

211 West 29th Street
NEW YORK, NEW YORK

Remedial Action Work Plan

NYC VCP Project Number 17CVCP001M
OER Project Number 16EHAN062M

Prepared For:

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REMEDIAL ACTION WORK PLAN

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LIST OF ACRONYMS

Acronym	Definition
AOC	Area of Concern
AS/SVE	Air Sparging/Soil Vapor Extraction
BOA	Brownfield Opportunity Area
CAMP	Community Air Monitoring Plan
C&D	Construction and Demolition
CEQR	City Environmental Quality Review
CFR	Code of Federal Regulations
CHASP	Construction Health and Safety Plan
COC	Certificate of Completion
CQAP	Construction Quality Assurance Plan
CSOP	Contractors Site Operation Plan
DCR	Declaration of Covenants and Restrictions
ECs/ICs	Engineering Controls and Institutional Controls
ELAP	Environmental Laboratory Accreditation Program
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations Emergency Response
IRM	Interim Remedial Measure
MNA	Monitored Natural Attenuation
NOC	Notice of Completion
NYS DEC	New York State Department of Environmental Conservation
NYC DEP	New York City Department of Environmental Protection
NYC DOHMH	New York State Department of Health and Mental Hygiene
NYC OER	New York City Office of Environmental Remediation
NYC VCP	New York City Voluntary Cleanup Program
NYCRR	New York Codes Rules and Regulations
NYS DEC	New York State Department of Environmental Conservation
NYS DEC DER	New York State Department of Environmental Conservation Division of

	Environmental Remediation
NYS DOH	New York State Department of Health
NYS DOT	New York State Department of Transportation
ORC	Oxygen-Release Compound
OSHA	United States Occupational Health and Safety Administration
PCBs	Polychlorinated Biphenyls
PE	Professional Engineer
PID	Photo Ionization Detector
QEP	Qualified Environmental Professional
QHHEA	Qualitative Human Health Exposure Assessment
RAOs	Remedial Action Objectives
RAR	Remedial Action Report
RAWP	Remedial Action Work Plan or Plan
RCA	Recycled Concrete Aggregate
RD	Remedial Design
RI	Remedial Investigation
RMZ	Residual Management Zone
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SSDS	Sub-Slab Depressurization System
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
USGS	United States Geological Survey
UST	Underground Storage Tank
VCA	Voluntary Cleanup Agreement
VOC	Volatile Organic Compound

CERTIFICATION

I, David Bligh, am currently a registered professional engineer licensed by the State of New York. I performed professional engineering services and had primary direct responsibility for designing the remedial program for the 211 West 29th Street, New York, NY site, site numbers 16EHAN062M and 17CVCP001M. I certify to the following:

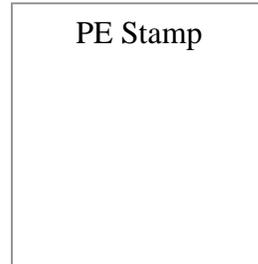
- I have reviewed this document and the Stipulation List, to which my signature and seal are affixed.
- Engineering Controls developed for this remedial action were designed by me or a person under my direct supervision and designed to achieve the goals established in this Remedial Action Work Plan for this site.
- The Engineering Controls to be constructed during this remedial action are accurately reflected in the text and drawings of the Remedial Action Work Plan and are of sufficient detail to enable proper construction.
- This Remedial Action Work Plan (RAWP) has a plan for handling, transport and disposal of soil, fill, fluids and other materials removed from the property in accordance with applicable City, State and Federal laws and regulations. Importation of all soil, fill and other material from off-Site will be in accordance with all applicable City, State and Federal laws and requirements. This RAWP has provisions to control nuisances during the remediation and all invasive work, including dust and odor suppression.

Name

PE License Number

Signature

Date



I, Robert Kovacs, am a qualified Environmental Professional. I will have primary direct responsibility for implementation of the remedial program for the 211 West 29th Street, New York, NY site, site number 16EHAN062M. I certify to the following:

- This Remedial Action Work Plan (RAWP) has a plan for handling, transport and disposal of soil, fill, fluids and other materials removed from the property in accordance with applicable City, State and Federal laws and regulations. Importation of all soil, fill and other material from off-Site will be in accordance with all applicable City, State and Federal laws and requirements. This RAWP has provisions to control nuisances during the remediation and all invasive work, including dust and odor suppression.

QEP Name

QEP Signature

Date

EXECUTIVE SUMMARY

211 Sea Foam Properties is working with the NYC Office of Environmental Remediation (OER) in the New York City Voluntary Cleanup Program to investigate and remediate a 4,500-square foot site located at 211 West 29th Street in Manhattan, New York (Site). A remedial investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP). The remedial action described in this document provides for the protection of public health and the environment consistent with the intended property use, complies with applicable environmental standards, criteria and guidance and conforms with applicable laws and regulations. NYSDEC was briefed on this project in April 2016.

Site Location and Background

The Site is located in the Chelsea neighborhood in the Borough of Manhattan and is identified as Block 779 and Lot 31 (Figure 1). The Site is located on the north side of 29th Street between 7th and 8th Avenues. The approximately 4,500-square foot Site is comprised of one rectangular parcel measuring 46-feet wide and 100-feet long. Currently, the Site is used as a fee based parking lot and contains multiple self-contained, hydraulically operated above-ground car stacking lifts. There are five parking lifts with a holding capacity of three cars per lift and approximately 35 parking spaces on the ground. Aside from a small kiosk used by the parking attendant and the above mentioned car lifts, there are no other improvements at the Site.

Summary of Redevelopment Plan

The proposed development project consists of the construction of an anticipated 20 story mixed use building with street level retail/office and residential above. The new building will occupy the entire lot and will include a sub-grade basement. It is anticipated that the depth of the basement slab will be at approximately 10.5 feet below ground surface (bgs) to 14 feet bgs. Excavation will therefore proceed to a maximum depth of approximately 14 feet bgs. The water table elevation varies across the Site, and was encountered at 20 to 22 feet bgs. The depth of

bedrock is also variable across the Site, found to be shallower on the east side of the Site (approximately 14 feet bgs) and deeper on the west side of the Site (approximately 30 feet bgs). Where necessary, bedrock will be removed as part of Site redevelopment construction to accommodate the sub-grade basement.

Summary of Surrounding Property

The area surrounding the Site consists of a mixture of urban commercial, industrial and residential properties. The Site is bordered to the north by a twelve--story industrial and manufacturing use building; to the east by a twenty one-story mixed commercial and office use building; to the south by 29th Street beyond which is a six-story mixed commercial and office use building, and to the west by a seven-story mixed commercial and residential use building.

Summary of Past Site Uses and Areas of Concern

A Phase I Environmental Site Assessment (ESA) was completed at the Site in August of 2015. The on-site and off-site recognized environmental conditions (RECs) identified as a result of the August 2015 Phase I ESA are as follows:

- Historical onsite uses: The Site was formerly utilized as a furrier, a chemical supply company and as a fee based parking facility. These historical operations include the long-term storage and parking of automobiles and the potential use of chlorinated hydrocarbons and humectants such as glycerine, ethylene glycol or sorbitol solutions may have potentially impacted the quality of the subsurface soil, soil vapor, and/or groundwater beneath the Site.
- Possible Groundwater and Soil Vapor Contamination: The potential impacts from historical use of the surrounding properties include use as furriers. The operations associated with several nearby properties are indicative of the use of benzene, chlorinated hydrocarbons, humectants, or sorbitol solutions.

Although not technically defined as RECs, the following is a list of potential business environmental risks at the Site that could impact potential redevelopment activities the Site:

- There is the potential that the Site is underlain by historic urban fill. This is common in the five boroughs of New York City.

- The Site has been identified as an E-Designation (E-276) for Hazardous Materials, Exhaust Stack Limitations and Air Quality Protocol. In order to address the Hazardous Materials E-Designation, site investigation guidelines provided by the New York City Office of Environmental Remediation (NYC OER), the governing agency overseeing New York City's E-Designation program, are required to be satisfied.
- DEC Spill Number 15-05845 was assigned to the site in September of 2015 due to the presence of LNAPL.

Summary of Work Performed under the Remedial Investigation

The Remedial Investigation (RI) work summarized herein was performed in two phases; an initial investigation which was completed in accordance with a Phase II Work Plan submitted to and approved by NYC OER, and a supplemental investigation completed in accordance with a Supplemental Investigation Work Plan submitted to the New York State Department of Environmental Conservation (NYSDEC) and NYC OER on December 11, 2015 and approved on December 23, 2015. The supplemental investigation was required to delineate light non-aqueous phase liquid (LNAPL) observed in two monitoring wells (B-1P and B-3P) installed during the initial investigation. NYSDEC Spill Number 15-05845 was assigned to the Site as a result of the LNAPL.

Roux Associates, Inc. (Roux Associates) performed the following scope of work in general accordance with the approved Phase II Work Plan and Supplemental Investigation Work Plan:

1. Conducted a Site inspection to identify areas of concern (AOCs) and physical obstructions (i.e., structures, buildings and utilities);
2. Installed six soil borings;
3. Installed five groundwater monitoring wells to establish groundwater flow and collected two groundwater samples for chemical analysis to evaluate environmental quality;
4. Collected 18 soil samples for laboratory analysis, 11 from the soil boring locations, seven from the monitoring well locations to evaluate soil quality;
5. Installed three soil vapor probes and collected three soil vapor samples; and
6. Collected one LNAPL sample for fingerprint analysis.

Summary of Findings of Remedial Investigation

1. Elevation of the Site is approximately 32 feet above mean sea level (amsl).
2. Depth to groundwater varies across the Site, from 20 to 22 feet bgs at the Site.
3. Groundwater flow is generally from south to north beneath the Site.
4. Depth to bedrock varies across the Site, from 14.5 to 30 feet bgs.
5. The stratigraphy of the Site, from the surface down, consists of 18 feet of urban fill material underlain by 12 feet of silty sand.

A total of eighteen soil/fill samples were collected during the RI and were compared to the NYSDEC Unrestricted Use Soil Cleanup Objectives (SCOs) as presented in NYSDEC Part 375.6. Analytical results indicate that several volatile organic compounds (VOCs) including: acetone (max of 340 micrograms per kilogram [$\mu\text{g}/\text{kg}$]), 1,2,4-Trimethylbenzene (max of 16,000 $\mu\text{g}/\text{kg}$), ethylbenzene (max of 1,100 $\mu\text{g}/\text{kg}$) and xylenes (max of 1,800 $\mu\text{g}/\text{kg}$) were detected above Unrestricted Use SCOs (UUSCOs) in one shallow and four deep samples. Petroleum related VOCs that exceed UUSCOs were detected in an offsite location-sidewalk along 29th Street (MW-1). No VOCs were detected at a concentration above their respective Restricted Residential Use SCOs (RRSCOs) in any of the soil borings.

Pesticides including 4,4'-DDT (max of 1,120 $\mu\text{g}/\text{kg}$), 4, 4'-DDD (max of 516 $\mu\text{g}/\text{kg}$) and 4, 4'-DDE (max of 742 $\mu\text{g}/\text{kg}$) were detected above their respective UUSCOs in three shallow samples and three deep samples. No pesticides were detected at a concentration above their respective RRSCOs.

Semivolatile organic compounds (SVOCs) including benzo(a)anthracene (max. of 1,600 $\mu\text{g}/\text{kg}$), benzo(a)pyrene (max. of 1,100 $\mu\text{g}/\text{kg}$), benzo(b)fluoranthene (max. of 1,600 $\mu\text{g}/\text{kg}$), chrysene (max. of 1,300) and indeno(1,2,3-cd)pyrene (max. of 780 $\mu\text{g}/\text{kg}$) were detected above their respective UUSCOs and RRSCOs in one shallow sample (B-6).

Metals including lead (max of 2,000 mg/kg) and mercury (max. of 1.2 mg/kg) were detected above their respective RRSCOs in a total of four samples: two shallow and

two deep. Copper (max. of 79 milligrams per kilogram mg/kg), chromium (max of 63 mg/kg), and zinc (max. of 660 mg/kg) were detected above their respective UUSCOs.

Total polychlorinated biphenyls (PCBs) were not detected above their respective UUSCOs.

6. A total of three groundwater samples were collected during the RI and indicated that SVOCs, PCBs and Pesticides were not detected in any samples. 1,2,4-trimethylbenzene (5.4 micrograms per liter ($\mu\text{g/L}$)) was detected above the Ambient Water Quality Standards and Guidance Values (AWQSGVs) in one sample (MW-1) at an offsite location. Naturally occurring metals including manganese (max of 4,343 $\mu\text{g/L}$), and iron (max of 38,700 $\mu\text{g/L}$) were detected above AWQSGVs in all groundwater samples.
7. A total of three soil vapor samples were collected during the RI and were compared to compounds listed in Table 3.1 Air Guideline Values derived by the New York State Department of Health (NYSDOH) located in the New York State Department of Health Final Guidance for Evaluating Soil Vapor Intrusion dated October 2006 (NYSDOH Guidance). Soil vapor samples collected during the RI indicated that petroleum and chlorinated-related VOCs were detected in each of the three samples. Total concentrations of petroleum-related VOCs (benzene, toluene, ethylbenzene and xylenes [BTEX]) ranged from 110.88 $\mu\text{g/m}^3$ to 166.70 $\mu\text{g/m}^3$. Other compounds detected included 2-Butanone (max of 106 $\mu\text{g/m}^3$), acetone (3,590 $\mu\text{g/m}^3$), 1,2,4-Trimethylbenzene (max of 18.5 $\mu\text{g/m}^3$), 4-Ethyltoluene (max of 13.0 $\mu\text{g/m}^3$), 1,3-Butadiene (max of 35.2 $\mu\text{g/m}^3$), 4-Methyl-2-Pentanone (max of 61.5 $\mu\text{g/m}^3$), carbon disulfide (max of 102 $\mu\text{g/m}^3$), cyclohexane (max of 3,040 $\mu\text{g/m}^3$), ethanol (max of 33.2 $\mu\text{g/m}^3$), N-heptane (max of 302 $\mu\text{g/m}^3$), 2,2,4-trimethylpentane (max of 23.5 $\mu\text{g/m}^3$), isopropanol (max of 16.4 $\mu\text{g/m}^3$), n-hexane (max of 652 $\mu\text{g/m}^3$), tert-Butyl Alcohol (max of 27.4 $\mu\text{g/m}^3$), and vinyl chloride (max of 74.9 $\mu\text{g/m}^3$). The NYSDOH Guidance identifies seven chlorinated compounds of concern; chlorinated compounds were identified in all soil vapor samples and included cis-1,2-dichloroethene (max of 31.4 $\mu\text{g/m}^3$), methylene chloride (max of 18.6 $\mu\text{g/m}^3$), and

tetrachloroethylene (PCE) with a maximum concentration of 17 $\mu\text{g}/\text{m}^3$. Indoor air was not sampled as there are no onsite buildings. Concentrations of all chlorinated compounds were below the monitoring level ranges established by NYSDOH.

Summary of the Remedial Action

The preferred remedy for the site is Alternative 1, a Track 1 Unrestricted Use Site-Specific SCOs remedy. The Track 1 remedy will remove all soil/fill exceeding Unrestricted Use SCOs throughout the Site, which will be confirmed with post-excavation sampling. Engineering and Institutional Controls are not required for a Track 1 cleanup. After achieving Track 1 remedy, E-designation for hazardous materials would be removed from this property.

The proposed remedial action achieves protection of public health and the environment for the intended use of the property. The proposed remedial action achieves all of the remedial action objectives established for the project and addresses applicable standards, criterion, and guidance; is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants; is cost effective and implementable; and uses standards methods that are well established in the industry.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP Citizen Participation activities according to an approved Citizen Participation Plan.
2. Performance of a Community Air Monitoring Program for particulates and volatile organic carbon compounds.
3. Selection of Unrestricted Use (Track 1) Soil Cleanup Objectives (SCOs).
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
5. Performance of a remedial action for the petroleum spill #15-05845 under New York State Department of Environmental Conservation (NYSDEC) Spill program. This remedial action will include removal of LNAPL present beneath the site. If required by NYSDEC, treatment of groundwater plume via injections (e.g., chemical oxidation

solutions) and the implementation of a groundwater monitoring program. A separate RAWP addendum will be prepared and submitted to NYSDEC.

6. Request for closure of onsite petroleum spill number 15-05845 under the authority of NYSDEC pending the results of the investigation and remediation and in accordance with CP-51 soil cleanup objectives. This RAWP does not alter or interfere with the remedial action for the petroleum spill. A separate Spill closure report may be required by NYSDEC, if warranted based on the results of the remediation.
7. Excavation and removal of soil/fill exceeding Unrestricted Use (Track 1) SCOs. The entire footprint of the building area (about 100% of the property) will be excavated to a depth of approximately 10.5 to 14 feet bgs for development purposes. A 10 feet by 10 feet portion of property will be excavated to a depth of approximately 25 feet below grade in the vicinity of boring B-3P to remove soil impacted by LNAPL. It will not be technically possible to expand the dimensions of the B-3P hotspot for structural reasons (i.e., concerns relating to the structural integrity of the building located on the adjacent property to the west of the Site) in the unlikely event that the impacts are not fully addressed by the proposed B-3P hot spot excavation. . Approximately 3,500 tons of soil/fill will be removed from the Site and properly disposed at an appropriately licensed or permitted facility.
8. Daily reports will be provided to OER and DEC during active excavation work. If no work is performed for extended time period, daily report frequency will be reduced to weekly basis. Monthly reports will be provided by the owner/developer (or environmental consultant) after excavation work is completed for the duration of the construction period.
9. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID. Appropriate segregation of excavated media on-Site.
10. Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials.
11. Removal of UST's that are encountered during soil/fill removal actions. Registration of tanks and reporting of any petroleum spills associated with UST's and appropriate

closure of these petroleum spills in compliance with applicable local, State and Federal laws and regulations.

12. Transportation and off-Site disposal of all soil/fill material at licensed or permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media on-Site.
13. Collection and analysis of five end-point samples to determine the performance of the remedy with respect to attainment of Track 1 SCOs. End point samples will be collected if soils are remaining above bedrock. No end-point samples will be collected if soil has been excavated to bedrock.
14. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
15. Performance of all activities required for the remedial action, including acquisition of required permits and attainment of pretreatment requirements, in compliance with applicable laws and regulations.
16. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
17. Submission of a Remedial Action Report (RAR) that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, and lists any changes from this RAWP.

If Track 1 Unrestricted Use SCOs are not achieved, the following construction elements implemented as part of new development will constitute Engineering and Institutional Controls:

18. As part of development, construction of an engineered composite cover consisting of a six-inch thick concrete building slab with an 8-inch clean granular sub-base beneath all building areas, 4-inch poured concrete on a 6-inch sub-base in sidewalk areas, and two feet of clean soil in all open space and landscaped areas.
19. As part of development, installation of a vapor barrier system consisting of vapor barrier beneath the building slab and outside of sub-grade foundation sidewalls to mitigate soil vapor migration into the building. The vapor barrier system will consist of a 1.2-millimeter (mm) Grace Construction Products Preprufe 300R below the slab throughout

the full building area and a 0.8-mm Grace Construction Products Preprufe 160R outside all sub-grade foundation sidewalls.

20. The building will also be constructed to meet passive house standards. Additional information regarding passive house design and construction can be found in Appendix 7.
21. If Track 1 Unrestricted Use SCOs are not achieved, Site Management Plan (SMP) will be required in the RAR for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency.
22. If Track 1 Unrestricted Use SCOs are not achieved, the property will continue to be registered with an E-Designation at the NYC Buildings Department. Establishment of Engineering Controls and Institutional Controls; a requirement that management of these controls must be in compliance with an approved SMP. Institutional Controls will include prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER-approval.

COMMUNITY PROTECTION STATEMENT

The NYC Office of Environmental Remediation (OER) provides governmental oversight for the cleanup of contaminated property in NYC. This Remedial Action Work Plan (“cleanup plan”) describes the findings of prior environmental studies, shows the location of identified contamination at the site, and describes the plans to clean up the site to protect public health and the environment.

This cleanup plan provides a very high level of protection for neighboring communities and also includes many other elements that address common community concerns, such as community air monitoring, odor, dust and noise controls, hours of operation, good housekeeping and cleanliness, truck management and routing, and opportunities for community participation. The purpose of this Community Protection Statement is to explain these community protection measures in non-technical language to simplify community review.

Project Information:

- Site Address: 211 West 29th Street, New York, NY
- NYC Voluntary Cleanup Program Project Number: 17CVCP001M

Project Contacts:

- OER Project Manager: Amanda Duchesne, 212-788-8841
- Site Project Manager: Robert Kovacs, (631) 232-2600
- Site Safety Officer: David Bligh(631) 232-2600
- Online Document Repository:
<http://www.nyc.gov/html/oer/html/repository/RManhattan.shtml>

Remedial Investigation and Cleanup Plan: Under the oversight of the NYC OER, a thorough study of this property (called a remedial investigation) has been performed to identify past property usage, to sample and test soils, groundwater and soil vapor, and to identify contaminant sources present on the property. The cleanup plan has been designed to address all contaminant sources that have been identified during the study of this property.

Identification of Sensitive Land Uses: Prior to selecting a cleanup, the neighborhood was evaluated to identify sensitive land uses nearby, such as schools, day care facilities, hospitals and residential areas. The cleanup program was then tailored to address the special conditions of this community.

Qualitative Human Health Exposure Assessment: An important part of the cleanup planning for the Site is a study to find all of the ways that people might come in contact with contaminants at the Site now or in the future. This study is called a Qualitative Human Health Exposure Assessment (QHHEA). A QHHEA was performed for this project. This assessment has considered all known contamination at the Site and evaluated the potential for people to come in contact with this contamination. All identified public exposures will be addressed under this cleanup plan.

Health and Safety Plan: This cleanup plan includes a Construction Health and Safety Plan (CHASP) that is designed to protect community residents and on-Site workers. The elements of this RAWP are in compliance with applicable safety requirements of the United States Occupational Safety and Health Administration (OSHA). This RAWP includes many protective elements including those discussed below.

Site Safety Coordinator: This project has a designated Site safety coordinator to implement the CHASP. The safety coordinator maintains an emergency contact sheet and protocol for management of emergencies. The Site safety coordinator is identified at the beginning of this Community Protection Statement.

Worker Training: Workers participating in cleanup of contaminated material on this project are required to be trained in a 40-hour hazardous waste operators training course and to take annual refresher training. This pertains to workers performing specific tasks including removing contaminated material and installing cleanup systems in contaminated areas.

Community Air Monitoring Plan: Community air monitoring will be performed during this cleanup project to ensure that the community is properly protected from contaminants, dust and odors. Air samples will be tested in accordance with a detailed plan called the Community Air Monitoring Plan or CAMP. Results will be regularly reported to the NYC Office of Environmental Remediation. This cleanup plan also has a plan to address any unforeseen problems that might occur during the cleanup (called a ‘Contingency Plan’).

Odor, Dust and Noise Control: This cleanup plan includes actions for odor and dust control. These actions are designed to prevent off-Site odor and dust nuisances and includes steps to be taken if nuisances are detected. Generally, dust is managed by application of physical covers and by water sprays. Odors are controlled by limiting the area of open excavations, physical covers, spray foams and by a series of other actions (called operational measures). The project is also required to comply with applicable NYC noise control standards. If you observe problems in these areas, please contact the onsite Project Manager or NYC Office of Environmental Remediation Project Manager listed on the first page of this Community Protection Statement document.

Quality Assurance: This cleanup plan requires that evidence be provided to illustrate that all cleanup work required under the plan has been completed properly. This evidence will be summarized in the final report, called the Remedial Action Report. This report will be submitted to the NYC Office of Environmental Remediation and will be thoroughly reviewed.

Stormwater Management: To limit the potential for soil erosion and discharge, this cleanup plan has provisions for stormwater management. The main elements of the stormwater management include physical barriers such as tarp covers and erosion fencing, and a program for frequent inspection.

Hours of Operation: The hours for operation of cleanup will comply with the NYC Department of Buildings construction code requirements or according to specific variances

issued by that agency. For this cleanup project, the hours of operation will conform to requirements of the NYC Department of Buildings.

Signage: While the cleanup is in progress, a placard will be prominently posted at the main entrance of the property with a laminated project Fact Sheet that states that the project is in the NYC Voluntary Cleanup Program and provides project contact names and numbers, and a link to the document repository where project documents can be viewed.

Complaint Management: The contractor performing this cleanup is required to address all complaints. If you have any complaints, you can call the facility Project Manager or the NYC Office of Environmental Remediation Project Manager listed on the first page of this Community Protection Statement document, or call 311 and mention the Site is in the NYC Voluntary Cleanup Program.

Utility Mark-outs: To promote safety during excavation in this cleanup, the contractor is required to first identify all utilities and must perform all excavation and construction work in compliance with NYC Department of Buildings regulations.

Soil and Liquid Disposal: All soil and liquid material removed from the Site as part of the cleanup will be transported and disposed of in accordance with all applicable City, State and Federal regulations, and required permits will be obtained.

Soil Chemical Testing and Screening: All excavations will be supervised by a trained and properly qualified environmental professional. In addition to extensive sampling and chemical testing of soils on the Site, excavated soil will be screened continuously using hand-held instruments, by sight, and by smell to ensure proper material handling and management, and community protection.

Stockpile Management: Soil stockpiles will be kept covered with tarps to prevent dust, odor and erosion. Stockpiles will be frequently inspected. Damaged tarp covers will be

promptly replaced. Stockpiles will be protected with silt fences. Hay bales will be used, as needed, to protect storm water catch basins and other discharge points.

Trucks and Covers: Loaded trucks leaving the Site will be covered in compliance with applicable laws and regulations to prevent dust and odor. Trucks will be properly recorded in logs and records and placarded in compliance with applicable City, State and Federal laws, including those of the New York State Department of Transportation. If loads contain wet material that can leak, truck liners will be used. All transport of materials will be performed by licensed truckers and in compliance with applicable laws and regulations.

Imported Material: All fill materials proposed to be brought onto the Site will comply with rules outlined in this cleanup plan and will be inspected and approved by a qualified worker located on the Site. Waste materials will not be brought onto the Site. Trucks entering the Site with imported clean materials will be covered in compliance with applicable laws and regulations.

Equipment Decontamination: All equipment used for cleanup work will be inspected and washed, if needed, before it leaves the Site. Trucks will be cleaned at a truck inspection station on the property before leaving the Site.

Housekeeping: Locations where trucks enter or leave the Site will be inspected every day and cleaned regularly to ensure that they are free of dirt and other materials from the Site.

Truck Routing: Truck routes have been selected to: (a) limit transport through residential areas and past sensitive nearby properties; (b) maximize use of city-mapped truck routes; (c) limit total distance to major highways; (d) promote safety in entry to highways; (e) promote overall safety in trucking; and (f) minimize off-Site line-ups (queuing) of trucks entering the property. Operators of loaded trucks leaving the Site will be instructed not to stop or idle in the local neighborhood.

Final Report: The results of all cleanup work will be fully documented in a final report (called the Remedial Action Report) that will be available for public review online. A link to the online document repository and the public library with Internet access nearest the Site are listed on the first page of this Community Protection Statement document

Long-Term Site Management: If long-term protection is needed after the cleanup is complete, the property owner will be required to comply with an ongoing Site Management Plan that calls for continued inspection of protective controls, such as Site covers. The Site Management Plan is evaluated and approved by the NYC Office of Environmental Remediation. Requirements that the property owner must comply with are defined either in the property's deed or established through a city environmental designation registered with the Department of Buildings. A certification of continued protectiveness of the cleanup will be required from time to time to show that the approved cleanup is still effective.

REMEDIAL ACTION WORK PLAN

1.0 Project Background

211 Sea Foam Properties is working with the NYC OER in the New York City Voluntary Cleanup Program and/or in the “E” Designation Program to investigate and remediate a property located at 211 West 29th Street in the Chelsea section of Manhattan, New York (the “Site”). A RI was performed to compile and evaluate data and information necessary to develop this RAWP in a manner that will render the Site protective of public health and the environment consistent with the contemplated end use. This RAWP establishes remedial action objectives, provides a remedial alternatives analysis that includes consideration of a permanent cleanup, and provides a description of the selected remedial action. The remedial action described in this document provides for the protection of public health and the environment, and complies with applicable environmental standards, criteria and guidance and applicable laws and regulations.

1.1 Site Location and Background

The Site is located in the Chelsea neighborhood in the Borough of Manhattan and is identified as Block 779 and Lot 31 (Figure 1). The Site is located on the north side of 29th Street between 7th and 8th Avenues. The approximately 4,500-square foot Site is comprised of one rectangular parcel measuring 46-feet wide and 100-feet long. Currently, the Site is used as a fee based parking lot and contains multiple self-contained, hydraulically operated above-ground car stacking lifts. There are five parking lifts with a holding capacity of three cars per lift and approximately 35 parking spaces on the ground. Aside from a small kiosk used by the parking attendant and the above mentioned car lifts, there are no other improvements at the Site.

1.2 Redevelopment Plan

The proposed development project consists of the construction of an anticipated 20 story mixed use building with street level retail/office and residential above. The new building will occupy the entire lot and will include a sub-grade basement. It is anticipated that the depth of the basement slab will be at approximately 14 feet below ground surface (bgs). Excavation will therefore proceed to a maximum depth of approximately 16 feet bgs. The water table elevation varies across the Site, and was encountered at 20 to 22 feet bgs. The depth of bedrock is also

variable across the Site, found to be shallower on the east side of the Site (approximately 14 feet bgs) and deeper on the west side of the Site (approximately 30 feet bgs). Where necessary, bedrock will be removed as part of Site redevelopment construction to accommodate the sub-grade basement. Proposed Development Plans are provided in Appendix 1.

The current zoning designation is M1-6D, light manufacturing. The proposed use is consistent with existing zoning for the property. The remedial action contemplated under this RAWP may be implemented independently of the proposed redevelopment plan.

1.3 Description of Surrounding Property

The area surrounding the Site consists of a mixture of urban commercial, industrial and residential properties. The Site is bordered to the north by a twelve-story industrial and manufacturing use building; to the east by a twenty one-story mixed commercial and office use building; to the south by 29th Street beyond which is a six-story mixed commercial and office use building, and to the west by a seven-story mixed commercial and residential use building. Figure 3 shows the surrounding land usage.

1.4 Summary of Past Site Uses and Areas of Concern

A Phase I Environmental Site Assessment (ESA) was completed at the Site in August of 2015. The on-site and off-site recognized environmental conditions (RECs) identified as a result of the August 2015 Phase I ESA are as follows:

- **Historical onsite uses:** The Site was formerly utilized as a furrier, a chemical supply company and as a fee based parking facility. These historical operations include the long-term storage and parking of automobiles and the potential use of chlorinated hydrocarbons and humectants such as glycerine, ethylene glycol or sorbitol solutions may have potentially impacted the quality of the subsurface soil, soil vapor, and/or groundwater beneath the Site.
- **Possible Groundwater and Soil Vapor Contamination:** The potential impacts from historical use of the surrounding properties include use as furriers. The operations associated with several nearby properties are indicative of the use of benzene, chlorinated hydrocarbons, humectants, or sorbitol solutions.

Although not technically defined as RECs, the following is a list of potential business environmental risks at the Site that could impact potential redevelopment activities the Site:

- There is the potential that the Site is underlain by historic urban fill. This is common in the five boroughs of New York City.
- The Site has been identified as an E-Designation (E-276) for Hazardous Materials, Exhaust Stack Limitations and Air Quality Protocol. In order to address the Hazardous Materials E-Designation, site investigation guidelines provided by the New York City Office of Environmental Remediation (NYC OER), the governing agency overseeing New York City's E-Designation program, are required to be satisfied.

1.5 Summary of Work Performed under the Remedial Investigation

The Remedial Investigation (RI) work summarized herein was performed in two phases; an initial investigation which was completed in accordance with a Phase II Work Plan submitted to and approved by NYC OER, and a supplemental investigation completed in accordance with a Supplemental Investigation Work Plan submitted to the New York State Department of Environmental Conservation (NYSDEC) and NYC OER on December 11, 2015 and approved on December 23, 2015 . The supplemental investigation was required to delineate light non-aqueous phase liquid (LNAPL) observed in two monitoring wells (B-1P and B-3P) installed during the initial investigation. NYSDEC Spill Number 15-05845 was assigned to the Site as a result of the LNAPL.

Roux Associates, Inc. (Roux Associates) performed the following scope of work in general accordance with the approved Phase II Work Plan and Supplemental Investigation Work Plan:

1. Conducted a Site inspection to identify areas of concern (AOCs) and physical obstructions (i.e., structures, buildings and utilities);
2. Installed six soil borings;
3. Installed five groundwater monitoring wells to establish groundwater flow and collected two groundwater samples for chemical analysis to evaluate environmental quality;
4. Collected 18 soil samples for laboratory analysis, 11 from the soil boring locations, seven from the monitoring well locations to evaluate soil quality;
5. Installed three soil vapor probes and collected three soil vapor samples;

6. Collected one LNAPL sample for fingerprint analysis.

1.6 Summary of Findings of Remedial Investigation

A remedial investigation was performed and the results are documented in a companion document called “Remedial Investigation Report, 211 West 29th Street, New York, New York”, dated April 2016 (RIR).

1. Elevation of the Site is approximately 32 feet above mean sea level (amsl).
2. Depth to groundwater varies across the Site, from 20 to 22 feet bgs at the Site.
3. Groundwater flow is generally from south to north beneath the Site.
4. Depth to bedrock varies across the Site, from 14.5 to 30 feet bgs.
5. The stratigraphy of the Site, from the surface down, consists of 18 feet of urban fill material underlain by 12 feet of silty sand.
6. A total of eighteen soil/fill samples were collected during the RI and were compared to the NYSDEC Unrestricted Use Soil Cleanup Objectives (SCOs) as presented in NYSDEC Part 375.6. Analytical results indicate that several volatile organic compounds (VOCs) are present including: acetone (max of 340 micrograms per kilogram [$\mu\text{g}/\text{kg}$]), 1,2,4-Trimethylbenzene (max of 16,000 $\mu\text{g}/\text{kg}$), ethylbenzene (max of 1,100 $\mu\text{g}/\text{kg}$) and xylenes (max of 1,800 $\mu\text{g}/\text{kg}$) were detected above Unrestricted Use SCOs (UUSCOs) in one shallow and four deep samples. Petroleum related VOCs that exceed UUSCOs were detected in an offsite location-sidewalk along 29th Street (MW-1). No VOCs were detected at a concentration above their respective Restricted Residential Use SCOs (RRSCOs) in any of the soil borings.

Pesticides including 4,4'-DDT (max of 1,120 $\mu\text{g}/\text{kg}$), 4, 4'-DDD (max of 516 $\mu\text{g}/\text{kg}$) and 4, 4'-DDE (max of 742 $\mu\text{g}/\text{kg}$) were detected above their respective UUSCOs in three shallow samples and three deep samples. No pesticides were detected at a concentration above their respective RRSCOs.

Semivolatile organic compounds (SVOCs) including benzo(a)anthracene (max. of 1,600 µg/kg), benzo(a)pyrene (max. of 1,100 µg/kg), benzo(b)fluoranthene (max. of 1,600 µg/kg), chrysene (max. of 1,300) and indeno(1,2,3-cd)pyrene (max. of 780 µg/kg) were detected above their respective UUSCOs and RRSCO in one shallow sample (B-6).

Metals including lead (max of 2,000 mg/kg) and mercury (max. of 1.2 mg/kg) were detected above their respective RRSCO in a total of four samples: two shallow and two deep. Copper (max. of 79 milligrams per kilogram mg/kg), chromium (max of 63 mg/kg), and zinc (max. of 660 mg/kg) were detected above their respective UUSCOs.

Total polychlorinated biphenyls (PCBs) were not detected above their respective UUSCOs.

7. A total of three groundwater samples were collected during the RI and indicated that SVOCs, PCBs and Pesticides were not detected in any samples. 1,2,4-trimethylbenzene (5.4 micrograms per liter (µg/L)) was detected above the Ambient Water Quality Standards and Guidance Values (AWQSGVs) in one sample (MW-1) at an offsite location. Naturally occurring metals including manganese (max of 4,343 µg/L), and iron (max of 38,700 µg/L) were detected above AWQSGVs in all groundwater samples.
8. A total of three soil vapor samples were collected during the RI and were compared to compounds listed in Table 3.1 Air Guideline Values derived by the New York State Department of Health (NYSDOH) located in the New York State Department of Health Final Guidance for Evaluating Soil Vapor Intrusion dated October 2006 (NYSDOH Guidance). Soil vapor samples collected during the RI indicated that petroleum and chlorinated-related VOCs were detected in each of the three samples. Total concentrations of petroleum-related VOCs (benzene, toluene, ethylbenzene and xylenes [BTEX]) ranged from 110.88 µg/m³ to 166.70 µg/m³. Other compounds detected included 2-Butanone (max of 106 µg/m³), acetone (3,590 µg/m³), 1,2,4-Trimethylbenzene (max of 18.5 µg/m³), 4-Ethyltoluene (max of 13.0 µg/m³), 1,3-

Butadiene (max of 35.2 $\mu\text{g}/\text{m}^3$), 4-Methyl-2-Pentanone (max of 61.5 $\mu\text{g}/\text{m}^3$), carbon disulfide (max of 102 $\mu\text{g}/\text{m}^3$), cyclohexane (max of 3,040 $\mu\text{g}/\text{m}^3$), ethanol (max of 33.2 $\mu\text{g}/\text{m}^3$), N-heptane (max of 302 $\mu\text{g}/\text{m}^3$), 2,2,4-trimethylpentane (max of 23.5 $\mu\text{g}/\text{m}^3$), isopropanol (max of 16.4 $\mu\text{g}/\text{m}^3$), n-hexane (max of 652 $\mu\text{g}/\text{m}^3$), tert-Butyl Alcohol (max of 27.4 $\mu\text{g}/\text{m}^3$), and vinyl chloride (max of 74.9 $\mu\text{g}/\text{m}^3$). The NYSDOH Guidance identifies seven chlorinated compounds of concern; chlorinated compounds were identified in all soil vapor samples and included cis-1,2-dichloroethene (max of 31.4 $\mu\text{g}/\text{m}^3$), methylene chloride (max of 18.6 $\mu\text{g}/\text{m}^3$), and tetrachloroethylene (PCE) with a maximum concentration of 17 $\mu\text{g}/\text{m}^3$. Indoor air was not sampled as there are no onsite buildings. Concentrations of all chlorinated compounds were below the monitoring level ranges established by NYSDOH.

For more detailed results, consult the RIR. Based on an evaluation of the data and information from the RIR and this RAWP, disposal of significant amounts of hazardous waste is not suspected at this site.

2.0 Remedial Action Objectives

Based on the results of the RI, the following Remedial Action Objectives (RAOs) have been identified for this Site:

Soil

- Prevent direct contact with contaminated soil.
- Prevent exposure to contaminants volatilizing from contaminated soil.
- Prevent migration of contaminants that would result in groundwater or surface water contamination.

