.
- Soil/fill sample(s) will be collected from the segregated stockpile for analysis in accordance with NYSDEC requirements and sampling results will be submitted to NYSDEC for approval.
- No material will be added to or removed from the segregated stockpile intended for import following the sample collection.
- Samples will be collected into laboratory-supplied containers.
- Samples will be kept in an ice-filled cooler or refrigerator, with the exception of any asbestos samples, until receipt by the laboratory.
- The clean soil/fill layer will be underlain by a demarcation layer such as orange snow fence to indicate the top of the original soil/fill.
- Decontaminate all sampling equipment between sampling locations as described in Sections 3.2 and 3.3 of this QAPP.

4.2 Reuse Sampling

Prior to reuse as backfill, excavated material will be evaluated using the criteria below:

- Concrete or demolition debris that does not exhibit signs of contamination will be sampled for asbestos prior to reuse on-site.
- Soil/fill material proposed for reuse will be sampled at a frequency and for the required parameters as outlined in NYSDEC's DER-10, Table 5.4.
- Samples will be collected into laboratory-supplied containers.
- Samples will be kept in an ice-filled cooler or refrigerator, with the exception of any asbestos samples, until receipt by the laboratory.
- Decontaminate all sampling equipment between sampling locations as described in Sections 3.2 and 3.3 of this QAPP.

4.3 Endpoint Soil Sampling

In the event that evidence of contamination [odors, staining, elevated photoionization detector (PID) readings, or analytical results of soil samples above NYSDEC Part 375 Restricted Residential Soil Cleanup Objectives (RRSCOs)] is identified during any breach to the composite cover system or excavation of soil/fill as part of the redevelopment or renovation of the Site, endpoint soil sampling activities will be performed in accordance with NYSDEC DER-10. Per NYSDEC DER-10 Section 5.4, sidewall samples will be collected a minimum one sample for every 30 linear feet and bottom samples will be collected at a frequency of one every 900 square feet. Endpoint soil samples will be analyzed for NYSDEC Final Commissioner's Policy - Soil Cleanup Guidance (CP-51) volatile organic compounds (VOCs) by EPA Method 8260C, target compound list (TCL) semivolatile organic compounds/base-neutrals (SVOCs/BNs) by EPA Method 8270D, and Toxicity Characteristic Leaching Procedure (TCLP) metals by EPA Method 6010C.

Soil sampling will be conducted according to the following procedures:

- Characterize the sample according to the modified Burmister soil classification system.

- After selecting which samples will be analyzed in the laboratory, fill the required laboratory-supplied sample jars with the soil from the selected sampling location or labeled sealable plastic bags. Seal and label the sample jars as described in Section 4.6 of this QAPP and place in an ice-filled cooler.
- Decontaminate any reusable soil sampling equipment between sample locations as described in Section 3.2 of this QAPP.
- Record boring number, sample depth, and sample observations (evidence of contamination, PID readings, soil classification) in field log book and boring log data sheet, if applicable.

4.4 Sub-Slab Depressurization System (SSDS) and Soil Vapor Extraction System (SVES) Operations and Maintenance Sampling

Three vapor monitoring points (VMPs) were installed during remedial action implementation at strategic locations to inspect induced vacuum conditions during the operation of the SSDS and SVES. Vacuum will be monitored at these locations at regular intervals as designated in the SMP.

4.4.1 Vacuum Monitoring

The procedures for instantaneously screening the vacuum monitoring points are as follows:

- Remove the access manhole cover.
- Attach the analog vacuum gauge or digital manometer with male Quick-Connect fitting to the female quick connect fitting at the monitoring point well head and document reading.
- Detach vacuum gauge/manometer and confirm that Quick-Connect female fitting is closed.
- Replace the access manhole.

4.5 SSDS and SVES Sampling

4.5.1 System Vacuum Monitoring

The procedures for instantaneously screening the vacuum monitoring points are as follows:

- Remove the access manhole.
- Attach the analog vacuum gauge or digital manometer with male Quick-Connect fitting to the female Quick-Connect fitting at the monitoring point well head and document reading.
- Detach vacuum gauge/manometer and confirm that Quick-Connect female fitting is closed/sealed.
- Replace the access manhole.

4.5.2 Indoor Air Sampling

Indoor air quality sampling may be conducted at the Site. If implemented, sampling will be conducted in accordance with the New York State Department of Health (NYSDOH) Vapor Intrusion Guidance Document. Indoor air quality sampling will be performed at

the Site following system failure greater than 48 hours in accordance with the following details:

- The indoor air sampling is to be conducted following the completion of a pre-sampling inspection and chemical inventory of the Site building.
- Place a labeled 6-Liter SUMMA® canister at the breathing zone level (3 to 4 feet above ground surface) in sampling locations established by NYSDEC and NYSDOH.
- Record the vacuum reading from the vacuum gauge on the canister at the beginning of the 8-hour sampling period.
- Open the valve of the canister and record the time in the field book. At the end of the 8-hour sampling period, close valves, remove flow-rate controllers and vacuum gauges, install caps on canisters, and record time.
- Place SUMMA canisters in shipping containers for transportation to laboratory.
- Repeat procedure for all of the sampling locations.

4.5.3 Influent/Effluent Vapor Sampling

Confirmatory vapor sampling will be conducted following startup and 6 months of operation (and as determined by the SMP and NYSDEC thereafter) as part of a reassessment of VOC emissions calculations according to the following procedure:

- Confirmatory sampling will comprise grab samples from each individual SSDS and SVES line and combined influent, intermediate, and effluent samples, as appropriate.
- A GilAir® Plus, or equivalent will be used to extract influent/effluent vapors from each of the sample ports installed on the SSDS/SVE lines. A 1 Liter Tedlar® bag will be filled with extracted vapors by attaching dedicated silicon-lined or silicon tubing from the sampling port to the inlet of the peristaltic pump. The Tedlar® bag fill port will be attached to the outlet of the peristaltic pump. Both ports will be opened and the peristaltic pump will be started. The pump rate will be throttled to fill the one liter Tedlar® bag in approximately 10 minutes, resulting in a an approximate air flow rate of 0.1 Liter per minute. The Tedlar® bag will be removed after its fill port has been closed.
- The Tedlar® bag will be properly labeled and enclosed in a zip-lock bag, which will be used as an added protection layer to ensure safety in transit to the laboratory.
- The silicone tubing used in the peristaltic pump will be replaced after each sample collected.
- Place Tedlar® bars in a shipping container for transportation to laboratory (do not put the Tedlar® bags on ice).
- Samples will be analyzed for VOCs by EPA Method TO-15.
- Decontaminate all non-dedicated sampling equipment between sampling locations as described in Section 3.2 of this QAPP.

4.5.4 Carbon Sampling

Based on monitoring inspections performed during the operation of the SVES, a representative grab sample of spent carbon maybe collected and submitted for laboratory analysis prior to off-site disposal according to the following procedure:

- Access carbon treatment filter in accordance with manufacturer's specification and component manuals.
- Note any unusual or abnormal olfactory or visual field observations.
- Collect one aliquot of spent carbon material into a laboratory supplied sampling container.
- Relinquish sealed sampling container to a certified laboratory for analysis of VOCs by EPA Method 8260.

4.5.5 Condensate Water Sampling

Based on monitoring inspections performed during the operation of the SVES, a representative sample of condensate water may be collected and submitted for laboratory analysis prior to off-site disposal according to the following procedure:

- Slowly remove the lid of the 55-gallon drum containing the collected condensate water and immediately measure the vapor concentrations in the well with a PID calibrated to the manufacturer's specifications.
- Lightly stir the water in the drum with clean, dedicated sample collection equipment or tubing to homogenize the collected condensate water.
- Collect a representative sample directly from a dedicated bailer or tubing connected to a peristaltic pump and place into the required sample containers as described in Section 4.6 of this QAPP. Sample should be collected for VOCs and submitted to a certified laboratory.

4.6 Laboratory Methods

Table 1 summarizes the laboratory methods that will be used to analyze field samples as well as the sample container type, preservation, and applicable holding times. Other analytes may be added if required by the disposal facility. An Environmental Laboratory Approval Program (ELAP)-certified laboratory will be used for all chemical analyses in accordance with DER-10 2.1(b) and 2.1(f), including NYSDEC July 2005 Analytical Services Protocol (ASP) Category B Deliverables.

Table 1
Laboratory Analytical Methods for Analysis Groups

Sample Type	Analysis	Method	Container Type	Preservative	Hold Time
Soil/Fill (Reuse/Backfill)	TCL VOCs	8260C	Encore sampler	4 °C	48 hours
	SVOCs	8270D	4 oz. clear glass jar	4 °C	5 days to extract, 49 days to analyze
	TAL Metals Mercury	6010C 7471B	4 oz. clear glass jar	4 °C	14 days 26 days
	PCBs	8082A	4 oz. clear glass jar	4 °C	14 days
	Pesticides	8081B	4 oz. clear glass jar	4 °C	5 days to extract, 49 days to analyze
Soil/Fill (Endpoint Sampling)	CP-51 VOCs	8260	Encore samplers (3), 2 oz. plastic jar	4 °C	48 hours
	TCL SVOCs-BNs	8270D	4 oz. clear glass jar	4 °C	5 days to extract, 49 days to analyze
	TCLP Metals	6010C	4 oz. clear glass jar	4 °C	14 days 26 days
Soil Vapor/Indoor Air Sampling	VOCs	TO-15	6-L SUMMA® Canister	None	30 days
SSDS/SVES Total Influent, Intermediate, Effluent	TCL VOCs	TO-15	1L Tedlar® Bags	None	72 hours
SSDS/SVES Individual Line Samples	TCL VOCs	TO-15	1L Tedlar® Bags	None	3 days
Granular Activated Carbon	TCL VOCs	8260C	EnCore sampler	4 °C	48 hours
Condensate Water	TCL VOCs	8260C	40 mL glass vial, septa top	4 °C, HCL	14 days

4.7 Quality Control (QC) Sampling

In addition to the laboratory analysis of the investigative soil samples, additional analysis will be included for QC measures, as required by the NYSDEC July 2005 ASP Category B sampling techniques. The QC samples will include field blanks, trip blanks, matrix spike/matrix spike duplicates (MS/MSD), and blind duplicate samples at a minimum frequency of one sample per 20 field samples collected or per sample delivery group (SDG). No additional QC samples will be collected during waste classification sampling unless required by the disposal facility. Table 2 provides a summary of the field samples and QA/QC samples to be analyzed by the laboratory.

Table 2
Field Sample and QC Sample Quantities

				QC Samples			
Sample Type	**Parameters**	**Analytical Method[1]**	**Field Samples**	**Field Blank[2]**	**Trip Blank[2]**	**MS/MSD[3]**	**Duplicate[3]**
Soil	VOCs	EPA 8260C	TBD	1/20 (TBD)	1 (Laboratory-Supplied)	1/20 (TBD)	1/20 (TBD)
	SVOCs, TAL Metals, Mercury, PCBs, and Pesticides	EPA 8270D, 6010C/7471B, 8082A, and 8081B	TBD	1/20	NA	1/20	1/20
SSDS/SVE Total Influent, Intermediate, Effluent	TCL VOCs	TO-15	X	NA	NA	NA	NA
SSDS/SVE Individual Line Samples	TCL VOCs	TO-15	X	NA	NA	NA	NA

Notes:
MS/MSD – matrix spike/matrix spike duplicate
TBD – sampling to be determined based on work activities
NA – not applicable

[1] – NYSDEC July 2005 ASP Category B deliverables
[2] – One trip blank per shipment with VOC analyses
[3] – One MS/MSD and duplicate sample per twenty field samples or sample shipment

4.8 Sample Handling

4.8.1 Sample Identification

All samples will be consistently identified in all field documentation, chain-of-custody (COC) documents, and laboratory reports. All samples will be amended with the collection date at the end of the sample name in a year, month, day (YYYYMMDD) format. Blind duplicate sample nomenclature will consist of: the sample type, followed by an "X"; MS/MSD sample nomenclature will consist of the parent sample name only but triplicate sample volume will be collected and the COC comment section will explain that the additional volume is for running the 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 and the matrix (soil or groundwater). In accordance with NYSDEC Environmental Quality Information System (EQuIS™) protocol, special characters will not be used for sample nomenclature and sample IDs below 10 will be amended with a "0". Sample nomenclature examples are provided in Table 3.