Groundwater

- Remove contaminant sources causing impact to groundwater.
- Monitor groundwater improvement in response to contaminant source removal and/or treatment as required by NYSDEC.
- Prevent direct exposure to contaminated groundwater.
- Prevent exposure to contaminants volatilizing from contaminated groundwater.
- Prevent off-Site migration of contaminated groundwater above applicable groundwater standards as required by NYSDEC.

Soil Vapor

- Prevent exposure to contaminants in soil vapor.
- Prevent migration of soil vapor into dwelling and other occupied structures.

3.0 Remedial Alternatives Analysis

The goal of the remedy selection process is to select a remedy that is protective of human health and the environment taking into consideration the current, intended and reasonably anticipated future use of the property. The remedy selection process begins by establishing RAOs for media in which chemical constituents were found in exceedance of applicable standards, criteria and guidance values (SCGs). Remedial alternatives are then developed and evaluated based on the following ten criteria:

- Protection of human health and the environment;
- Compliance with SCGs;
- Short-term effectiveness and impacts;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume of contaminated material;
- Implementability;
- Cost effectiveness;
- Community acceptance;
- Land use; and
- Sustainability.

As required, a Track 1 Unrestricted Use scenario is evaluated for the remedial action. The following is a detailed description of the alternatives analyzed to address impacted media at the Site:

Alternative 1:

- Selection of NYSDEC 6NYCRR Part 375 Unrestricted Use (Track 1) Soil Cleanup Objectives (SCOs).
- Removal of all soil/fill exceeding Track 1 Unrestricted Use SCOs throughout the Site and confirmation that Track 1 Unrestricted Use SCOs have been achieved with post-excavation endpoint sampling. Based on the results of the RI, it is expected that this alternative would be achieved by excavating the entire Site to a depth of approximately 10.5 to 14 feet below grade to remove all historic fill, and excavating soil impacted by LNAPL to a depth of approximately 25 feet below grade in the vicinity of B-3P (up to 10

feet by 10 feet excavation area). If soil/fill containing analytes at concentrations above Unrestricted Use SCOs is still present at the base of the excavation after removal of all soil required for construction of the new building's cellar level is complete, additional excavation would be performed to ensure complete removal of soil/ fill that does not meet Track 1 Unrestricted Use SCOs.

- No Engineering or Institutional Controls are required for a Track 1 cleanup, but as part of development, a vapor barrier would be installed and the building would meet passive house certification standards to prevent potential exposures from soil vapor in the future. Additional information regarding passive house design and construction can be found in Appendix 7.

Alternative 2:

- Establishment of Track 4 Site Specific SCOs.
- Removal of all soil/fill exceeding Track 4 Site-specific SCOs and confirmation that Track 4 Site-specific SCOs have been achieved with post-excavation end point sampling. Based on the results of the RI, it is expected that this alternative would be achieved by excavating one hot spot to a depth of about 25 feet with an excavation area of approximately 10 feet by 10 feet. It will not be technically possible to expand the dimensions of the B-3P hotspot for structural reasons (i.e., concerns relating to the structural integrity of the building located on the adjacent property to the west of the Site) in the unlikely event that the impacts are not fully addressed by the proposed B-3P hot spot excavation. If soil/fill containing analytes at concentrations above Track 4 Site-specific SCOs is still present at the base of the excavation, additional excavation would be performed to meet Track 4 Site-Specific SCOs.
- Placement of a composite cover system over the entire Site to prevent exposure to remaining soil/fill;
- Installation of a vapor barrier system beneath the building slab and along foundation side walls and building structure meeting passive house certification standards to prevent potential exposures from soil vapor (See Appendix 7 for additional information regarding passive house design and construction);

- Establishment of use restrictions including prohibitions on the use of groundwater from the Site; prohibitions of restricted Site uses, such as farming or vegetable gardening, to prevent future exposure pathways; and prohibition of a higher level of land use without OER approval;
- Establishment of an approved Site Management Plan (SMP) to ensure long-term management of these Engineering and Institutional Controls including the performance of periodic inspections and certification that the controls are performing as they were intended. The SMP will note that the property owner and property owner's successors and assigns must comply with the approved SMP; and
- The property will continue to be registered with an E-Designation at the NYC Buildings Department.

3.1 Threshold Criteria

Protection of Public Health and the Environment

This criterion is an evaluation of the remedy's ability to protect public health and the environment, and an assessment of how risks posed through each existing or potential pathway of exposure are eliminated, reduced or controlled through removal, treatment, and implementation of Engineering Controls or Institutional Controls. Protection of public health and the environment must be achieved for all approved remedial actions.

Alternative 1 would be protective of human health and the environment by removing all soil/fill exceeding Track 1 Unrestricted Use SCO's and groundwater protection standards, thus eliminating potential for direct contact with contaminated soil/fill once construction is complete and eliminating the risk of contaminants leaching into groundwater. There is minimal potential for contact with groundwater as it is not used for potable purposes. Potential exposure from soil vapor will be addressed by installing a vapor barrier beneath the foundation slab of the new building as part of development and by meeting passive house certification standards. Additional information regarding passive house design and construction can be found in Appendix 7.

Alternative 2 would achieve comparable protections of human health and the environment by excavation and removal of most of the historic fill at the Site and by ensuring that remaining soil/fill on-Site meets Track 4 Site-Specific SCO's, as well as by placement of Institutional and Engineering Controls, including a composite cover system. The composite cover system would prevent direct contact with any remaining on-Site soil/fill. Implementing Institutional Controls including a Site Management Plan and continuing the E-designation would ensure that the composite cover system remains intact and protective of public health. Establishment of Track 4 Site-Specific SCO's would minimize the risk of contamination leaching into groundwater. For both Alternatives, potential exposure to contaminated soils or groundwater during construction would be minimized by implementing a Construction Health and Safety Plan (CHASP), an approved Soil/Materials Management Plan (SMMP), and Community Air Monitoring Plan (CAMP). Potential contact with contaminated groundwater would be prevented as its use is prohibited by city laws and regulations. Potential future migration of off-Site soil vapors into the new building would be prevented by installing a vapor barrier below the building slab and outside foundations walls below grade and by the building structure meeting passive house certification standards. Additional information regarding passive house design and construction can be found in Appendix 7.

3.2 Balancing Criteria

Compliance with Standards, Criteria and Guidance (SCGs)

This evaluation criterion assesses the ability of the alternative to achieve applicable standards, criteria and guidance.

Alternative 1 would achieve compliance with the remedial goals, chemical-specific SCGs and RAOs for soil through removal of soil to achieve Track 1 Unrestricted Use SCO's and Protection of Groundwater SCO's. Compliance with SCGs for soil vapor would also be achieved by installing a vapor barrier system below the new building's basement slab and continuing the vapor barrier outside of subgrade foundation walls and by the building structure meeting passive

house certification standards, as part of development. Additional information regarding passive house design and construction can be found in Appendix 7.

Alternative 2 would achieve compliance with the remedial goals, chemical-specific SCG's and RAOs for soil through removal of soil to meet Track 4 Site-Specific SCO's. Compliance with SCG's for soil vapor would also be achieved by installing a vapor barrier system below the new building's basement slab and continuing the vapor barrier outside of subgrade foundation walls and by the building structure meeting passive house certification standards. Additional information regarding passive house design and construction can be found in Appendix 7. A Site Management Plan would ensure that these controls remained protective for the long term. Health and safety measures contained in the CHASP and CAMP will be implemented during Site redevelopment under this RAWP. For both Alternatives, focused attention on means and methods employed during the remedial action would ensure that handling and management of contaminated material would be in compliance with applicable SCGs. These measures will protect on-site workers and the surrounding community from exposure to Site-related contaminants.

Short-Term Effectiveness and Impacts

This evaluation criterion assesses the effects of the alternative during the construction and implementation phase until remedial action objectives are met. Under this criterion, alternatives are evaluated with respect to their short term effects during the remedial action on public health and the environment during implementation of the remedial action, including protection of the community, protection of onsite workers and environmental impacts.

Both Alternative 1 and 2 have similar short-term effectiveness during their implementation, as each requires excavation of historic fill material. Both alternatives would result in short-term dust generation impacts associated with excavation, handling, load out of materials, and truck traffic. Short-term impacts could potentially be higher for Alternative 1 since excavation of greater amounts of historical fill material would take place. However, focused attention to means and methods during a Track 1 removal action, including community air monitoring and appropriate truck routing, would minimize the overall impact of these activities.

An additional short-term adverse impact and risks to the community associated with both remedial alternatives is increased truck traffic. Truck traffic will be routed on the most direct course using major thoroughfares where possible and flag persons will be used to protect pedestrians at Site entrances and exits.

The potential adverse impact to the community, workers and the environment for both alternatives would be minimized through implementation of control plans including a CHASP, a CAMP and a SMMP, during all on-Site soil disturbance activities and would minimize the release of contaminants into the environment. Both alternatives provide short-term effectiveness in protecting the surrounding community by decreasing the risk of contact with on-Site contaminants. Construction workers operating under appropriate management procedures and a CHASP would provide protection from on-Site contaminants by using personal protective equipment would be worn consistent with the documented risks within the respective work zones.

Long-term effectiveness and permanence

This evaluation criterion addresses the results of a remedial action in terms of its permanence and quantity/nature of waste or residual contamination remaining at the Site after response objectives have been met, such as permanence of the remedial alternative, magnitude of remaining contamination, adequacy of controls including the adequacy and suitability of Engineering Controls/Institutional Controls (ECs/ICs) that may be used to manage contaminant residuals that remain at the Site and assessment of containment systems and ICs that are designed to eliminate exposures to contaminants, and long-term reliability of ECs.

Alternative 1 would achieve long-term effectiveness and permanence related to on-Site contamination by permanently removing all impacted soil/fill above Track 1 Unrestricted Use SCO's. Removal of on-Site contaminant sources will also prevent future groundwater contamination.

Alternative 2 would provide long-term effectiveness by removing most on-Site contamination and attaining Track 4 Site-Specific SCOs; installing a composite cover system across the Site; maintaining use restrictions; establishing an SMP to ensure long-term management of ICs and ECs; and maintaining registration as an E-designated property to memorialize these controls for the long term. The SMP would ensure long-term effectiveness of all ECs and ICs by requiring periodic inspection and certification that these controls and restrictions continue to be in place and are functioning as they were intended, assuring that protections designed into the remedy continue to provide the required level of protection.

Reduction of toxicity, mobility, or volume of contaminated material

This evaluation criterion assesses the remedial alternative's use of remedial technologies that permanently and significantly reduce toxicity, mobility, or volume of contaminants as their principal element. The following is the hierarchy of source removal and control measures that are to be used to remediate a Site, ranked from most preferable to least preferable: removal and/or treatment, containment, elimination of exposure and treatment of source at the point of exposure. It is preferred to use treatment or removal to eliminate contaminants at a Site, reduce the total mass of toxic contaminants, cause irreversible reduction in contaminants mobility, or reduce of total volume of contaminated media.

Alternative 1 will permanently eliminate the toxicity, mobility, and volume of contaminants from on-Site soil by removing all soil in excess of Track 1 Unrestricted Use SCO's.

Alternative 2 would remove most of the historic fill at the Site, and all remaining on-Site soil/fill beneath the new building will meet Track 4 Site-Specific SCO's.

Alternative 1 would remove a greater total mass of contaminants from the Site. The removal of soil to 10.5 to 14 feet for the new development in both scenarios would lessen the difference in contaminant mass removal between these two alternatives.

Implementability

This evaluation criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation, including technical feasibility of construction and operation, reliability of the selected technology, ease of undertaking remedial action, monitoring considerations, administrative feasibility (e.g. obtaining permits for remedial activities), and availability of services and materials.

The techniques, materials and equipment to implement both Alternatives 1 and 2 are readily available and have been proven to be effective in remediating the contaminants present on the Site. They use standard equipment and technologies that are well established in the industry. The reliability of each remedy is also high. There are no special difficulties associated with any of the activities proposed.

Cost effectiveness

This evaluation criterion addresses the cost of alternatives, including capital costs (such as construction costs, equipment costs, and disposal costs, engineering expenses) and site management costs (costs incurred after remedial construction is complete) necessary to ensure the continued effectiveness of a remedial action.

Since historic fill at the Site was found to extend to a depth of up to 6 feet below grade during the RI, and the new building requires excavation of the entire Site to a depth of 14 feet, the costs associated with both Alternative 1 and Alternative 2 will likely be comparable. Costs associated with Alternative 1 could potentially be higher than Alternative 2 if soil with analytes above Track 1 Unrestricted Use SCOs is encountered below the excavation depth required for development. Additional costs would include installation of additional shoring/underpinning, disposal of additional soil, and import of clean soil for backfill. However, long-term costs for Alternative 2 are likely higher than Alternative 1 based on implementation of a Site Management Plan as part of Alternative 2.

The remedial plan would couple the remedial action with the redevelopment of the Site, lowering total costs. The remedial plan will also consider the selection of the most appropriate disposal facilities to reduce transportation and disposal costs during cleanup and redevelopment of the Site.

Community Acceptance

This evaluation criterion addresses community opinion and support for the remedial action. Observations here will be supplemented by public comment received on the RAWP.

This RAWP will be subject to a public review under the NYC VCP and will provide the opportunity for detailed public input on the remedial alternatives and the selected remedy. This public comment will be considered by OER prior to approval of this plan. The Citizen Participation Plan for the project is provided in Appendix 2. Observations here will be supplemented by public comment received on the RAWP. Under both alternatives, the overall goals of the remedial program, to protect public health and the environment and eliminate potential contaminant exposures, have been broadly supported by citizens in NYC communities.

Land use

This evaluation criterion addresses the proposed use of the property. This evaluation has considered reasonably anticipated future uses of the Site and takes into account: current use and historical and/or recent development patterns; applicable zoning laws and maps; NYS Department of State's Brownfield Opportunity Areas (BOA) pursuant to section 970-r of the general municipal law; applicable land use plans; proximity to real property currently used for residential use, and to commercial, industrial, agricultural, and/or recreational areas; environmental justice impacts, Federal or State land use designations; population growth patterns and projections; accessibility to existing infrastructure; proximity of the site to important cultural resources and natural resources, potential vulnerability of groundwater to contamination that might emanate from the site, proximity to flood plains, geography and geology; and current Institutional Controls applicable to the site.

The current, intended, and reasonably anticipated future land use of the Site and its surroundings are compatible with the selected remedy of soil remediation. The proposed future use of the Site includes the development of an anticipated twenty-story mixed use building with street level retail and office space with residential units above. Following remediation, the Site will meet either Track 1 Unrestricted Use or Track 4 Site-Specific SCOs, both of which are protective of public health and the environment for its planned residential use. The proposed use is compliant with the property's zoning and is consistent with recent development patterns. The areas surrounding the site are urban and consist predominately of commercial and office use buildings in zoning districts designated for commercial and residential use. The development would remediate a contaminated lot and provide a modern mixed use commercial and residential building.. The proposed development would clean up the property and make it safer, create new employment opportunities, living space, and associated societal benefits to the community, and other economic benefits from land revitalization.

Temporary short-term project impacts are being mitigated through site management controls and truck traffic controls during remediation activities. Following remediation, the Site will meet either Track 1 Unrestricted Use SCOs or Track 4 Site-Specific SCOs, both of which are protective of public health and the environmental for its planned use.

The Site is not in close proximity to important cultural resources, including federal or state historic or heritage sites or Native American religious sites, natural resources, waterways, wildlife refuges, wetlands, or critical habitats of endangered or threatened species. The Site is located in an urban area and not in proximity to fish or wildlife and neither alternative would result in any potential exposure pathways of contaminant migration affecting fish or wildlife. The remedial action is also protective of groundwater natural resources. The Site does not lie in a Federal Emergency Management Agency (FEMA)-designated flood plain. Both alternatives are equally protective of natural resources and cultural resources. Improvements in the current environmental condition of the property achieved by both alternatives considered in this plan are consistent with the City's goals for cleanup of contaminated land.

Sustainability of the Remedial Action

While Alternative 2 would potentially result in lower energy usage based on reducing the volume of material transported off-Site, both remedial alternatives are comparable with respect to the opportunity to achieve sustainable remedial action. The remedial plan for either alternative would take into consideration the shortest trucking routes during off-Site disposal of historic fill and other soils, which would reduce greenhouse gas emissions and conserve energy used to fuel trucks. The New York City Clean Soil Bank program is available for reuse of any clean native soils under either alternative. A complete list of green remedial activities considered as part of the NYC VCP is included in a Sustainability Statement.

SELECTION OF THE PREFERRED REMEDY

The preferred remedy for the site is Alternative 1, a Track 1 Unrestricted Use Site-Specific SCOs remedy. The Track 1 remedy will remove all soil/fill exceeding Unrestricted Use SCOs throughout the Site, which will be confirmed with post-excavation sampling. If soil/fill containing analytes at concentrations above Track 1 Unrestricted Use SCOs is still present at the base or walls of the excavation after removal of all soil required for construction of the new building's cellar level and slab are complete, additional excavation would be performed to ensure complete removal of soil/ fill that does not meet Track 1 Unrestricted Use SCOs.

Engineering and Institutional Controls are not required for a Track 1 cleanup. However, a composite cover consisting of the concrete building slab and a vapor barrier membrane would be installed as part of standard building development and are not considered part of the remedy.

Use restrictions are not required for Track 1 Unrestricted Use cleanup. A Notice of Completion will be issued after Spill is closed by NYSDEC. After achieving Track 1 remedy, E-designation for hazardous materials would be removed from this property.

4.0 Remedial Action

4.1 Summary of Preferred Remedial Action

The preferred remedial action alternative is Alternative, the Track 1 remedial action. The preferred remedial action achieves protection of public health and the environment for the intended use of the property. The preferred remedial action will achieve all of the remedial action objectives established for the project and addresses applicable SCGs. The preferred remedial action is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants. The preferred remedial action alternative is cost effective and implementable and uses standards methods that are well established in the industry.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP Citizen Participation activities according to an approved Citizen Participation Plan.
2. Performance of a Community Air Monitoring Program for particulates and volatile organic carbon compounds.
3. Selection of Unrestricted Use (Track 1) Soil Cleanup Objectives (SCOs).
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
5. Performance of a remedial action for the petroleum spill #15-05845 under New York State Department of Environmental Conservation (NYSDEC) Spill program. This remedial action will include removal of LNAPL present beneath the site. If required by NYSDEC, treatment of groundwater plume via injections (e.g., chemical oxidation solutions) and the implementation of a groundwater monitoring program. A separate RAWP addendum will be prepared and submitted to NYSDEC.
6. Request for closure of onsite petroleum spill number 15-05845 under the authority of NYSDEC pending the results of the investigation and remediation and in accordance with CP-51 soil cleanup objectives. This RAWP does not alter or interfere with the remedial action for the petroleum spill. A separate Spill closure report may be required by NYSDEC, if warranted based on the results of the remediation.

7. Excavation and removal of soil/fill exceeding Unrestricted Use (Track 1) SCOs. The entire footprint of the building area (about 100% of the property) will be excavated to a depth of approximately 10.5 to 14 feet bgs for development purposes. A 10 feet by 10 feet portion of property will be excavated to a depth of approximately 25 feet below grade in the vicinity of boring B-3P to remove soil impacted by LNAPL. It will not be technically possible to expand the dimensions of the B-3P hotspot for structural reasons (i.e., concerns relating to the structural integrity of the building located on the adjacent property to the west of the Site) in the unlikely event that the impacts are not fully addressed by the proposed B-3P hot spot excavation. Approximately 3,500 tons of soil/fill will be removed from the Site and properly disposed at an appropriately licensed or permitted facility.
8. Daily reports will be provided to OER and DEC during active excavation work. If no work is performed for extended time period, daily report frequency will be reduced to weekly basis. Monthly reports will be provided by the owner/developer (or environmental consultant) after excavation work is completed for the duration of the construction period.
9. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID. Appropriate segregation of excavated media on-Site.
10. Management of excavated materials including temporarily stockpiling and segregating in accordance with defined material types and to prevent co-mingling of contaminated material and non-contaminated materials.
11. Removal of UST's that are encountered during soil/fill removal actions. Registration of tanks and reporting of any petroleum spills associated with UST's and appropriate closure of these petroleum spills in compliance with applicable local, State and Federal laws and regulations.
12. Transportation and off-Site disposal of all soil/fill material at licensed or permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media on-Site.

13. Collection and analysis of five end-point samples to determine the performance of the remedy with respect to attainment of Track 1 SCOs. End point samples will be collected if soils are remaining above bedrock. No end-point samples will be collected if soil has been excavated to bedrock.
14. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
15. Performance of all activities required for the remedial action, including acquisition of required permits and attainment of pretreatment requirements, in compliance with applicable laws and regulations.
16. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
17. Submission of a Remedial Action Report (RAR) that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, and lists any changes from this RAWP.

If Track 1 Unrestricted Use SCOs are not achieved, the following construction elements implemented as part of new development will constitute Engineering and Institutional Controls:

18. As part of development, construction of an engineered composite cover consisting of a six-inch thick concrete building slab with an 8-inch clean granular sub-base beneath all building areas, 4-inch poured concrete on a 6-inch sub-base in sidewalk areas, and two feet of clean soil in all open space and landscaped areas.
19. As part of development, installation of a vapor barrier system consisting of vapor barrier beneath the building slab and outside of sub-grade foundation sidewalls to mitigate soil vapor migration into the building. The vapor barrier system will consist of a 1.2-millimeter (mm) Grace Construction Products Preprufe 300R below the slab throughout the full building area and a 0.8-mm Grace Construction Products Preprufe 160R outside all sub-grade foundation sidewalls.
20. The building will also be constructed to meet passive house standards. Additional information regarding passive house design and construction can be found in Appendix 7.
21. If Track 1 Unrestricted Use SCOs are not achieved, Site Management Plan (SMP) will be required in the RAR for long-term management of residual contamination, including

plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency.

22. If Track 1 Unrestricted Use SCOs are not achieved, the property will continue to be registered with an E-Designation at the NYC Buildings Department. Establishment of Engineering Controls and Institutional Controls; a requirement that management of these controls must be in compliance with an approved SMP. Institutional Controls will include prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER-approval.

4.2 Soil Cleanup Objectives and Soil/ Fill Management

Track 1 SCOs are proposed for this project and SCO's are defined in 6 NYCRR Part 375, Table 6.8(a) Track 1 Unrestricted Use. If Track 1 SCO's are not achieved, the following Track 4 Site-Specific SCO's will be utilized:

<u>Contaminant</u>	<u>Site-Specific SCO's</u>
Total SVOCs	250 ppm
Lead	1,000 ppm
Mercury	1.5 ppm

Soil and materials management on-Site and off-Site, including excavation, handling and disposal, will be conducted in accordance with the Soil/Materials Management Plan in Appendix 4. Discrete contaminant sources (such as hotspots) identified during the remedial action will be identified by GPS or surveyed. This information will be provided in the Remedial Action Report.

Soil/Fill Excavation and Removal

The location of planned excavations is shown in Figure 5. The total quantity of soil/fill expected to be excavated and disposed off-Site is 3,500 tons. For each disposal facility to be used in the remedial action, a letter from the developer/QEP to the receiving facility requesting approval for disposal and a letter back to the developer/QEP providing approval for disposal will be submitted to OER prior to any transport and disposal of soil at a facility.

Disposal facilities will be reported to OER when they are identified and prior to the start of remedial action.

End-point Sampling

End-point samples will be analyzed for compounds and elements as described below utilizing the following methodology:

- VOCs by United States Environmental Protection Agency (USEPA) Method 8260;
- SVOCs by USEPA Method 8270;
- Target Analyte List (TAL) metals; and
- Pesticides/ Polychlorinated Biphenyls (PCBs) by USEPA Method 8081/8082.

New York State ELAP certified labs will be used for all end-point sample analyses. Labs performing end-point sample analyses will be reported in the RAR. The RAR will provide a tabular and map summary of all end-point sample results and will include all data including non-detects and applicable standards and/or guidance values. Proposed end-point sample locations are shown in Figure 4.

Confirmation End-point Sampling

Removal actions for development purposes under this plan will be performed in conjunction with confirmation end-point soil sampling. 5 confirmation samples will be collected from the base of the excavation at locations to be determined by OER. To evaluate attainment of Track 1 SCOs, analytes will include those for which SCOs have been developed, including VOCs, SVOCs, metals, pesticides and PCBs according to analytical methods described above. If Track 1 Unrestricted Use SCOs are pursued, samples will be analyzed for VOCs, SVOCs, pesticides, PCBs and metals according to analytical methods described above. No end-point samples will be collected if soil has been excavated to bedrock.

Hotspot End-point Sampling

No end-point samples will be collected from the sidewalls and base of excavation at the hotspot location identified in the Remedial Investigation. Hotspots include B-3P for LNAPL. The B-3P hot spot will be excavated to an approximate depth of 25 feet (with an excavation area up to 10 feet by 10 feet) to remove soil impacted by LNAPL. It will not be technically possible to expand the dimensions of the B-3P hotspot for structural reasons (i.e., concerns relating to the structural integrity of the building located on the adjacent property to the west of the Site) in the unlikely event that the impacts are not fully addressed by the proposed B-3P hot spot excavation.

For other hotspots identified during this remedial program, including any hotspots identified during the remedial action, hotspot removal actions will be performed to ensure that hotspots are fully removed and end-point samples will be collected at the following frequency:

1. For excavations less than 20 feet in total perimeter, at least one bottom sample and one sidewall sample biased in the direction of surface runoff.
2. For excavations 20 to 300 feet in perimeter:
 - For surface removals, one sample from the top of each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.
 - For subsurface removals, one sample from each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.
3. For sampling of volatile organics, bottom samples should be taken within 24 hours of excavation, and should be taken from the zero to six-inch interval at the excavation floor. Samples taken after 24 hours should be taken at six to twelve inches.
4. For contaminated soil removal, post remediation soil samples for laboratory analysis should be taken immediately after contaminated soil removal. If the excavation is enlarged horizontally, additional soil samples will be taken pursuant to bullets 1-3 above.

Post-remediation end-point sample locations and depth will be biased towards the areas and depths of highest contamination identified during previous sampling episodes unless field indicators such as field instrument measurements or visual contamination identified during the

remedial action indicate that other locations and depths may be more heavily contaminated. In all cases, post-remediation samples should be biased toward locations and depths of the highest expected contamination.

If either LNAPL and/or DNAPL are detected, appropriate samples will be collected for characterization and “finger print analysis” and required regulatory reporting (i.e. spills hotline) will be performed.

Quality Assurance/Quality Control

QA/QC procedures will be used to provide performance information with regard to accuracy, precision, sensitivity, representation, completeness, and comparability associated with the sampling and analysis for this investigation. Field QA/QC procedures will be used to document that samples are representative of actual conditions at the Site and identify possible cross-contamination from field activities or sample transit. Laboratory QA/QC procedures and analyses will be used to demonstrate whether analytical results have been biased either by interfering compounds in the sample matrix, or by laboratory techniques that may have introduced systematic or random errors to the analytical process. QA/QC samples including field blanks, and trip blanks, and duplicates, will be collected and analyzed at rates in accordance with DER-10.

Import of Soils

Soil import is not planned on this project.

Reuse of Onsite Soils

Soil reuse is not planned on this project.

4.3 Engineering Controls

The remedial action will achieve Track 1 Unrestricted Use SCOs and no Engineering Controls are required. However, the following design elements will be incorporated into the project as part of the development:

- (1) Composite Cover System
- (2) Soil Vapor Barrier System
- (3) Passive House Certification

If Track 1 is not achieved, these elements will constitute Engineering Controls that will be employed in the remedial action to address residual contamination remaining at the Site.

Composite Cover System

Exposure to residual soil/fill will be prevented by an engineered, composite cover system to be built on the Site. This composite cover system will be comprised of 5 inches of reinforced concrete slab underlain by a 2-inch mud slab and 6 inches of clean sub-base material in building areas.

Vapor Barrier System

Migration of soil vapor from onsite or offsite sources into the building will be mitigated with a combination of building slab and vapor barrier. The subslab vapor barrier will be a minimum 20-mil vapor barrier that is American Society of Testing and Materials (ASTM) E 1745 Class A, B, and C compliant, resistant to puncturing and has high tensile strength. The permeance of the vapor barrier is compliant with ASTM E 154 Sections 8, 11, 12, and 13. The vapor barrier will not deteriorate, decompose, or degrade below concrete slabs when buried and has an indefinite life expectancy. A Grace Preprufe 160 (or equivalent) vapor barrier system will be installed for the subgrade walls and Grace Preprufe 300R will be installed below the slab throughout the full building area according to manufacturer specifications and depending on foundation construction methods. The proposed vapor barrier specifications and construction details are provided in Appendix 6. The RAR will include photographs (maximum of two photos per page) of the installation process, PE/RA certified letter (on company letterhead) from primary contractor responsible for installation oversight and field inspections, and a copy of the manufacturers certificate of warranty.

The building will also be constructed to meet passive house certification standards. Passive buildings are designed and constructed to meet strenuous energy efficient standards, effectively rendering the building air tight. Additional information regarding passive house design and construction can be found in Appendix 7.

4.4 Institutional Controls

A Track 1 remedial action is proposed and Institutional Controls are not required. If a Track 1 remedial action is not achieved, Institutional Controls (IC's) will be incorporated in this remedial action to manage residual soil/fill and other media and render the Site protective of public health and the environment. These IC's define the program to operate, maintain, inspect and certify the performance of Engineering Controls and Institutional Controls on this property. Institutional Controls would be implemented in accordance with a Site Management Plan included in the final Remedial Action Report (RAR). Institutional Controls would be:

- Continued registration of the E-Designation for the property. This RAWP includes a description of all ECs and ICs and summarizes the requirements of the SMP which will note that the property owner and property owner's successors and assigns must comply with the approved SMP;
- Submittal of a SMP in the RAR for approval by OER that provides procedures for appropriate operation, maintenance, inspection, and certification of ECs and IC's. SMP will require that the property owner and property owner's successors and assigns will submit to OER a periodic written statement that certifies that: (1) controls employed at the Site are unchanged from the previous certification or that any changes to the controls were approved by OER; 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. OER retains the right to enter the Site in order to evaluate the continued maintenance of any controls. This certification shall be submitted at a frequency to be determine by OER in the SMP and will comply with RCNY §43-1407(1)(3).
- Vegetable gardens and farming on the Site are prohibited in contact with residual soil materials;

- Use of groundwater underlying the Site is prohibited without treatment rendering it safe for its intended use;
- All future activities on the Site that will disturb residual material must be conducted pursuant to the soil management provisions in an approved SMP;
- The Site will be used for usage type residential and commercial and will not be used for a higher level of use without prior approval by OER.

4.5 Site Management Plan

A Track 1 remedial action is proposed and Site Management is not required. If a Track 1 remedial action is not achieved, Site Management will be required and will be the last phase of remediation. Site Management will begin with the approval of the Remedial Action Report and issuance of the Notice of Completion (NOC) for the Remedial Action. The Site Management Plan (SMP) describes appropriate methods and procedures to ensure implementation of all ECs and ICs that are required by this RAWP. The Site Management Plan is submitted as part of the RAR but will be written in a manner that allows its use as an independent document. Site Management continues until terminated in writing by OER. The property owner is responsible to ensure that all Site Management responsibilities defined in the Site Management Plan are implemented.

The SMP will provide a detailed description of the procedures required to manage residual soil/fill left in place following completion of the remedial action in accordance with the Voluntary Cleanup Agreement with OER. This includes a plan for: (1) implementation of EC's and ICs; (2) operation and maintenance of EC's; (3) inspection and certification of IC's and EC's.

Site management activities and EC/IC certification will be scheduled by OER on a periodic basis to be established in the RAR and the SMP and will be subject to review and modification by OER. The Site Management Plan will be based on a calendar year and certification reports will be due for submission to OER by July 30 of the year following the reporting period.

4.6 Qualitative Human Health Exposure Assessment

The objective of the qualitative exposure assessment is to identify potential receptors and pathways for human exposure to the contaminants of concern (COC) that are present at, or

migrating from, the Site. The identification of exposure pathways describes the route that the COC takes to travel from the source to the receptor. An identified pathway indicates that the potential for exposure exists; it does not imply that exposures actually occur.

Data and information reported in the Remedial Investigation Report (RIR) are sufficient to complete a Qualitative Human Health Exposure Assessment (QHHEA) for this project. As part of the VCP process, a QHHEA was performed to determine whether the Site poses an existing or future health hazard to the Site's exposed or potentially exposed population. The sampling data from the RI were evaluated to determine whether there is any health risk under current and future conditions by characterizing the exposure setting, identifying exposure pathways, and evaluating contaminant fate and transport. This QHHEA was prepared in accordance with Appendix 3B and Section 3.3 (b) 8 of the NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation.

Known and Potential Contaminant Sources

Based on the results of the RIR, the contaminants of concern are:

- Soil: Pesticides including 4,4'-DDT, 4,4'-DDD and 4,4'-DDE were detected but did not exceed RRSCOs.
- SVOCs (PAH compounds) including including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene and indeno(1,2,3-cd)pyrene were detected above their respective RRSCOs;
- Metals, specifically lead and mercury, were detected above 6NYCRR Part 375-6.8 Restricted Residential SCOs;

Groundwater:

No groundwater contaminants of concern were detected above GQS at onsite locations

Soil Vapor:

- Low levels of VOCs including cis-1,2-dichloroethene, methylene chloride and tetrachloroethylene (PCE) were detected in soil vapor.

Nature, Extent, Fate and Transport of Contaminants

Soil: Semivolatile organic compounds (SVOCs) including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene and indeno(1,2,3-cd)pyrene were detected above their respective UUSCOs and RRSCOs in one shallow sample (B-6). Mercury and Lead were detected above UUSCOs and RRSCOs in one sample (B-6). These compounds were not detected in groundwater above their respective GQs, indicating that this contamination is not mobilizing into on-site or off-site groundwater.

Groundwater: 1,2,4-trimethylbenzene was detected above the Ambient Water Quality Standards and Guidance Values (AWQSGVs) in one sample (MW-1) at an offsite location. Metals including manganese and iron were detected above AWQSGVs in all groundwater samples. The metal contaminants that were detected above AMQSGVs in groundwater throughout the Site during the RI (iron and manganese) are considered naturally occurring, rather than from any on-site source.

Soil Vapor: Soil vapor samples collected during the RI indicated that petroleum and chlorinated-related VOCs were detected in each of the three samples. Benzene, toluene, ethylbenzene, xylenes, acetone, 1,2,4-Trimethylbenzene, 4-Ethyltoluene, 1,3-Butadiene, 4-Methyl-2-Pentanone, carbon disulfide, cyclohexane, ethanol, N-heptane, 2,2,4-trimethylpentane, isopropanol, n-hexane, tert-Butyl Alcohol and vinyl chloride were detected. Chlorinated compounds were detected in all samples and included cis-1,2-dichloroethene, methylene chloride and tetrachloroethylene (PCE). The chlorinated VOCs in soil vapor were below guidance issued by New York State DOH and were not found in any of the on-Site soil or groundwater samples collected.

Receptor Populations

On-Site Receptors: The site is currently paved and used as a fee-based parking facility. Onsite receptors are limited to trespassers, site representatives and visitors granted access to the property. During construction, potential on-site receptors include construction workers, site representatives, and visitors. Under proposed future conditions, potential on-site receptors include adult and child building residents, workers and visitors.

Off-Site Receptors: Potential off-site receptors within a 500 foot radius of the Site include adult and child residents; commercial and construction workers; pedestrians; and trespassers based on the following land uses within 500 feet of the Site:

1. Commercial Businesses – existing and future
2. Residential Buildings – existing and future
3. Building Construction/ Renovation – existing and future
4. Pedestrians, Trespassers, Cyclists – existing and future
5. Schools – existing and future

Potential Routes of Exposure

Three potential primary routes exist by which chemicals can enter the body: ingestion, inhalation, and dermal absorption. Exposure can occur based on the following potential media:

- Ingestion of groundwater or fill/ soil;
- Inhalation of vapors or particulates; and
- Dermal absorption of groundwater or fill/ soil.

Potential Exposure Points

Current Conditions: The site is currently capped with asphalt there are no potential exposure pathways from ingestion, inhalation, or dermal absorption of soil/ fill. Groundwater is not exposed at the site. The site is served by the public water supply and groundwater is not used at the site for potable supply and there is no potential for exposure. Because the site is currently undeveloped, there is no potential for soil vapor to accumulate on site.

Construction/ Remediation Conditions: During the remedial action, onsite workers will come into direct contact with surface and subsurface soils as a result of on-Site construction and excavation activities. On-Site construction workers potentially could ingest, inhale or have dermal contact with exposed impacted soil and fill. Similarly, off-Site receptors could be exposed to dust and vapors from on-Site activities. Due to the depth of groundwater, direct contact with groundwater is not expected. During construction, on-Site and off-Site exposures to contaminated dust from on-Site will be addressed through the SMMP, dust controls, and through the implementation of the CAMP and a CHASP.

Proposed Future Conditions: Under future remediated conditions, all soils in excess of Track SCOs will be removed. The site will be fully capped, preventing potential direct exposure to soil and groundwater remaining in place, and engineering controls (vapor barrier/passive house construction) will prevent any potential exposure due to inhalation by preventing soil vapor intrusion. The site is served by the public water supply, and groundwater is not used at the site. There are no plausible off-site pathways for oral, inhalation, or dermal exposure to contaminants derived from the site.

Overall Human Health Exposure Assessment

There are potential complete exposure pathways for the current site condition. There are potential complete exposure pathways that require mitigation during implementation of the remedy. There are no complete exposure pathways under future conditions after the site is developed. This assessment takes into consideration the reasonably anticipated use of the site, which includes a residential structure, site-wide surface cover, and a subsurface vapor barrier system for the building. Under current conditions, on-Site exposure pathways exist for those with access to the Site and trespassers. During remedial construction, on-Site and off-Site exposures to contaminated dust from historic fill material will be addressed through dust controls, and through the implementation of the CAMP, the SMMP, and a CHASP. Potential post-construction use of groundwater is not considered an option because groundwater in this area of New York City is not used as a potable water source. There are no surface waters in close proximity to the Site that could be impacted or threatened.

5.0 Remedial Action Management

5.1 Project Organization and Oversight

Principal personnel who will participate in the remedial action include Robert Kovacs and David Bligh. The Professional Engineer (PE) and Qualified Environmental Professionals (QEP) for this project are:

- David Bligh, P.E. – Professional Engineer
- Robert Kovacs, LSRP – Qualified Environmental Professional

5.2 Site Security

Site access will be controlled by an approved construction fence with locking gated entrances will be placed around the perimeter of the Site during all phases of construction.

5.3 Work Hours

The hours for operation of cleanup will comply with the NYC Department of Buildings construction code requirements or according to specific variances issued by that agency. The hours of operation will be conveyed to OER during the pre-construction meeting.

5.4 Construction Health and Safety Plan

The Health and Safety Plan is included in Appendix 5. The Site Safety Coordinator will be determined prior to the start of construction. Remedial work performed under this RAWP will be in full compliance with applicable health and safety laws and regulations, including Site and OSHA worker safety requirements and HAZWOPER requirements. Confined space entry, if any, will comply with OSHA requirements and industry standards and will address potential risks. The parties performing the remedial construction work will ensure that performance of work is in compliance with the HASP and applicable laws and regulations. The HASP pertains to remedial and invasive work performed at the Site until the issuance of the Notice of Completion.