Table 3
Examples of Sample Nomenclature

Sample Description	Sample Designation
Soil endpoint sample collected from 1 to 2 feet below grade at the north wall of an excavation	EP-N 1-2_ YYYYMMDD
Duplicate soil sample collected from 1 to 2 feet at the north wall of the excavation	EP-N 1-2_YYYYMMDD
Import soil sample collected from the first imported stockpile	ISP-1_YYYYMMDD
Reuse soil sample collected from the first on-site stockpile	SP-1_YYYYMMDD
Soil vapor sample	SV-1_YYYMMDD
Ambient air sample	AA-1_YYYYMMD
Indoor air sample	IA-1_YYYYMMDD
SVES effluent sample collected from the carbon treatment system intermediate port	SVE-INT_YYYYMMDD
SVES individual line sample collected from SVE-04	SVE-04_YYYYMMDD
Granular activated carbon	GAC_YYYYMMDD
Condensate Water	COND_YYYYMMDD

4.8.2 Sample Labeling and Shipping

All sample containers will be provided with labels containing the following information:

- Project identification
- Sample identification
- Date and time of collection
- Analysis(es) to be performed
- Sample preservative, if any
- Sampler's initials

Once the samples are collected and labeled, they will be placed in chilled coolers and stored in a cool area away from direct sunlight to await shipment to the laboratory. All samples will be shipped to the laboratory at least twice per week. At the start and end of each workday, field personnel will add ice to the coolers as needed.

The samples will be prepared for shipment by placing each sample in a sealable plastic bag, then wrapping each container in bubble wrap to prevent breakage, adding freezer packs and/or fresh ice in sealable plastic bags and the chain-of-custody (COC) form. Tedlar® bags will be enclosed in a zip lock bag as an added protection prior to being placed in a cooler or shipment container without ice. SUMMA® canisters will also be placed into their appropriate shipment containers and do not require preservation with ice. All samples will be shipped overnight (e.g., Federal Express) or transported by a laboratory courier. All coolers and shipment containers shipped to the laboratory will be sealed with mailing tape and a COC seal to ensure that they remain sealed during delivery.

4.8.3 Sample Custody

Field personnel will be responsible for maintaining the sample coolers in a secured location until they are picked up and/or sent to the laboratory. The record of possession of samples from the time they are obtained in the field to the time they are delivered to the laboratory or shipped off-site will be documented on COC forms. The COC forms will contain the following information: project name; names of sampling personnel; sample number; date and time of collection and matrix; and signatures of individuals involved in sample transfer, and the dates and times of transfers. Laboratory personnel will note the condition of the custody seal and sample containers at sample check-in.

4.9 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 applicable. 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 calibrated each day using 100 parts per million (ppm) isobutylene standard gas.

4.10 Data Review

In accordance with DER-10, each of the samples collected will undergo a third-party data review process to ensure the usability of the data collected. Data usability summary reports documenting any issues with QA/QC will be prepared and included in the Periodic Review Report (PRR). The resume for Lori Beyer of L.A.B. Validation Corp., the anticipated third-party data reviewer, is included in Attachment A.

4.11 Reporting of Data

All data generated during the monitoring activities will be submitted in the appropriate Environmental Quality Information System (EQuIS™) Electronic Data Deliverable (EDD) format.

ATTACHMENT A

RESUMES OF KEY PROJECT PERSONNEL

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

Manhattan West, Manhattan, NY - NYC OER and USEPA

AKRF is providing environmental consulting services to Brookfield Office Properties in connection with the Manhattan West development site, which encompasses an entire city-block above the Amtrak approach to Penn Station. The four towers that comprise the Manhattan west development site are being remediated as four different sites under the New York City Mayor's Office of Environmental Remediation (OER), due to an E-Designation for hazardous materials, air quality, and noise attenuation. Ms. Lapin is the Remedial Engineer for the project, and oversees all remedial activities.

85 Jay Street, Brooklyn, NY - NYS Brownfield Redevelopment

AKRF's work includes the preparation and implementation of a NYSDEC-approved Remedial Action Work Plan for this approximately three-acre former industrial site that encompasses an entire city-block. The remediation is being conducted under the NYSDEC Brownfield Cleanup Program, primarily due to high levels of lead associated with former smelting operations. Ms. Lapin is the Remedial Engineer for this project and oversees all remedial activities.

Elton Crossing (Melrose C - Family), Bronx, NY - NYS Brownfield Redevelopment

AKRF's work includes the implementation of the NYSDEC-approved Remedial Action Work Plan for this former industrial property, including: in-situ testing, off-site transport, the closure of two petroleum spills; the registration, removal, and closure of five petroleum storage tanks encountered during excavation; and the delineation of soil contaminants, including hazardous lead, petroleum, and pesticides. Ms. Lapin was the Remedial Engineer for the project, and oversaw all remedial activities.

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.

Atlantic Chestnut, Brooklyn, NY

AKRF was retained by Phipps Houses to provide environmental consulting services in connection with the purchase and development of former burned manufacturing buildings encompassing an entire city block in Brooklyn, New York. As part of due diligence, AKRF prepared a Phase I Environmental Site Assessment (ESA) Report for the property. After acquisition, the property was divided into three separate sites (3264 Fulton Street, 235 Chestnut Street, and 3301 Atlantic Avenue). AKRF prepared a Subsurface (Phase II) Investigation Work Plans and conducted Phase IIs at each of the sites, which included the collection and analysis of soil, soil vapor, and groundwater samples. Based on the results of the Phase IIs, documented in Subsurface (Phase II) Reports, New York State Brownfield Cleanup Program (NYSBCP) applications were prepared for each of the sites. After acceptance into the NYSBCP, AKRF prepared Citizen Participation Plans (CPPs) and distributed public notices. AKRF prepared Remedial Investigation (RI) Work Plans (RIWPs) for each of the sites to further investigate contaminated media prior to redevelopment, conducted the RIs, and is in the process of preparing the RI Reports (RIRs). Ms. Lapin is the Remedial Engineer for the project, and oversees all remedial activities.

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.

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 was 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 New York City Department of Environmental Protection (DEP) and New York City Mayor's Office of Environmental Remediation (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).

443 Greenwich Street, Manhattan, NY

This Site was assigned an E-Designation for hazardous materials (and 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.

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 stormwater 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.

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.

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.

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).

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.

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.

MARC S. GODICK, LEP

SR. VICE PRESIDENT

Marc S. Godick, a Senior Vice President of the firm, has over 27 years of experience in the environmental consulting industry. Mr. Godick has broad-based environmental experience includes expertise in brownfield redevelopment, site assessment, remedial investigation, design and implementation of remedial measures, compliance assessment, and litigation support.

Education

M.E., Engineering Science/Environmental Engineering, Pennsylvania State University, 1998

B.S., Chemical Engineering, Carnegie Mellon University, 1989

Licenses/Certifications

Licensed Environmental Professional (License # 396) – State of Connecticut – 2003 - Present

40 Hour HAZWOPER and Annual Refresher Training, 1990 - Present

Supervisors of Hazardous Waste Operations (8 Hour), 1990

Professional Memberships

Chairman, Village of Larchmont/Town of Mamaroneck Coastal Zone Management Commission, 1997 – Present

Member, Westchester County Stormwater Advisory Board, 2011 – Present

Chairman/Member, Westchester County Soil and Water Conservation District, 2005 - 2010

Board of Directors, Sheldrake Environmental Center, Larchmont, New York, 2006 - 2008

Member, NYSDEC Risk-Based Corrective Action (RBCA) Advisory Group for Petroleum-Impacted Sites, 1997

Community Leadership Alliance, Pace University School of Law, 2001

Years of Experience

Year started in company: 2002

Year started in industry: 1990

RELEVANT EXPERIENCE

New York City Department of Design and Construction, East Side Coastal Resiliency, Manhattan, NY

Mr. Godick leads the environmental investigation and related support for a multidisciplinary design team selected by the New York City agency partnership of DDC, DPR, and ORR for the Feasibility Study and Pre-Scoping Services for East Side Coastal Resiliency (ESCR) project. The AKRF Team is providing design services, for 100+ year storm protection with anticipated sea level rise along the east side of Lower Manhattan. The ESCR subsurface exploration program involved a review of available utility plans and environmental reports involving manufactured gas plant (MGP) and potential petroleum-related contamination along a 2.5 mile study area from Montgomery Street to East 25th Street to develop a Subsurface Investigation Work Plan, which was approved by the NYCDEP.

The program included both public and private utility mark-out services across vast areas of the project site containing critical infrastructure to enable the installation of numerous shallow and deep borings and groundwater wells. Mr. Godick supervised the implementation of the investigation, which was completed in two phases. He was also responsible for the interpreting the wide-range of chemical parameters to evaluate critical cost and environmental impacts for the City and design team, and to prepare technical reports for submission and approval by the NYCDEP to satisfy for City Environmental Quality Review (CEQR) requirements. In addition, he

continues to support the design and environmental review team, including preparation of the Hazardous Materials chapter for the Environmental Impact Statement, estimating cost impacts to the project for design and cost recovery purposes, and developing a Soil Management Plan. Mr. Godick also managed a hydrogeologic modeling study to evaluate potential hydraulic and contaminant migration impacts associated with construction of the proposed flood control structure. Mr. Godick continues to coordinate with the NYC team, NYSDEC, and Con Edison to ensure that the design incorporates appropriate remedial measures to be implemented prior to and/or in conjunction with construction.

Remedial Design, Gowanus Canal First Street Turning Basin, New York City Department of Design and Construction (DDC)

Mr. Godick is managing the remedial design for restoration of the filled-in former First Street Turning Basin in Brooklyn, New York. The remediation is being conducted as part of an Order of Consent between the City of New York and EPA for the Gowanus Canal Superfund Site. The remedial design will include removal of fill and sediment within the fill-in basing in an approximately 475-foot by 50-foot area. The restored basin will provide enhanced waterfront access to the community and a boat launch for canoes and kayaks. Design considerations include geotechnical concerns related to adjacent buildings and new, existing bulkheads; soil, and water management; landscape design; and access/construction logistics. The design in anticipated to be completed in late 2017.

Remediation & Litigation Support, 3200 Jerome Avenue, Bronx, NY (Former PS 151)

Mr. Godick managed the investigation and remediation of a former public school in the Bronx under the New York State Department of Environmental Conservation (NYSDEC) Brownfields Cleanup Program (BCP). The site was contaminated with trichloroethylene (TCE) from historic operations at the property prior to use as a school. The remedial investigation included soil, groundwater, and vapor intrusion assessment both on-site and off-site. The remedial design included excavation of the source area, in-situ chemical oxidation of groundwater, and installation of a sub-slab depressurization system (SSDS) to address to potential vapor intrusion. Implementation of the remedy was complete in late 2014. The completed remediation allows for future multi-family residential, educational, childcare, and/or medical uses. Mr. Godick also provided litigation support in connection with a cost recovery claim against the former operator of the site.

Remediation & Litigation Support, Queens West Project, Avalon Bay Communities, Queens, 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 prepared an Environmental Impact Statement (EIS) that examines issues pertaining to air quality, land use and community character, economic impacts, historic and archaeological resources, and infrastructure. As part of this project, Mr. Godick managed one of the largest remediation projects completed under the NYSDEC BCP at the time that was contaminated by coal tar and petroleum. The remedy included the installation of a hydraulic barrier (sheet pile cut off wall), excavation of contaminated soil under a temporary structure to control odors during remediation, a vapor mitigation system below the buildings, and implementation of institution controls. The investigation, remediation design, and remedy implementation, and final sign-off (issuance of Certificate of Completion) were completed in two years. Total remediation costs were in excess of $13 million. Following completion of the remediation, Mr. Godick developed a cost allocation model and provided litigation support for a cost recovery action against a former operator of the site, including participation in a deposition as a fact witness prior to settlement between the parties.