All field personnel involved in remedial activities will participate in training required under 29 CFR 1910.120, such as 40-hour hazardous waste operator training and annual 8-hour refresher training. Site Safety Officer will be responsible for maintaining workers training records. Personnel entering any exclusion zone will be trained in the provisions of the HASP and will comply with all requirements of 29 CFR 1910.120. Site-specific training will be provided to field personnel. Additional safety training may be added depending on the tasks performed. Emergency telephone numbers will be posted at the site location before any remedial work begins. A safety meeting will be conducted before each shift begins. Topics to be discussed include task hazards and protective measures (physical, chemical, environmental); emergency procedures; PPE levels and other relevant safety topics. Meetings will be documented in a log book or specific form.

An emergency contact sheet with names and phone numbers is included in the CHASP. That document will define the specific project contacts for use in case of emergency.

5.5 Community Air Monitoring Plan

Real-time air monitoring for volatile organic compounds (VOCs) and particulate levels at the perimeter of the exclusion zone or work area will be performed. Continuous monitoring will be performed for all ground intrusive activities and during the handling of contaminated or potentially contaminated media. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pit excavation or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be performed during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. Periodic monitoring during sample collection, for instance, will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well bailing/purging, and taking a reading prior to leaving a sample location. Depending upon the proximity of potentially exposed individuals, continuous monitoring may be performed during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence. Exceedences of action levels observed during performance of the Community Air Monitoring Plan (CAMP) will be reported to the OER Project Manager and included in the Daily Report.

VOC Monitoring, Response Levels, and Actions

VOCs will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will

be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

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

All 15-minute readings must be recorded and be available for OER personnel to review.

Instantaneous readings, if any, used for decision purposes will also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m³) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed.

Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m³ above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m³ above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m³ of the upwind level and in preventing visible dust migration.

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

5.6 Agency Approvals

All permits or government approvals required for remedial construction have been or will be obtained prior to the start of remedial construction. Approval of this RAWP by OER does not constitute satisfaction of these requirements and will not be a substitute for any required permit.

5.7 Site Preparation

Pre-Construction Meeting

OER will be invited to attend the pre-construction meeting at the Site with all parties involved in the remedial process prior to the start of remedial construction activities.

Mobilization

Mobilization will be conducted as necessary for each phase of work at the Site. Mobilization includes field personnel orientation, equipment mobilization (including securing all sampling equipment needed for the field investigation), marking/staking sampling locations and utility mark-outs. Each field team member will attend an orientation meeting to become familiar with the general operation of the Site, health and safety requirements, and field procedures.

Utility Marker Layouts, Easement Layouts

The presence of utilities and easements on the Site will be fully investigated prior to the performance of invasive work such as excavation or drilling under this plan by using, at a

minimum, the One-Call System (811). Underground utilities may pose an electrocution, explosion, or other hazard during excavation or drilling activities. All invasive activities will be performed in compliance with applicable laws and regulations including NYC Building Code to assure safety. Utility companies and other responsible authorities will be contacted to locate and mark the locations, and a copy of the Mark-Out Ticket will be retained by the contractor prior to the start of drilling, excavation or other invasive subsurface operations. Overhead utilities may also be present within the anticipated work zones. Electrical hazards associated with drilling in the vicinity of overhead utilities will be prevented by maintaining a safe distance between overhead power lines and drill rig masts.

Proper safety and protective measures pertaining to utilities and easements, and compliance with all laws and regulations will be employed during invasive and other work contemplated under this RAWP. The integrity and safety of on-Site and off-Site structures will be maintained during all invasive, excavation or other remedial activity performed under the RAWP.

Dewatering

Dewatering is not anticipated during remediation and construction.

Equipment and Material Staging

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations.

Stabilized Construction Entrance

Steps will be taken to ensure that trucks departing the site will not track soil, fill or debris off-Site. Such actions may include use of cleaned asphalt or concrete pads or use of stone or other aggregate-based egress paths between the truck inspection station and the property exit.

Measures will be taken to ensure that adjacent roadways will be kept clean of project related soils, fill and debris.

Truck Inspection Station

An outbound-truck inspection station will be set up close to the Site exit. Before exiting the Site, trucks will be required to stop at the truck inspection station and will be examined for evidence

of contaminated soil on the undercarriage, body, and wheels. Soil and debris will be removed. Brooms, shovels and clean water will be utilized for the removal of soil from vehicles and equipment, as necessary.

Extreme Storm Preparedness and Response Contingency Plan

Damage from flooding or storm surge can include dislocation of soil and stockpiled materials, dislocation of site structures and construction materials and equipment, and dislocation of support of excavation structures. Damage from wind during an extreme storm event can create unsafe or unstable structures, damage safety structures and cause downed power lines creating dangerous site conditions and loss of power. In the event of emergency conditions caused by an extreme storm event, the enrollee will undertake the following steps for site preparedness prior to the event and response after the event.

Storm Preparedness

Preparations in advance of an extreme storm event will include the following: containerized hazardous materials and fuels will be removed from the property; loose materials will be secured to prevent dislocation and blowing by wind or water; heavy equipment such as excavators and generators will be removed from excavated areas, trenches and depressions on the property to high ground or removed from the property; an inventory of the property with photographs will be performed to establish conditions for the site and equipment prior to the event; stockpile covers for soil and fill will be secured by adding weights such as sandbags for added security and worn or ripped stockpile covers will be replaced with competent covers; stockpiled hazardous wastes will be removed from the property; stormwater management systems will be inspected and fortified, including, as necessary: clean and reposition silt fences, hay bales; clean storm sewer filters and traps; and secure and protect pumps and hosing.

Storm Response

At the conclusion of an extreme storm event, as soon as it is safe to access the property, a complete inspection of the property will be performed. A site inspection report will be submitted to OER at the completion of site inspection and after the site security is assessed. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm

event and significant differences will be noted. Damage from storm conditions that result in acute public safety threats, such as downed power lines or imminent collapse of buildings, structures or equipment will be reported to public safety authorities via appropriate means such as calling 911. Petroleum spills will be reported to NYS DEC within 2 hours of identification and consistent with State regulations. Emergency and spill conditions will also be reported to OER. Public safety structures, such as construction security fences will be repaired promptly to eliminate public safety threats. Debris will be collected and removed. Dewatering will be performed in compliance with existing laws and regulations and consistent with emergency notifications, if any, from proper authorities. Eroded areas of soil including unsafe slopes will be stabilized and fortified. Dislocated materials will be collected and appropriately managed. Support of excavation structure will be inspected and fortified as necessary. Impacted stockpiles will be contained and damaged stockpile covers will be replaced. Stormwater control systems and structures will be inspected and maintained as necessary. If soil or fill materials are discharged off site to adjacent properties, property owners and OER will be notified and corrective measure plan designed to remove and clean dislocated material will be submitted to OER and implemented following approval by OER and granting of site access by the property owner. Impacted offsite areas may require characterization based on site conditions, at the discretion of OER. If onsite petroleum spills are identified, a qualified environmental professional will determine the nature and extent of the spill and report to NYS DEC's spill hotline at DEC 800-457-7362 within statutory defined timelines. If the source of the spill is ongoing and can be identified, it should be stopped if this can be done safely. Potential hazards will be addressed immediately, consistent with guidance issued by NYS DEC.

Storm Response Reporting

A site inspection report will be submitted to OER at the completion of site inspection. An inspection report established by OER is available on OER's website (www.nyc.gov/oer) and will be used for this purpose. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm event and significant differences will be noted. The site inspection report will be sent to the OER project manager and will include the site name, address, tax block and lot, site primary and alternate contact name and phone number. Damage and soil release assessment will include: whether the project had stockpiles; whether stockpiles

were damaged; photographs of damage and notice of plan for repair; report of whether soil from the site was dislocated and whether any of the soil left the site; estimates of the volume of soil that left the site, nature of impact, and photographs; description of erosion damage; description of equipment damage; description of damage to the remedial program or the construction program, such as damage to the support of excavation; presence of onsite or offsite exposure pathways caused by the storm; presence of petroleum or other spills and status of spill reporting to NYS DEC; description of corrective actions; schedule for corrective actions. This report should be completed and submitted to OER project manager with photographs within 24 hours of the time of safe entry to the property after the storm event.

5.8 Traffic Control

Drivers of trucks leaving the Site with soil/fill will be instructed to proceed without stopping in the vicinity of the Site to prevent neighborhood impacts. The planned route on local roads for trucks leaving the site is shown on Figure 6.

5.9 Demobilization

Demobilization will include:

- As necessary, restoration of temporary access areas and areas that may have been disturbed to accommodate support areas (e.g., staging areas, decontamination areas, storage areas, temporary water management areas, and access area);
- Removal of sediment from erosion control measures and truck wash and disposal of materials in accordance with applicable laws and regulations;
- Equipment decontamination, and;
- General refuse disposal.

Equipment will be decontaminated and demobilized at the completion of all field activities. Investigation equipment and large equipment (e.g., soil excavators) will be washed at the truck inspection station as necessary. In addition, all investigation and remediation derived waste will be appropriately disposed.

5.10 Reporting and Record Keeping

Daily reports

Daily reports providing a general summary of activities for each day of active remedial work will be emailed to the OER Project Manager by the end of the following business day. Those reports will include:

- Project number and statement of the activities and an update of progress made and locations of excavation and other remedial work performed;
- Quantities of material imported and exported from the Site;
- Status of on-Site soil/fill stockpiles;
- A summary of all citizen complaints, with relevant details (basis of complaint; actions taken; etc.);
- A summary of CAMP results noting all excursions. CAMP data may be reported;
- Photograph of notable Site conditions and activities.

The frequency of the reporting period may be revised in consultation with OER project manager based on planned project tasks. Daily email reports are not intended to be the primary mode of communication for notification to OER of emergencies (accidents, spills), requests for changes to the RAWP or other sensitive or time critical information. However, such information will be included in the daily reports. Emergency conditions and changes to the RAWP will be communicated directly to the OER project manager by personal communication. Daily reports will be included as an Appendix in the Remedial Action Report.

Record Keeping and Photo Documentation

Job-site record keeping for all remedial work will be performed. These records will be maintained on-Site during the project and will be available for inspection by OER staff. Representative photographs will be taken of the Site prior to any remedial activities and during major remedial activities to illustrate remedial program elements and contaminant source areas. Photographs will be submitted at the completion of the project in the RAR in digital format (i.e. jpeg files).

5.11 Complaint Management

All complaints from citizens will be promptly reported to OER. Complaints will be addressed and outcomes will also be reported to OER in daily reports. Notices to OER will include the nature of the complaint, the party providing the complaint, and the actions taken to resolve any problems.

5.12 Deviations From The Remedial Action Work Plan

All changes to the RAWP will be reported to, and approved by, the OER Project Manager and will be documented in daily reports and reported in the Remedial Action Report. The process to be followed if there are any deviations from the RAWP will include a request for approval for the change from OER noting the following:

- Reasons for deviating from the approved RAWP;
- Effect of the deviations on overall remedy; and
- Determination with basis that the remedial action with the deviation(s) is protective of public health and the environment.

6.0 Remedial Action Report

A Remedial Action Report (RAR) will be submitted to OER following implementation of the remedial action defined in this RAWP. The RAR will document that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The RAR will include:

- Information required by this RAWP;
- Text description with thorough detail of all engineering and institutional controls (if Track 1 remedial action is not achieved)
- As-built drawings for all constructed remedial elements;
- Manifests for all soil or fill disposal;
- Photographic documentation of remedial work performed under this remedy;
- Site Management Plan (if Track 1 remedial action is not achieved);
- Description of any changes in the remedial action from the elements provided in this RAWP and associated design documents;

- Tabular summary of all end point sampling results (including all soil test results from the remedial investigation for soil that will remain on site) and all soil/fill waste characterization results, QA/QC results for end-point sampling, and other sampling and chemical analysis performed as part of the remedial action;
- Test results or other evidence demonstrating that remedial systems are functioning properly;
- Account of the source area locations and characteristics of all soil or fill material removed from the Site including a map showing the location of these excavations and hotspots, tanks or other contaminant source areas;
- Full accounting of the disposal destination of all contaminated material removed from the Site. Documentation associated with disposal of all material will include transportation and disposal records, and letters approving receipt of the material;
- Account of the origin and required chemical quality testing for material imported onto the Site;
- Continue registration of the property with an E-Designation by the NYC Department of Buildings (if Track 1 remedial action is not achieved);
- The RAWP and Remedial Investigation Report will be included as appendices to the RAR;
- Reports and supporting material will be submitted in digital form and final PDF's will include bookmarks for each appendix.

Remedial Action Report Certification

I, David Bligh, am currently a registered professional engineer licensed by the State of New York. I performed professional engineering services and had primary direct responsibility for implementation of the remedial program for the 211 West 29th Street site, site number 16EHAN062M. I certify to the following:

- I have reviewed this document, to which my signature and seal are affixed.
- Engineering Controls implemented during this remedial action were designed by me or a person under my direct supervision and achieve the goals established in the Remedial Action Work Plan for this site.
- The Engineering Controls constructed during this remedial action were professionally observed by me or by a person under my direct supervision and (1) are consistent with the Engineering Control design established in the Remedial action Work Plan and (2) are accurately reflected in the text and drawings for as-built design reported in this Remedial Action Report.
- The OER-approved Remedial Action Work Plan dated [date] and Stipulations in a letter dated [date] were implemented and that all requirements in those documents have been substantively complied with. I certify that contaminated soil, fill, liquids or other material from the property were taken to facilities licensed to accept this material in full compliance with applicable laws and regulations.

Name

PE License Number

Signature

Date

PE Stamp

I, Robert Kovacs, am a Qualified Environmental Professional. I had primary direct responsibility for implementation of the remedial program for the 211 West 29th Street site, site number 16EHAN062M. I certify to the following:

- The OER-approved Remedial Action Work Plan dated were implemented and that all requirements in those documents have been substantively complied with. I certify that contaminated soil, fill, liquids or other material from the property were taken to facilities licensed to accept this material in full compliance with applicable laws and regulations.

QEP Name

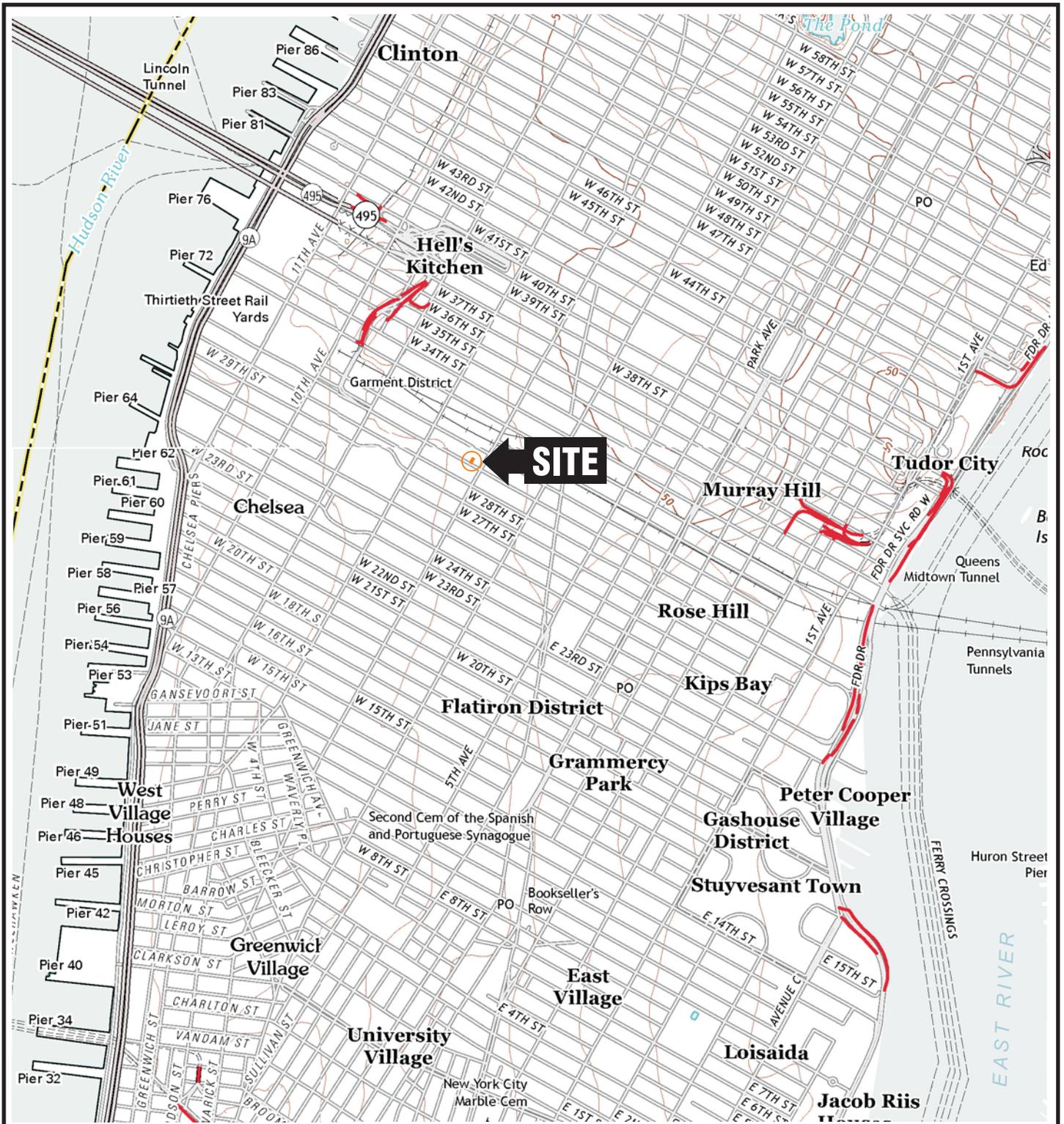
QEP Signature

Date

7.0 Schedule

The table below presents a schedule for the proposed remedial action and reporting. If the schedule for remediation and development activities changes, it will be updated and submitted to OER. Currently, a one month remediation period is anticipated.

Schedule Milestone	Weeks from Remedial Action Start	Duration (weeks)
OER Approval of RAWP	0	-
Fact Sheet 2 announcing start of remedy	0	-
Mobilization	1	1
Remedial Excavation	2	4
Demobilization	6	1
Submit Remedial Action Report	15	8



QUADRANGLE LOCATION



SOURCE:
 USGS; Brooklyn, NY (2013),
 USGS; Central Park, NY-NJ (2013),
 USGS; Weehawken, NJ-NY (2011),
 USGS; Jersey City, NJ-NY (2011)
 7.5 Minute Topographic Quadrangles

Title:

SITE LOCATION MAP

211 W 29TH STREET
 NEW YORK, NEW YORK

Prepared for:

211 SEA FOAM PROPERTIES, LLC

ROUX
 ROUX ASSOCIATES, INC.
 Environmental Consulting
 & Management

Compiled by: J.M.	Date: 02MAR16
Prepared by: G.M.	Scale: AS SHOWN
Project Mgr.: J.M.	Project No.: 2625.0001Y000
File: 2625.0001Y106.01.CDR	

FIGURE

1



LEGEND

VCP SITE BOUNDARY

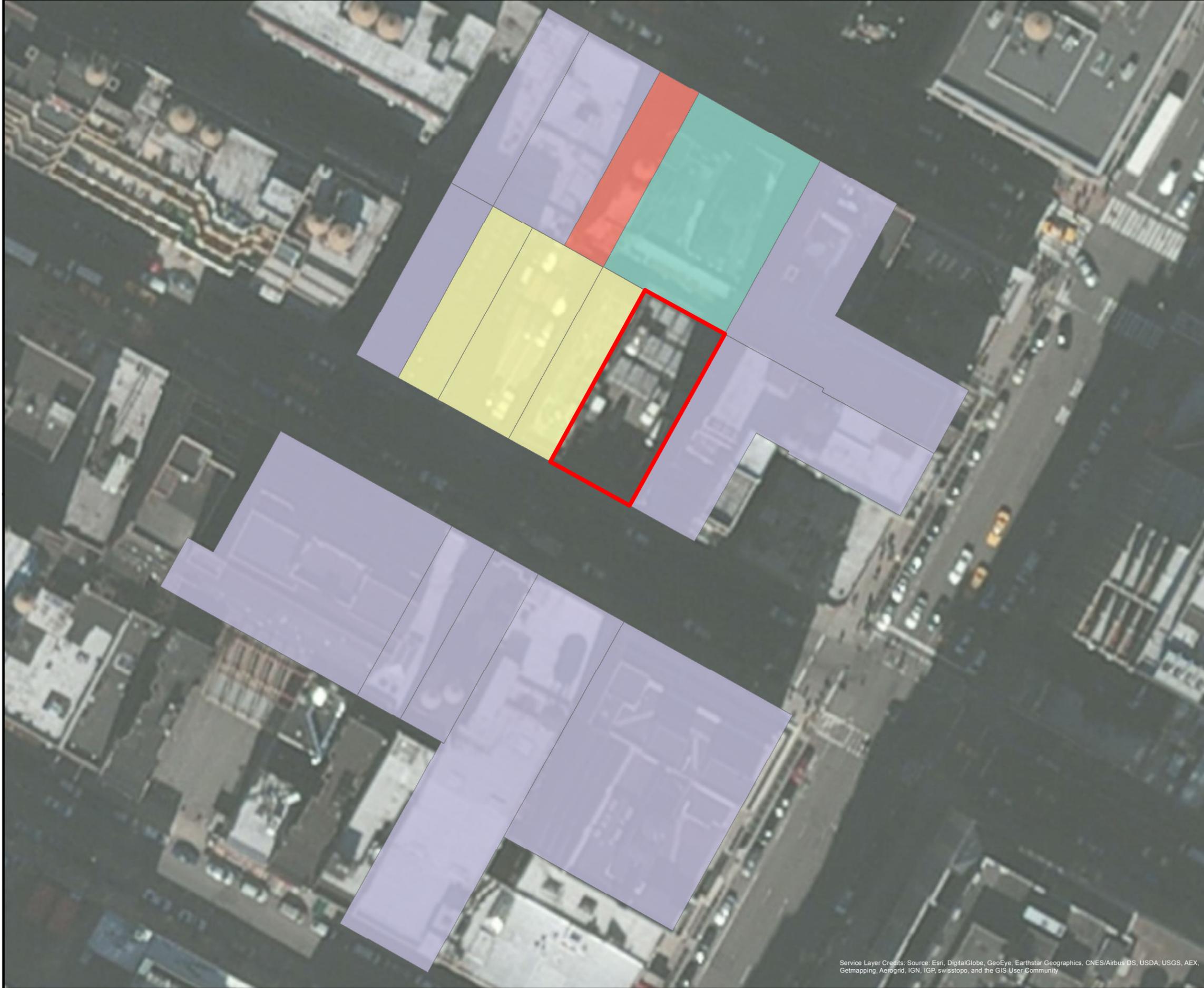


Title: **SITE BOUNDARY**
211 W 29TH STREET, NEW YORK, NY

Prepared For: 211 SEAFOAM PROPERTIES, LLC

ROUX Environmental Consulting & Management	Compiled by: J.M.	Date: 09JUN16	FIGURE 2
	Prepared by: M.R.	Scale: 1" = 50'	
	Project Mgr: J.M.	Project: 2526Y.0001Y000	
	File:		

Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



LAND USE LEGEND

- RESIDENTIAL
- VACANT
- COMMERCIAL
- INDUSTRIAL & MANUFACTURING
- VCP SITE BOUNDARY

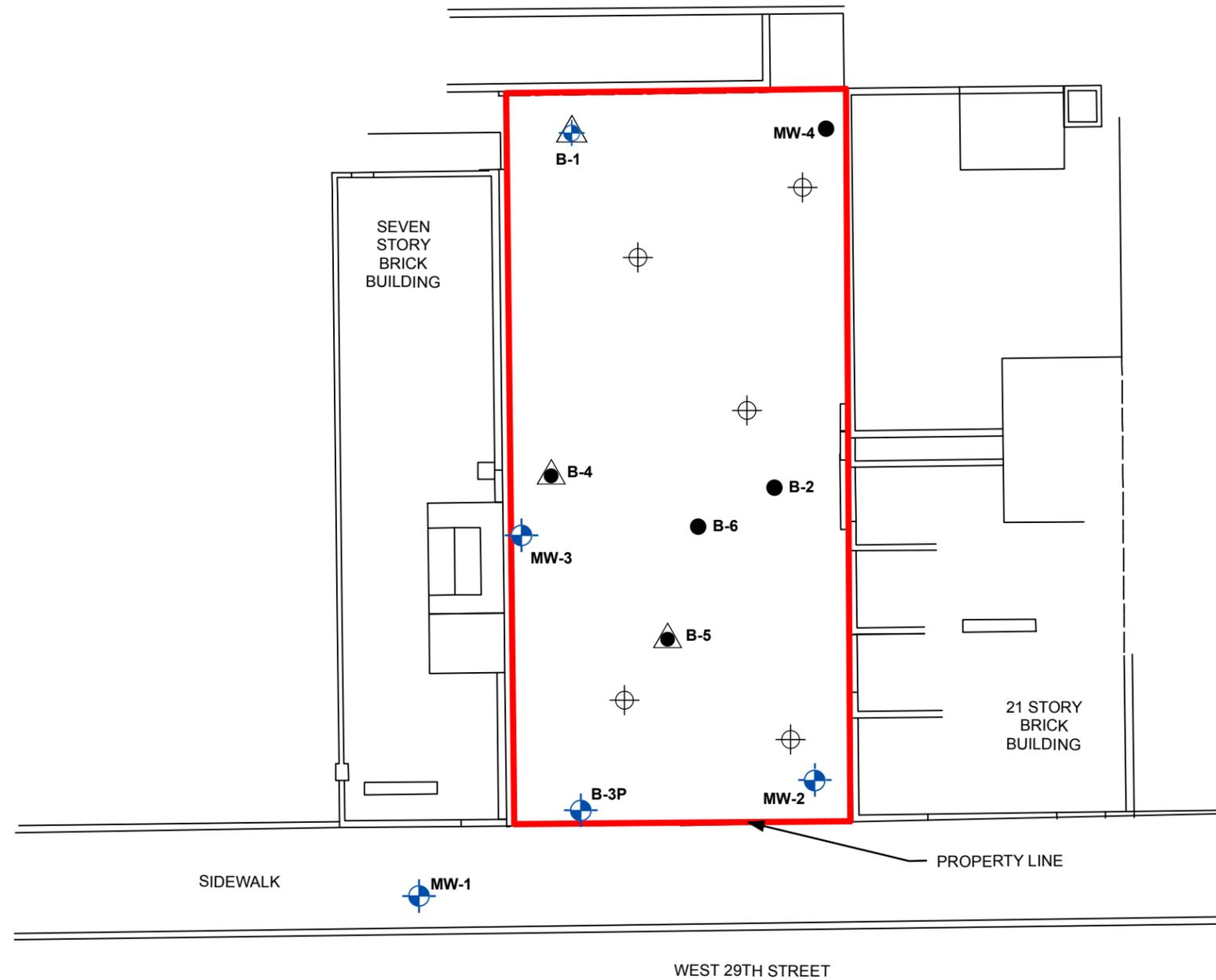


Title:
SURROUNDING AREA USAGE
 211 W 29TH STREET, NEW YORK, NY

Prepared For:
 211 SEAFOAM PROPERTIES, LLC

ROUX Environmental Consulting & Management	Compiled by: J.M.	Date: 09JUN16	FIGURE 3
	Prepared by: M.R.	Scale: 1" = 50'	
	Project Mgr: J.M.	Project: 2526Y.0001Y000	
	File: 2625Y.0001Y107.1		

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Gelmapping, Aerialgrid, IGN, IGP, swisstopo, and the GIS User Community



Legend

-  Monitoring Well and Soil Vapor Location
-  Monitoring Well and Soil Boring Location
-  Soil Boring Location
-  Endpoint Sampling Location
-  Soil Vapor Location
-  Project Site

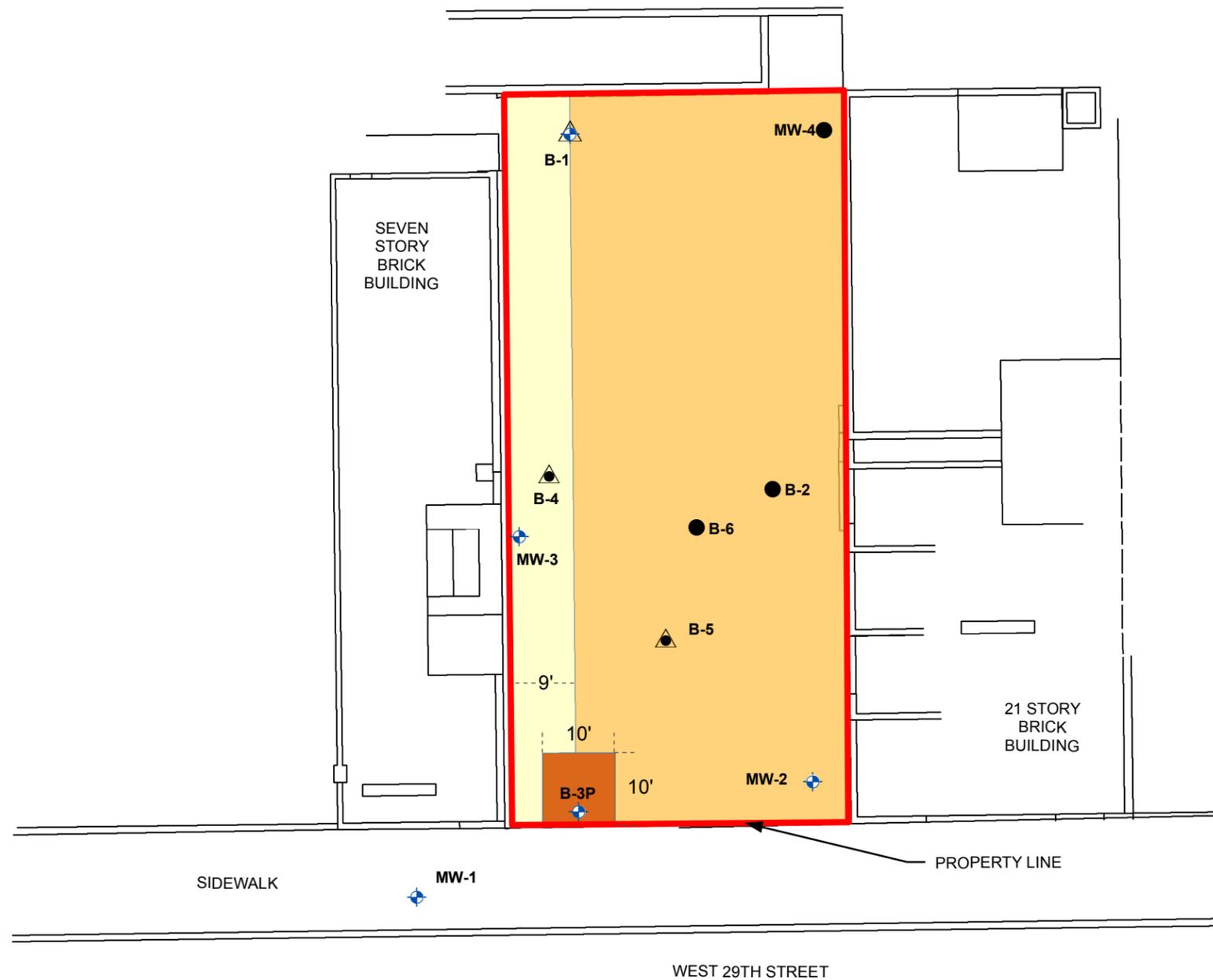


Title: **END-POINT SAMPLING LOCATION**

211 W 29TH STREET, NEW YORK, NY

Prepared For: 211 SEAFOAM PROPERTIES, LLC

ROUX Environmental Consulting & Management	Compiled by: J.M.	Date: 20JUN16	FIGURE 4
	Prepared by: M.R.	Scale: 1" = 20'	
	Project Mgr: J.M.	Project: 2526Y.0001Y000	
	File: 2625Y.0001Y107.4		

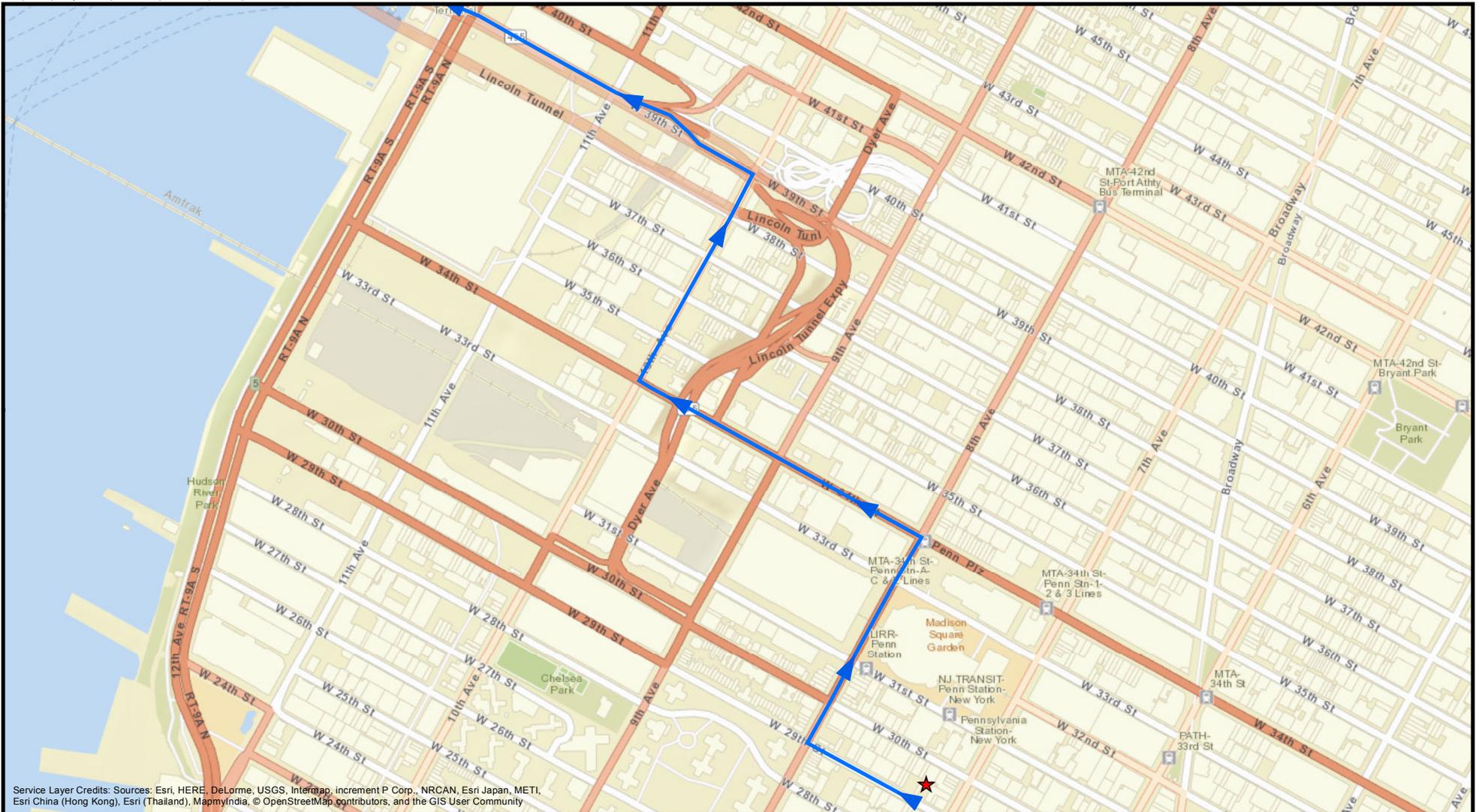


Legend

-  Monitoring Well and Soil Vapor Location
-  Monitoring Well and Soil Boring Location
-  Soil Boring Location
-  Soil Vapor Location
-  Project Site
-  Excavated to 10.5 Feet Below Grade
-  Excavated to 14 Feet Below Grade
-  Excavated to Approximately 25 Feet Below Grade



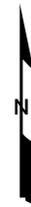
SITE EXCAVATION DIAGRAM		
211 W 29TH STREET, NEW YORK, NY		
Prepared For:		
211 SEAFOAM PROPERTIES, LLC		
ROUX ROUX ASSOCIATES, INC. <i>Environmental Consulting & Management</i>	Compiled by: J.M.	Date: 20JUN16
	Prepared by: M.R.	Scale: 1" = 20'
	Project Mgr: J.M.	Project: 2526Y.0001Y000
	File: 2625Y.0001Y107.6	
		FIGURE 5



Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Driving Directions to NY-495 W

1. Head **northwest** on **W 29th St** toward **8th Ave**
2. Turn **right** at the 3rd cross street onto **10th Ave**
3. Turn **left** onto **W 39th St**
4. Use the **right** lane to take the ramp to **NY-495 W**
5. Keep **right** at the fork and merge onto the **NY-495 W**



Title:		
TRUCK ROUTE		
211 W 29TH STREET, NEW YORK		
Prepared For:		
211 SEA FOAM PROPERTIES, LLC		
	Compiled by:	Date: 09JUN16
ROUX ASSOCIATES, INC. Environmental Consulting & Management	Prepared by:	Scale: 1" = 800'
	Project Mgr:	Project:
	File: 2625Y.0001Y107.2	FIGURE
		6

APPENDIX 1

PROPOSED DEVELOPMENT PLANS

**PASSIVE HOUSE
211 WEST 29TH STREET
NEW YORK, NY 10001**

OWNER:
SEA FOAM PROPERTY, LLC
150 West 30th Street, 20th Floor
New York, NY 10001
T: 212.594.1414
E: 211seafoam@gmail.com

CODE AND ZONING CONSULTANT:
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New York, NY 10013
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F: 212.766.1368
E: kapp@codenyc.com

STRUCTURAL ENGINEER:
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T: 212.620.7970
F: 212.620.8157
E: arnett@silman.com

MECHANICAL/ELECTRICAL/PLUMBING/SPRINKLER ENGINEER:
EP ENGINEERING
100 William Street, 32nd Floor
New York, NY 10038
T: 212.257.6191
F: 212.994.8381
E: robert@epengineer.com

GEOTECHNICAL ENGINEER:
MUESER RUTLEDGE CONSULTING ENGINEERS
14 Penn Plaza -
225 West 34th Street
New York, NY 10122-0002
T: 917.339.9443
E: elddy@mrce.com

ENERGY/FACADE CONSULTANT/ACCESSIBILITY:
STEVEN WINTER ASSOCIATES
307 Seventh Avenue, Suite 1701
New York, NY 10001
T: 212.564.5800
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E: wzoeller@swinter.com

CIVIL ENGINEER:
MARIN ARCHITECTS
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F: 212.463.9040
E: gramirez@marinarchitects.com

ENVIRONMENTAL CONSULTANT:
ROUX ASSOCIATES, INC.
209 Shafter Street
Islandia, NY 11749
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F: 212.463.9040
E: maxwell@rouxinc.com

LIGHTING CONSULTANT:
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Brooklyn, NY 11201
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F: 212.796.2072
E: drussell@lightingworkshop.com

ACOUSTIC CONSULTANT:
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124 East 40th Street, Suite 701
New York, NY 10016
T: 212.687.2672
F: 212.661.0398
E: rjh@hansencoustics.com

NO. DATE REVISIONS

NO. DATE ISSUED FOR

1	1 APR 2016	DOB FILING



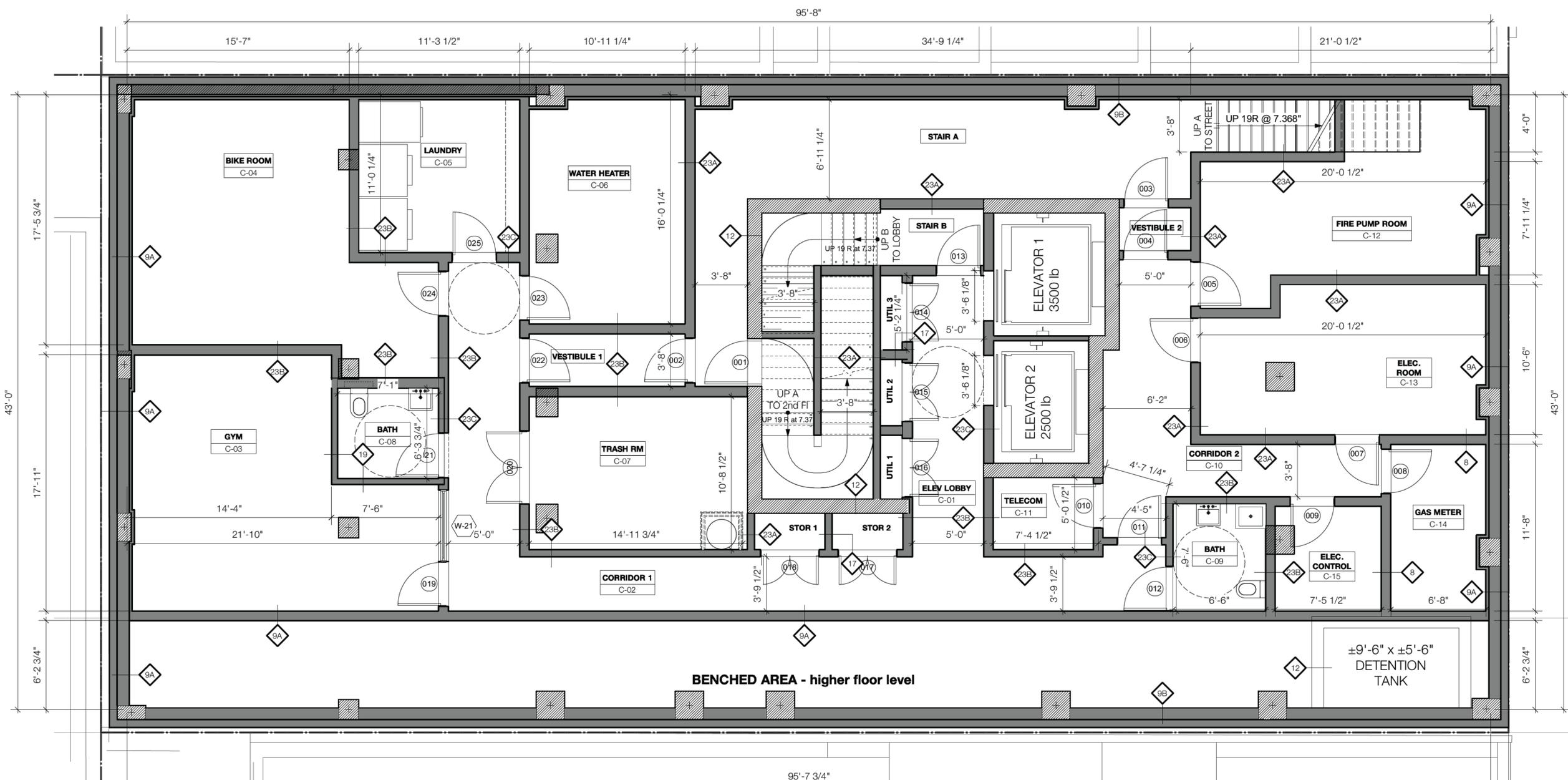
DRAWING TITLE:
CELLAR PROPOSED PLAN

DATE: 1 APRIL 2016
PROJECT NO: 15-0009
DRAWN BY: DS / AG / GF / AM
CHK BY: SZ / MH

DWG NO:
A-100.00

PAGE: 27 of 52

DOB APPLICATION NUMBER:



1 CELLAR PROPOSED PLAN
Scale: 1/4" = 1'-0"

PASSIVE HOUSE
211 WEST 29TH STREET
NEW YORK, NY 10001

OWNER:
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 E: 211seafoam@gmail.com

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 F: 212.661.0898
 E: rjh@hansenacoustics.com

NO.	DATE	REVISIONS

NO.	DATE	ISSUED FOR
1	1 APR 2016	DOB FILING

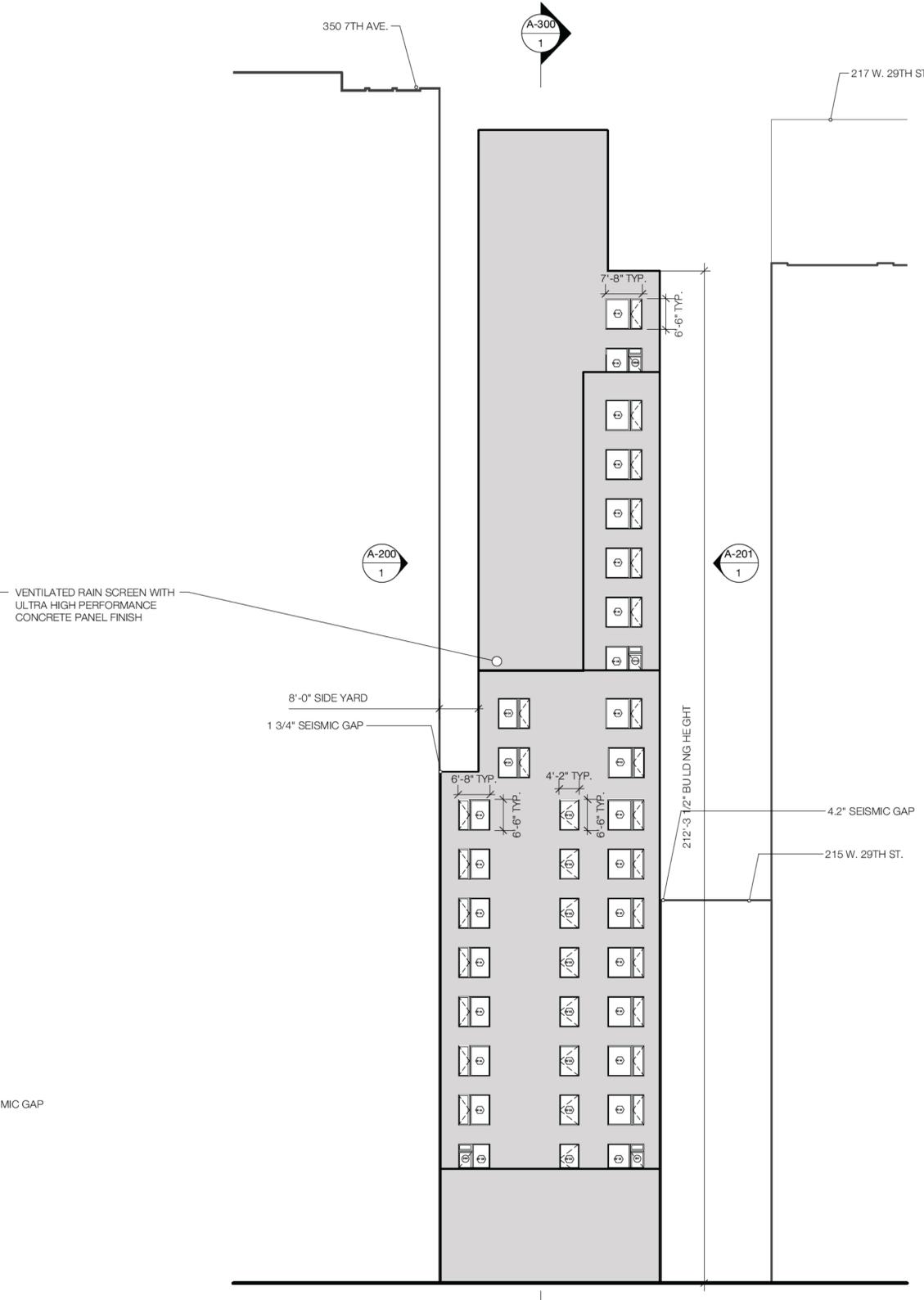
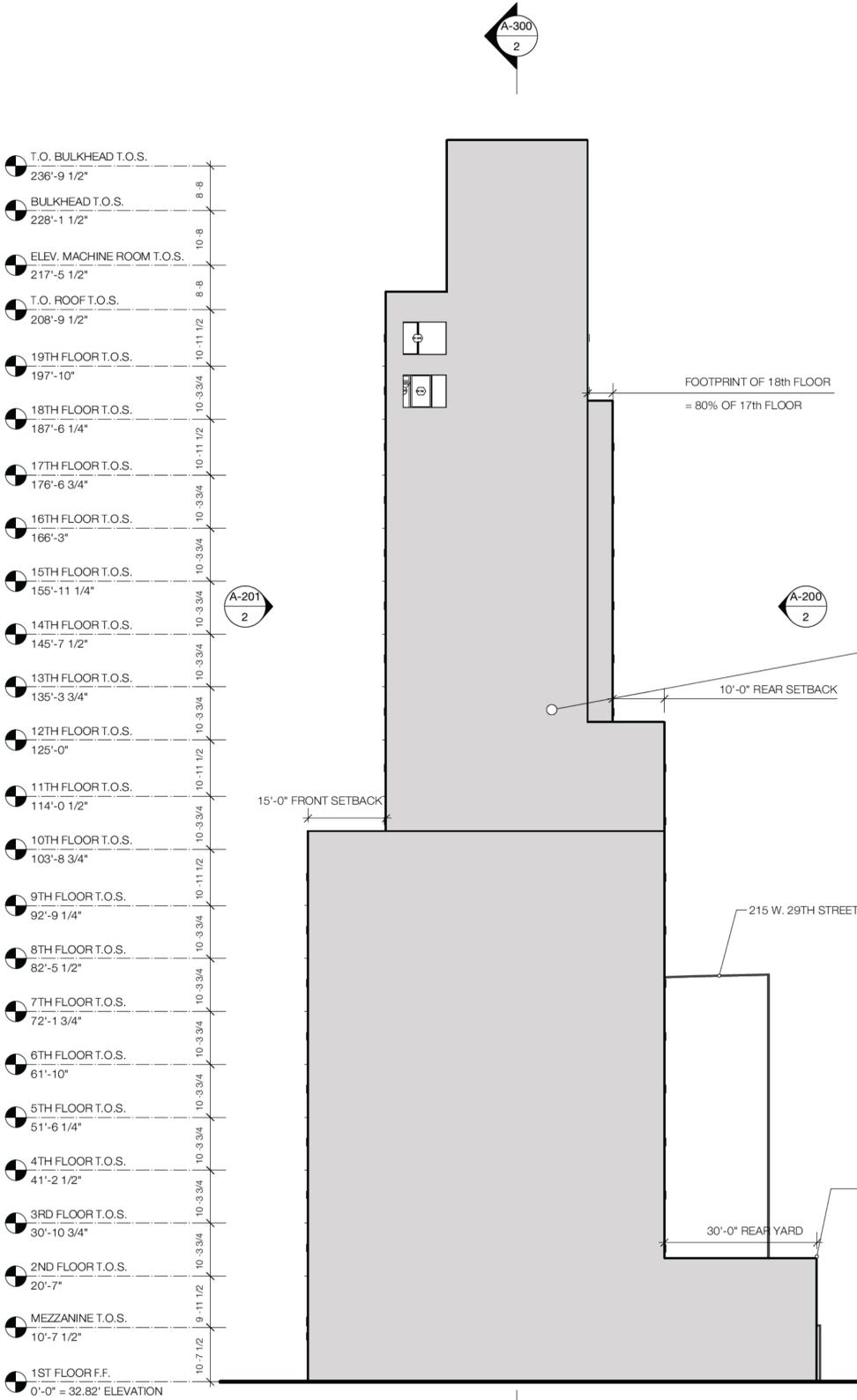


DRAWING TITLE:
BUILDING ELEVATIONS

DATE: 1 APR 2016
 PROJECT NO: 15-0009
 DRAWN BY: DS / AG / GF / AM
 CHK BY: SZ / MH

DWG NO:
A-201.00

DOB APPLICATION NUMBER:



1 PROPOSED EAST ELEVATION
 Scale: 1/16" = 1'-0"

2 PROPOSED NORTH ELEVATION
 Scale: 1/16" = 1'-0"

PASSIVE HOUSE
211 WEST 29TH STREET
NEW YORK, NY 10001

OWNER:
SEA FOAM PROPERTY, LLC
 150 West 30th Street, 20th Floor
 New York, NY 10001
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MUESER RUTLEDGE CONSULTING ENGINEERS
 14 Penn Plaza
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 New York, NY 10122-0002
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 E: clddy@mrcs.com

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 F: 212.741.8673
 E: wzoeller@swinter.com

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 F: 212.463.9040
 E: gramirez@marinarchitects.com

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 F: 212.463.9040
 E: maxwell@rouxinc.com

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 E: drussell@lightingworkshop.com

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ROBERT J. HANSEN ASSOCIATES
 124 East 40th Street, Suite 701
 New York, NY 10016
 T: 212.687.2672
 F: 212.661.0698
 E: rjh@hansenaoustics.com

NO.	DATE	REVISIONS

NO.	DATE	ISSUED FOR
1	1 APR 2016	DOB FILING

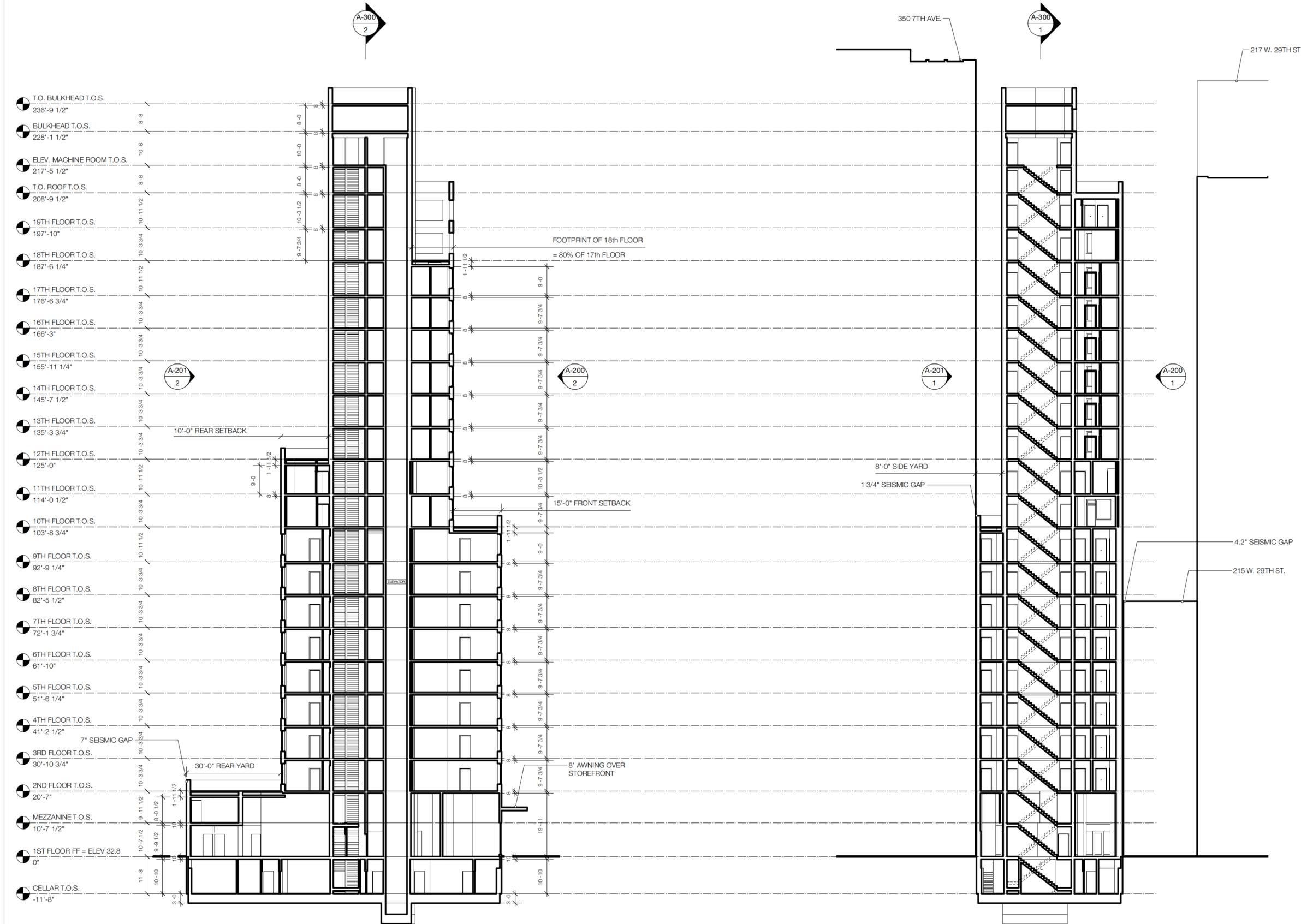
zh Zakrzewski + Hyde Architects
 515 Canal Street, Suite 1C | NY, NY 10013
 zh-architects.com | 212.366.0425

DRAWING TITLE:
BUILDING SECTIONS

DATE: 1 APR 2016
 PROJECT NO: 15-0009
 DRAWN BY: DS / AG / GF / AM
 CHK BY: SZ / MH

DWG NO:
A-300.00

DOB APPLICATION NUMBER:



1 BUILDING SECTION - LONGITUDINAL LOOKING EAST
 Scale: 1/16" = 1'-0"

2 BUILDING SECTION - TRANSVERSE LOOKING SOUTH
 Scale: 1/16" = 1'-0"

APPENDIX 2

CITIZEN PARTICIPATION PLAN

The NYC Office of Environmental Remediation and 211 Sea Foam Properties have established this Citizen Participation Plan because the opportunity for citizen participation is an important component of the NYC Voluntary Cleanup Program. This Citizen Participation Plan describes how information about the project will be disseminated to the Community during the remedial process. As part of its obligations under the NYC VCP, 211 Sea Foam Properties will maintain a repository for project documents and provide public notice at specified times throughout the remedial program. This Plan also takes into account potential environmental justice concerns in the community that surrounds the project Site. Under this Citizen Participation Plan, project documents and work plans are made available to the public in a timely manner. Public comment on work plans is strongly encouraged during public comment periods. Work plans are not approved by the NYC Office of Environmental Remediation (OER) until public comment periods have expired and all comments are formally reviewed. An explanation of cleanup plans in the form of a public meeting or informational session is available upon request to OER's project manager assigned to this Site, Amanda Duchesne, who can be contacted about these issues or any others questions, comments or concerns that arise during the remedial process at (212) 788-8841.

Project Contact List: OER has established a Site Contact List for this project to provide public notices in the form of fact sheets to interested members of the Community.

Communications will include updates on important information relating to the progress of the cleanup program at the Site as well as to request public comments on the cleanup plan. The Project Contact List includes owners and occupants of adjacent buildings and homes, principal administrators of nearby schools, hospitals and day care centers, the public water supplier that serves the area, established document repositories, the representative Community Board, City Council members, other elected representatives and any local Brownfield Opportunity Area (BOA) grantee organizations. Any member of the public or organization will be added to the

Site Contact List on request. A copy of the Site Contact List is maintained by OER's project manager. If you would like to be added to the Project Contact List, contact NYC OER at (212) 788-8841 or by email at brownfields@cityhall.nyc.gov.

Repositories: A document repository is maintained online. Internet access to view OER's document repositories is available at public libraries. This document repository is intended to house, for community review, all principal documents generated during the cleanup program including Remedial Investigation plans and reports, Remedial Action work plans and reports, and all public notices and fact sheets produced during the lifetime of the remedial project. The library nearest the Site is:

New York Public Library/Muhlenberg Library
209 West 23rd Street, New York, New York
212-924-1585
10AM through 7PM

Digital Documentation: NYC OER requires the use of digital documents in our repository as a means of minimizing paper use while also increasing convenience in access and ease of use.

Issues of Public Concern: There are no specific issues of concern to stakeholders proximate to the project site.

Public Notice and Public Comment: Public notice to all members of the Project Contact List is required at three major steps during the performance of the cleanup program (listed below) and at other points that may be required by OER. Notices will include Fact Sheets with descriptive project summaries, updates on recent and upcoming project activities, repository information, and important phone and email contact information. All notices will be reviewed and approved by OER prior to distribution and mailed by 211 Sea Foam Properties. Public comment is solicited in public notices for all work plans developed under the NYC Voluntary Cleanup Program. Final review of all work plans by OER will consider all public comments. Approval will not be granted until the public comment period has been completed.

Citizen Participation Milestones: Public notice and public comment activities occur at several steps during a typical NYC VCP project. These steps include:

- **Public Notice of the availability of the RIR and RAWP and a 30-day public comment period on the RAWP:** Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the availability of the RIR and RAWP and the initiation of a 30-day public comment period on the RAWP. The Fact Sheet summarizes the findings of the RIR and provides details of the RAWP. The public comment period will be extended an additional 15 days upon public request. A public meeting or informational session will be conducted by OER upon request.
- **Public Notice announcing the approval of the RAWP and the start of remediation:** Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the approval of the RAWP and the start of remediation.
- **Public Notice announcing the completion of remediation, designation of Institutional and Engineering Controls and issuance of the Notice of Completion:** Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the completion of remediation, providing a list of all Institutional and Engineering Controls implemented for to the Site and announcing the issuance of the Notice of Completion.

APPENDIX 3

SUSTAINABILITY STATEMENT

This Sustainability Statement documents sustainable activities and green remediation efforts planned under this remedial action.

Reuse of Clean, Recyclable Materials and Reduced Consumption of Non-

Renewable Resources: Reuse of clean, locally-derived recyclable materials reduces consumption of non-renewable virgin resources and can provide energy savings and greenhouse gas reduction.

An estimate of the quantity (in tons) of clean, non-virgin materials (reported by type of material) reused under this plan will be quantified and reported in the RAR.

Reduced Energy Consumption and Promotion of Greater Energy Efficiency:

Reduced energy consumption lowers greenhouse gas emissions, improves local air quality, lessens in-city power generation requirements, can lower traffic congestion, and provides substantial cost savings.

Best efforts will be made to quantify energy efficiencies achieved during the remediation and will be reported in the Remedial Action Report (RAR). Where energy savings cannot be easily quantified, a gross indicator of the amount of energy saved or the means by which energy savings was achieved will be reported.

Conversion to Clean Fuels: Use of clean fuel improves NYC's air quality by reducing harmful emissions.

Natural gas will be utilized for fuel in the new building.

An estimate of the volume of clean fuels used during remedial activities will be quantified and reported in the RAR.

Recontamination Control: Recontamination after cleanup and redevelopment is completed undermines the value of work performed, may result in a property that is less protective of public health or the environment, and may necessitate additional cleanup work later or impede future redevelopment. Recontamination can arise from future releases that occur within the property or by influx of contamination from off-Site.

An estimate of the area of the Site that utilizes recontamination controls under this plan will be reported in the RAR in square feet.

Stormwater Retention: Stormwater retention improves water quality by lowering the rate of combined stormwater and sewer discharges to NYC's sewage treatment plants during periods of precipitation, and reduces the volume of untreated influent to local surface waters.

An estimate of the enhanced stormwater retention capability of the redevelopment project will be included in the RAR.

Linkage with Green Building: Green buildings provide a multitude of benefits to the city across a broad range of areas, such as reduction of energy consumption, conservation of resources, and reduction in toxic materials use.

The number of Green Buildings that are associated with this brownfield redevelopment property will be reported in the RAR. The total square footage of green building space created as a function of this brownfield redevelopment will be quantified for residential, commercial and industrial/manufacturing uses.

Paperless Voluntary Cleanup Program: 211 Sea Foam Properties is participating in OER's Paperless Voluntary Cleanup Program. Under this program, submission of electronic documents will replace submission of hard copies for the review of project documents, communications and milestone reports.

Low-Energy Project Management Program: 211 Sea Foam Properties is participating in OER's low-energy project management program. Under this program, whenever possible, meetings are held using remote communication technologies, such as videoconferencing and

teleconferencing to reduce energy consumption and traffic congestion associated with personal transportation.

Trees and Plantings: Trees and other plantings provide habitat and add to NYC's environmental quality in a wide variety of ways. Native plant species and native habitat provide optimal support to local fauna, promote local biodiversity, and require less maintenance. An estimate of the land area that will be vegetated, including the number of trees planted or preserved, will be reported in square feet in the RAR.

APPENDIX 4

SOIL/MATERIALS MANAGEMENT PLAN

1.1 Soil Screening Methods

Visual, olfactory and PID soil screening and assessment will be performed under the supervision of a Qualified Environmental Professional and will be reported in the final remedial report. Soil screening will be performed during invasive work performed during the remedy and development phases prior to issuance of final signoff by OER.

1.2 Stockpile Methods

Excavated soil from suspected areas of contamination (e.g., hot spots, USTs, drains, etc.) will be stockpiled separately and will be segregated from clean soil and construction materials.

Stockpiles will be used only when necessary and will be removed as soon as practicable. While stockpiles are in place, they will be inspected daily, and before and after every storm event.

Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. Excavated soils will be stockpiled on, at minimum, double layers of 8-mil minimum sheeting, will be kept covered at all times with appropriately anchored plastic tarps, and will be routinely inspected. Broken or ripped tarps will be promptly replaced.

All stockpile activities will be compliant with applicable laws and regulations. Soil stockpile areas will be appropriately graded to control run-off in accordance with applicable laws and regulations. Stockpiles of excavated soils and other materials shall be located at least of 50 feet from the property boundaries, where possible. Hay bales or equivalent will surround soil stockpiles except for areas where access by equipment is required. Silt fencing and hay bales will be used as needed near catch basins, surface waters and other discharge points.

1.3 Characterization of Excavated Materials

Soil/fill or other excavated media that is transported off-Site for disposal will be sampled in a manner required by the receiving facility, and in compliance with applicable laws and regulations. Soils proposed for reuse on-Site will be managed as defined in this plan.

1.4 Materials Excavation, Load-Out, and Departure

The PE/QEP overseeing the remedial action will:

- oversee remedial work and the excavation and load-out of excavated material;
- ensure that there is a party responsible for the safe execution of invasive and other work performed under this work plan;
- ensure that Site development activities and development-related grading cuts will not interfere with, or otherwise impair or compromise the remedial activities proposed in this RAWP;
- ensure that the presence of utilities and easements on the Site has been investigated and that any identified risks from work proposed under this plan are properly addressed by appropriate parties;
- ensure that all loaded outbound trucks are inspected and cleaned if necessary before leaving the Site;
- ensure that all egress points for truck and equipment transport from the Site will be kept clean of Site-derived materials during Site remediation.

Locations where vehicles exit the Site shall be inspected daily for evidence of soil tracking off premises. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

Open and uncontrolled mechanical processing of historical fill and contaminated soil on-Site will not be performed without prior OER approval.

1.5 Off-Site Materials Transport

Loaded vehicles leaving the Site will comply with all applicable materials transportation requirements (including appropriate covering, manifests, and placards) in accordance with applicable laws and regulations, including use of licensed haulers in accordance with 6 NYCRR Part 364. If loads contain wet material capable of causing leakage from trucks, truck liners will be used. Queuing of trucks will be performed on-Site, when possible in order to minimize off Site disturbance. Off-Site queuing will be minimized.

Outbound truck transport routes are described in the remedial report. This routing takes into account the following factors: (a) limiting transport through residential areas and past sensitive sites; (b) use of mapped truck routes; (c) minimizing 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. To the extent possible, all trucks loaded with Site materials will travel from the Site using these truck routes. Trucks will not stop or idle in the neighborhood after leaving the project Site.

1.6 Materials Disposal Off-Site

The following documentation will be established and reported by the PE/QEP for each disposal destination used in this project to document that the disposal of regulated material exported from the Site conforms with applicable laws and regulations: (1) a letter from the PE/QEP or Enrollee to each disposal facility describing the material to be disposed and requesting written acceptance of the material. This letter will state that material to be disposed is regulated material generated at an environmental remediation Site in New York City under a governmental remediation program. The letter will provide the project identity and the name and phone number of the PE/QEP or Enrollee. The letter will include as an attachment a summary of all chemical data for the material being transported; and (2) a letter from each disposal facility stating it is in receipt of the correspondence (1, above) and is approved to accept the material. These documents will be included in the final remedial report.

The Remedial Action Report will include an itemized account of the destination of all material removed from the Site during this remedial action. Documentation associated with disposal of all material will include records and approvals for receipt of the material. This information will be presented in the final remedial report.

All impacted soil/fill or other waste excavated and removed from the Site will be managed as regulated material and will be disposed in accordance with applicable laws and regulations. Historic fill and contaminated soils taken off-Site will be handled as solid waste and will not be disposed at a Part 360-16 Registration Facility (also known as a Soil Recycling Facility). Waste characterization will be performed for off-Site disposal in a manner required by the receiving facility and in conformance with its applicable permits. Waste characterization sampling and analytical methods, sampling frequency, analytical results and QA/QC will be

reported in the final remedial report. A manifest system for off-Site transportation of exported materials will be employed. Manifest information will be reported in the final remedial report. Hazardous wastes derived from on-Site will be stored, transported, and disposed of in compliance with applicable laws and regulations.

If disposal of soil/fill from this Site is proposed for unregulated disposal (i.e., clean soil removed for development purposes), including transport to a Part 360-16 Registration Facility, a formal request will be made for approval by OER with an associated plan compliant with 6NYCRR Part 360-16. This request and plan will include the location, volume and a description of the material to be recycled, including verification that the material is not impacted by site uses and that the material complies with receipt requirements for recycling under 6NYCRR Part 360. This material will be appropriately handled on-Site to prevent mixing with impacted material.

1.7 Materials Reuse On-Site

Soil and fill that is derived from the property that meets the Soil Cleanup Objectives (SCOs) established in this plan may be reused on-Site. The SCOs for on-Site reuse are listed in Section 4.2 of this cleanup plan. 'Reuse on-Site' means material that is excavated during the remedy or development, does not leave the property, and is relocated within the same property and on land with comparable levels of contaminants in soil/fill material, compliant with applicable laws and regulations, and addressed pursuant to the NYC VCP agreement subject to Engineering and Institutional Controls. The PE/QEP will ensure that reused materials are segregated from other materials to be exported from the Site and that procedures defined for material reuse in this remedial plan are followed. The expected location for placement of reused material is shown in Section 4.2.

Organic matter (wood, roots, stumps, etc.) or other waste derived from clearing and grubbing of the Site will not be buried on-Site. Soil or fill excavated from the site for grading or other purposes will not be reused within a cover soil layer or within landscaping berms.

1.8 Demarcation

After completion of hotspot removal and any other invasive remedial activities, and prior to backfilling, the top of the residual soil/fill will be defined by one of three methods: (1) placement of a demarcation layer. The demarcation layer will consist of geosynthetic fencing or equivalent

material to be placed on the surface of residual soil/fill to provide an observable reference layer. A description or map of the approximate depth of the demarcation layer will be provided in the SMP; or (2) a land survey of the top elevation of residual soil/fill before the placement of cover soils, pavement and associated sub-soils, or other materials or structures or, (3) all materials beneath the approved cover will be considered impacted and subject to site management after the remedy is complete. Demarcation may be established by one or any combination of these three methods. As appropriate, a map showing the method of demarcation for the Site and all associated documentation will be presented in the RAR.

This demarcation will constitute the top of the site management horizon. Materials within this horizon require adherence to special conditions during future invasive activities as defined in the Site Management Plan.

1.9 Import of Backfill Soil From Off-Site Sources

This Section presents the requirements for imported fill materials to be used below the cover layer and within the clean soil cover layer. All imported soils will meet OER-approved backfill and cover soil quality objectives for this Site. Imported soils will not exceed groundwater protection standards established in Part 375. Imported soils for Track 1 remedial action projects will not exceed Track 1 SCO's.

A process will be established to evaluate sources of backfill and cover soil to be imported to the Site, and will include an examination of source location, current and historical use(s), and any applicable documentation. Material from industrial sites, spill sites, environmental remediation sites or other potentially contaminated sites will not be imported to the Site.

The following potential sources may be used pending attainment of backfill and cover soil quality objectives:

- Clean soil from construction projects at non-industrial sites in compliance with applicable laws and regulations;
- Clean soil from roadway or other transportation-related projects in compliance with applicable laws and regulations;
- Clean recycled concrete aggregate (RCA) from facilities permitted or registered by the regulations of NYS DEC.

- All materials received for import to the Site will be approved by a PE/QEP and will be in compliance with provisions in this remedial plan. The final remedial report will report the source of the fill, evidence that an inspection was performed on the source, chemical sampling results, frequency of testing, and a Site map indicating the locations where backfill or soil cover was placed.
- All material will be subject to source screening and chemical testing.
- Inspection of imported fill material will include visual, olfactory and PID screening for evidence of contamination. Materials imported to the Site will be subject to inspection, as follows:
 - Trucks with imported fill material will be in compliance with applicable laws and regulations and will enter the Site at designated locations;
 - The PE/QEP is responsible to ensure that every truck load of imported material is inspected for evidence of contamination; and
 - Fill material will be free of solid waste including pavement materials, debris, stumps, roots, and other organic matter, as well as ashes, oil, perishables or foreign matter.

Composite samples of imported material will be taken at a minimum frequency of one sample for every 500 cubic yards of material. Once it is determined that the fill material meets imported backfill or cover soil chemical requirements and is non-hazardous, and lacks petroleum contamination, the material will be loaded onto trucks for delivery to the Site.

Recycled concrete aggregate (RCA) will be imported from facilities permitted or registered by NYSDEC. Facilities will be identified in the final remedial report. A PE/QEP is responsible to ensure that the facility is compliant with 6NYCRR Part 360 registration and permitting requirements for the period of acquisition of RCA. RCA imported from compliant facilities will not require additional testing, unless required by NYSDEC under its terms for operation of the facility. RCA imported to the Site must be derived from recognizable and uncontaminated concrete. RCA material is not acceptable for, and will not be used as cover material.

1.10 Fluids Management

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable laws and regulations. Liquids discharged into the

New York City sewer system will receive prior approval by New York City Department of Environmental Protection (NYC DEP). The NYC DEP regulates discharges to the New York City sewers under Title 15, Rules of the City of New York Chapter 19. Discharge to the New York City sewer system will require an authorization and sampling data demonstrating that the groundwater meets the City's discharge criteria. The dewatering fluid will be pretreated as necessary to meet the NYC DEP discharge criteria. If discharge to the City sewer system is not appropriate, the dewatering fluids will be managed by transportation and disposal at an off-Site treatment facility.

Discharge of water generated during remedial construction to surface waters (i.e. a stream or river) is prohibited without a SPDES permit issued by New York State Department of Environmental Conservation.

1.11 Stormwater Pollution Prevention

Applicable laws and regulations pertaining to stormwater pollution prevention will be addressed during the remedial program. Erosion and sediment control measures identified in this remedial plan (silt fences and barriers, and hay bale checks) will be installed around the entire perimeter of the remedial construction area and inspected once a week and after every storm event to ensure that they are operating appropriately. Discharge locations will be inspected to determine whether erosion control measures are effective in preventing significant impacts to receptors. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. Undercutting or erosion of the silt fence toe anchor will be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

1.12 Contingency Plan for Unknown Contamination Sources

This contingency plan is developed for the remedial construction to address the discovery of unknown structures or contaminated media during excavation. Identification of unknown contamination source areas during invasive Site work will be promptly communicated to OER's Project Manager. Petroleum spills will be reported to the NYS DEC Spill Hotline. These findings

will be included in the daily report. If previously unidentified contaminant sources are found during on-Site remedial excavation or development-related excavation, sampling will be performed on contaminated source material and surrounding soils and reported to OER. Chemical analytical testing will be performed for TAL metals, TCL volatiles and semi-volatiles, TCL pesticides and PCBs, as appropriate.

1.13 Odor, Dust, and Nuisance Control

Odor Control

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

This odor control plan is capable of controlling emissions of nuisance odors. If nuisance odors are identified, 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. OER will be notified of all odor complaint events. Implementation of all odor controls, including halt of work, will be the responsibility of the PE/QEP's certifying this remedial plan.

Dust Control

Dust management during invasive on-Site work will include, at a minimum:

- Use of a dedicated water spray methodology for roads, excavation areas and stockpiles.
- Use of properly anchored tarps to cover stockpiles.
- Exercise extra care during dry and high-wind periods.
- Use of gravel or recycled concrete aggregate on egress and other roadways to provide a clean and dust-free road surface.

This dust control plan is capable of controlling emissions of dust. If nuisance dust emissions are identified, work will be halted and the source of dusts will be identified and corrected. Work will not resume until all nuisance dust emissions have been abated. OER will be notified of all

dust complaint events. Implementation of all dust controls, including halt of work, will be the responsibility of the PE/QEP's responsible for certifying this remedial plan.

Other Nuisances

Noise control will be exercised during the remedial program. All remedial work will conform, at a minimum, to NYC noise control standards.

Rodent control will be provided during Site clearing and grubbing and during the remedial program, as necessary, to prevent nuisances.

APPENDIX 5

CONSTRUCTION HEALTH AND SAFETY PLAN

August 28, 2015

**SITE-SPECIFIC HEALTH AND
SAFETY PLAN**

**211 West 29th Street
Manhattan, New York**

Prepared for

**BERNSTEIN REAL ESTATE
150 West 30th Street
New York, New York 10001**

ROUX ASSOCIATES, INC.