On-Call Environmental Consulting Services (Various Locations), New York City Mayor's Office of Environmental Remediation (OER) (administered by NYCEDC)

Mr. Godick is managing an on-call contract with the OER for brownfields environmental assessment and remediation. The work has included conducting Phase I environmental site assessments (ESAs) and multi-media

sampling of soil, groundwater, and soil vapor for various sites funded by EPA grants. The work plans and investigation reports were completed in accordance with OER and EPA requirements. AKRF also developed a remedial plan for a former gas station site in the Bronx and implemented a remedial plan for capping a park site in Staten Island. In addition, Mr. Godick is providing support to OER and an affordable housing developer to expedite an application for entry into the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP), as well as preparation and implementation of the remedial investigation and remedial plan.

On-Call Environmental Consulting (Various Locations), New York City School Construction Authority

Mr. Godick is managing an on-call contract with the SCA for environmental assessment, remedial design, and plumbing disinfection. For new school sites, initial due diligence involves conducting Phase I environmental site assessments (ESAs) and multi-media sampling of soil, groundwater, and soil vapor to determine the suitability of a site for development as a school and remediation requirements and associated costs. Once design for a school is underway, AKRF would prepare remediation plans and construction specifications and oversee the construction activities. For existing school sites, the work can involve conducting Phase I ESAs and indoor air quality testing, preparation of specifications, supervision of storage tank removals, investigation and remediation of spills, and development of remediation cost estimates. 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 a report documenting the work was conducted in accordance with the specifications and applicable requirements. Due to the sensitivity of school sites, work under this contract is often conducted on short notice and during non-school hours. Mr. Godick also manages AKRF's potable water sampling (for lead) work for SCA, including providing recommendations for mitigating exceedances.

Remediation, Former Industrial Laundry/Dry Cleaning Plant, 2350 Fifth Avenue. New York, NY

Mr. Godick managed the assessment, cleanup and post-remedial operations, maintenance and monitoring of the only NYSDEC listed inactive hazardous waste (State Superfund) site in Manhattan, a former laundry/dry cleaning plant in Harlem. Remedial investigation included evaluation of soil, groundwater, soil vapor, indoor air, and building materials. Interim remediation included the removal of contaminated building materials and operation of a sub-slab vapor extraction system retrofitted into the existing building. Mr. Godick coordinated with the regulatory agencies, site owner and occupants; and managed the investigation, remedial design, and remedial implementation activities. Phase 1 of the Remedial Action Work Plan consisted of further removal of contaminated building materials. Phase 2 of the remediation included a sub-slab depressurization system (SSDS) retrofitted into the existing building, soil vapor extraction (SVE) system, and chemical oxidation injection. Remedial action work was completed in 2014 and documented in a Final Engineering Report. NYSDEC issued Certificate of Completion in January 2015 and the site has been reclassified to a "Class 4" site (site properly closed – requires continued management). Mr. Godick continues to manage the project, including operations, maintenance and monitoring of the SSDS and SVE system under the NYSDEC-approved Site Management Plan.

606 West 57th Street, New York, NY, TF Cornerstone

AKRF has been retained by TF Cornerstone to provide environmental services for the proposed redevelopment of a portion of the block bounded by Eleventh and Twelfth Avenues and West 56th and 57th Streets. The proposed actions included a zoning map amendment, zoning text amendments, a special permit, and an authorization to facilitate development of approximately 1.2 million square feet of residential and retail space. AKRF prepared an Environmental Impact Statement (EIS) for the New York City Department of City Planning (DCP) to analyze the effects of the proposed actions and development of the proposed building. The EIS addressed the full range of environmental impacts associated with the proposed development.

Mr. Godick was responsible for the elements of the EIS pertaining to hazardous materials, including coordination of a Phase I ESA and summarizing pertinent site information for the hazardous materials and construction

chapters. Mr. Godick provided pre-acquisition support to TF Cornerstone, which included development of a remedial cost estimate report to outline remediation cost during site development. Mr. Godick also managed work related to the subsurface investigation, localized remediation (chemical injection and limited excavation beneath the building basement) and regulatory closure of a petroleum spill on a portion of the project site to satisfy NYSDEC requirements. After EIS certification, Mr. Godick coordinated approvals with NYCOER, the regulatory agency overseeing remedial measures related to the redevelopment of the site. The Site has an (E) Designation and is participating in the New York City Voluntary Cleanup Program. Mr. Godick managed the preparation of a Phase II Investigation Work Plan, Remedial Investigation Report, Remedial Action Work Plan (RAWP), and contractor specifications for soil management and tank and hydraulic lift removal. Mr. Godick managed implementation of the remediation in accordance with the RAWP.

164 Kent Avenue, Brooklyn, NY (AKA Northside Piers and 1 North 4th Place), RD Management, L&M Development, Toll Brothers, and Douglaston Development

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 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 development of remedial cost estimates for development, 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. Closure reports were prepared and the project is fully built-out and occupied.

Site Investigation–Over 20 Facilities, Con Edison, New York, NY

Mr. Godick managed site investigations associated with petroleum, dielectric fluid, and PCB releases at over 20 Con Edison facilities including service centers, substations, generating stations, and underground transmission and distribution systems. Site investigations have included due diligence site reviews, soil boring installation, monitoring well installation, hydrogeologic testing, and water quality sampling. Risk-based closures were proposed for several sites.

Underground Storage Tank Closure and Site Remediation–Program Management, Con Edison, New York, NY

Mr. Godick provided technical assistance to Con Edison in developing technical submittals and budgets associated with tank closures at over 50 facilities. Technical summaries were prepared for submittal of contractor-prepared closure reports to the NYSDEC. The summaries included a review of historic pre-closure assessments, tank closure data, and provided recommendations for additional assessment, remediation or closure. Subsequently, a three-year program budget was developed for implementation of the UST investigation/remedial program, which Con Edison utilized for internal budgeting purposes.