Environmental Consulting & Management



209 Shafter Street, Islandia, New York 11749 ♦ 631-232-2600

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1. Site Location
2. Site Plan
3. Route to Hospital
4. Route to Urgent Care Center

APPENDICES

- A. Job Safety Analysis Forms*
- B. Hazard Communication MSDS / SDS for Chemicals Used
- C. Roux Health & Safety Lessons Learned / Accident Report Forms
- D. Health and Safety Briefing / Meeting Log and Daily Site Safety Checklist
- E. Roux Heavy Equipment Exclusion Zone Policy
- F. Roux Subsurface Utility Clearance Procedure
- G. *ACORD*[®] Automobile Loss Notice Form
- H. Job Safety and Health Protection Poster

***List Job Safety Analyses Forms which are required for the project and are included in Appendix A below:**

1. Job Safety Analysis Form
2. Site Walk and Inspection
3. Mobilization and Demobilization
4. Pre-Clearing
5. Sonic Drilling
6. Soil Sampling
7. Drum Handling
8. Well Development
9. Soil Vapor Sampling
10. Groundwater Sampling

1.0 INTRODUCTION

This site-specific Health and Safety Plan (HASP) has been prepared in accordance with 29 CFR 1910.120 Occupational Safety and Health Act (OSHA) Hazardous Waste Operations and Roux Associates, Inc. (Roux Associates) Standard Operating Procedures (SOPs). It addresses all the activities described below that are associated with the property located at 211 West 29th Street in the City and State of New York (the Site, Figure 1) and will be implemented by the designated Site Health and Safety Officer (SHSO) during Site work. When activities are to be conducted which are not specifically addressed by this HASP, appropriate SOPs and Job Safety Analyses (JSAs) will be reviewed to determine the appropriate work approach and associated levels of health and safety required. If a JSA for the specific activity does not exist, one will be prepared by the field work team, reviewed for completeness by the Project Manager, and implemented as required by the JSA (see Section 6.3 and Appendix A).

Compliance with this HASP is required for all Roux Associates personnel and subcontractors contracted directly by Roux Associates. Assistance in implementing this HASP can be obtained from the Roux Associates Office Health and Safety Manager (OHSM). The content of this HASP may undergo revision based upon additional information made available. Any changes proposed to this HASP must be reviewed and approved by the OHSM or his/her designee [and the Client contact, if applicable].

All Site operations are under the direction of 211 Sea Foam Properties, LLC (Client) and any operations or activities covered under this safety plan, which are also addressed by the Client's procedures and protocols will be performed in compliance with their requirements. Specifically, routine operations or activities performed at the Site that commonly require adherence to Clients procedures and protocols include confined space entry, welding, other "hot work" operations, lock-out/tag-out and the use of personal protective equipment/clothing. These requirements were incorporated into Section 8.2 of this HASP and, at a minimum, include the use of high visibility clothing, hardhats, steel toe boots/shoes, work gloves, and safety glasses.

Prior to performing work each task should be evaluated to determine the appropriate procedures that need to be followed.

Responsibility	Name	Telephone Number
<u>Roux Associates Contacts</u>		
Project Principal	Robert Kovacs	631-232-2600
Project Manager	Richard Maxwell	631-232-2600
Site Health and Safety Officer	Ron Lombino	631-960-2010
<u>Client Contacts</u>		
Client Contact	Andrew Hirsch	646-454-2903
Site Supervisor	Lance Howard	646-734-0738

Scope of Work:

The scope of work will vary depending on the tasks planned for each geographic area of the Site (Figure 2). In general, the tasks will include the following:

- Investigation of soil, sediment, surface-water and ground-water quality to develop data on environmental conditions;
- Implementation of remedial measures to recover free product and remediate contaminated soil, ground water and surface water (installation and operation of remedial equipment including product, ground water, and soil vapor recovery equipment); and
- Oversight of excavation activities and other facility construction and demolition activities.

Detailed scopes of work for these activities will be prepared prior to implementation of the tasks.

Emergency Information

Multiple emergency services may be obtained by calling 911. More specific numbers for local services are listed below but should not be used until after 911 is alerted.

Type	Name	Telephone Numbers
Police	NYPD	911
Fire	FDNY	911
Urgent Care Facility (map attached)	City MD	(646) 596-9267####
Hospital (map attached)	Bellevue Hospital Center	(212) 562-4141

Environmental Emergency

(e.g., release or spill)

Type	Name	Telephone Numbers
Corporate Health and Safety Manager	Joseph Gentile	(856) 832-3768 (Office) (610) 844-6911 (Cell)
Office Health and Safety Manager	Ray Fitzpatrick	(631) 232-2600 (Office) (631) 484-1168 (Cell)
Site Health and Safety Officer	Ron Lombino	(631) 960-2010 (Cell)
Project Manager	Richard Maxwell	(631) 921-9531 (Cell)
Project Principal	Robert Kovacs	(516) 250-0359 (Cell)

2.0 PERSONNEL DESIGNATIONS

Project Manager

The Project Manager (PM) is responsible for coordination of subcontractors and tasks related to accomplishment of the scope of work. The PM for this project is Richard Maxwell.

Site Manager

The Site Manager (SM) is responsible for committing to a goal of ZERO environmental, health and safety incidents. The SM is also responsible for making certain that personnel receive and are aware of the provisions of this HASP, are instructed in the work practices necessary to ensure safety and are familiar with planned procedures for dealing with emergencies. The SM assures that personnel are aware of the potential hazards associated with site operations and correcting any work practices or conditions that may result in injury or exposure to hazardous substances. The SM ensures that at least one person on site, prior to assignment, is trained and certified by the American Red Cross or equivalent and is responsible for rendering first aid. These individuals will be identified by job function and will be recertified per the certifying agency's time schedule. Blood borne Pathogens training will be conducted concurrently and will be provided annually. Potential exposure to blood borne pathogens will be determined without regard for personal protective equipment. When rendering first aid or CPR universal precautions will be observed. Labels and signs will be used to serve as warnings of infectious materials. Employees will also have a copy of the site-specific exposure control plan. The use of PPE/PPC provides for work practice controls. This PPE/PPC will be provided at no cost to employees. Where PPE is provided to minimize exposure to lead, gloves, hats, vented goggles, shoes or disposable shoe covers are provided. Protective clothing shall be in clean and dry condition at least weekly. Protective clothing shall be cleaned, laundered, properly disposed and repaired or replaced as necessary. Any blood soaked bandages, etc., will be placed in leak proof bags for handling, storage and transport. After contact with blood or other potentially infectious material, all equipment and surfaces shall be cleaned and decontaminated. Hepatitis B vaccine is made available to all employees that have occupational exposure to BBP at no cost. The SM assures that all field personnel are in compliance with the hazardous waste worker health and safety training and medical surveillance requirements of 29 CFR 1910.120 and all other applicable regulations. The SM for this project is Ron Lombino.

Corporate Health and Safety Manager

The Corporate Health and Safety Manager (CHSM) is responsible for assuring that the appropriate monitoring and safety equipment and other resources necessary to perform Site activities safely are addressed in the HASP. The CHSM provides consultation to Site personnel on all questions related to health and safety. The CHSM also provides HAZWOPER training based on his extensive industrial experience and technical background (i.e., CIH). The CHSM for Roux Associates is Mr. Joseph Gentile.

Site Health and Safety Officer

The Site Health and Safety Officer (SHSO) will be present onsite during the conduct of all field operations, will be responsible for all health and safety activities, and has the authority to make all health and safety related decisions. The SHSO ensures that all personnel working onsite are qualified according to applicable Environmental Protection Agency, Occupational Safety and Health Association (OSHA) and state requirements. The determination of hazard concentrations will be made by the SHSO in consultation with the CHSM. The SHSO has stop-work authorization which he or she will execute upon determination of an imminent safety hazard, emergency situations, or other potentially dangerous situation, such as detrimental weather conditions. Authorization to proceed with work will be issued by the SHSO or CHSM in consultation with the SM after such action. The SHSO or SM will initiate and execute all contact with emergency facilities and personnel when this action is appropriate. The SHSO will also monitor decontamination procedures to determine their effectiveness. When such procedures are found to be ineffective, appropriate steps shall be taken to correct any deficiencies. The SHSO for this site is Ron Lombino. An assistant SHSO may be designated by the SHSO if required but must be pre-qualified and approved by the CHSM.

Office Health and Safety Manager

The New York Office Health and Safety Manager (OHSM) is responsible for providing support, as needed, to the Project and serves as back-up to the Site Health and Safety Officer. The OHSM assures that field personnel assigned to the project receive a health and safety orientation and are provided with the necessary personal protective equipment and clothing. The OHSM may periodically perform field audits, participate in field assessments and prepare information to be used for safety communication. The OHSM for this project is Ray Fitzpatrick.

Project Personnel

Project personnel will be responsible for: complying with this HASP; taking all reasonable precautions to prevent injury to themselves and to their fellow employees; performing only those tasks that they believe they can do safely; immediately reporting any accidents and/or unsafe conditions to the SHSO; notifying the SM and the SHSO of any special medical problems (e.g., allergies) and making certain that all on-site personnel are aware of any such problems.

3.0 SITE HISTORY AND PHYSICAL DESCRIPTION

This section provides a brief summary of the history and physical description of the Site.

The Site is located on 29th Street, between 7th Avenue and 28th Street, in the Borough of Manhattan, City and State of New York. The Site is comprised of one rectangular parcel (Tax Lot 31 of Tax Block 779) measuring 46-feet wide and 100-feet long. The Site is bordered to the north by a twelve-story industrial and manufacturing use building; to the east by a twenty one-story mixed commercial and office use building; to the south by 29th Street beyond which is a six-story mixed commercial and office use building, and to the west by a seven-story mixed commercial and residential use building.

The approximately 4,500 square foot Site, consists of a fee based parking lot containing multiple hydraulic car stacking lifts. One car is positioned at ground level while one additional car is held in the lift. There are five parking lifts with a holding capacity of three cars per lift and approximately 35 parking spaces on the ground. Aside from a small kiosk used by the parking attendant and the above mentioned car lifts, there are no other improvements at the Site.

4.0 SITE-RELATED INCIDENTS, COMPLAINTS AND ACTIONS

Historical evidence supporting the potential occurrence of releases exists in two forms, those supported by documentation, and those based on the knowledge of Client personnel. These incidents are presented below by geographical area with documented information first, then "knowledge" information procured from Client personnel. Locations of the tanks, buildings, and Site features mentioned in this HASP are shown on maps maintained in on-site files.

A Phase I Environmental Site Assessment completed in 2015 identified the following recognized environmental concerns (RECs):

- Historical onsite uses: The Site was formerly utilized as a furrier, a chemical supply company and as a fee based parking facility. These historical operations include the long-term storage and parking of automobiles and the potential use of chlorinated hydrocarbons and humectants such as glycerin, ethylene glycol or sorbitol solutions may have potentially impacted the quality of the subsurface soil, soil vapor, and/or groundwater beneath the Site.
- Possible Groundwater and Soil Vapor Contamination: The potential impacts from historical use of the surrounding properties include use as furriers. The operations associated with several nearby properties are indicative of the use of benzene, chlorinated hydrocarbons, humectants, or sorbitol solutions.

Although not technically defined as RECs, the following is a list of potential business environmental risks at the Site that could impact potential redevelopment activities the Site:

- There is the potential that the Site is underlain by historic urban fill. This is common in the five boroughs of New York City. It is recommended that subsurface soil be fully characterized, if future redevelopment activities require excavation.
- The Site has been identified as an E-Designation (E-276) for Hazardous Materials, Exhaust Stack Limitations and Air Quality Protocol. In order to address the Hazardous Materials E-Designation, site investigation guidelines provided by the New York City Office of Environmental Remediation (NYCOER), the governing agency overseeing New York City's E-Designation program, are required.

5.0 HAZARD ASSESSMENT

5.1 Chemical Hazards

Investigation results and materials storage records indicate that benzene, toluene, ethylbenzene, xylenes (BTEX), lead, total petroleum hydrocarbons (TPHs) and other petroleum-related constituents are present at the Site. The toxicological, physical, and chemical properties of these potential contaminants are presented in Table 1. This table includes action levels (permissible exposure levels), which will establish the level of protection. The potential for encountering these hazards exists during intrusive activities such as working at active and former petroleum refinery sites, while working on or near ASTs/USTs containing or formerly containing BTEX and excavation/earth moving activities with soils potentially impacted by BTEX. Material Safety Data Sheets (MSDSs) / Safety Data Sheets (SDS) for chemical products found at the Site are provided in Appendix B where they are available for review by project personnel during field operations.

5.1.1 Carbon Monoxide Hazards

Carbon monoxide (CO) is a colorless, odorless, and toxic gas, which is predominately produced by incomplete combustion of carbon-containing materials. Incomplete combustion occurs when insufficient oxygen is used in the fuel (hydrocarbon) burning process. Common sources of CO may include: motor vehicle exhausts, fuel burning¹, furnaces, coal burning power plants, small gasoline engines including electric generators, demolition equipment, chain saws, lawn mowers and power washers, marine engines, fuel powered forklifts, propane or kerosene-powered heaters, and fuel burning water heaters.

Exposure to CO impedes the blood's ability to carry oxygen to body tissues and vital organs. When CO is inhaled, it combines with hemoglobin (an iron-protein component of red blood cells), producing carboxyhemoglobin, which greatly diminishes hemoglobin's oxygen-carrying capacity. **Hemoglobin's binding affinity for CO is 300 times greater than its affinity for oxygen.** As a result, small amounts of CO can dramatically reduce hemoglobin's ability to transport oxygen.

Common symptoms of CO exposure are headache, nausea, rapid breathing (i.e., shortness of breath), weakness, exhaustion, dizziness, and confusion (i.e., light headedness). Hypoxia (severe oxygen deficiency) due to acute CO poisoning may result in reversible neurological effects, or it

¹ Fuel burning may include natural gas, propane, fuel oil, kerosene, gasoline, coal, or other carbon-based items.

may result in long-term (and possibly delayed) irreversible neurological (brain damage) or cardiological (heart damage) effects.

CO exposure can be dangerous during pregnancy for both the mother and the developing fetus. Please contact CDC-INFO (800-232-4636) if you have any questions regarding CO exposure during pregnancy.

At work sites where carbon-containing fuels are used, such as in internal combustion engines and generators, the exhausts from these units can contain significant concentrations of CO. In situations where the exhausts create exposure to CO, the exhausts of these units should be extended via appropriate hoses/piping to well ventilated exterior areas (i.e., outside and downwind of structures). Where the concentrations of CO exceed the following “action levels”, notify the Project Manager and immediately implement the corresponding actions to mitigate exposure.

Action Levels Table (CO)

Carbon Monoxide (CO) Action Levels²	
Concentration of CO in air	Action
< 25 ppm	Inspect exhaust system for leaks or other sources of CO. Monitor initially and every 15 minutes during use of CO-generating equipment.
25 – 50 ppm	Ventilate area. Monitor continuously and record measurements. Contact PM.
> 50 ppm	Stop work activities. Ventilate area.

5.2 Physical Hazards

A variety of physical hazards may be present during Site activities. These hazards are similar to those associated with any construction-type project. These physical hazards are due to motor vehicle and heavy equipment operation and hazardous walking and working surfaces. In particular, when entering or exiting a bermed area surrounding a storage tank, use the stairways provided. Do not enter or exit the bermed area by walking on the bermed surface itself.

² Based upon The American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) of 25 ppm as an 8-hour time-weighted average (TWA) [ACGIH 2014 TLVs® and BEIs®] and OSHA’s Permissible Exposure Limit (PEL) of 50 ppm as an 8-hour TWA concentration [29 CFR Table Z-1].

A hard hat must be worn at all times while working at the base of the cliffs. Additionally, when performing activities at the Site, a hard hat and reflective vest must be worn at all times. Workers must also be aware of electrical hazards, such as overhead power lines, while performing their assigned tasks. These hazards are not unique and are generally familiar to most field personnel. These will be addressed in accordance with Roux's Lock, Tag and Try Program. Additional task-specific requirements may be covered during safety briefings.

5.2.1 Flammability/Explosive Hazards

A variety of highly flammable/explosive materials are stored at the Site. Prior to performing activities near potentially flammable/explosive materials (i.e., within storage tank bermed areas), all applicable sections of this HASP and any Client procedures specific to these areas need to be thoroughly understood and adhered to. Any questions or concerns should be directed to the SHSO or the Client's Project Engineer.

5.3 Biological Hazards

Biological hazards include exposure to poison ivy/oak, the possibility of disease carrying insects (i.e., ticks) and a variety of wild animals (i.e., coyotes, raccoons, etc.).

5.3.1 Insect Stings

Stings from insects are often painful, may cause swelling, and can be fatal if a severe allergic reaction, such as anaphylactic shock, occurs. If a sting occurs, the stinger should be scraped out of the skin, opposite of the sting direction. The area should be washed with soap and water, followed by an ice pack. Personnel allergic to bee and/or wasp stings shall alert their PM, SHSO and coworkers immediately, and provide/self-administer medicine and antidotes to treat allergic reactions immediately as prescribed by their personal physician, or if the victim has a history of allergic reaction, he/she should be taken to the designated hospital.

5.3.2 Tick Injury Prevention Program

Ticks may carry Lyme disease, Rocky Mountain spotted fever or other diseases. As such, Roux Associates has instituted a program to prevent tick bites and to provide prompt, adequate and appropriate notifications and treatment in the event of a work-related tick bite. This SOP applies to all Roux Associates employees and their subcontractors and is additionally addressed by applicable JSAs.

5.3.3 Project Planning

Pre-planning is the first step in tick avoidance. Where possible, plan the work to avoid tick-infested areas.

- Avoid brushy, overgrown grassy and wooded habitats, particularly in spring and early summer when nymphal-stage ticks feed.
- Remove leaves, tall grass and brush from areas surrounding work areas (to include residential Sites), thereby reducing tick, deer and rodent habitat.
- Consider having a licensed applicator apply tick-toxic chemicals (e.g., Damminix, Dursban, Sevin, etc.) to surrounding work or residential areas to suppress the tick population.
- Consider performing work during dormant (sub-freezing) seasons; or not during maximum season (spring and early summer) unless it is not practical or rescheduling may introduce other hazards.

5.3.4 Tick Injury Prevention Measures

Where avoidance of tick habitat or clearing of the area is not possible, follow Roux Associates' Tick Prevention SOP which includes the use of PPE and other measures to avoid tick bites. These include:

- Using Permethrin on clothes to kill ticks on contact;
- Wearing light-colored clothing so that ticks can be more easily seen and removed before attachment occurs;
- Wearing long-sleeved shirts and tucking in (or taping) pant legs into socks or boots to prevent ticks from reaching the skin;
- Wearing high boots or closed shoes that cover the entire foot;
- Wearing a hat; and
- Spraying insect repellents containing n,n-diethylm-toluamide (DEET) on exposed skin, excluding the face, in accordance with United States Environmental Protection Agency (USEPA) guidelines.

Tick prevention measures as described above must be implemented prior to entering a potentially tick-infested area. This usually means that the PPE needs to be in place and properly worn before stepping off of a paved or concrete area onto a grassy or wooded area. Pant legs need to be tucked into socks. Where Tyvek is used, the pant legs need to be taped at the ankles.

Insect repellent should be applied in accordance with the manufacturer's instructions. In the event of sensitive ecosystems ensure that the application does not need to be applied at a certain distance from the habitat.

The PPE needs to remain on with the tucking or taping of pant legs, all closures fastened, etc., until leaving the potentially tick-infested area. Upon leaving the area, remove the PPE and bag it to prevent ticks from traveling and subsequently attaching themselves to your skin.

Workers are to inspect themselves and co-workers frequently to see if any ticks are on their clothing and remove them as soon as they are identified. If an embedded tick is found, it should be promptly removed with tweezers. This should be done by grasping the tick firmly and as close to the skin as possible. Then, with a steady motion, pull the tick's body away from the skin. Cleanse the area with an antiseptic. **DO NOT** use petroleum jelly, a hot match, nail polish or other products to remove the tick. **Preserve the tick for analysis (i.e., by placing in a zip lock bag, envelope or jar). The tick will be analyzed to determine if it contains the bacteria capable of causing Lyme disease.** After returning home, it is also important to do another thorough examination while showering as a further check that no ticks were missed in previous inspections. Also, it is recommended that any work clothes be washed and dried at high temperatures.

5.3.5 Responding to Known or Suspected Tick Bites

Any discovery of a tick embedded in the skin where the tick contact may have occurred at work will require (in addition to project management) immediate contact of the Office Manager, OHSM, and CHSM.

Medical practitioners consulted by Roux Associates recommend not administering an antibiotic until AFTER symptoms such as rash, flu-like symptoms, fever, joint or muscle aches, nausea or vomiting develop which could take a few days. Therefore, for tick bites determined to be work related, **antibiotics should not be prescribed or administered until AFTER the results of the tick testing are reviewed and until after any characteristic symptoms develop.**

5.3.6 Tick Incident Investigation and Reporting

Investigation and reporting of a work-related tick bite will follow established incident investigation and reporting procedures. The Roux Associates Health & Safety Lessons Learned

(H&SLL) / Accident Report Forms (ARF) will be used for documenting incidents as appropriate, and are provided in Appendix C. .

5.3.7 Animals and Animal Wastes

There is potential for various wildlife to reside within the structures, including, but not limited to pigeons, bats, mice, rats, squirrels, raccoons, stray dogs, and feral cats. Certain animals can represent significant sources (vectors) of disease transmission. Precautions to avoid or minimize potential contact with (biting) animals (such as some of the above listed) or animal waste and/or dead animals should be considered prior to all field activities. Rats, squirrels, raccoons, feral cats, and other wild animals can inflict painful bites which can also cause disease (as in the case of rabid animals). Site personnel should avoid contact with any of the above.

If contact occurs, be sure to clean the area thoroughly with soap and water as soon as possible. If a bite occurs, the area should be cleaned thoroughly immediately with soap and water and medical attention should be sought.

5.3.8 Blood-Borne Pathogens

The majority of the occupational tasks on-Site will not involve a significant risk of exposure to blood, blood components, or body fluids. The highest risk of acquiring any blood borne pathogen for employees on-Site will be following an injury. When administering first aid care, there are potential hazards associated with blood borne pathogens that cause diseases such as Human Immunodeficiency Virus (HIV), Hepatitis B (HBV), Hepatitis A (HAV), Hepatitis C (HCV), or the Herpes Simplex Virus (HSV). An employee who has not received the appropriate certification and blood borne pathogens training should never perform first aid and/or cardiopulmonary resuscitation (CPR).

In order to minimize any potential pathogen exposure, all employees should use the hand washing facilities on a regular basis. The decontamination area will provide an adequate supply of water, soap, and single use towels for hand washing. Additionally, the following universal precautions should be followed to prevent further potential risk:

- Direct skin or mucous membrane contact with blood should be avoided.
- Open skin cuts or sores should be covered to prevent contamination from infectious agents.

- Body parts should be washed immediately after contact with blood or body fluids that might contain blood, even when gloves or other barriers have been used.
- Gloves and disposable materials used to clean spilled blood shall be properly disposed of in an approved hazardous waste container.
- First aid responders shall wear latex or thin mil nitrile gloves when performing any procedure risking contact with blood or body substances.
- Safety glasses will be worn to protect the eyes from splashing or aerosolization of body fluids.
- A CPR mask will be worn when performing CPR to avoid mouth-to-mouth contact.
- Cut-resistant work gloves will be worn to minimize the risk of injury to the hands and finger when working on all equipment with sharp or rough edges.
- Broken glass or possible contaminated material shall be avoided with unprotected hands.

5.3.9 Mold

A collection of moisture inside on-Site structures may lead to the growth of mold within the structures.

Although mold affects individuals differently and to different degrees, the following are some of the most common adverse health effects:

- Respiratory problems – wheezing, difficulty breathing;
- Nasal and sinus congestion;
- Eyes – burning, watery, reddened, blurry vision, light sensitivity;
- Dry, hacking cough;
- Sore throat;
- Nose and throat irritation;
- Shortness of breath and lung disease;
- Chronic fatigue;
- Skin irritation;
- Central nervous system (headaches, loss of memory, and mood changes);
- Aches and pains;
- Fever;

- Headaches;
- Diarrhea; and
- Immune suppression.

Decisions about removing individuals from an affected area must be based on the results of a medical evaluation, and be made on a case-by-case basis.

Workers that discover the visible presence of mold in excess of ten square feet need to notify the SHSO for consultation. If a worker smells mold and feels that he/she is experiencing symptoms of exposure, he/she should retreat and report the symptoms to the SHSO.

5.3.10 Other Biohazards

Other biological hazards include mosquitoes which generally live in the vicinity of brush, trees, and stagnant water. Some areas have mosquitoes that carry viruses (for example, West Nile virus, or Eastern Equine Encephalitis). Another category of biohazards include plants such as poison ivy, poison oak, and poison sumac. If exposed to these plants, personnel will wash skin thoroughly with soap and water or post-contact cleansers.

5.4 Heat/Cold Stress

Heat and cold stress are potential hazards associated with heavy physical activity and/or the use of personal protective equipment in hot or cold weather environments. Heat and Cold stress are discussed in Sections 9.13 and 9.14. Protection against sun exposure by wearing a sun screen, hat, and long-sleeved shirts must be implemented when warranted in addition to frequent and proactive hydration of workers.

5.5 Noise

Noise is associated with the operation of heavy equipment, power tools, pumps, and generators. Personnel with 8-hour time weighted average (TWA) exposures exceeding 85 decibels (dB) must be included in a hearing conservation program in accordance with 29 CFR 1910.95. High noise operations will be evaluated by the SHSO. Noise exposure will be controlled through the use of hearing protection such as ear plugs or ear muffs or by maintaining set-backs from high-noise equipment as warranted.

5.6 Hazards Caused by Roux's Work

Roux Associates will advise the Client of any unique hazards presented by its work or of any hazards found by Roux during the course of its work for the Client.

- Heavy equipment and motor vehicle traffic- Workers shall wear fluorescent, reflective Class 3 vests or high visibility outerwear in high traffic areas and utilize traffic cones, barricades and caution tape to protect work areas, as necessary;
- Slip, trip, fall hazards associated with uneven terrain, obstacles, and slippery or icy surfaces- General housekeeping will be performed to reduce slip, trip and fall hazards;
- Sharp edges, broken glass, exposed nails, rusty metal (wear leather or ANSI Level 2 cut-resistant gloves);
- Pinch points (wear leather or ANSI Level 2 cut-resistant gloves);
- Overhead hazards (wear hard hats as applicable); and
- Flying objects and airborne particulate hazards (Wear safety glasses, goggles, or face shields when appropriate).

5.7 Electrical Hazards

Portable pumps, generators, and other power tools require proper grounding and/or a ground fault circuit interrupter (GFCI) before operation. Personnel should never attempt to move an operating pump or generator.

6.0 TRAINING REQUIREMENTS

6.1 Basic Training

All site personnel who will perform work in areas where there exists the potential for toxic exposure will be health and safety trained prior to performing work onsite per OSHA (29 CFR 1920.120(e)). Initial and annual training will include the locations of and proper use of safety equipment such as portable fire extinguishers. American Red Cross basic first aid and adult CPR will be offered to employees approximately every two years. Training records will be maintained by the SHSO onsite and as described in Section 6.4. OSHA HAZWOPER training will be provided annually and is limited to first responder awareness level only. Where training is required by a specific health or safety standard, this will be conducted initially and annually and will include the information summarized in the Toxicological Table, Table 1 of this HASP.

6.2 Site-Specific Training

Training will be provided by the SHSO and SM that specifically addresses the activities, procedures, monitoring and equipment to be utilized by site personnel and visitors. The training will include site and facility layout, hazards, emergency services at the site, and will detail all provisions contained within this HASP. Site-specific training will be documented and kept as part of the project records.

6.3 Safety Briefings

Project personnel will be given briefings by the SHSO, the PM and/or the Client's Project Engineer on an as-needed basis to further assist them in conducting their activities safely. Safety briefings will be provided each morning and when new operations are to be conducted; changes in work practices must be implemented due to new information made available and before work is begun at each onsite work area. Safety briefings will include a discussion of anticipated hazards, review Job Safety Analyses for tasks to be implemented, pertinent Loss, Lessons Learned, Peer Observation finding, and safety violations. These include not following Client rules or procedures, not following established safe work practices, and lack or improper use of personal protective equipment/clothing, etc. On-site safety briefings will be documented daily on the forms included as Appendix D (Health and Safety Briefing/Meeting Log and Daily Site Safety Checklist), and will be kept by the SHSO as part of the project records. In addition, when activities are to be conducted which are not specifically addressed by this HASP, appropriate JSAs

will be reviewed to determine the appropriate levels of health and safety required. If a JSA for the specific activity does not exist, one will be prepared by the field work team, reviewed for completeness by the Project Manager, and implemented as required by the work scope. Copies of the completed JSA forms for various tasks are included in Appendix B. Modifications to JSAs will be documented on these forms and maintained in the project file. Observed safety violations will be addressed by coaching and mentoring of personnel.

6.4 Record Keeping Requirements

All record keeping requirements mandated by OSHA (29 CFR 1910.120) will be strictly followed. Specifically, all current personnel training records, medical fit for duty papers, and respirator fit test forms will be required before work can begin and maintained onsite during the length of the project. These records along with injury/incident reports, medical examination records and exposure monitoring records will become a permanent part of the project records. Each subcontractor will maintain the above-mentioned records for his employees.

Medical and exposure records maintained per 29 CFR 1910.1020 will be maintained for at least the duration of employment plus 30 years. Training records will be maintained for 3 years from the date of training.

Medical and exposure records shall be made available upon request to employees, and to the Assistant Secretary or the Director (OSHA) for examination and copying. Medical records must have written consent of employee before being released. Transfer of records will be in compliance with 29 CFR 1910.1020 (h).

7.0 ZONES, PROTECTION, AND COMMUNICATIONS

7.1 Site Zones

A three zone approach to site operations to control the potential spread of contamination will be employed. The three zones are:

- The Exclusion Zone;
- The Contamination Reduction Zone; and
- The Support Zone.

The establishment of work zones will ensure that: personnel are properly protected against the potential hazards in the area where they are working; work activities and potential contamination are limited to the specific areas; and personnel can be easily located and evacuated in an emergency.

The establishment of work zones and the levels of protection required within the zones will be determined on a case-by-case basis. The SHSO, PM and the Client's Project Engineer will determine the need for work zones, and based upon Site-specific knowledge and data, determine the levels of protection within the established zones. The following sections provide general specifications for the three work zones.

7.1.1 Exclusion Zone

The area(s) which contain, or are suspected to contain, hazardous materials or activities will be considered the Exclusion Zone (EZ). The SHSO may establish more than one restricted area within the EZ when different levels of protection may be employed or different hazards exist. Signs will be posted in and around areas required to be posted by a specific health or safety standard. No personnel are allowed in the EZ without:

- The proper personal protective equipment;
- Medical authorization per Section 8.4;
- A need to be in the zone; and
- Training certification.

During excavation, drilling and sampling activities, the Exclusion Zone is defined as the excavation and a 10-foot radius around the excavation boundary, or drilling or sampling locations. For the purposes of this project, the Exclusion Zone(s) will be delineated once the work sites have been determined.

7.1.2 Contamination Reduction Zone

A Contamination Reduction Zone (CRZ) will be established between the Exclusion Zone and the Support Zone. The CRZ will contain the contamination reduction corridor (CRC) and is designed to reduce the probability that the uncontaminated clean areas will become contaminated or affected by other site hazards. It is the area where decontamination of personnel and equipment takes place and serves to limit the physical transfer of hazardous substances into clean areas. Decontamination shall be performed in geographical areas that minimize the exposure of uncontaminated employees or equipment to contaminated employees or equipment. The CRZ is to be used for general site entry and egress including access for heavy equipment for investigation activities. The CRZ will also contain safety and emergency equipment (see Section 7.2.3). No personnel are allowed in the CRZ without:

- The proper personal protective equipment;
- Medical authorization per Section 8.4;
- A need to be in the zone; and
- Training certification.

7.1.3 Support Zone

The Support Zone (SZ) is considered the uncontaminated area and will be separated from the CRZ by the "Contamination Control Line". The SZ will contain the support facility that will provide for team communications and emergency response. Appropriate sanitary facilities and safety and support equipment will be located in this zone. The majority of site operations as well as site access of authorized persons will be controlled from this location. The support facility will be located up-wind of site operations, if possible, and may be used as a potential evacuation point. No potentially contaminated personnel or materials are allowed in this zone.

7.1.4 Buddy System

Select field activities conducted in contaminated, hazardous, and remote areas of the Site may require the use of the buddy system. Instances when the buddy system should be employed include, but are not limited to activities performed in wetland areas (i.e., surface-water sampling, etc.), excavation activities, drilling activities and confined space entry (permit required and non-permit required). Prior to commencing with field tasks in a potentially hazardous area, the need for using the buddy system should be evaluated. If required, a buddy should be able to:

- Provide his/her partner with assistance;
- Observe his/her partner for signs of chemical or heat/cold exposure;
- Periodically check the integrity of his/her partner's protective clothing; and
- Notify the SHSO or others if emergency help is needed.

7.2 Personal Protection

This section describes the levels of protection that will be required by on-site personnel during Site activities.

7.2.1 General

The level of protection to be worn by field personnel and visitors will be defined and controlled by the SHSO, the PM and the Client's Project Engineer. Where more than one hazard is indicated, further definition shall be provided by review of Site hazards, conditions, and operational requirements and by monitoring at the particular operation being conducted.

Intrusive activities (i.e., drilling, excavation activities, etc.) include any Site activity which will, or potentially will, result in exposure(s) to hazardous or toxic chemicals or physical agents at or above the permissible exposure limit (PEL), or to flammable or oxygen-deficient atmospheres. Prior to commencing with any field activity, the potential for such conditions should be evaluated to determine air monitoring requirements. General procedures for air monitoring are described below.

During intrusive activities, continuous monitoring will be performed using the photoionization detector (PID) and Dräger or Sensidyne tubes for initial and periodic real-time measurements of benzene. Personnel monitoring utilizing activated charcoal tubes may also be performed in areas

where high benzene concentrations were present during previous investigations. If personal monitoring is needed, it will only be undertaken under the direction and direct supervision of the CHSM.

The use of Dräger or Sensidyne tubes for benzene will allow the SHSO to make an immediate decision on the adequacy of protection against this compound. Should the PID or Dräger or Sensidyne tubes indicate that any detectable concentration for this constituent has been exceeded, work will cease in this area until:

- Workers have donned a full-face air-purifying respirator; or
- The concentration levels for benzene are below the Dräger or Sensidyne tube detection levels.

Based upon the results of air measurements of intrusive activities in these worst case areas, the level of personnel protection will be established for the remainder of the Site. Protection may be upgraded or downgraded by the SHSO in conjunction with the PM based upon the PID instrument and Dräger or Sensidyne tube results.

All non-intrusive activities that preclude contact with contaminated media will be performed in Level D protection without continuous monitoring, unless periodic PID monitoring indicates additional monitoring is warranted. However, initial monitoring may be necessary utilizing the PID and the Dräger or Sensidyne tubes and/or personal monitoring (charcoal tubes).

7.2.2 Respiratory Protection and Clothing

Three levels of protective equipment are discussed below including Level D, Level C, and Level B.

Level D Protection

1. Personal Protective Equipment:
 - High visibility/reflective coveralls/clothing
 - Cut Resistant gloves (or leather work gloves);
 - Boots/shoes, leather, or chemical-resistant, steel toe and shank;
 - Ice cleats⁽¹⁾;
 - Boots (outer), chemical-resistant (disposable)*;

- Chemical resistant gloves – nitriles*;
- Chemical resistant clothing (e.g., Tyveks)*;
- Fire Retardant Clothing⁽²⁾*;
- Safety glasses or chemical splash goggles⁽³⁾;
- Hard hat; and
- Hearing protection.

* Optional for activities except when handling petroleum product (i.e., well bailing) and materials (i.e., soil, sorbent products, etc.) exhibiting high degrees of petroleum contamination

- ⁽¹⁾ Ice Cleats to be worn with approved safety shoes when working in areas with snow/ice cover.
- ⁽²⁾ Fire retardant coveralls required in areas of hot work/areas with potential for flash (i.e., truck flammable loading rack, within tank berms)
- ⁽³⁾ Clear lenses to be worn when working in low light areas inside site buildings and outside during overcast days that may limit visibility.

2. Criteria for Selection.

- Non-intrusive activities and intrusive activities in areas where the potential airborne hazards are substantially characterized and do not pose a threat of exposure in excess of one-half the PEL.
- PID instrument (such as the MiniRAE 3000 or other comparable instrument) readings in the breathing zone are less than 5 ppm and benzene and furfural are not detectable utilizing colorimetric indicator tubes (e.g., Dräger or Sensidyne). Work functions preclude splashes, immersion, or potential for unexpected inhalation of any chemicals.

Notes: 1. Benzene and furfural may also be monitored initially and periodically in the breathing zone utilizing activated charcoal sampling devices.

- 3. Modifications of Level D will be used to increase or decrease the level of skin protection during activities that increase or preclude, respectively, the degree of contact with chemical hazards. Modifications for increased protection may include the use of chemical resistant coveralls (e.g., Tyveks) and chemical resistant gloves. Chemical resistant coveralls, gloves and boots will be used when the handling of petroleum products is required (i.e., well bailing). Any modifications of Level D will require approval of the SHSO and PM.

Protection may be upgraded or downgraded by the SHSO in conjunction with the Project Principal on the basis of action levels presented below:

Action Levels for Respiratory Protection (Total Organic Vapors)

Total Organic Vapors in Breathing Zone (ppm)⁽¹⁾	Action
≤ 5	No Action
> 5 – < 25	Cease Field Operations
≥ 25	Cease Field Operations

⁽¹⁾ Based on relative response (sensitivity of PID to total organic vapors).

PID Action Levels

If photoionization detector measurements are above 5 ppm-v but below 25 ppm-v above background for five minutes in the breathing zone, employee protection will be upgraded to Level C with the use of a full-face respirator.

If PID measurements exceed 25 ppm-v above background for five minutes in the breathing zone, work activities will cease until airborne vapor levels can be reduced to less than 25 ppm-v and are quantified or the SHSO determines alternate methods to be followed in order to proceed.

Most activities are conducted outdoors, where breathing of high vapor levels are not likely in aboveground areas. Excavations which are not to be entered are likely to have higher vapor concentrations. Where a spill occurs in a basement or other indoor area, ventilation will not be as good as outdoors and extra care shall be taken in monitoring vapor levels.

Action Levels for Oxygen Levels and Combustible Gases

COMBUSTIBLE GASES ¹	
0-2.0 – 2.0% LEL	Continue monitoring
2.0 – 5.0% LEL	Notify SHSO
5.0% LEL or greater	Potential explosion hazard Interrupt task / Evacuate Area

Action Levels for Oxygen Levels and Combustible Gases

OXYGEN ¹	
20.8% O ₂	Oxygen level normal
Greater than 22.0% O ₂ / Less than 20.0% O ₂	Oxygen enriched / deficient – notify SHSO
Greater than 23.5% O ₂ / Less than 19.5% O ₂	Oxygen enriched / deficient Interrupt task / Evacuate area

¹ Action levels are based on Environmental Protection Agency Standard Operating Safety Guides; Table 5-1, Atmospheric Hazard Action Guidelines may be further restricted based on the CIH's professional judgment and experience.

Level C Protection

1. Personal Protective Equipment:

- Full-face, air-purifying, cartridge-equipped respirator (MSHA/NIOSH specifically approved for protection from organic vapors per OSHA 1910.1028);
- Chemical-resistant clothing (coverall; hooded, two-piece chemical splash suit; chemical-resistant hood and apron; disposable chemical-resistant coveralls);
- Gloves (outer), chemical-resistant - nitriles;
- Gloves (inner), chemical-resistant - latex;
- Boots (inner), chemical-resistant, steel toe and shank;
- Boots (outer), chemical-resistant (disposable*);
- Hard hat;
- Hearing protection;
- Escape mask*.

* Optional

2. Criteria for Selection.

Meeting any of these criteria warrants use of Level C protection.

- Airborne hazards are known to be present but are unlikely to exceed protection factors provided by air-purifying respirators.
- Continuous total organic vapor readings in the breathing zone register between 5 ppm and 25 ppm on a PID (such as the MiniRAE 3000 or other comparable instrument), benzene and furfural readings utilizing colorimetric indicator tubes (e.g., Dräger or Sensidyne) are detectable but less than 5 ppm.

- Measured air concentrations of known organic vapors will be reduced by the respirator to, at, or below one-half the permissible exposure limits, and the individual and combined compound concentrations are within the service limit of the respirator cartridge.
- Atmospheric contaminant concentrations do not exceed Immediately Dangerous to Life and Health (IDLH) concentrations.
- Atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect the small area of skin left unprotected by chemical-resistant clothing.
- Job functions have been determined not to require self-contained breathing apparatus.

Notes: 1. Benzene and furfural may also be monitored initially and periodically in the breathing zone utilizing activated charcoal sampling devices.

2. Modifications of Level C will be used to increase or decrease the level of skin protection during activities that increase or preclude, respectively, the degree of contact with chemical hazards. Modifications for increased protection may include the use of chemical resistant coveralls (e.g., Tyveks) and chemical resistant gloves. Any modifications to Level C will require approval of the SHSO and PM.

Level B Protection

1. Personal Protection Equipment:

- Pressure-demand, self-contained breathing apparatus (MSHA/NIOSH approved);
- Chemical-resistant clothing (overall and long-sleeved jacket; coveralls; hooded, one or two-piece chemical-splash suit; disposable chemical-resistant coveralls);
- Gloves (outer), chemical-resistant;
- Gloves (inner), chemical-resistant;
- Boots (inner), chemical-resistant, steel toe and shank;
- Boots (outer), chemical-resistant, (disposable);
- Hard hat;
- Hearing protection; and
- Two-way radio communications (intrinsically safe).

2. Criteria for Selection

Meeting any one of these criteria warrants use of Level B protection:

- PID instrument (such as the MiniRAE 3000 or other comparable instrument) readings in the breathing zone are greater than 25 ppm and less than 500 ppm, benzene and

furfural are detectable at concentrations at or above 5 ppm utilizing colorimetric indicator tubes (e.g., Draeger or Sensidyne).

- Airborne hazards are known to be present, but are not identified or quantified.
- The type(s) and atmospheric concentration(s) of toxic substance(s) have been identified and require the highest level of respiratory protection, but a lower level of skin and eye protection. These would be atmospheres:
 - ♦ With IDLH concentrations;
 - ♦ Exceeding limits of protection afforded by a full-face, air-purifying respirator; or
 - ♦ Containing substances requiring air-supplied equipment, but substances and/or concentrations do not represent a serious skin hazard.
- The atmosphere contains less than 19.5% oxygen.
- Site operations make it highly unlikely that the small, unprotected arc of the head or neck will be contacted by splashes of extremely hazardous substances.
- If work is performed in an enclosed space where the exposure to toxics or an oxygen deficient atmosphere may be present.

7.2.3 Safety Equipment

Basic emergency and first aid equipment will be available at the Support Zone and/or the CRZ as appropriate. This shall include first aid kit, emergency eyewash, fire extinguishers, and other safety-related equipment. Basic emergency and first aid equipment is available onsite. Field personnel will be notified of the locations of emergency and first aid equipment prior to commencing with field activities.

Hand Tools

Where hand and power tools are used and employees are potentially exposed to the hazard of falling, flying, abrasive, or splashing objects, or are exposed to harmful dust, fumes, mists, vapors, or gases, the employees shall be provided the appropriate Personal Protective Equipment as necessary to protect them from the hazard.

Communications

Mobile Telephones – for communication with emergency support services/facilities. All Roux Associates, Inc. site personnel will be equipped with a mobile phone. Mobile communications, however, will be prohibited when the user is within the work area to avoid injuries resulting from distraction.

8.0 MONITORING PROCEDURES FOR SITE OPERATIONS

8.1 Air Quality Monitoring During Site Operations

The SHSO will monitor wind direction and temperature during monitoring and record all data in a log book. All monitoring equipment will be calibrated to the manufacturer's specifications each day prior to use and documented in Site field books.

8.2 Air Quality Monitoring During Intrusive Activities

Intrusive activities include any Site activity which will, or will possibly, result in exposure(s) to hazardous or toxic chemicals or physical agents at or above a permissible exposure limit (PEL), or to flammable or oxygen-deficient atmospheres. Prior to commencing with any field activity, the potential for such conditions should be evaluated to determine air monitoring requirements. General procedures for air monitoring are described below.

Air monitoring will be performed to establish the concentrations of volatile organic compounds during invasive activities using the following instrument(s):

- Photoionization detector;

The PID will be used to provide direct readings of organic vapor concentrations during intrusive activities to determine that personnel protection is adequate.

8.2.1 Level D Intrusive Activities

Level D intrusive activities will initially include all intrusive Site activities. These investigations/activities will begin utilizing Level D protection as described in Section 7.2.2, with upgrading as necessary to assure adequate personnel protection.

The SHSO will monitor the breathing zone with the PID in continuous operating mode and with the alarm activated. The alarm will be set at 5 ppm, which is below the permissible exposure level (PEL) for all constituents of concern, except benzene and furfural. If the PID indicates the 5 ppm concentration has been exceeded, the SHSO will order cessation of the activity and the exclusion zone cleared of all personnel until the PID indicates a reading less than 5 ppm, or until the nature of the hazard has been more thoroughly evaluated.

8.2.2 Level C Intrusive Activities

Level C intrusive activities will initially include only those activities which require upgrading from Level D. Level C protection will be as described in Section 7.2.2, with upgrading, as necessary, to Level B to assure adequate personnel protection. Downgrading to Level D protection will also be possible if monitoring demonstrates no inhalation hazard exists for the activity.

The SHSO will monitor the breathing zone with the PID in continuous operating mode and with the alarm activated. The alarm will be set at 5 ppm, which is below the permissible exposure level (PEL) for all constituents of concern except benzene and furfural. If the PID indicates the 5 ppm concentration has been exceeded, the SHSO will initiate measurements utilizing the colorimetric indicator tubes for benzene and furfural.

If the PID readings exceed 25 ppm total organic vapor, or the benzene and/or furfural colorimetric indicator tube readings exceed 5 ppm, the SHSO will order cessation of the activity until: 1) the PID indicates a reading less than 25 ppm, and the benzene and/or furfural concentrations are below 5 ppm based upon the colorimetric indicator tube readings, 2) all potentially exposed personnel have donned Level B respiratory protection or, 3) the nature of the hazard has been more thoroughly evaluated and it is determined that the measured concentrations do not pose a potential exposure in excess of the PEL utilizing the Level C protection.

To confirm the adequacy of respiratory protection, personnel monitoring utilizing activated charcoal sampling devices may be performed to measure the airborne concentrations of benzene and furfural and possibly other organic compounds (as necessary) at the beginning of new activities and periodically during intrusive activities. These samples would be sent to an AIHA accredited laboratory for analysis using the approved NIOSH analytical methods.

8.2.3 Level B Intrusive Activities

Level B intrusive activities will initially include only those activities that require upgrading from Level C, and only those activities required to bring work to a safe stoppage. No work is currently planned utilizing Level B protection, and this HASP will require amendment at such time as Level B work becomes necessary (except for safe work stoppage activities).

When Level B protection is utilized, the SHSO will monitor the breathing zone with the PID in continuous operating mode and with the alarm activated. The alarm will be set at 100 ppm. If the PID indicates the 100 ppm concentration is exceeded, the SHSO will order cessation of the activity until: 1) the PID readings are below 100 ppm or; 2) until the nature of the hazard has been more thoroughly evaluated and it is determined that the measured concentrations do not pose a potential exposure in excess of a PEL utilizing the Level B protection.

To confirm the adequacy of respiratory protection, personnel monitoring utilizing activated charcoal sampling devices may be performed to measure the airborne concentrations of benzene and furfural and possibly other organic compounds (as necessary) whenever Level B protection is utilized.

8.3 Air Quality Monitoring During Non-Intrusive Activities

Non-intrusive activities include any Site activity which would not reasonably be expected to result in exposure(s) to hazardous or toxic chemicals or physical agents at or above the permissible exposure limit (PEL), or to flammable or oxygen-deficient atmospheres. Based upon the current understanding of Site conditions no monitoring is required during non0intrusive activities.

8.4 Medical Surveillance Requirements

Medical surveillance specifies any special medical monitoring and examination requirements as well as stipulates that all Roux Associates personnel and subcontractors contracted directly by Roux Associates are required to pass the medical surveillance examination or equivalent for hazardous waste work required by 29 CFR 1910.120.

The examination will be taken annually, at a minimum, and upon termination of employment with the company at no cost to employees. Additional medical testing may be required by the CHSM, or CHSM in consultation with the company physician and the SHSO, if an overt exposure or accident occurs, or if other site conditions warrant further medical surveillance. .

Medical examinations and procedures shall be performed by or under the supervision of a licensed physician. Medical surveillance is provided without cost to the employees.

9.0 SAFETY CONSIDERATIONS FOR SITE OPERATIONS

9.1 General

In this section, non-monitoring, safety-related procedures are described. In general, all site activities should be conducted in accordance with the Client's Safe Work Practices Requirements and Contractor Safety Rules & Work Procedures included as Appendix E.

9.2 Site Walk-Throughs

Safety considerations during site walk-throughs are important since this activity will usually precede all other field operations. Air monitoring will be performed as indicated in Section 8.0 and will be used to assist in prescribing levels of protection for future site operations, designating site layout and identifying areas of particular hazard, if any.

9.3 Construction Activities

Activities involved with construction of remedial action treatment systems will initially be considered non-intrusive activities. However, initial and/or periodic monitoring, as described in Section 7.2 may be performed by the SHSO.

A variety of physical hazards may be present during any construction-type project. Personnel should be aware of safety issues associated with; noise, cold, hot work such as welding, cutting and burning, heavy lifting, rough terrain, heavy equipment operation, ladders, scaffolding, excavating and trenching, underground and overhead utilities, electrical hazards, and the hazards associated with hand and power tools. These hazards are not unique and are generally familiar to most construction personnel.

9.4 Heavy Equipment and Traffic Safety

The SHSO will be present onsite during all invasive operations and will provide health and safety monitoring to ensure that appropriate levels of protection and safety procedures are utilized.

This Site utilizes all of the mechanical equipment used on any major construction site. Typical machinery to be found includes pumps, compressors, generators, portable lighting systems, pneumatic tools (drum openers), hydraulic drum crushers, pug mills, forklifts, trucks, dozers, and

backhoes, drill rigs. It poses a serious hazard if not operated properly, or if personnel near machinery cannot be seen by equipment operators.

Roux SOP 1.13R1 outlines Roux policies and procedures regarding Heavy Equipment Exclusion Zone (HEEZ) set up and use. The objective of the Exclusion Zone Policy is to establish the minimum clearance distance that must be maintained between workers and heavy equipment while equipment is in operation (i.e., engaged or moving). The intent is to have no personnel or other equipment entering the HEEZ while the equipment is in operation/moving, to ensure that Roux and Subcontractor employees are not unnecessarily exposed to the hazards of the equipment. Appendix F provides Roux Associates' Heavy Equipment Exclusion Zone SOP.

In addition, the following safety procedures relating to traffic safety must be followed while performing on-site and off-site activities. Refer to Appendix G for Client's Traffic Control Procedures.

On-Site Traffic Safety Procedures

When performing activities on, or adjacent to on-site roads, the following traffic safety procedures must be followed.

- High-visibility coveralls must be worn during Site activities as described in Section 7.2 of this HASP. If possible, the coveralls being worn should be modified via wearing of a reflective vest or with a reflective, reflective stripe(s) when working on, or adjacent to all paved and unpaved roads at the Site.
- When performing activities on, or on the shoulder of any paved roads (e.g., Site entrance and exit roads, the primary roads leading to a truck loading rack, paved areas at a truck loading rack), a minimum of two people must be present. One person will serve as a "traffic watchman" whose sole responsibility is to monitor traffic conditions and alert worker(s) of potential traffic hazards. The "traffic watchman" must be alert at all times and focused on traffic conditions. At no time should the "traffic watchman" engage in activities other than monitoring traffic conditions.
- When performing activities at wells, well vaults, manholes, etc., on, or adjacent to all paved and unpaved roads at the Site, the work vehicle should be positioned, to the fullest extent possible, to form a barrier between the worker(s) and oncoming traffic. In addition, each work vehicle will be equipped with a minimum of four high visibility traffic cones. All traffic cones will be placed as necessary to alert traffic of ongoing activities.
- All Client and Roux Associates subcontractors performing work at the Site must also adhere to the above safety procedures.

Off-Site Traffic Safety Procedures

When performing activities on or adjacent to off-site roads, the following traffic safety procedures must be followed.

- When performing activities on, or adjacent to off-site roads (paved and unpaved), a reflective vest or high visibility outerwear will be worn at all times.
- As described in on-site procedures, when performing activities on, or adjacent to off-site paved roads, a “traffic watchman” must be used at all times.
- As described in on-site procedures, when performing activities on, or adjacent to off-site roads, the work vehicle should be positioned, to the fullest extent possible, to form a barrier between the worker(s) and oncoming traffic. In addition, a minimum of four 42” high traffic cones will be placed as necessary to alert traffic of ongoing activities.

9.5.1 Inspection

Each piece of potentially hazardous equipment (i.e., power tools,) will be inspected for proper and safe operation prior to its use.

- All mechanical and rigging equipment will be inspected by the operators prior to beginning this work effort, and at least daily thereafter, to ensure proper operating capability and that all guards are adequate and in place. Defective equipment must be repaired or replaced prior to continued use/operation.
- Inspect all cables, sheaves, slings, chains, hooks, and eyes prior to use.
- Secure equipment firmly or make sure it is supported.
- Be sure all power lines are inactivated, removed, or at a safe distance.
- Always use proper loading for capacity at lifting radius.
- Keep all equipment lubricated and maintained.
- Employ signal persons whenever needed.
- Make certain that signals are understood and observed.

9.6 Drilling Operations

The SHSO will be present onsite during all Roux Associates contracted, and when requested, Client contracted, drilling operations. The SHSO will provide health and safety monitoring to ensure that appropriate levels of protection and safety procedures are utilized. The proximity of chemical, water, sewer, and electrical lines will be identified by the Client’s Project Engineer before any subsurface activity or sampling is attempted. Refer to Appendix H for the Roux

Associates' Subsurface Utility Clearance Procedure, which provides guidance regarding the identification of subsurface structures through exploratory test-hole advancement to target depths in order to be protective of underground utilities potentially in the borehole location and the health and safety of both onsite personnel and the public.

Proper stockpiling, containment, and disposal practices will be utilized in regard to the potential amount of waste generated during operations. The location of safety equipment and evacuation procedures will be established prior to initiation of operations according to this HASP. The use of hard hats, eye protection, ear protection, hand protection, and steel-toed boots will be required during all drilling operations.

9.7 Excavation and Backfill Operations

The SHSO will be present onsite during all Roux Associates contracted excavation and backfill operations and will provide health and safety monitoring to ensure that appropriate levels of protection and safety procedures are utilized. The proximity of chemical, water, sewer, and electrical lines will be identified by the Client's Project Engineer before any subsurface activity or sampling is attempted.

The following safe work practices will be followed during this task:

- The proximity of chemical, water, sewer and electrical lines will be identified by a facility representative prior to any subsurface activity beginning.
- Roux's subsurface protocol or the Client's protocol will be used, whichever is more stringent.
- While excavating, stay out of the reach of the backhoe arm's swing by standing at the end of the excavation, not near the sides (sides have the potential to cave in).

Maximum Allowable Slopes

Soil or Rock Type	Maximum Allowable Slopes (H:V) ¹ for Excavations less than 20 Feet Deep ³
Stable Rock	Vertical (90°)
Type A ²	¾ : 1 (53°)
Type B	1 : 1 (45°)
Type C	1½ : 1 (34°)

Maximum Allowable Slopes

OSHA (29 CFR 1926.652, Subpart P, Appendices A and B)

Notes:

- ¹ Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.
- ² A short term maximum allowable slope of 1/2H : 1V (63°) is allowed in excavations in Type A soil that are 12 feet (3.67 m) or less in depth. Short term maximum allowable slopes for excavations greater than 12 feet (3.67 m) in depth shall be 3/4H : 1V (53°).
- ³ Sloping or benching for excavations greater than 20 feet deep shall be designed by a Registered Professional Engineer.

Proper stockpiling, containment, and disposal practices will be utilized in regard to the potential amount of waste generated during operations. The location of safety equipment and evacuation procedures will be established prior to initiation of operations according to this HASP. The use of hard hats, eye protection, ear protection, hand protection and steel-toed boots will be required during excavation or other heavy equipment operations.

9.8 Overhead/Underground Power Lines

The positioning or operation of heavy equipment in the vicinity of utility services will not be initiated until the activities have been coordinated with the Client's Project Engineer and SM. Operation of equipment adjacent to or under overhead power lines, in such a manner that encroaches on authorized clearances, will not take place unless one of the following are satisfied:

- Power has been shut off and positive steps are taken to prevent the lines from being energized;
- The equipment does not have the ability to move laterally or horizontally within the minimum clearance specified in the table below, from energized power lines;
- The equipment has been positioned and blocked to allow no part, including cables, to come within the minimum clearance specified in the table below; or
- Excavation operations are not initiated within 25 feet of the verified position of underground power lines.

Minimum Required Clearances for Energized Overhead Power Lines

Nominal System Voltage of Power Line (K V)	Minimum Required Clearance (feet)
0-50	10
51-100	12
101-200	15
201-300	20
301-500	25
501-750	35
751-1000	45

1 kilovolt (KV) = 1,000 volts

9.9 Heavy Equipment Decontamination

If a steam cleaner will be utilized to decontaminate equipment, personnel should exercise caution as the high pressure steam can cause severe burns. Protective gloves, face shields, hard hats, steel-toed boots, and Tyvek suits or rain gear will be worn when using steam cleaners.

9.10 Hot/Cold Work

Roux Associates shall not perform welding unless specific clearance and a hot work permit have been obtained from the Client's Project Engineer, PM or SM. Any contractors or Roux Associates personnel performing welding must adhere to the Client's Hot Work Procedures (see Appendix E) and the procedures outlined below.

Welding equipment shall be chosen for safe application to the work and shall be installed properly. Employees designated to operate welding equipment shall be properly instructed and qualified to operate it. Mechanical ventilation shall be provided when welding or cutting:

- Where there is less than 10,000 cubic feet of air per welder;
- Where the overhead height is less than 16 feet; and
- Where required by Client practices and procedures (e.g., Confined Space Permitting).

Proper shielding and eye protection shall be used to prevent exposure of personnel to welding hazards. Proper precautions (isolating welding and cutting, removing fire hazards from vicinity,

etc.) for fire prevention shall be taken in areas where welding or other "hot work" is being done. All welding operations and other "hot work" shall be scheduled and performed in accordance with the Client's permitting system. The SHSO will be responsible for securing these permits.

9.11.1 Welding in Confined Spaces

All welding and cutting operations carried out in confined spaces shall be adequately ventilated to prevent the accumulation of toxic materials or possible oxygen deficiency and shall be performed in compliance with the Client's and Roux Associates' Confined Space Entry Procedures (Appendices E and I). In general, oxygen shall never be used for ventilation. In such circumstances where it is impossible to provide ventilation, OSHA requires airline respirators or hose masks approved by the National Institute for Occupational Safety and Health (NIOSH) for this purpose to be utilized. In areas immediately dangerous to life, NIOSH approved powered air purifying respirators (PAPR) or self-contained breathing apparatus (SCBA) shall be used. These exposures and tasks are not to be performed by Roux employees. If the work requires welding in confined spaces, this will only be performed by a qualified welder who is Confined Space Entry Trained (for permit-required entries) and provided with procedures and PPE that satisfy OSHA 29 CFR 1910.134.

9.12 Asbestos

Asbestos may be present at the site as pipe wrap, as part of the pipe material itself (asbestos-cement pipe), or as part of other building materials (e.g., in floor tiles and roofing). Asbestos shall be abated by a licensed abatement contractor according to all applicable laws and standards. Personnel should be aware of the presence of asbestos and avoid contact with friable material. Asbestos-cement pipe can emit airborne fibers if the materials are cut or sawed, or if they are damaged during demolition operations. Handling of these non-friable materials shall be limited to activities that will not generate airborne fibers.

9.13 Heat Stress

Heat stress is a significant potential hazard and can be associated with heavy physical activity and/or the use of personal protective equipment/clothing in hot weather environments.

Heat cramps are brought on by prolonged exposure to heat. As an individual sweats, water and salts are lost by the body resulting in painful muscle cramps. The signs and symptoms of heat stress are as follows:

- Severe muscle cramps, usually in the legs and abdomen;
- Exhaustion, often to the point of collapse; and
- Dizziness or periods of faintness.

First aid treatment includes shade, rest and fluid replacement. Normally, the individual should recover within one-half hour. If the individual is not better within 30 minutes and the body temperature has not decreased, the individual should be transported to an occupational health clinic or hospital for medical attention.

Heat exhaustion may occur in a healthy individual who has been exposed to excessive heat while working or exercising. The circulatory system of the individual fails as blood collects near the skin in an effort to rid the body of excess heat. The signs and symptoms of heat exhaustion are as follows:

- Rapid and shallow breathing;
- Weak pulse;
- Cold and clammy skin with heavy perspiration;
- Skin appears pale;
- Fatigue and weakness;
- Dizziness; and
- Elevated body temperature.

First aid treatment includes cooling the victim, elevating the feet, and replacing fluids. If the individual is not better within 30 minutes and the body temperature has not decreased, the individual should be transported to an occupational health clinic or hospital for medical attention. A New York vicinity city map with the location of Bellevue Hospital Center and City MD and Urgent Care Facility is included as Figure 3 and 4 (see colored tabs).

Heat stroke occurs when an individual is exposed to excessive heat and stops sweating. This condition is classified as a **MEDICAL EMERGENCY** requiring immediate cooling of the victim and transport to an emergency medical facility. The signs and symptoms of heat stroke are as follows:

- Dry, hot red skin;
- Body temperature approaching or above 105 degrees F;
- Large (dilated) pupils; and
- Loss of consciousness - the individual may go into a coma.

First aid treatment requires immediate cooling and transportation to an emergency medical facility.

Heat stress is a significant hazard if any type of protective equipment (semipermeable or impermeable) which prevents evaporative cooling is worn in hot weather environments.

9.14 Cold Stress

Cold stress is a danger at low temperatures and when the wind-chill factor is low. Prevention of cold-related illnesses is a function of whole body protection. Adequate insulating clothing must be used when the air temperature is below 40°F. A work/rest regimen will be initiated when ambient temperatures and protective clothing cause a stressful situation. In addition, reduced work periods followed by rest in a warm area may be necessary in extreme conditions. The signs and symptoms of cold stress include the following:

- Severe shivering;
- Abnormal behavior;
- Slowing;
- Weakness;
- Stumbling or repeated falling;
- Inability to walk;
- Collapse; and/or
- Unconsciousness.

First aid requires removing the victim from the cold environment, and preventing further body heat loss by covering the victim lightly with blankets. Do not cover the victim's face. If the victim is still conscious, administer hot drinks and encourage activity such as walking, wrapped in a blanket. If the victim's conditions do not improve, seek further medical attention.

9.15 Communications

- Telephones
Telephones will be available for communication with emergency support services/facilities. Telephones are located in the kiosk and are available for communication with emergency support services. In addition, Site personnel are equipped with cellular telephones. Applicable telephone and cellular phone numbers are provided in Section 1.0 (page 3) and in the colored tab section located in the back of this HASP.
- Hand Signals
To be employed by personnel required to use Level C respiratory protection. They shall be known by the entire field team before operations commence and covered during Site-specific training.

Hand Signals

SIGNAL	MEANING
Hand gripping throat	Out of air, can't breath
Grip partner's wrist	Leave area immediately
Hands on top of head	Need assistance
Thumbs up	I'm alright, okay
Thumbs down	No, negative

9.16 Additional Safe Work Practices

Refer to the SHSO for specific concerns on each individual site task. The safety rules listed below, as well as in the Client's Safe Work Practices Requirements (Appendix E), must be strictly followed:

- Inform SM of planned activities and evaluate the degree of health and safety protection required for each task;
- Practice contamination avoidance, avoid any skin contact with potentially contaminated materials (i.e., surface or ground water, soil, etc.);
- Hard hat and safety eye protection will be worn when inside the exclusion zone;

- Do not carry gum, cigarettes, food drink or cosmetics of any kind into contaminated areas;
- Wash hands before handling food and drink and other activities that could cause hand-to-mouth transfer of contaminants;
- Appropriate foot, hearing, eye, head and hand protection will be worn by those directly involved in the work efforts when warranted;
- No facial hair that interferes with the face to face piece seal of respirators will be allowed;
- Personnel not involved in the operations, excavating, or monitoring activities will remain a safe distance from the equipment;
- Do not climb over/under obstacles or barricades;
- Be alert to your own physical condition;
- Watch your buddy for signs of fatigue, exposure, heat or cold stress, etc.;
- No work will be conducted without adequate light;
- Report all accidents, no matter how minor, immediately to the SHSO and the Project Engineer; and
- **KNOW YOUR HEALTH AND SAFETY PLAN.**

10.0 DECONTAMINATION PROCEDURES

10.1 Contamination Prevention

One of the most important aspects of decontamination is the prevention of contamination. Good contamination prevention should minimize worker exposure and help ensure valid sample results by precluding cross-contamination. Procedures for contamination avoidance include:

Personnel

- Do not walk through areas of obvious or known contamination;
- Do not handle or touch contaminated materials directly;
- Make sure all personal protective equipment (PPE) has no cuts, tears or other signs of deterioration prior to donning;
- Fasten all closures on suits, covering with tape, if necessary;
- Take particular care to protect any skin injuries;
- Stay upwind of airborne contaminants; and
- Do not carry cigarettes, gum, etc., into contaminated areas.

Sampling/Monitoring

- When required by the SHSO, cover instruments with clear plastic, leaving opening for sampling and exhaust ports; and
- Bag sample containers prior to the placement of sample material.

Heavy Equipment

- Care should be taken to limit the amount of contamination that comes in contact with heavy equipment;
- Excavated soils should be contained and kept away from workers; and
- Decontaminate equipment prior to moving to another work area.

10.2 Decontamination

The SHSO shall be responsible for determining appropriate decontamination methods for all Site activities. Decontamination water should be collected, handled, drummed, and/or containerized prior to determination of classification and appropriate disposal method (see Section 11.0).

Equipment Decontamination

Sampling equipment will be decontaminated through the following steps, if necessary:

- fresh water rinse;
- non-phosphate detergent wash;
- fresh water rinse; and
- distilled water rinse.

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 onsite. All potentially contaminated materials should be bagged, drummed, or placed in waste wranglers, as necessary, and placed in a designated area determined by the Client.

All personal protective clothing and sorbent products contaminated with petroleum product will be stored in waste storage containers (i.e., waste wranglers). Additionally, all petroleum products generated from product recovery activities (i.e., well bailing, etc.) will be drummed and stored within the hazardous waste storage area or placed in drums/storage tanks positioned in an area to be determined. All hazardous waste storage containers, tanks and drums will be labeled with the appropriate hazardous waste labels and/or placards. All contaminated materials will be disposed of in accordance with appropriate regulations. All non-contaminated materials shall be collected and bagged for appropriate disposal as normal domestic waste.

PPE & equipment shall be decontaminated, cleaned, laundered, maintained or replaced as needed to maintain their effectiveness. Employees whose non-impermeable clothing becomes wetted with hazardous substances shall immediately remove the clothing.

12.0 EMERGENCY PLAN

As a result of the hazards onsite and the conditions under which operations are conducted, the possibility of an emergency exists. An emergency plan is required by OSHA (29 CFR 1910.120) to be available for use and is included below. A copy of this plan shall be available in the Support zone at each work site.

In the event of an emergency situation, such as fire, explosion, significant release of particulates, etc., all persons in both the restricted and non-restricted areas will evacuate and assemble near the Support Zone or other safe area as identified by the Site Emergency Coordinator(s). The Site Emergency Coordinator(s) will have authority to initiate proper action if outside services are required. Under no circumstances will incoming personnel or visitors be allowed to proceed into the area once the emergency signal has been given. The SHSO or SM must see that access for emergency equipment is provided and that all spark-producing apparatus has been shut down once the alarm has been sounded. Once the safety of all personnel is established, the fire department and other emergency response groups will be notified by telephone of the emergency. Then, other personnel listed in Section 12.4 shall be notified.

12.1 Site Emergency Coordinator(s)

The Site Emergency Coordinator(s) are:

- Site Manager;
- Site Health and Safety Officer;
- Project Engineer; and
- Facility Manager.

The Site Emergency Coordinator(s) shall implement this emergency plan whenever conditions at the site warrant such action. The coordinator(s) will be responsible for assuring the evacuation, emergency treatment, emergency transport of site personnel as necessary, and notification of emergency response units and the appropriate management staff.

12.2 Evacuation

Withdrawal Upwind

The work party will continually note general wind directions while onsite. Upon noting the conditions warranting movement away from the work site, the crew will move upwind a distance of approximately 100 feet or farther, as indicated by the site monitoring instruments. Donning SCBA and a lifeline, SHSO will return to the work site to determine if the condition noted was transient or persistent. If persistent, on-site personnel will be notified of the situation and the need to leave the site or don SCBA. When access to the site is restricted and escape possibly hindered, the crew may be instructed to evacuate the site rather than move upwind, especially if withdrawal upwind moves the crew away from escape routes.

Site Evacuation

Upon determination of conditions warranting site evacuation, the work party will proceed upwind of the work site and notify the SHSO and the Client's Project Engineer of site conditions. If the hazard is toxic gas, respirators will be donned. The crew will proceed to the field office to assess the situation. The advisability and type of further response action will be coordinated and carried out by the SHSO, the PM and the Client's Project Engineer. Site evacuation routes are illustrated in Figure 7.

12.3 Potential or Actual Fire or Explosion

If the potential for a fire exists or if an actual fire or explosion occurs, the following procedure will be implemented:

- Immediately evacuate the site as described above (Section 12.2);
- Notify Client's Project Engineer, SHSO and PM; and
- Notify fire and security. Call **911**
Fire Department – 911
Police Department – 911

12.4 Environmental Incident (Release or Spread of Contamination)

If possible, the spread of contamination should be controlled or stopped. The Facility Manager must be informed of the need to contact police and fire authorities to inform them of the possible or immediate need for nearby evacuation. If a significant release has occurred, the National

Response Center and other appropriate groups should be contacted by the Facility Manager or his designee. Those groups will alert National or Regional Response Teams as necessary. Following these emergency calls, the remaining personnel listed in the table below shall be notified:

Emergency Telephone Numbers

Type	Name	Telephone #
Fire Department	FDNY	911
HazMat Emergency Response		911
Law Enforcement	NYPD	911
Hospital	Bellevue Hospital Center	(212) 562-4141
Ambulance	FDNY	911
Urgent Care Center	City MD	(646) 596-9267
National Response Center (Release or Spill)		(800) 424-8802
Facility Manager	Lance Howard	(646) 734-0738
Site Health and Safety Officer	Ron Lombino	(631) 969-2010
Project Manager	Richard Maxwell	(631) 921-9531
Corporate H&S Manager	Joseph Gentile	(856) 832-3768 (Office) (610) 844-6911 (Cell)

These contacts and phone numbers will be posted in the SZ.

12.5 Personal Injury

If on-site personnel require emergency medical treatment, the following steps will be taken:

- 1) Notify the Project Manager, Principal, and/or other Roux Senior Management for Illness or Injury Case Management protocol to be initiated.
- 2) Notify the Fire Department or Ambulance service and request an ambulance or transport the victim to the hospital, as appropriate.
- 3) Decontaminate to the extent possible prior to administration of first aid or movement to emergency facilities.
- 4) First aid will be provided by emergency medical services (EMS) or by on-site personnel trained in first aid, CPR, and blood borne pathogens, if available.
- 5) The OHSM will supply medical data sheets on the victim (if a Roux Associates, Inc. employee) to appropriate medical personnel.

Accident Report Forms and Medical Services Form are provided in Appendices F, G, and H.

12.6 Overt Personnel Exposure

If an overt exposure to toxic materials should occur, the exposed person shall be treated onsite as follows:

Skin Contact:	Wash/rinse affected area thoroughly with copious amounts of soap and water, then provide appropriate medical attention. An emergency shower or drench system shall be accessible at the Site at all times. Utilizing eyewash, eyes should be rinsed for at least fifteen (15) minutes upon chemical contamination.
Inhalation:	Move to fresh air and/or, if necessary, decontaminate, and transport to the hospital.
Ingestion:	Decontaminate and transport to emergency medical facility.
Puncture Wound or Laceration:	Decontaminate and transport to emergency medical facility. SHSO will coordinate with the CHSM and the HR Director to obtain medical information on the injured if necessary.

12.7 Adverse Weather Conditions

In the event of adverse weather conditions, the SHSO will determine if work can continue without sacrificing the health and safety of field workers. Some of the items to be considered prior to determining if work should continue are:

- Heavy rainfall;
- High wind;
- Potential for heat stress;
- Potential for cold stress and cold-related injuries;
- Limited visibility;
- Potential for electrical storms – stop work for a minimum of 15 minutes after observing a lightning strike and for at least 15 minutes after the storm has passed;
- Potential for malfunction of H&S monitoring equipment or gear; and
- Potential for accidents.

12.8 Reportable Incidents at the Site

Since submission of the revised HASP, there has been zero reportable incident(s) at the Site. Any incident where Roux Associates' or Roux employees' vehicles are involved in a collision with structures, equipment, other vehicles, or pedestrians will result in the notification of Roux Associates personnel and Client Managers and completion of an *ACORD*[®] Automobile Loss Notice Form (attached as Appendix J).

14.0 APPROVALS

By their signature, the undersigned certify that this HASP is approved and will be utilized at the 211 West 29th Street Facility.