Site Investigation–7 World Trade Center Substation, Con Edison, New York, NY

Mr. Godick managed the site investigation at the former 7 World Trade Center Substation in an effort to delineate and recover approximately 140,000 gallons of transformer and feeder oil following the collapse of the building. The project involved coordination with several crews, Con Edison, and other site personnel.

Site Investigation–Former Manufactured Gas Plant (MGP) Facilities, Con Edison, New York, NY

Mr. Godick managed site investigations at four former manufactured gas plant (MGP) facilities. The investigations were completed at Con Edison substations, a flush pit facility, and a service center to support remedial design and expansion at select locations. The findings from these characterizations were used by Con Edison to make appropriate changes to the design specifications and to plan for appropriate handling of impacted materials and health and safety protocols during future construction activities.

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

Mr. Godick managed the remedial design and engineering work associated with remediation of National Grid's former MGP located in the Town of Huntington. The site is situated in a sensitive location along the waterfront, surrounded by commercial and residential properties, and half the property where the remediation was conducted was a steep slope. The remedy consisted of soil removal, oxygen injection, and non-aqueous phase liquid recovery. Mr. Godick was responsible for the development of the remedial work plans, design/construction documents, landscape architecture, confirmatory sampling, air monitoring, supervision, and preparation of closeout documentation in accordance with NYSDEC requirements.

Verizon, Investigation & Remediation, Various Locations, NY, PA and DE

Mr. Godick managed over 50 environmental investigations and remediation projects related to petroleum releases at various facilities. Responsibilities included annual budgeting, day-to-day project management, development and implementation of soil and ground water investigation workplans, ground water modeling, risk evaluation, remedial action work plans, remedial design, system installation, waste disposal, well abandonment, and operation and maintenance. Many of the assessment and remedial projects followed a risk-based approach. Remedial technologies implemented included air sparging, soil vapor extraction, bioremediation, pump and treat, soil excavation, and natural attenuation.

Storage Tank Management, Verizon, Various Locations, NY, PA, DE, and MA

Mr. Godick managed the removal and replacement of underground and aboveground storage tank systems for Verizon in New York, Pennsylvania, Delaware, and Massachusetts. Responsibilities included the management of design, preparation of specifications, contractor bidding, construction oversight, project budget, and documentation. For selected AST sites, managed the development of Spill Control, Contingency and Countermeasures (SPCC) plans.

Litigation Support, Cost Recovery Action, Gowanus Superfund Site, New York

Mr. Godick provided technical support to one of the 40+ potential responsible parties (PRPs) associated with a Federal Superfund site in New York State, which included conducting a liability assessment for the various parties and development of a cost allocation model.

Litigation Support, Cost Recovery Action, New York State Superfund Site

Mr. Godick provided technical support for the former owner of a New York State Superfund site in upstate New York. The owner of the property brought a cost recovery action against our client as a PRP. Mr. Godick completed a technical review of the draft Remedial Investigation/Feasibility Study prepared by the opposing party's consultant to develop a more cost effective remedial strategy and to better position the client for liability allocation as part of future settlement negotiations. Mr. Godick also developed a cost allocation report that included a model for settlement negotiations, as well as participated in mediation.

Litigation Support & Remediation, Former Service Station, Brooklyn, New York

Mr. Godick took over management of remediation of an inactive service station (formerly conducted by another firm). His approach outlined additional characterization and remediation efforts, which resulted in successful closure of the spill by NYSDEC within two years. Mr. Godick testified as an expert witness at a hearing in the New York State Supreme Court of Kings County to determine the adequacy of the remediation efforts.

Litigation Support, Cost Recovery Action, Town of Carmel, New York

Mr. Godick served as an expert witness representing the owner of a property in a landlord-tenant dispute, which was used as a gasoline station and oil change facility. Mr. Godick prepared exhibits, testified, and participated in

meetings with NYSDEC to support the landlord's claim that the oil change tenant's practices were poor and were adversely affecting the environment and the overall facility systems at the site.

Litigation Support, Cost Recovery Action, New York State Petroleum Spill Site, New York, NY

Mr. Godick provided technical support for the former owner of a New York City multi-unit residential apartment building. The State of New York brought a cost recovery action against our client as a result of a previous spill from a former underground storage tank. Mr. Godick reviewed invoices and project documentation to dispute work performed by the NYSDEC, which provided the basis for settlement at a fraction of the initial claim.

Litigation Support, Class Action Lawsuit, Confidential Client, NJ

Mr. Godick provided technical support for a class action suit involving a petroleum-impacted community water supply in southern New Jersey. The technical assistance included analysis of expert testimony and coordination with legal counsel in preparing for cross-examination of the opposing party's lead expert witness.

Cost Analysis, Environmental Insurance Claims, Various Locations

Mr. Godick provided technical support for cost analyses completed for a large national insurance company related to several former MGP and other industrial sites. Responsibilities included evaluation and development of cost-effective remedial strategies, as well as compilation of detailed costs for remedial action implementation and closure.

AMY T. JORDAN

GEOSCIENTIST

Amy Jordan is a geoscientist with over six years of environmental consulting experience related to site assessment and remediation from the initial proposal and assessments of properties through post-remedial site management under regulatory oversight of local, state, and federal agencies. Ms. Jordan conducts and manages all aspects of redevelopment projects from the initial proposal and assessments of properties through post-remedial site management under regulatory oversight of local, state, and federal agencies. Ms. Jordan works with non-profit organizations, affordable housing developers, for-profit developers, and government agencies under the regulatory oversight of the New York State Department of Environmental Conservation (NYSDEC), the New York City Department of Environmental Protection (NYCDEP), and the New York City Office of Environmental Remediation (NYCOER). Ms. Jordan manages projects enrolled in the New York State Brownfield Cleanup Program (BCP), the New York City Voluntary Cleanup Program (VCP), NYSDEC petroleum spills program, and NYCOER's E Designation program. Her management skill set is supported by several years of fieldwork, including: oversight of remedial construction activities; soil, groundwater, and soil vapor sampling; Phase I Environmental Site Assessments; Subsurface and Remedial Investigations; design, operation, and maintenance of engineering controls, including sub-slab depressurization and soil vapor extraction systems; oversight and sampling of direct-push, sonic, and hollow stem auger drilling; waste characterization, handling, and disposal; and petroleum bulk storage closure.