Ron Lombino – Site Health and Safety Officer

Date

Joseph Gentile – Corporate Health and Safety Manager

Date

Richard Maxwell – Project Manager

Date

Robert Kovacs – Project Principal

Date

Site-Specific Health and safety Plan
211 West 29th Street, Manhattan, New York

TABLE

1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 1590 White Plains Road, Bronx, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Acenaphthene	83-32-9	None established	None established	None established	None established	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system	Eyes, skin, respiratory system	Brown solid
Acetone	67-64-1	TWA 500 ppm STEL 750 ppm	TWA 250 ppm (590 mg/m ³)	TWA 1000 ppm (2400 mg/m ³)	2500 ppm [10%LEL]	inhalation, ingestion, skin and/or eye contact	Irritation eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a fragrant, mint-like odor BP: 133°F F.P: 0°F UEL: 12.8% LEL: 2.5% Class IB Flammable Liquid
Anthracene (Coal Tar Pitch Volatile)	65996-93-2	TWA 0.2 mg/m ³	Ca TWA 0.1 mg/m ³ (cyclohexane-extractable fraction)	TWA 0.2 mg/m ³ (benzene-soluble fraction)	Ca [80 mg/m ³]	inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue. Combustible Solids
Antimony	7440-36-0	TWA 0.5 mg/m ³	TWA 0.5 mg/m ³	TWA 0.5 mg/m ³	50 mg/m ³ (as Sb)	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly	Eyes, skin, respiratory system, cardiovascular system	Silver-white, lustrous, hard, brittle solid; scale-like crystals; or a dark-gray, lustrous powder. BP: 2975°F
Arsenic (inorganic)	7440-38-2 (metal)	TWA 0.01 mg/m ³	Ca C 0.002 mg/m ³ [15-min]	TWA 0.010 mg/m ³	Ca [5 mg/m ³ (as As)]	Inhalation; ingestion; skin absorption; skin and/or eye contact	Ulceration of nasal septum, dermatitis, GI disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen]	Liver, kidneys, skin, lungs, lymphatic sys	Metal: sliver-gray or tin-white, brittle, odorless solid BP: sublimes
Asphalt fumes	8052-42-4	TWA 0.5 mg/m ³ (fumes)	Ca C 5 mg/m ³ [15 min]	None established	Ca [IDLH value has not been determined]	Skin absorption; inhalation; skin and/or eye contact	Irritation eyes, resp sys	Eyes, respiratory system	Black or dark brown cement-like substance Combustible solid
Barium	7440-39-3	TWA 0.5 mg/m ³	None established	TWA 0.5 mg/m ³	None established	Inhalation, ingestion, skin contact	Irritation skin, respiratory system, digestive system	Skin, eyes, respiratory system	Yellow white powder BP: 1640 C
Benzene	71-43-2	TWA 0.5 ppm STEL 2.5 ppm	Ca TWA 0.1 ppm STEL 1 ppm	TWA 1 ppm ST 5 ppm	Ca [500 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]	Eyes, skin, respiratory system, blood, central nervous system, bone marrow	Colorless to light yellow liquid with an aromatic odor [Note: Solid below 42 °F] BP: 176°F Fl.Pt. = 12°F LEL: 1.2% UEL: 7.8% Class B Flammable liquid
Benz[a]anthracene	56-55-3	None established [skin cancer]	None established	None established	None established	Inhalation; ingestion; skin absorption; skin and/or eye contact	Irritation eyes, skin, respiratory system, CNS; skin cancer	Skin	Pale Yellow crystal, solid BP: 438 C
Benzo[a]pyrene	50-32-8	None established [skin cancer]	TWA 0.1 mg/m ³	TWA 0.2 mg/m ³	None established	Inhalation; ingestion; skin absorption; skin and/or eye contact	POISON. This material is an experimental carcinogen, mutagen, tumorigen, neoplastigen and teratogen. It is a probable carcinogen in humans and a known human mutagen. IARC Group 2A carcinogen. It is believed to cause bladder, skin and lung cancer. Exposure to it may damage the developing fetus. May cause reproductive damage. Skin, respiratory and eye irritant or burns.	Skin, eye, bladder, lung, reproductive	Yellow crystals or powder [found in cigarette smoke, coal tar, fuel exhaust gas and in many other sources] BP: 495 C
Benzo[b]fluoranthene	205-99-2	None established [skin cancer]	TWA 0.1 mg/m ³	TWA 0.2 mg/m ³	None established	Inhalation; ingestion; skin and/or eye contact	No data were identified on the toxicity of benzo[b]fluoranthene to humans. Based on results of studies in animals, IARC concluded that benzo[b]fluoranthene is possibly carcinogenic to humans	Respiratory system, skin, bladder, kidneys	Off-white to tan powder
Benzo[k]fluoranthene	207-08-9	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory tract, gastrointestinal; fatal if swallowed, inhaled, absorbed through the skin; vomiting, nausea, diarrhea	Lungs, respiratory system	Yellow crystals BP: 480 C
Beryllium	7440-41-7 (metal)	TWA 0.00005 mg/m ³	Ca C 0.0005 mg/m ³	TWA 0.002 mg/m ³ C 0.005 mg/m ³ (30 minutes) with a maximum peak of 0.025 mg/m ³	Ca [4 mg/m ³ (as Be)]	inhalation, skin and/or eye contact	Berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation eyes; dermatitis; [potential occupational carcinogen]	Eyes, skin, respiratory system	Metal: A hard, brittle, gray-white solid. BP: 4532°F
Bis(2-ethylhexyl) phthalate (Di(2-ethylhexyl)phthalate)	117-81-7	TWA 5 mg/m ³	TWA 5 mg/m ³ STEL 10 mg/m ³ (do not exceed during any 15-minute work period)	TWA 5 mg/m ³	None established	inhalation, skin and/or eye contact	Irritation eyes, skin, nose, throat; affect the nervous system and liver; damage to male reproductive glands	Eyes, skin, nose, respiratory system, nervous system, reproductive system, liver	Colorless to light colored, thick liquid with slight odor
Butane	106-97-8	STEL 1000 ppm	TWA 800 ppm (1900 mg/m ³)	None established	None established	inhalation, skin and/or eye contact (liquid)	Drowsiness, narcosis, asphyxia; liquid: frostbite	central nervous system	Colorless gas with a gasoline-like or natural gas odor. BP: 31°F UEL: 8.4% LEL: 1.6% Flammable Gas

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 1590 White Plains Road, Bronx, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
2-Butanone (Methyl Ethyl Ketone or MEK)	78-93-3	TWA 200 ppm (590 mg/m ³) STEL 300 ppm (885 mg/m ³)	TWA 200 ppm (590 mg/m ³) STEL 300 ppm (885 mg/m ³)	TWA 200 ppm (590 mg/m ³)	3000 ppm	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose; headache; dizziness; vomiting; dermatitis	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a moderately sharp, fragrant, mint- or acetone-like odor. BP: 175°F Fl.P: 16°F UEL(200°F): 11.4% LEL(200°F): 1.4% Class IB Flammable Liquid
n-Butylbenzene	104-51-8	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; CNS depression, lung damage; nausea, vomiting, headache, dizziness, weakness, loss of coordination, blurred vision, drowsiness, confusion, disorientation	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a sweet odor BP: 183 C Fl.P: 59 C UEL: 5.8% LEL: 0.8%
sec-Butylbenzene	135-98-8	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, upper airway; central nervous system, headache, dizziness; gastrointestinal disturbance	Respiratory system, central nervous system, eyes, skin;	Colorless liquid BP: 344°F Fl.P: 126 °F UEL: 6.9% LEL: 0.8% Combustible liquid
tert-Butylbenzene	98-06-6	None established	None established	None established	None established	inhalation, skin absorption, ingestion,	Eye and respiratory irritant; CNS depression; liver or kidney damage	Respiratory system, central nervous system, eyes, liver, kidney	Colorless liquid with an aromatic odor BP: 168 - 169 C Fl.P: 34 C UEL: 5.6 % LEL: 0.8 %
Cadmium	7440-43-9 (metal)	TWA 0.01 mg/m ³	Ca	TWA 0.005 mg/m ³	Ca [9 mg/m ³ (as Cd)]	inhalation, ingestion	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]	respiratory system, kidneys, prostate, blood	Metal: Silver-white, blue-tinged lustrous, odorless solid. BP: 1409°F
Carbon Disulfide	75-15-0	TWA 1 ppm	TWA 1 ppm (3 mg/m ³) STEL 10 ppm (30 mg/m ³) [skin]	TWA 20 ppm C 30 ppm 100 ppm (30-minute maximum peak)	500 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Dizziness, headache, poor sleep, lassitude (weakness, exhaustion), anxiety, anorexia, weight loss; psychosis; polyneuropathy; Parkinson-like syndrome; ocular changes; coronary heart disease; gastritis; kidney, liver injury; eye, skin burns; dermatitis; reproductive effects	central nervous system, peripheral nervous system, cardiovascular system, eyes, kidneys, liver, skin, reproductive system	Colorless to faint-yellow liquid with a sweet ether-like odor. BP: 116°F Fl.P: -22°F UEL: 50.0% LEL: 1.3% Class IB Flammable Liquid
Carbon Monoxide	630-08-0	TWA 25 ppm	TWA 35 ppm C 200 ppm	TWA 50 ppm	1,200 ppm	inhalation	Carboxyhemoglobinemia	Blood	Colorless, odorless gas
Chlorobenzene	108-90-7	TWA 10 ppm	None established	TWA 75 ppm (350 mg/m ³)	1000 ppm	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose; drowsiness, incoordination; central nervous system depression; in animals: liver, lung, kidney injury	Eyes, skin, respiratory system, central nervous system, liver	Colorless liquid with an almond-like odor BP: 270°F Fl.P: 82°F UEL: 9.6% LEL: 1.3%
Chloroethane (Ethyl Chloride)	75-00-3	TWA 100ppm	Handle with caution in the workplace	TWA 1000 ppm (2600 mg/m ³)	3800 ppm [10%LEL]	inhalation, skin absorption (liquid), ingestion (liquid), skin and/or eye contact	Incoordination, inebriation; abdominal cramps; cardiac arrhythmias, cardiac arrest; liver, kidney damage	Liver, kidneys, respiratory system, cardiovascular system, central nervous system	Colorless gas or liquid (below 54°F) with a pungent, ether-like odor. BP: 54°F Fl.P: NA (Gas) -58°F (Liquid) UEL: 15.4% LEL: 3.8% Flammable Gas
Chloroform	67-66-3	TWA 10 ppm	Ca STEL 2 ppm (9.78 mg/m ³) [60-minute]	C 50 ppm (240 mg/m ³)	Ca [500 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; [potential occupational carcinogen]	Liver, kidneys, heart, eyes, skin, central nervous system	Colorless liquid with a pleasant odor BP: 143°F
Chromium	7440-47-3	TWA 0.5 mg/m ³ (metal and Cr III compounds) TWA 0.05 mg/m ³ (water-soluble Cr VI compounds) TWA 0.01 mg/m ³ (insoluble Cr IV compounds)	TWA 0.5 mg/m ³	TWA 1 mg/m ³	250 mg/m ³ (as Cr)	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; lung fibrosis (histologic)	Eyes, skin, respiratory system	Blue-white to steel-gray, lustrous, brittle, hard, odorless solid. BP: 4788°F
Chrysene; Phenanthrene; Pyrene; Coal tar pitch volatiles	65996-93-2	TWA 0.2 mg/m ³	Ca TWA 0.1 mg/m ³ (cyclohexane-extractable fraction)	TWA 0.2 mg/m ³ (benzene-soluble fraction)	Ca [80 mg/m ³]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue. Combustible Solids
Coal Tar Pitch Volatiles; Chrysene; Phenanthrene; Pyrene	65996-93-2	TWA 0.2 mg/m ³	Ca TWA 0.1 mg/m ³ (cyclohexane-extractable fraction)	TWA 0.2 mg/m ³ (benzene-soluble fraction)	Ca [80 mg/m ³]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue. Combustible Solids
Copper	7440-50-8	TWA 0.2mg/m ³ (fume) 1 mg/m ³ (dusts and mists)	TWA 1 mg/m ³	TWA 1 mg/m ³	100 mg/m ³ (as Cu)	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, respiratory system; cough, dyspnea (breathing difficulty), wheezing	Eyes, skin, respiratory system, liver, kidneys (increase(d) risk with Wilson's disease)	Noncombustible Solid in bulk form, but powdered form may ignite. BP: 4703°F

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 1590 White Plains Road, Bronx, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Crude Oil	8002-05-9	None established	TWA 350 mg/m ³	None established	1100 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system; lung damage; dermatitis; central nervous system effects	central nervous system	Viscous clear, yellow, brown, greenish black liquid, strong hydrocarbon and sulfur (rotten egg) odor when containing H ₂ S. BP: 30 -1000°F Fl.Pt.: -40°F LEL: 3% UEL: 12.5% Flammable liquid and vapor
1,2-Dichlorobenzene	95-50-1	TWA 25 ppm STEL 50 ppm	C 50 ppm (300 mg/m ³)	C 50 ppm (300 mg/m ³)	200 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose; liver, kidney damage; skin blisters	Eyes, skin, respiratory system, liver, kidneys	Colorless to pale-yellow liquid with a pleasant, aromatic odor. [herbicide] BP: 357°F Fl.P: 151°F UEL: 9.2% LEL: 2.2% Class IIIA Combustible Liquid
1,4-Dichlorobenzene	106-46-7	TWA 10 ppm	Ca	TWA 75 ppm (450 mg/m ³)	Ca [150 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Eye irritation, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen]	Liver, respiratory system, eyes, kidneys, skin	Colorless or white crystalline solid with a mothball-like odor. [insecticide] BP: 345°F Fl.P: 150°F LEL: 2.5% Combustible Solid
1,1-Dichloroethane	75-34-3	TWA 100 ppm	TWA 100 ppm (400 mg/m ³)	TWA 100 ppm (400 mg/m ³)	3000 ppm	inhalation, ingestion, skin and/or eye contact	Irritation skin; central nervous system depression; liver, kidney, lung damage	Skin, liver, kidneys, lungs, central nervous system	Colorless, oily liquid with a chloroform-like odor. BP: 135°F Fl.P: 2°F UEL: 11.4% LEL: 5.4%
1,2-Dichloroethane (Ethylene Dichloride)	107-06-2	TWA 10 ppm	Ca TWA 1 ppm (4 mg/m ³) STEL 2 ppm (8 mg/m ³)	TWA 50 ppm C 100 ppm 200 ppm [5-minute maximum peak in any 3 hours]	Ca [50 ppm]	inhalation, ingestion, skin absorption, skin and/or eye contact	Irritation eyes, corneal opacity; central nervous system depression; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen]	Eyes, skin, kidneys, liver, central nervous system, cardiovascular system	Colorless liquid with a pleasant, chloroform-like odor. [Note: Decomposes slowly, becomes acidic & darkens in color.] BP: 182°F Fl.P: 56°F UEL: 16% LEL: 6.2% Class IB Flammable Liquid
1,1-Dichloroethane	75-35-4	TWA 100 ppm	Ca (lowest feasible concentration)	TWA 1ppm	Ca [N.D.]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, throat; dizziness, headache, nausea, dyspnea (breathing difficulty); liver, kidney disturbance; pneumonitis; [potential occupational carcinogen]	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Colorless liquid or gas (above 89°F) with a mild, sweet, chloroform-like odor. BP: 89°F Fl.P: -2°F UEL: 15.5% LEL: 6.5% Class IA Flammable Liquid
1,2-Dichloroethene (total)	540-59-0	TWA 200 ppm	TWA 200 ppm (790 mg/m ³)	TWA 200 ppm (790 mg/m ³)	1000 ppm	inhalation, ingestion, skin and/or eye contact	Irritation eyes, respiratory system; central nervous system depression	Eyes, respiratory system, central nervous system	Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor BP: 118-140°F Fl.P: 36-39°F UEL: 12.8% LEL: 5.6% Class IB Flammable Liquid
cis-1,2-Dichloroethene	156-59-2	TWA 200 ppm	TWA 200 ppm	TWA 200 ppm	None established	inhalation, skin absorption, ingestion	Harmful if swallowed, inhaled, or absorbed through skin. Irritant. Narcotic. Suspected carcinogen	Skin	Colorless liquid BP: 60 C Fl.P: 4 C UEL: 12.8% LEL: 9.7 %
trans-1,2-Dichloroethene	156-60-5	TWA 200 ppm	None established	TWA 200 ppm STEL 250 ppm (skin)	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Narcotic. Irritation eyes, skin, respiratory tract, mucous membrane; CNS depression.	Respiratory tract, mucous membrane, eyes, skin, CNS	Colorless liquid with a fruity pleasant odor BP: 48°C Fl.P 6C UEL: 12.8% LEL: 9.7%
Dibenzo[a,h]anthracene	53-70-3	None established	None established	None established	None established	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin	Eyes, skin; skin photosensitization.	Colorless crystalline powder BP: 524°C

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 1590 White Plains Road, Bronx, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Diesel Fuel #2	68476-34-6	TWA 100 mg/m³	None established	Designated as an OSHA Select Carcinogen	None established	ingestion, skin and/or eye contact	Kidney damage; potential lung damage; suspected carcinogen; irritation of eyes, skin, respiratory tract; dizziness, headache, nausea; chemical pneumonitis (from aspiration of liquid); dry, red skin; irritant contact dermatitis; eye redness, pain.	Eyes, skin, kidneys	Clear yellow brown combustible liquid; floats on water; distinct diesel petroleum hydrocarbon odor. BP: 356-716°F Fl.P: 154.4-165.2°F LEL: 0.6% UEL: 7.0%
2,4-Dimethylphenol	105-67-9	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system, mouth, throat, stomach; dizziness, weakness, fatigue, nausea, headache; systemic damage; moderate to severe eye injury.	Skin, CVS, eyes, CNS	Clear, colorless liquid with a faint ether or chloroform-like odor BP: 178°F
Duosol	78207-03-1	None established	None established	None established	None established	ingestion, skin and/or eye contact	Irritation eyes, skin; Dermatitis	Eyes, skin	White solid with alcohol odor
Ethylbenzene	100-41-4	TWA 100 ppm	TWA 100 ppm (435 mg/m ³) STEL 125 ppm (545 mg/m ³)	TWA 100 ppm (435 mg/m ³)	800 ppm [10%LEL]	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma	Eyes, skin, respiratory system, central nervous system	Colorless liquid with an aromatic odor. BP: 277°F Fl.P: 55°F UEL: 6.7% LEL: 0.8% Class IB Flammable Liquid
Fluoranthene	206-44-0	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; possible burns; heart and liver injury, pulmonary edema, respiratory arrest, gastrointestinal disturbances.	Heart, liver, lungs.	Yellow needles.
Fluorene	86-73-7	None established	None established	None established	None established	inhalation, ingestion, skin and/or eye contact	Irritation skin, digestive tract	Skin	White crystals BP: 563°F
Fuel Oil #2	68476-30-2	TWA 100mg/m³	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; CNS effects; nausea, vomiting, headache, cramping, dizziness, weakness, loss of coordination,, drowsiness; kidney, liver damage	Eyes, skin, CNS	Clear or yellow to red oily liquid, kerosene-like odor BP: 347 - 689 °F UEL:5-6% LEL: 0.7-1.0%
Furfural	98-01-1	TWA 2 ppm	None established	TWA 5 ppm (20 mg/m ³) [skin]	100 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, upper respiratory system; headache; dermatitis	Eyes, skin, respiratory system	Colorless to amber liquid with an almond-like odor. BP: 323°F Fl.P: 140°F UEL: 19.3% LEL: 2.1% Class IIIA Combustible Liquid
Gasoline	8006-61-9	TWA 300 ppm STEL 500 ppm	Carcinogen	None established	Ca [IDLH value has not been determined]	Skin absorption; inhalation; ingestion; skin and/or eye contact	Eyes and skin irritation, mucous membrane; dermatitis; headache; listlessness, blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis; possible liver, kidney damage [Potential occupational carcinogen]	Eyes, skin, respiratory system, CNS, Liver, Kidneys	Clear liquid with a characteristic odor, aromatic Fl.Pt = -45°F LEL = 1.4% UEL = 7.6% Class 1B Flammable Liquid
Hexachlorobutadiene	87-68-3	TWA 0.02 ppm	Ca TWA 0.02 ppm (0.24 mg/m ³) [skin]	None established	Ca [N.D.]	inhalation, skin absorption, ingestion, skin and/or eye contact	In animals: irritation eyes, skin, respiratory system; kidney damage; [potential occupational carcinogen]	Eyes, skin, respiratory system, kidneys	Clear, colorless liquid with a mild, turpentine-like odor. BP: 419°F
Hydrogen Sulfide	7783-06-4	TWA 1 ppm STEL 5 ppm	C 10 ppm (15 mg/m ³) [10-minute]	C 20 ppm 50 ppm [10-minute maximum peak]	100 ppm	inhalation, skin and/or eye contact	Irritation eyes, respiratory system; apnea, coma, convulsions; conjunctivitis, eye pain, lacrimation (discharge of tears), photophobia (abnormal visual intolerance to light), corneal vesiculation; dizziness, headache, lassitude (weakness, exhaustion), irritability, insomnia; gastrointestinal disturbance; liquid: frostbite	Eyes, respiratory system, central nervous system	Colorless gas with a strong odor of rotten eggs. BP: -77°F UEL: 44.0% LEL: 4.0% Flammable Gas
Indeno[1,2,3-cd]pyrene	193-39-5	None established	None established	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; possible human carcinogen (skin); weakness; affect liver, lung tissue, renal tissue; impairment of blood forming tissue	Skin	Fluorescent green-yellow crystalline solid BP: 536 C
Isopropylbenzene (Cumene)	98-82-8	TWA 50 ppm	TWA 50 ppm (245 mg/m ³) [skin]	TWA 50 ppm (245 mg/m ³) [skin]	900 ppm [10%LEL]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; dermatitis; headache, narcosis, coma	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a sharp, penetrating, aromatic odor. BP: 306°F Fl.P: 96°F UEL: 6.5% LEL: 0.9%
p-Isopropyltoluene	99-87-6	None established	None established	None established	None established	inhalation, skin absorption, eye contact	Irritation skin	CNS, skin	Colorless, clear liquid, sweetish aromatic odor BP: 350.8°F Class III Flammable liquid

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 1590 White Plains Road, Bronx, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Kerosene	8008-20-6	TWA 200 mg/m ³	TWA 100 mg/m ³	None established	IDLH value has not been determined	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; chemical pneumonitis (aspiration liquid)	Eyes, skin, respiratory system, central nervous system	Colorless to yellowish, oily liquid with a strong, characteristic odor. BP: 347-617°F Fl.P: 100-162°F UEL: 5% LEL: 0.7% Class II Combustible Liquid
Lead	7439-92-1	TWA 0.05 mg/m ³	TWA (8-hour) 0.050 mg/m ³	TWA 0.050 mg/m ³	100 mg/m ³ (as Pb)	inhalation, ingestion, skin and/or eye contact	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension	Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue	A heavy, ductile, soft, gray solid. BP: 3164°F Noncombustible Solid in bulk form
Manganese	7439-96-5 (metal)	TWA 0.02 mg/m³	TWA 1 mg/m ³ STEL 3 mg/m ³	C 5 mg/m ³	500 mg/m ³ (as Mn)	inhalation, ingestion	Manganism; asthenia, insomnia, mental confusion; metal fume fever; dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage	respiratory system, central nervous system, blood, kidneys	A lustrous, brittle, silvery solid. BP: 3564°F
Mercury (organo) alkyl compounds (as Hg)	7439-97-6	TWA 0.01 mg/m ³ STEL 0.03 mg/m ³ [skin]	TWA 0.01 mg/m ³ STEL 0.03 mg/m ³ [skin]	TWA 0.01 mg/m ³ C 0.04 mg/m ³	2 mg/m ³ (as Hg)	inhalation, skin absorption, ingestion, skin and/or eye contact	Paresthesia; ataxia, dysarthria; vision, hearing disturbance; spasticity, jerking limbs; dizziness; salivation; lacrimation (discharge of tears); nausea, vomiting, diarrhea, constipation; skin burns; emotional disturbance; kidney injury; possible teratogenic effects	Eyes, skin, central nervous system, peripheral nervous system, kidneys	Appearance and odor vary depending upon the specific (organo) alkyl mercury compound
Mercury compounds [except (organo) alkyls] (as Hg) Mercury	7439-97-6	TWA 0.025 mg/m ³ (elemental and inorganic forms)	Hg Vapor: TWA 0.05 mg/m ³ [skin] Other: C 0.1 mg/m ³ [skin]	TWA 0.1 mg/m ³	10 mg/m ³ (as Hg)	inhalation, skin absorption, ingestion, skin and/or eye contact	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	Eyes, skin, respiratory system, central nervous system, kidneys	Metal: Silver-white, heavy, odorless liquid. [Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except (organo) alkyls.] BP: 674°F
Methyl Ethyl Ketone or MEK (2-Butanone)	78-93-3	TWA 200 ppm STEL 300 ppm	TWA 200 ppm (590 mg/m ³) STEL 300 ppm (885 mg/m ³)	TWA 200 ppm (590 mg/m ³)	3000 ppm	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose; headache; dizziness; vomiting; dermatitis	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a moderately sharp, fragrant, mint- or acetone-like odor. BP: 175°F Fl.P: 16°F UEL(200°F): 11.4% LEL(200°F): 1.4% Class IB Flammable Liquid
Methyl tert-butyl ether (MTBE)	1634-04-4	TWA 50 ppm	No established REL	None established	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, mucous membrane, respiratory; dizziness, nausea, headache, intoxication	Eyes, skin, mucous membrane, respiratory system, central nervous system	Colorless liquid BP: 55.2 C
Methylene Chloride (Dichloromethane)	75-09-2	TWA 50 ppm, A3 - suspected human carcinogen	Ca	TWA 25 ppm STEL 125 ppm	Ca [2300 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numbness, tingle limbs; nausea; [potential occupational carcinogen]	Eyes, skin, cardiovascular system, central nervous system	Colorless liquid with a chloroform-like odor BP: 104°F UEL: 23% LEL: 13%
Naphtha (Rubber Solvent)	8030-30-6	None established	TWA 100 ppm (400 mg/m ³)	TWA 100 ppm (400 mg/m ³)	1000 ppm [10%LEL]	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose; dizziness, drowsiness; dermatitis; in animals: liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Reddish-brown, mobile liquid with an aromatic odor BP: 320-428°F Fl.P: 100-109°F Class II Combustible Liquid
Naphthalene	91-20-3	TWA 10 ppm [skin]	TWA 10 ppm (50 mg/m ³) STEL 15 ppm (75 mg/m ³)	TWA 10 ppm (50 mg/m ³)	250 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage	Eyes, skin, blood, liver, kidneys, central nervous system	Colorless to brown solid with an odor of mothballs. BP: 424°F Fl.P: 174°F UEL: 5.9% LEL: 0.9%
Nickel	7440-02-0 (Metal)	TWA 1.5 mg/m ³ (elemental) TWA 0.1 mg/m ³ (soluble inorganic compounds) TWA 0.2 mg/m ³ (insoluble inorganic compounds) TWA 0.1 mg/m ³ (Nickel subsulfide)	Ca TWA 0.015 mg/m ³	TWA 1 mg/m ³	Ca [10 mg/m ³ (as Ni)]	inhalation, ingestion, skin and/or eye contact	Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Nasal cavities, lungs, skin	Metal: Lustrous, silvery, odorless solid. BP: 5139°F
Nitrobenzene	98-95-3	TWA 1 ppm	TWA 1 ppm (5 mg/m ³) [skin]	TWA 1 ppm (5 mg/m ³) [skin]	200 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; anoxia; dermatitis; anemia; methemoglobinemia; in animals: liver, kidney damage; testicular effects	Eyes, skin, blood, liver, kidneys, cardiovascular system, reproductive system	Yellow, oily liquid with a pungent odor like paste shoe polish. BP: 411°F Fl.P: 190°F LEL(200°F): 1.8%
Petroleum hydrocarbons(Petroleum distillates)	8002-05-9	None established	TWA 350 mg/m ³ C 1800 mg/m ³ [15 min]	TWA 500 ppm (2000 mg/m ³)	1,100 [10% LEL]	Inhalation; ingestion; skin and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, drowsiness, headache, nausea; dried/cracked skin; chemical pneumonitis	CNS, eyes, respiratory system, skin	Colorless liquid with a gasoline or kerosene-like odor BP: 86-460°F Fl. Pt = -40 to -86°F UEL: 5.9% LEL: 1.1% Flammable liquid

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 1590 White Plains Road, Bronx, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Phenol	108-95-2	TWA 5 ppm [skin]	TWA 5 ppm (19 mg/m ³) C 15.6 ppm (60 mg/m ³) [15-minute] [skin]	TWA 5 ppm (19 mg/m ³) [skin]	250 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose, throat; anorexia, weight loss; lassitude (weakness, exhaustion), muscle ache, pain; dark urine; cyanosis; liver, kidney damage; skin burns; dermatitis; ochronosis; tremor, convulsions, twitching	Eyes, skin, respiratory system, liver, kidneys	Colorless to light-pink, crystalline solid with a sweet, acrid odor. BP: 359°F UEL: 8.6% LEL: 1.8%
Polychlorinated Biphenyls (PCBs) (Chlorodiphenyl (42% Chlorine))	53469-21-9	TWA 1 mg/m³		0.5 mg/m ³	5 ppm	Dermal; inhalation; ingestion; skin and/or eye contact	Irritation eyes; chloracne; liver damage; reproductive effects; [potential occupational carcinogen]	Eyes, skin, liver, respiratory system	Colorless to light-colored, viscous liquid, hydrocarbon odor, BP: 617 - 734°F, non-flammable, LEL: NA, UEL: NA
n-Propylbenzene	103-65-1	None established	None established	None established	None established	inhalation, ingestion, skin and/or eye contact	Harmful if swallowed, Irritation eyes, skin, digestive tract, respiratory tract, central nervous system	Eyes, skin, central nervous system, respiratory system	colorless or light yellow liquid BP: 159 C FLP: 47 C UEL: 6% LEL: 0.8%
Selenium	7782-49-2	TWA 0.2 mg/m ³	TWA 0.2 mg/m ³	TWA 0.2 mg/m ³	1 mg/m ³ (as Se)	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; in animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage	Eyes, skin, respiratory system, liver, kidneys, blood, spleen	Amorphous or crystalline, red to gray solid. [Note: Occurs as an impurity in most sulfide ores.] BP: 1265°F
Silver	7440-22-4 (metal)	TWA 0.1 mg/m ³ (metal, dust, fume) TWA 0.01 mg/m ³ (Soluble compounds, as Ag)	TWA 0.01 mg/m ³	TWA 0.01 mg/m ³	10 mg/m ³ (as Ag)	inhalation, ingestion, skin and/or eye contact	Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance	Nasal septum, skin, eyes	Metal: White, lustrous solid BP: 3632°F
Slop Oil	69029-75-0	None established	None established	None established	None established	Inhalation; ingestion	Irritation eyes, skin, gastrointestinal tract	Eyes, skin, gastrointestinal tract	Clear light to dark amber liquid, with mild hydrocarbon odor. BP: >500°F FLP: 250°F
Sulfuric Acid	7664-93-9	TWA 0.2 mg/m ³	TWA 1 mg/m ³	TWA 1 mg/m ³	15 mg/m ³	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; pulmonary edema, bronchitis; emphysema; conjunctivitis; stomatitis; dental erosion; eye, skin burns; dermatitis	Eyes, skin, respiratory system, teeth	Colorless to dark-brown, oily, odorless liquid. BP: 554°F Noncombustible Liquid
Tetrachloroethene	127-18-4	TWA 25 ppm STEL 100 ppm listed as A3, animal carcinogen	Ca Minimize workplace exposure concentrations	TWA 100 ppm C 200 ppm (for 5 minutes in any 3-hour period), with a maximum peak of 300 ppm	Ca [150 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]	Eyes, skin, respiratory system, liver, kidneys, central nervous system	Colorless liquid with a mild, chloroform-like odor. BP: 250°F Noncombustible Liquid
Toluene	108-88-3	TWA 20 ppm	TWA 100 ppm (375 mg/m ³) STEL 150 ppm (560 mg/m ³)	TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)	500 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Colorless liquid with a sweet, pungent, benzene-like odor. BP: 232°F FLP: 40°F UEL: 7.1% LEL: 1.1% Class IB Flammable Liquid
1,1,1-Trichloroethane (Methyl Chloroform)	71-55-6	TWA 350 ppm STEL 450 ppm	C 350 ppm (1900 mg/m ³) [15-minute]	TWA 350 ppm (1900 mg/m ³)	700 ppm	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; headache, lassitude (weakness, exhaustion), central nervous system depression, poor equilibrium; dermatitis; cardiac arrhythmias; liver damage	Eyes, skin, central nervous system, cardiovascular system, liver	Colorless liquid with a mild, chloroform-like odor. BP: 165°F UEL: 12.5% LEL: 7.5%
1,1,2-Trichloroethane	79-00-5	TWA 10 ppm [skin]	Ca TWA 10 ppm (45 mg/m ³) [skin]	TWA 10 ppm (45 mg/m ³) [skin]	Ca [100 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose; central nervous system depression; liver, kidney damage; dermatitis; [potential occupational carcinogen]	Eyes, respiratory system, central nervous system, liver, kidneys	Colorless liquid with a sweet, chloroform-like odor. BP: 237°F UEL: 15.5% LEL: 6%
Trichloroethene	79-01-6	TWA 10 ppm STEL 25 ppm	Ca	TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 2 hours)	Ca [1000 ppm]	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]	Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system	Colorless liquid (unless dyed blue) with a chloroform-like odor. BP: 189°F UEL(77°F): 10.5% LEL(77°F): 8%
1,2,4-Trimethylbenzene	95-63-6	TWA 25 ppm	TWA 25 ppm (125mg/m ³)	None established	N.D.	Inhalation; ingestion; skin and/or eye contact	Eye, skin, nose, and throat, resp syst irritation; bronchitis; hypochromic anemia; headache, drowsiness, weakness, dizziness, nausea, incoordination, vomit, confusion; chemical pneumonitis	Eyes, skin, resp sys, CNS, blood	Clear, colorless liquid with a distinctive, aromatic odor BP: 337°F FLP: 112°F UEL: 6.4% LEL: 0.9% Class II Flammable liquid
1,2,4-Trimethylbenzene	95-63-6	TWA 25 ppm	TWA 25 ppm (125 mg/m ³)	None established	N.D.	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, fatigue, dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eyes, skin, respiratory system, central nervous system, blood	Clear, colorless liquid with a distinctive, aromatic odor. BP: 337°F FLP: 112°F UEL: 6.4% LEL: 0.9% Class II Flammable Liquid

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at 1590 White Plains Road, Bronx, New York

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
1,3,5-Trimethylbenzene	108-67-8	TWA 25 ppm	TWA 25 ppm (125mg/m ³)	None established	N.D.	Inhalation; ingestion; skin and/or eye contact	Eye, skin, nose, and throat, resp syst irritation; bronchitis; hypochromic anemia; headache, drowsiness, weakness, dizziness, nausea, incoordination, vomit, confusion; chemical pneumonitis	Eyes, skin, resp sys, CNS, blood	Clear, colorless liquid with a distinctive, aromatic odor BP: 329°F FL.P: 122°F Class II Flammable liquid
1,3,5-Trimethylbenzene	108-67-8	TWA 25 ppm	TWA 25 ppm (125 mg/m ³)	None established	N.D.	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eyes, skin, respiratory system, central nervous system, blood	Clear, colorless liquid with a distinctive, aromatic odor. BP: 329°F FL.P: 122°F Class II Flammable Liquid
Vinyl Chloride	75-01-4	TWA 1 ppm	Carcinogen	TWA 1 ppm C 5 ppm [15-minute]	Ca [IDLH value has not been determined]	inhalation, skin, and/or eye contact (liquid)	Lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]	Liver, central nervous system, blood, respiratory system, lymphatic system	Colorless gas or liquid (below 7°F) with a pleasant odor at high concentrations. BP: 7°F UEL: 33.0% LEL: 3.6% Flammable Gas
Xylene (m, o & p isomers)	108-38-3, 95-47-6, 106-42-3	TWA 100 ppm STEL 150 ppm	TWA 100 ppm (435 mg/m ³)	TWA 100 ppm (435 mg/m ³)	900 ppm	Skin absorption, inhalation, ingestion, skin, and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis	Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys	Colorless liquid with an aromatic odor BP: 282°F, 292°F, 281°F Fl. Pt. 82°F, 90°F, 81°F LEL: 1.1%, 0.9%, 1.1% UEL: 7.0%, 6.7%, 7.0% Class C Flammable Liquid
Zinc Oxide	1314-13-2	TWA 2 mg/m3 STEL 10 mg/m³	None established	TWA 10 mg/m3 (for zinc oxide fume)	None established	skin and/or eye contact, inhalation, ingestion	Irritation eyes, skin, respiratory tract; gastrointestinal disturbances	Eyes, skin, respiratory system,	Bluish gray solid BP: 1664.6°F Flammable

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2014 TLVs® and BEIs®, American Conference of Industrial Hygienists

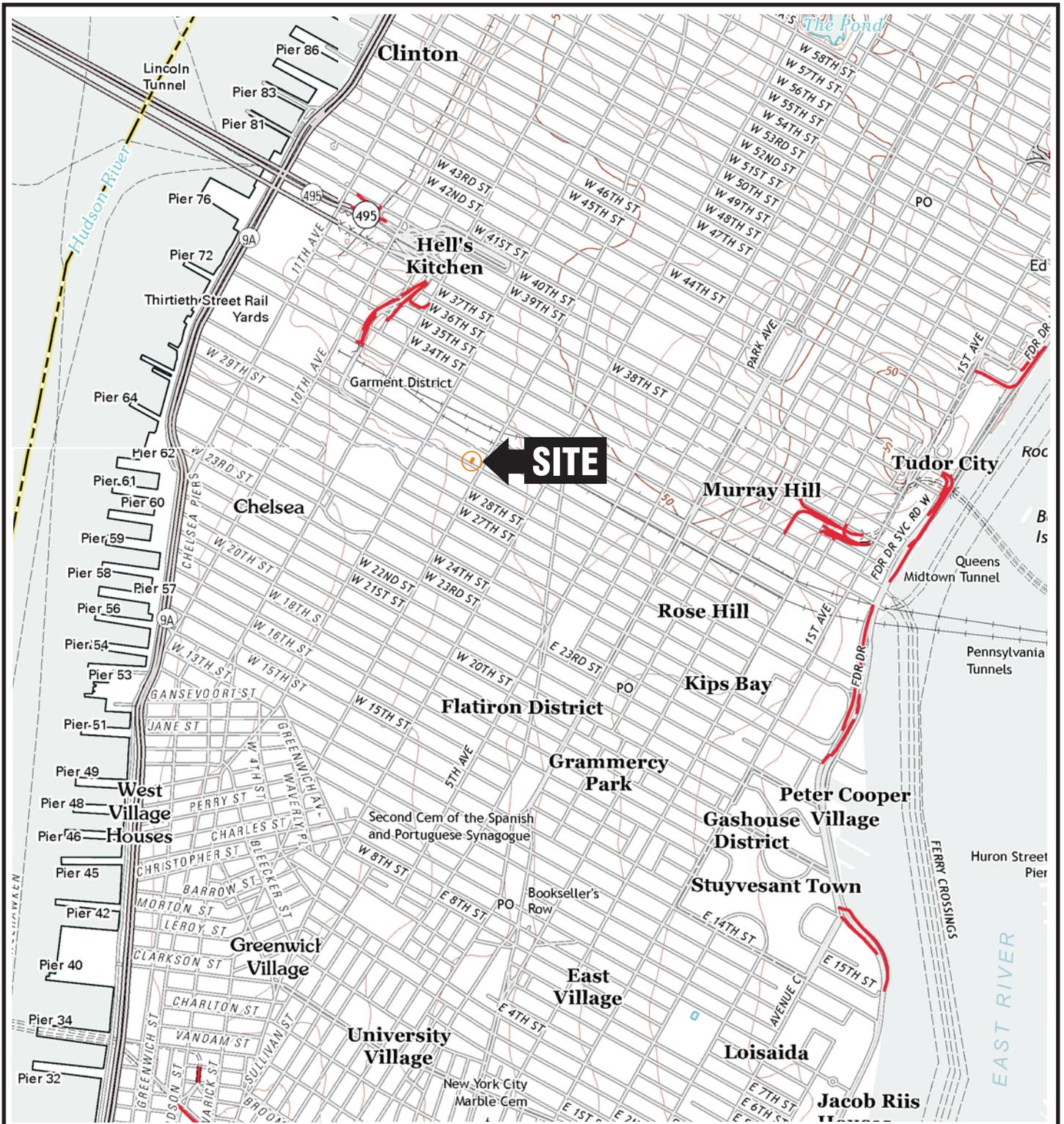
Abbreviations:

ACGIH – American Conference of Governmental Industrial Hygienists.
 BP – boiling point at 1 atmosphere, °F
 C – Ceiling, is a concentration that should not be exceeded during and part of the working exposure.
 CAS# – Chemical Abstracts Service registry number which is unique for each chemical.
 Ft Pt. – Flash point
 IDLH – Immediately Dangerous to Life and Health concentrations represent the maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.
 LEL – Lower explosive (flammable) limit in air, % by volume (at room temperature)
 mg/m³ – Milligrams of substance per cubic meter of air
 NIOSH - National Institute for Occupational Safety and Health.
 OSHA – Occupational Safety and Health Administration
 PEL - OSHA Permissible Exposure Limit (usually) a time weighted average concentration that must not be exceeded during any 8 hour work shift of a 40 hr work week.
 ppm – parts per million
 REL – NIOSH Recommended Limit indicated a time weighted average concentration that must not be exceeded during any 10 hour work shift of a 40 hr work week
 STEL – Short-term exposure limit (ST)
 TLV - ACGIH Threshold Limit Values (usually 8 hour time weighted average concentrations).
 TWA – 8-hour, time-weighted average
 UEL – Upper explosive (flammable) limit in air, % by volume (at room temperature)

Site-Specific Health and safety Plan
211 West 29th Street, Manhattan, New York

FIGURES

1. Site Location
2. Site Plan
3. Route to Hospital
4. Route to Urgent Care Center



QUADRANGLE LOCATION



SOURCE:
 USGS; Brooklyn, NY (2013), Central
 Park, NY-NJ (2013), Weehawken, NJ-NY
 (2011), Jersey City, NJ-NY (2011)
 7.5 Minute Topographic Quadrangles

Title:

SITE LOCATION MAP

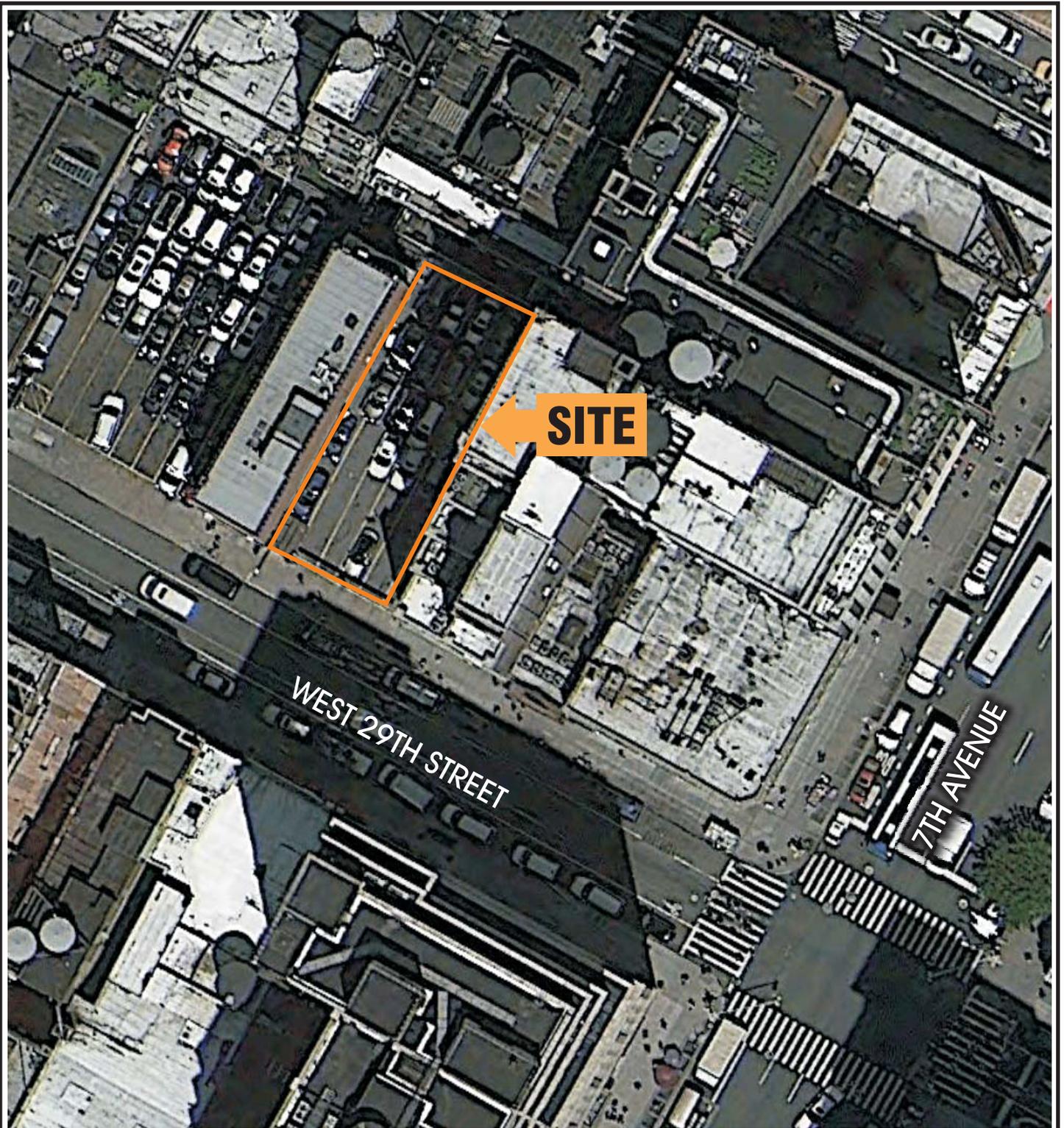
211 W 29TH STREET
 NEW YORK, NEW YORK

Prepared for:

BERNSTEIN REAL ESTATE

ROUX
 ROUX ASSOCIATES, INC.
 Environmental Consulting
 & Management

Compiled by: J.M.	Date: 19JUN15	FIGURE 1
Prepared by: B.H.C.	Scale: AS SHOWN	
Project Mgr.: J.M.	Project No.: 2591.0001Y000	
File: 2591.0001Y100.01.CDR		



Title:

SITE PLAN

211 W 29TH STREET
NEW YORK, NEW YORK

Prepared for:

BERNSTEIN REAL ESTATE



ROUX ASSOCIATES, INC.
*Environmental Consulting
& Management*

Compiled by: J.M.