BACKGROUND

Education

B.A. Geosciences, Franklin and Marshall College, Lancaster, PA, 2011
M.S. Geology, University of Pennsylvania, Philadelphia, PA, Expected 2020

Licenses/Certifications

40 Hour OSHA HAZWOPER
OSHA 10 Hour Occupational Construction Safety and Health
NYSDEC Erosion and Sediment Control Inspector
Amtrak Track Safety
New York State Asbestos Inspector

Years of Experience

Year started in company: 2012
Year started in industry: 2011

RELEVANT EXPERIENCE

Manhattan West Southeast Tower - Manhattan, NY – New York City Office of Environmental Remediation (NYCOER) E Designation Program and United States Environmental Protection Agency (USEPA)

AKRF is providing environmental consulting services to Brookfield Office Properties in connection with the Manhattan West development site, which encompasses an entire city-block above the Amtrak approach to Penn Station. The four towers that comprise the Manhattan west development site are being remediated as four different sites under the NYCOER, due to an E Designation for hazardous materials, air quality, and noise attenuation. Ms.

Jordan is currently managing the environmental work required for the NYCOER E Designation at the Southeast Tower site. In addition, due to the presence of polychlorinated biphenyls (PCBs) within the subterranean railyard, Ms. Jordan designed and prepared the Self-Implementing Cleanup Plan in coordination with the USEPA. Upon approval of the remedial plans, Ms. Jordan oversaw the remediation activities to ensure compliance with the SICP in accordance with the Toxic Substance and Control Act (TSCA); and is preparing to implement the NYCOER RAWP on the street-grade portion of the project.

12 Eckford Street – Brooklyn, New York – New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP)

AKRF is providing environmental consulting services in connection with the redevelopment of a former manufacturing property into a mix of affordable and market-rate residential units. Ms. Jordan manages the environmental consulting services in connection with the redevelopment of this property into a mix of affordable and market-rate residences in the BCP. For this project, I have developed and conducted several subsurface investigations at the property under the oversight of NYC agencies. Ms. Jordan prepared the BCP application after analytical data identified chlorinated solvent contamination at the property. She designed and conducted a soil vapor extraction (SVE) pilot test, developed and authored a remedial action plan including the design of an SSDS and SVE system, and hazardous waste delineation and disposal. After construction oversight, ongoing remedial monitoring under the oversight of NYSDEC will culminate with a Final Engineering Report (FER).

Atlantic Chestnut Lots 1, 2, and 3 – Brooklyn, New York – New York State Brownfield Cleanup Program

AKRF is providing environmental consulting services in connection with the purchase and redevelopment of an entire city block, from a burned manufacturing facility into three mixed-use commercial and affordable rental unit buildings. Ms. Jordan prepared a Phase I Environmental Site Assessment (ESA), conducted three subsurface investigations, and prepared three BCP Applications. She developed supplemental investigation work plans for the design of remedial actions and to aid in the design of in-situ groundwater treatment related to chlorinated solvent contamination in soil, groundwater, and soil vapor across the three sites. Prior to implementation of the remedial action, Ms. Jordan is designing and preparing three soil vapor extraction (SVE) systems The work will include construction oversight, ongoing remedial monitoring under the oversight of the NYSDEC, and will culminate with a FER.

Brook 156 - Bronx, New York – NYSDEC BCP

AKRF is providing environmental consulting services to Phipps Houses in connection with the purchase and development of two lots located at 740 Brook Avenue in the Bronx, NY. Before writing the New York State Brownfield Cleanup Program (NYSBCP) application, which was accepted by the State, AKRF prepared a Phase I Environmental Site Assessment (ESA) of the site (a former gasoline service station and railroad) and also conducted Tier 1 Vapor Encroachment Screening to satisfy HUD's vapor intrusion requirements, and prepared a Remedial Investigation Work Plan (RIWP) and a Remedial Investigation (RI) at the site. AKRF prepared a Citizen Participation Plan (CPP), distributed public notices, and prepared a Supplemental Remedial Investigation Work Plan (SRIWP) to further investigate soil, soil vapor, and groundwater at the site prior to redevelopment. Based on the results of the Supplemental Remedial Investigation (SRI), AKRF reported a petroleum spill to NYSDEC. Ms. Jordan prepared the Remedial Action Work Plan (RAWP), which included the design of an active SSDS and an SVE system. Ms. Jordan also acts as the project manager for client and agency correspondence and will oversee implementation of the RAWP.

Elton Crossing – Bronx, New York – NYSDEC BCP

AKRF provided environmental consulting services in connection with the purchase and redevelopment of this property into mixed-use commercial space and low-income rental units. Ms. Jordan prepared the Phase I ESA report, conducted several investigations including the installation of bedrock monitoring wells, and a BCP application. Ms. Jordan managed all aspects of the cleanup, including the development of supplemental work plans, the remedial action, and citizen participation documents. She managed the implementation of the remedial

action, including petroleum storage tank removal, soil brokering and disposal, and hazardous waste delineation and disposal. She prepared the FER and the Site Management Plan (SMP) for the institutional and engineering controls and authored the winning NYC Big Apple Brownfield Award application for the project in Spring 2017.

3363-3365 Third Avenue, Bronx, New York – NYCOER VCP

AKRF provided environmental consulting services in connection with the proposed affordable housing development at 3363-3365 Third Avenue. The proposed project consists of a residential building with a basement and approximately 30 affordable housing units. Ms. Jordan prepared Phase I ESA for due diligence purposes and to support an application to the New York City Acquisition Fund. The Phase I identified recognized environmental conditions as well as an E- Designation from the Morrisania Rezoning Action. Ms. Jordan is assisting the client with satisfying the E –Designation and has prepared and implemented a Remedial Investigation Work Plan, performed a Remedial Investigation, prepared a Remedial Action Work Plan, and Phase I ESA update for the New York City Acquisition Fund under the regulatory oversight of the New York City Mayor's Office of Environmental Remediation (NYCOER). The Remedial Investigation included soil, soil vapor, groundwater and ambient air sampling. AKRF is preparing the Remedial Action Work Plan for the site and assisted the client with enrollment into NYCOER's Voluntary Cleanup Program. The site is scheduled to break ground in the Spring of 2016.

VICTOR CHANG, EIT

ENVIRONMENTAL ENGINEER

Mr. Chang is an Environmental Engineer in AKRF's Hazmat department with two years of environmental consulting experience in site assessment and remediation. At AKRF, Mr. Chang conducts aspects of redevelopment projects from the initial Phase I ESA, Phase II Site Investigation, and remediation through post-remedial site management. His field work experience includes environmental site assessments and investigations (surface water, groundwater, soil, indoor air, and soil vapor), energy audits, construction oversight, safety supervisor, and waste management.

BACKGROUND

Education

Pursuing Masters of Engineering, Environmental Engineering, Stevens Institute of Technology, Hoboken, NJ

B.S., Environmental Engineering, *cum laude*, University at Buffalo, The State University of New York, UB School of Engineering and Applied Sciences, 2015

Certifications

Engineer-in-Training
OSHA 40-Hour Hazwoper
OSHA 30-Hour Construction
OSHA 8-Hour Supervisor
First Aid/CPR/AED

Years of Experience

Year started in company: 2017
Year started in industry: 2015

RELEVANT EXPERIENCE

AKRF – Various Projects, NY

Since joining AKRF, Mr. Chang has provided environmental consulting services on various projects. Mr. Chang has been involved with various environmental projects including Phase I Environmental Site Assessments (ESAs); Phase II (Subsurface) Environmental Site Investigations (soil, groundwater, and soil vapor intrusion investigations); Indoor Air Quality (IAQ) Assessments, and Construction Oversight (including community air monitoring, vapor barrier/SSDS installations, waste classification and delineation), as well as the proposals, work plans, and reporting associated with these tasks.

Merck OER and ACM Removal Project

While at another employer, Mr. Chang served as Site Superintendent, where his responsibilities included:

- Providing management and safety oversight for obsolete equipment and asbestos removal project;
- Assisting project manager with plans, schedules, costs, and overseeing sub-contractors;
- Participating actively in meetings, presentations, and Merck safety culture to foster client relationships; and

- Overseeing environmental compliance and monitoring (stormwater, waste management, air monitoring, excavation/confined spaces).

O'Brien & Gere Edison, NJ

While at another employer, Mr. Chang served as a Staff Environmental Engineer, where his responsibilities included:

- Supporting engineering projects through providing remedial oversight, calculations, and data analysis;
- Facilitating execution and supporting remediation projects including proposals, reports, designs, and workplans; and
- Performing and supervising field work (sampling, investigation, monitoring) for soil, vapor intrusion, groundwater, surface water.

En-Power Group Manhattan, NY

While at another employer, Mr. Chang served as an Energy Analysis and Field Intern, where his responsibilities included:

- Assisting lead engineers in the field conducting complete energy audits for multi-family buildings;
- Performing and evaluating feasibility, energy savings, and cost-benefit analysis for energy efficiency measures; and
- Producing energy efficiency reports including level I, II, and III audits for clients and the city.

Go Solar Green NY Queens, NY

While at another employer, Mr. Chang served as a Solar Design and Marketing Intern, where his responsibilities included:

- Applying solar theory and design to residential and commercial spaces;
- Performing cost and energy production estimates for small-scale solar systems; and
- Qualifying and contacting prospective clients for distribution of marketing materials.

APPENDIX F
SITE MANAGEMENT FORMS

SITE MANAGEMENT FORM - DETAILED SYSTEM MONITORING INSPECTION FORM
C224242; New 470 Project
12 Eckford Street, Brooklyn, New York

Inspector Name:	**Date:**
Time In:	**Time Out:**

General

Weather:	Temperature:	Barometric Pressure:	

When was the last rain event?

Is the blower currently operating? Yes / No (circle one)

If no, please list reason/alarm condition:

Any evidence of system tampering, vandalism or damage in the first floor equipment room?

Any evidence of system tampering, vandalism, or damage to the exhaust stack?

Were all cleanout/sampling port caps securely attached prior to system testing?

If no, list location and contact Project Manager/Project Director.

Is the concrete floor slab overlying all of the SSDS piping runs intact?

If no, list location and contact Project Manager/Project Director.

SSDS Operations

Sample Identification	Sample Location	Flow Rate[1] cfm	Applied Vacuum[1] in. H2O	Induced Vacuum[2] in. H2O	Notes
MP-1		NA	NA		
MP-2		NA	NA		
MP-3		NA	NA		
VR-1A				NA	
VR-1B				NA	
VR-1C				NA	
VR-1D				NA	

Comments:

Notes:

1. Normal system flow rates range from 40 to 100 cfm. Applied vacuum readings range from 0.5 to 10 in. H_2O. System readings will be obtained from each riser leg.

2. Normal system induced vacuum readings should be a minimum of 0.005 in. H_2O. System readings will be obtained from each monitoring point (MP-1 through MP-3).

3. If observations are confirmed to be outside of this range, inform emergency contacts below and prepare corrective action plan, if necessary.

in. of H_2O - inches of water

cfm - cubic feet per minute

NA - not applicable

Site Management Form – General Inspection
New 470 Project (BCP Site No. C224242)
12 Eckford Street, Brooklyn, New York

Inspector:

Date:

1. Site Use Restrictions

No on-site vegetable gardens?

No groundwater withdrawal for potable/non-potable use?

Restricted residential use maintained?

2. Site Cap

Note the date that the annual site cap inspection was performed.

Repairs made as noted during inspection?

3. Soil Management

Note the date(s) of any soil disturbance activities conducted during the past year.

Proper soil management procedures implemented (cite appropriate close-out reports)?

4. Recordkeeping

Check that the following records/reports are being maintained/completed (note report/log dates as appropriate):

1) Annual site cap inspection log:

2) Close-out report(s) for soil disturbance activities (including manifests for soil disposal):

5. Comments