Date: 19JUN15

Prepared by: B.H.C.

Scale: AS SHOWN

Project Mgr.: J.M.

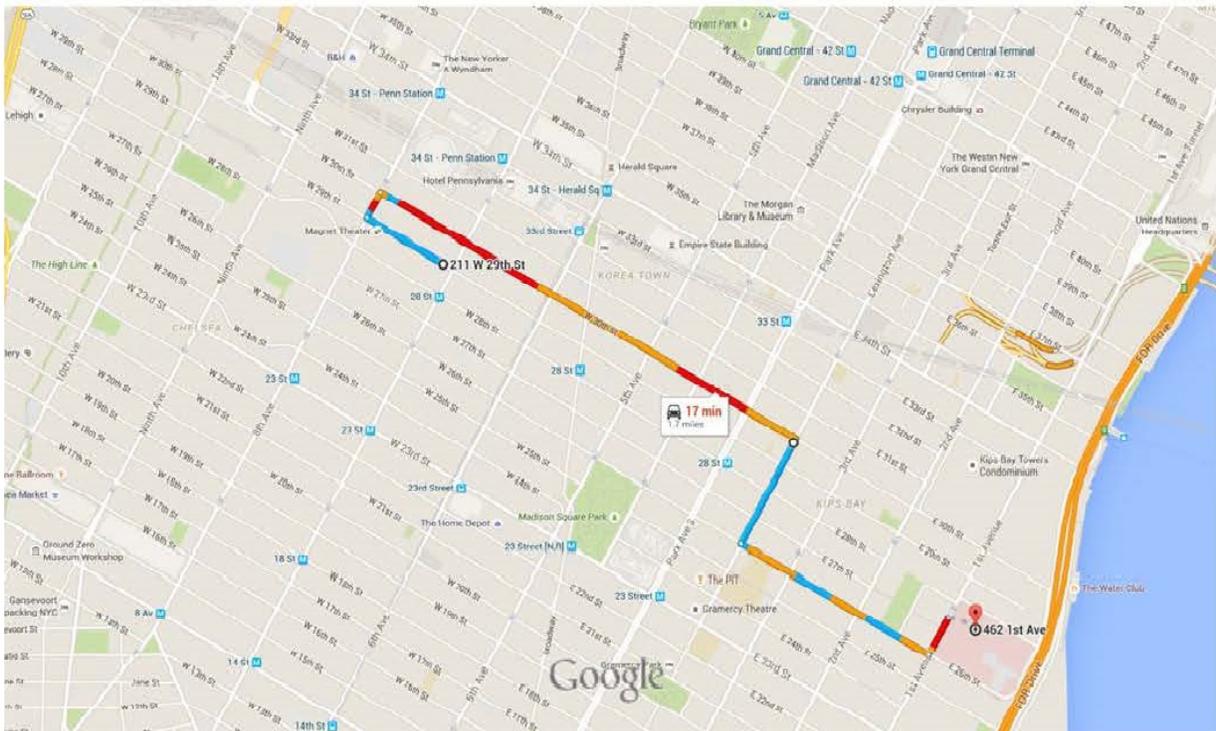
Project No.: 2591.0001Y000

File: 2591.0001Y100.01.CDR

FIGURE

2

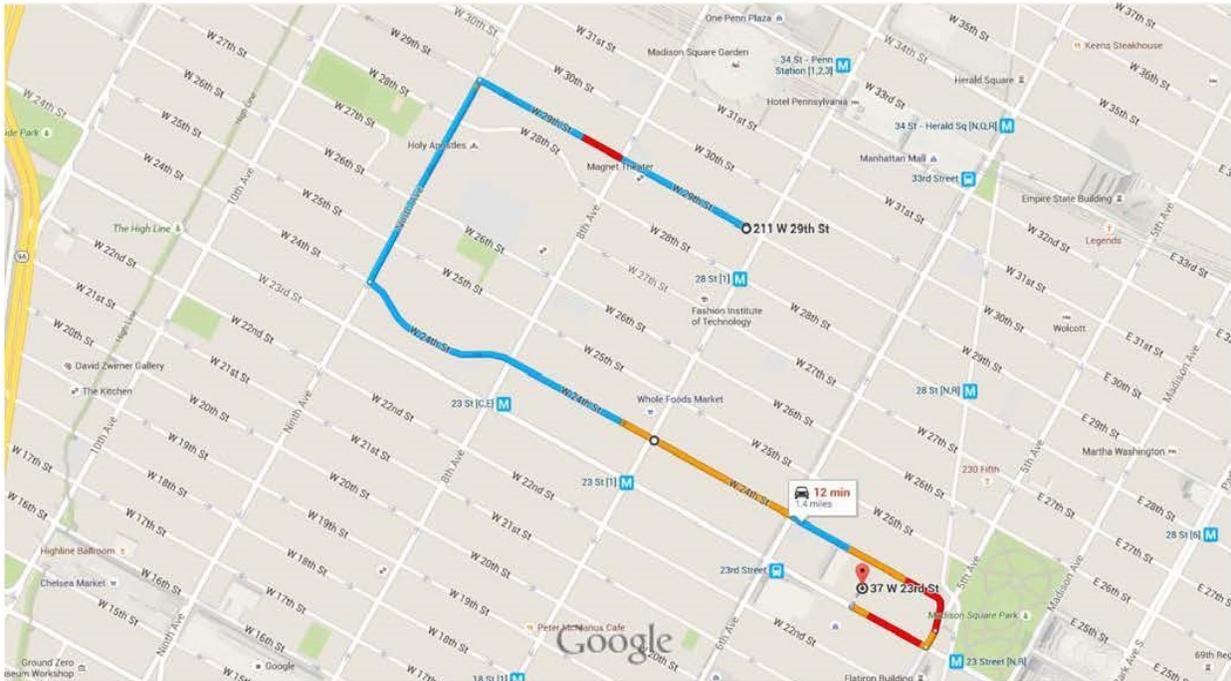
Figure 3. Directions to Bellevue Hospital Center



Bellevue Hospital Center
462 1st Avenue
New York, New York

- 211 West 29th Street, New York
- Head northwest on 29th Street Toward 8th Ave (0.2 mi)
- Turn left at the 1st cross street onto 8th Ave (259 ft)
- Turn right at the 1st cross street onto W 30th St. (0.8 mi)
- Turn right onto Lexington Ave. (0.2 mi)
- Turn left onto east 26th St. (0.4 mi)
- Turn left onto 1st Ave, destination will be on the right (367 feet)

Figure 4. Directions to City MD



City MD
37 West 23rd Street
New York, New York

- 211 West 29th Street, New York
- Head northwest on West 29th Street Toward 8th Ave (0.3 mi)
- Turn left at the 2nd cross street onto 9th Ave (0.2 mi)
- Turn left onto West 24th St. (0.7 mi)
- Slight right onto 5th Ave. (105 ft)
- Turn right at the 1st cross street onto W 23rd St, destination will be on the right (472 ft)

Site-Specific Health and safety Plan
211 West 29th Street, Manhattan, New York

APPENDICES

- A. Job Safety Analysis Forms*
- B. Hazard Communication MSDS / SDS for Chemicals Used
- C. Roux Health & Safety Lessons Learned / Accident Report Forms
- D. Health and Safety Briefing / Meeting Log and Daily Site Safety Checklist
- E. Roux Heavy Equipment Exclusion Zone Policy
- F. Roux Subsurface Utility Clearance Procedure
- G. *ACORD*[®] Automobile Loss Notice Form
- H. Job Safety and Health Protection Poster

Site-Specific Health and safety Plan
211 West 29th Street, Manhattan, New York

APPENDIX A

Job Safety Analysis Forms*

JOB SAFETY ANALYSIS		Cntrl. No.	DATE:	<input checked="" type="checkbox"/> NEW <input type="checkbox"/> REVISED	PAGE 1 of 2
JSA TYPE CATEGORY GENERIC		WORK TYPE	WORK ACTIVITY (Description)		
DEVELOPMENT TEAM	POSITION / TITLE		REVIEWED BY:	POSITION / TITLE	
REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT					
<input type="checkbox"/> LIFE VEST <input type="checkbox"/> HARD HAT <input type="checkbox"/> LIFELINE / BODY HARNESS <input type="checkbox"/> SAFETY GLASSES	<input type="checkbox"/> GOGGLES <input type="checkbox"/> FACE SHIELD <input type="checkbox"/> HEARING PROTECTION <input type="checkbox"/> SAFETY SHOES	<input type="checkbox"/> AIR PURIFYING RESPIRATOR <input type="checkbox"/> SUPPLIED RESPIRATOR <input type="checkbox"/> PPE CLOTHING:	<input type="checkbox"/> GLOVES: <input type="checkbox"/> OTHER		
REQUIRED AND / OR RECOMMENDED EQUIPMENT					
Required Equipment:					
Commitment to LPS – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.					
EXCLUSION ZONE: A _ foot exclusion zone will be maintained around (indicate equipment).					
Assess 1JOB STEPS	Analyze 2POTENTIAL HAZARDS		Act 3CRITICAL ACTIONS		
1. [INSERT JOB STEP]	1a. CONTACT: [INSERT HAZARD]	1a.			
	1b. CAUGHT: [INSERT HAZARD]	1b.			
	1c. FALL: [INSERT HAZARD]	1c.			
	1d. EXPOSURE: [INSERT HAZARD]	1d.			
	1e. EXERTION: [INSERT HAZARD]	1e.			
	1f. ENERGY SOURCE: [INSERT HAZARD]	1f.			
2. [INSERT JOB STEP]	2a. CONTACT: [INSERT HAZARD]	2a.			
	2b. CAUGHT: [INSERT HAZARD]	2b.			

¹ Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

² A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object;

Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards.

³ Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

	<p>2c. FALL: [INSERT HAZARD]</p> <p>2d. EXPOSURE: [INSERT HAZARD]</p> <p>2e. EXERTION: [INSERT HAZARD]</p> <p>2f. ENERGY SOURCE: [INSERT HAZARD]</p>	<p>2c.</p> <p>2d.</p> <p>2e.</p> <p>2f.</p>
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³ Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS		Cntrl. No. GEN-011	DATE: 1/18/2015	<input type="checkbox"/> NEW <input checked="" type="checkbox"/> REVISED	PAGE 1 of 2
JSA TYPE CATEGORY GENERIC		WORK TYPE Site Recon	WORK ACTIVITY (Description) Site Walk and Inspection		
DEVELOPMENT TEAM		POSITION / TITLE	REVIEWED BY:	POSITION / TITLE	
Anthony Giannetti		Staff Geologist	Daniel Abberton	SHSM	
			Mike Ritorto	Project Hydrogeologist	
			Joe Gentile	CHSM	
REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT					
<input type="checkbox"/> LIFE VEST <input checked="" type="checkbox"/> HARD HAT <input type="checkbox"/> LIFELINE / BODY HARNESS <input checked="" type="checkbox"/> SAFETY GLASSES		<input type="checkbox"/> GOGGLES <input type="checkbox"/> FACE SHIELD <input checked="" type="checkbox"/> HEARING PROTECTION: ear plugs as necessary <input checked="" type="checkbox"/> SAFETY SHOES: <u>Steel or</u> <u>composite toed</u>	<input type="checkbox"/> AIR PURIFYING RESPIRATOR <input type="checkbox"/> SUPPLIED RESPIRATOR <input checked="" type="checkbox"/> PPE CLOTHING: <u>High-</u> <u>visibility vest or high-vis</u> <u>outerwear, sleeved shirt</u>	<input checked="" type="checkbox"/> GLOVES: <u>Leather/cut-</u> <u>resistant/chemical</u> <u>resistant</u> <input checked="" type="checkbox"/> OTHER: tyvek and rubber boots as necessary, dust mask as necessary	
REQUIRED AND / OR RECOMMENDED EQUIPMENT					
Required Equipment: Site map and/or guide familiar with Site, operating cell phone or walkie-talkie if Site allows.					
Commitment to LPS – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.					
EXCLUSION ZONE (EZ): A minimum 10' exclusion zone will be maintained around equipment.					
Assess JOB STEPS	Analyze POTENTIAL HAZARDS	Act CRITICAL ACTIONS			
1. Check in with Site manager.	1a. CONTACT/EXPOSURE/FALL: Lack of communication could result in H&S incident.	1a. Inform Site personnel of work scope, timeline and location(s). 1a. Inquire about hazards and other activities taking place at the Site. 1a. Discuss emergency evacuation procedures and muster points with Site manager..			
2. Traversing the Site and setting up at work locations.	2a. CONTACT: Property damage and personal injury caused by obstructions/vehicles or unauthorized personnel at remote Sites. 2b. FALL: Uneven terrain and weather conditions. Overgrown shrubs and vines. Equipment in the work zone. 2c. OVEREXERTION: Muscle strain while carrying equipment. 2d. EXPOSURE: Biological hazards - ticks, bees/wasps, poison ivy, insects, etc. (Ticks are most active any time the temperature is above freezing, typically from March to November.)	2a. Maintain speed limit of 5 mph on-site. 2a. All equipment must be stowed and secured prior to moving. Use wheel chocks on all construction vehicles when not in motion. 2a. Drive on established roadways. 2a. Yield to all pedestrians. 2a. Do not back up vehicle without spotter where visibility is limited; use pull-through spots or back into parking spots; use an audible signal (horn/back-up alarm) when backing up vehicles. 2a. Wear high visibility clothing/safety vest. If working at remote Site, add orange accessories during hunting season. 2b. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 2b. Use established pathways and walk on stable, secure ground. 2b. Communicate traversing hazards with others 2c. When carrying equipment to/from work area, use proper lifting techniques; keep back straight, lift with legs, keep load close to body, never reach with a load. Ensure that loads are balanced to reduce the potential for muscle strain. Use mechanical assistance or make multiple trips to carry equipment. 2c. Two people or a mechanical lifting device are required when lifting objects over 50 lbs or when the shape makes the object difficult to lift. 2d. Inspect area to avoid contact with biological hazards. 2d. Ticks: <ul style="list-style-type: none"> • Treat outer clothing including pants, shirts, socks, boots and hats the evening before use with Permethrin (allowing at least two hours before use). • Apply DEET to exposed skin before travelling to the Site and reapply after two hours. • Check for ticks during and after work. 2d. Bees: Use bee spray to remove nests. Protect exposed skin with insect repellent. 2d. Poison Ivy: <ul style="list-style-type: none"> • Identify areas of poison ivy and spray with weed killer. Don Tyvek and rubber boots while traversing poison ivy areas. • If skin comes in contact with poison ivy, wash skin thoroughly with soap and water. 			

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³ Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

	<p>2e. EXPOSURE: Heat Stress & Cold Stress. Personal injury from working in inclement weather conditions.</p>	<p>2e. Wear sunscreen with SPF 15 or greater on exposed skin whenever 30 minutes or more of sun exposure is expected.</p> <p>2e. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). Take breaks as needed.</p> <p>2e. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks as needed.</p> <p>2e. Wear appropriate rain gear as needed.</p> <p>2e. Take frequent breaks if tired, wet, or cold/hot. Drink water.</p> <p>2e. If lightning is observed, wait 30 minutes after last thunder boom/lightning bolt in a sheltered location (car acceptable) before starting work again.</p>
<p>3. Define and secure the work area.</p>	<p>3a. CONTACT: Personal injury or property damage from other vehicles on-site.</p>	<p>3a. Face traffic, maintain eye contact with oncoming vehicles, and establish a safe exit route.</p> <p>3a. Look both ways in high traffic areas.</p> <p>3a. Position vehicle to protect against oncoming traffic.</p> <p>3a. Use 42" traffic cone and caution tape to delineate work area. Use a spotter in high traffic areas.</p> <p>3a. Wear high visibility clothing/safety vest.</p>
<p>4. Walking near heavy equipment and machinery.</p>	<p>4a. CONTACT: Personal injury from Site and roadway traffic. Personal injury from flying debris.</p> <p>4b. OVEREXERTION: Personal injury from lifting/moving/rotating equipment.</p> <p>4c. EXPOSURE: Hearing damage from excavation activities. Inhalation/exposure to hazardous vapors and or dust.</p> <p>4d. EXPOSURE: Working in a remote area.</p>	<p>4a. See 3a.</p> <p>4a. Place traffic cones to re-direct traffic flow around work area and to alert others as to activity taking place. Evaluate possible need for police detail and request as needed.</p> <p>4a. Maintain a minimum exclusion zone of 10 feet from all equipment. Task specific JSAs should be referenced to determine the actual exclusion zone for the piece of equipment being used.</p> <p>4a. Keep body parts out of the line of fire of pinch points.</p> <p>4a. Routinely inspect work area and be aware of location of all Site personnel. Make eye contact with spotter, if provided, or operator prior to entering the work area.</p> <p>4a. Wear safety glasses at all times.</p> <p>4b. See 2c.</p> <p>4c. Monitor air quality with multi-gas meter and dust meter, if necessary. Use water to suppress dust, if necessary. Wear dust mask, if necessary.</p> <p>4c. Wear hearing protection if >85 dBA.</p> <p>4c. Always wear leather gloves when handling any tools or equipment. Wear cut-resistant gloves (Kevlar or similar) when handling sharp objects, glassware or cutting tools.</p> <p>4d. Use the "buddy system" whenever possible. If working alone, contact PM upon arrival/departure, as well as during work activities prior to commencing work.</p> <p>4d. Always carry a communication (i.e., cell phone, walkie-talkie) or directional (i.e., map, compass, etc.) device when traversing remote areas.</p>
<p>5. Working in adverse weather conditions.</p>	<p>5a. EXPOSURE: Heat Stress & Cold Stress. Personal injury from working in inclement weather conditions.</p>	<p>5a. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). Take breaks as needed.</p> <p>5a. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks as needed.</p> <p>5a. Wear appropriate rain gear as needed.</p> <p>5a. Take frequent breaks if tired, wet, or cold/hot. Drink water.</p> <p>5a. If lightning is observed, wait 30 minutes after last thunder boom/lightning bolt in a sheltered location (car acceptable) before starting work again.</p>
<p>6. Departing Site.</p>	<p>6a. EXPOSURE: Exposure to unnecessary hazards should personnel believe Roux is on-Site during an emergency and conduct a search.</p>	<p>6a. Sign out or notify Site personnel of your departure.</p>

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JOB SAFETY ANALYSIS		Cntrl. No. GEN-010	DATE: 1/15/2014	<input type="checkbox"/> NEW <input checked="" type="checkbox"/> REVISED	PAGE 1 of 2
JSA TYPE CATEGORY GENERIC		WORK TYPE Site Recon	WORK ACTIVITY (Description) Mobilization/Demobilization		
DEVELOPMENT TEAM		POSITION / TITLE	REVIEWED BY:	POSITION / TITLE	
Jared Lefkowitz		Staff Assistant Scientist	Daniel Abberton	SHSM	
John Williams		OHSM	Mike Ritorto	Project Hydrogeologist	
			Joe Gentile	CHSM	
REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT					
<input type="checkbox"/> LIFE VEST <input checked="" type="checkbox"/> HARD HAT <input type="checkbox"/> LIFELINE / BODY HARNESS <input checked="" type="checkbox"/> SAFETY GLASSES		<input type="checkbox"/> GOGGLES <input type="checkbox"/> FACE SHIELD <input checked="" type="checkbox"/> HEARING PROTECTION (as needed) <input checked="" type="checkbox"/> SAFETY SHOES: <u>Steel Toe or composite toe</u>	<input type="checkbox"/> AIR PURIFYING RESPIRATOR <input type="checkbox"/> SUPPLIED RESPIRATOR <input checked="" type="checkbox"/> PPE CLOTHING: <u>Fluorescent reflective vest of high-visibility clothing;</u> <u>sleeved shirt; long pants</u>	<input checked="" type="checkbox"/> GLOVES: <u>Leather, nitrile, and cut resistant (as needed)</u> <input type="checkbox"/> OTHER	
REQUIRED AND / OR RECOMMENDED EQUIPMENT					
Required Equipment: None					
Commitment to LPS – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.					
EXCLUSION ZONE: A minimum exclusion zone of 10' will be maintained around moving equipment (if heavy equipment is utilized)					
Assess JOB STEPS	Analyze POTENTIAL HAZARDS	Act CRITICAL ACTIONS			
1. Mobilize/demobilize and establish work area	<p>1a. FALL: Slip/trips/falls from obstructions, uneven terrain, weather conditions, heavy loads, and/or poor housekeeping.</p> <p>1b. CONTACT: Personal injury and/or property damage caused by being struck by Site traffic or equipment used in Site activities.</p> <p>1c. CAUGHT: Personal injury from pinch points and being in line-of-fire of vehicle and/or equipment.</p>	<p>1a. Use 3 points-of-contact/ensure secure footing when entering and exiting vehicle.</p> <p>1a. Inspect walking path for uneven terrain, steep hills, obstructions, and/or weather-related hazards (i.e., ice, snow, and puddles) prior to mobilizing equipment. Use established pathways. Walk on stable/secure ground.</p> <p>1a. Do not climb over stored materials/equipment; walk around. Practice good housekeeping; organize and store equipment neatly in one area.</p> <p>1a. Wear boots with adequate treads.</p> <p>1a. Delineate unsafe areas with 42" cones, caution tape and/or flagging.</p> <p>1b. Observe and maintain the posted speed limits.</p> <p>1b. When first arriving onsite, park vehicles in designated parking space and/or out of the way locations. Use parking brake on all vehicles and tire chocks on work trucks and trailers.</p> <p>1b. Check in with Site Manager/Supervisor to ensure coordination with other Site activities and to discuss any special hazards. Ensure that short-service employees (SSE) are identified.</p> <p>1b. Identify potential traffic sources.</p> <p>1b. Wear PPE including high visibility clothing or reflective vest.</p> <p>1b. Use a spotter while moving work vehicles; plan ahead to avoid backing whenever possible.</p> <p>1b. Maintain a minimum 10' exclusion zone when vehicles are in motion. When backing up truck rig with an attached trailer use a second spotter if there is tight clearance simultaneously on multiple sides of the equipment or if turning angles limit driver visibility.</p> <p>1b. Delineate work area with 42" cones, flags, caution tape, and/or other barriers.</p> <p>1b. Position "Work Area" signs at Site entrances, if possible, or at either side of work area.</p> <p>1b. Position largest vehicle to protect against oncoming traffic.</p> <p>1b. Face traffic, maintain eye contact with oncoming vehicles, use a spotter, and establish a safe exit route.</p> <p>1b. Observe potential overhead and ground surface features that may interfere with moving equipment. Clear the path of physical hazards prior initiating mobilization.</p> <p>1c. Make sure driver has engaged parking brake and placed wheel chocks in a position to prevent movement. Be sure that vehicle is parked in front/down gradient of work area.</p> <p>1c. Wear leather gloves when handling any tools or equipment. Wear cut-resistant gloves (Kevlar or similar) when handling sharp objects/cutting tools/glass.</p> <p>1c. Keep body parts away from line-of-fire of equipment.</p> <p>1c. Always carry tools by the handles and/or designated carrier. Ensure sharp-edged tools are sheathed/secure.</p>			

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		<p>1c. Remove any loose jewelry. Avoid wearing loose clothing and/or ensure loose clothing is secure.</p> <p>1c. Secure all items on the equipment, tighten up any items or features that have potential to shift or break during mobilization.</p>
	<p>1d. OVEREXERTION: Muscle strains while lifting/carrying equipment.</p> <p>1e. EXPOSURE: Personal injury from exposure to biological and environmental hazards.</p> <p>1f. EXPOSURE: Heat and cold related injuries.</p> <p>1g. EXPOSURE: Personal injury from noise hazards.</p>	<p>1d. Use body positioning and lifting techniques that avoid muscle strain; keep back straight, lift with legs, keep load close to body, and never reach with a load.</p> <p>1d. Ensure that loads are balanced. Use assistance (mechanical or additional person) to carry equipment that is either unwieldy or over 50 lbs.</p> <p>1e. Inspect area to avoid contact with biological hazards (i.e. poisonous plants, stinging insects, ticks, etc.).</p> <p>1e. Wear long sleeved clothes treated with Permethrin, apply insect repellent containing DEET to exposed skin, and inspect clothes and skin for ticks during and after work.</p> <p>1e. Apply sunscreen (SPF 15+) if exposure to sun for 30 minutes or more is expected.</p> <p>1f. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). Take breaks as needed.</p> <p>1f. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks as needed.</p> <p>1f. Wear clothing appropriate for weather and temperature conditions (e.g., rain jackets, snow pants, multiple layers).</p> <p>1f. If lightning is observed, wait 30 minutes in a sheltered location (car is acceptable) before resuming work.</p> <p>1g. Wear hearing protection if sound levels exceed 85 dBA (if you must raise your voice for normal conversation).</p>

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JOB SAFETY ANALYSIS		Cntrl. No. GEN-009	DATE: 2/11/2015	<input type="checkbox"/> NEW <input checked="" type="checkbox"/> REVISED	PAGE 1 of 2
JSA TYPE CATEGORY GENERIC		WORK TYPE Hand Tools	WORK ACTIVITY (Description) Pre-Clearing activities, including Air Knifing and Soil Vacuuming		
DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:		POSITION / TITLE	
Alyssa Lau	Staff Engineer	Daniel Abberton		SHSM	
		Mike Ritorto		Senior Hydrogeologist	
		Laura Jensen		Staff Hydrogeologist	
REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT					
<input type="checkbox"/> LIFE VEST <input checked="" type="checkbox"/> HARD HAT <input type="checkbox"/> LIFELINE / BODY HARNESS <input checked="" type="checkbox"/> SAFETY GLASSES	<input type="checkbox"/> GOGGLES <input checked="" type="checkbox"/> FACE SHIELD (while air knifing) <input checked="" type="checkbox"/> HEARING PROTECTION (as needed) <input checked="" type="checkbox"/> SAFETY SHOES: <u>Steel or composite toed</u>	<input type="checkbox"/> AIR PURIFYING RESPIRATOR <input type="checkbox"/> SUPPLIED RESPIRATOR <input checked="" type="checkbox"/> PPE CLOTHING: <u>Fluorescent reflective vest or high visibility clothing</u>	<input checked="" type="checkbox"/> GLOVES: <u>Nitrile and cut resistant</u> <input checked="" type="checkbox"/> OTHER: <u>Dust mask (as needed)</u>		
REQUIRED AND / OR RECOMMENDED EQUIPMENT					
Required Equipment: Air Knife, Vactor Truck (Vac Truck), Compressor, Hand Tools, Circular Saw, Dust Mask, Photoionization Detector, Multi-Gas Meter, Traffic Cones, Rigid Barrier, Caution Tape, 20 lb. Fire Extinguisher, "Work Area" and/or "Exclusion Zone" Signs					
Commitment to LPS – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.					
EXCLUSION ZONE: A 10 foot exclusion zone will be maintained around air knife and/or soil vacuum operations.					
Assess 1JOB STEPS	Analyze 2POTENTIAL HAZARDS	Act 3CRITICAL ACTIONS			
1. Verify pre-clearance protocol.	1a. CONTACT: Underground utility damage; property damage; personal injury. See Site Walk Inspection JSA for potential hazards.	1a. Confirm that local utility companies were contacted prior to drilling. 1a. Walk the Site to evaluate utility markings and review maps (See Site Walk Inspection JSA for critical actions). 1a. Review pre-clearing checklist form and sub-surface clearance form. Pre-clearing protocol indicates that clearance must be conducted to a minimum of 5 vertical feet below ground surface or 8 vertical feet below ground surface in the critical zone using hand tools.			
2. Mobilize/demobilize and establish work area.	2a. See Mobilization / Demobilization JSA for potential hazards.	2a. See Mobilization / Demobilization JSA for critical actions.			
3. Pre-clear with air knife, water lance, and soil vacuum, and/or clearance with hand tools	3a. CONTACT: Flying debris striking face or body 3b. EXPOSURE/ENERGY SOURCE: Inhalation/exposure to hazardous vapors; inhalation/exposure to dust; electrocution. 3c. CONTACT: Damage to unknown/known utility with air knife. 3d. ERGONOMICS Poor body positioning when handling equipment and materials.	3a. Maintain 10 foot exclusion zone. Only (air knife/vac truck) operator and designated helper shall remain within exclusion zone while air knife/vac truck is active. Use the required PPE, including (at a minimum), cut resistant gloves, safety glasses with side shields, and long sleeved shirt. 3a. Wear a face shield to protect face from flying debris when using air knife. 3a. Aim air knife tip away from self and others, so to avoid line-of-fire hazards. 3a. Use anti-whip devices on compressor hoses. 3b. Monitor breathing zone with a calibrated PID and multi-gas meter. If vapors sustain levels > 5 ppm, the Roux field personnel must temporarily cease work, instruct all Site personnel to step away from the area of elevated readings and inform the Roux Project Manager of the condition. The Roux Project Manager will then recommend additional precautions. 3b. Wear dust masks as needed 3b. Ensure no open flames/heat sources are present within the work area. 3b. No open flames/heat sources. 3b. Ensure vac truck is properly grounded prior to use. 3b. Do not use metal dig bar; use fiberglass or equivalent. 3c. Avoid contacting utilities directly with the high pressure air stream and using the air knife tip as a physical digging tool. 3c. Keep the air knife tip constantly moving to reduce direct pressure on a potential utility. 3c. increase the distance between air knife tip and soil/utility. 3c. Continually remove soil slurry from hole with vacuum, which may have an abrasive effect on utility casings. 3d. Use proper body positioning and lifting techniques that minimizes muscle strain; keep back straight, lift with legs, keep load close to body, and never reach with a load.			

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Assess 1JOB STEPS	Analyze 2POTENTIAL HAZARDS	Act 3CRITICAL ACTIONS
3. Pre-clearing with air knife and soil vacuum, and/or clearance with hand tools (continued)	<p>3d. ERGONOMICS: (continued) Poor body positioning when handling equipment and materials.</p> <p>3e. FALL: Tripping/falling due to uneven terrain, weather conditions, and materials/equipment stored at the Site.</p> <p>3f. CAUGHT: Pinch points or amputation points associated with the equipment and vacuum hose.</p> <p>3g. EXPOSURE: Noise from vac truck and/or air compressor.</p>	<p>3d. Ensure that loads are balanced to reduce the potential for muscle strain.</p> <p>3d. Two people or a mechanical lifting aid are required when lifting objects over 50 lb. or when the shape makes the object difficult to lift.</p> <p>3e. Inspect walking path for uneven terrain, weather-related hazards (e.g., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment.</p> <p>3e. Walk around any stored materials/equipment; do not climb over. Practice good housekeeping.</p> <p>3e. Use established pathways and walk on stable, secure ground.</p> <p>3e. Equipment and tools will be stored at the lowest point of potential energy and out of the walkway and immediate work area (i.e., tools should not be propped against walls or nearby equipment or vehicles).</p> <p>3e. Equipment and tools that are not anticipated to be used will be returned to a storage area that is out of the immediate work area.</p> <p>3e. Ensure power cords/hoses are grouped when used within the work area. Mark out cords/hoses that cross pathways with traffic cones.</p> <p>3e. Ensure all Site personnel and equipment stay a minimum of 2 feet from an open hole. Mark out open holes with traffic cones/caution tape, etc.</p> <p>3e. Pre-cleared location will be finished flush to grade as to prevent a slip/trip hazard.</p> <p>3f. Always wear cut-resistant gloves when making connections and using hand tools.</p> <p>3f. Inspect the equipment prior to use for potential pinch points.</p> <p>3f. Test all emergency shutdown devices prior to using equipment.</p> <p>3f. Ensure all jewelry is removed, loose clothing is secured, and PPE is secured close to the body.</p> <p>3f. All non-essential personnel shall maintain a 10 foot exclusion zone; position body out of the line-of-fire.</p> <p>3f. Drillers and helpers will understand and use the "Show Me Your Hands Policy".</p> <p>3g. Wear hearing protection when vac truck and air compressor are in operation. Otherwise, if sound levels exceed 85 dB, don hearing protection.</p>
4. Move drum to staging area using drum cart.	<p>4a. EXPOSURE/CONTACT: Contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated groundwater, soil).</p> <p>4b. ERGONOMICS: Muscle strain while maneuvering drums with drum cart/lift gate.</p> <p>4c. CAUGHT: Pinch points or amputation points associated with handling drum lid.</p>	<p>4a. Wear chemically resistant gloves (i.e., Nitrile; worn in addition to cut resistant gloves).</p> <p>4a. Do not overfill drums. Ensure that the drum lids are attached securely.</p> <p>4a. Stage all drums in the designated storage area (per Roux Project Manager) and ensure they are labeled.</p> <p>4b. See 3d. Do not overfill drums. Use lift gate on back of truck to load and unload drums or drum cart to transport drums.</p> <p>4c. Ensure that fingers are not placed under the lid of the drum. Wear cut-resistant gloves. Use 15/16" ratchet while sealing drum lid.</p>
5. Decontaminate equipment and tools.	<p>5a. EXPOSURE/CONTACT: To contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated groundwater, vapors).</p> <p>5b. EXPOSURE: To chemicals in cleaning solution.</p>	<p>5a. See 4a.</p> <p>5a. Contain decontamination water (closed lid) so that it does not spill.</p> <p>5a. Use an absorbent pad to clean spills, if necessary.</p> <p>5a. Store all impacted materials/PPE in a designated storage container (per Roux Project Manager) and ensure the container is labeled.</p> <p>5b. See 4a.</p>

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JOB SAFETY ANALYSIS Ctrl. No. GEN-004		DATE 1/8/2015	<input type="checkbox"/> NEW <input checked="" type="checkbox"/> REVISED	PAGE 1 of 2
JSA TYPE CATEGORY: Generic		WORK TYPE: Drilling	WORK ACTIVITY (Description): Direct Push Soil Borings / Well Installation	
DEVELOPMENT TEAM		POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Jeffrey Wills		Project Hydrogeologist	Laura Jensen	Staff Hydrogeologist
			Dan Abberton	Health and Safety Officer
			Michael Ritorto	Senior Hydrogeologist
REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT				
<input type="checkbox"/> LIFE VEST <input checked="" type="checkbox"/> HARD HAT <input type="checkbox"/> LIFELINE / BODY HARNESS <input checked="" type="checkbox"/> SAFETY GLASSES	<input type="checkbox"/> GOGGLES <input type="checkbox"/> FACE SHIELD <input type="checkbox"/> HEARING PROTECTION: (as needed) <input checked="" type="checkbox"/> SAFETY SHOES: <u>Composite-toe or steel toe boots</u>	<input type="checkbox"/> AIR PURIFYING RESPIRATOR <input type="checkbox"/> SUPPLIED RESPIRATOR <input checked="" type="checkbox"/> PPE CLOTHING: <u>Fluorescent reflective vest or high visibility clothing, Sleeved Shirt</u>	<input checked="" type="checkbox"/> GLOVES: <u>Leather, Nitrile and cut resistant</u> <input checked="" type="checkbox"/> OTHER: <u>Insect Repellant, sunscreen (as needed)</u>	
REQUIRED AND / OR RECOMMENDED EQUIPMENT				
Geoprobe or Truck-Mounted Direct Push Drill Rig, Hand Tools, Photoionization Detector, Multi-Gas Meter (or equivalent), Macrocore liners, Liner Opening Tool, 20 lb. Fire Extinguisher, 42" Cones & Flags, "Work Area" Signs, Water				
COMMITMENT TO LPS - All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.				
Exclusion Zone Policy – All non-essential personnel will maintain a distance of 10 feet from drilling equipment while moving/engaged.				
"SHOW ME YOUR HANDS"				
Driller and helper should show that hands are clear from controls and moving parts				
Assess ¹JOB STEPS	Analyze ²POTENTIAL HAZARDS	Act ³CRITICAL ACTIONS		
1. Mobilization of drilling rig (ensure the Subsurface Clearance Protocol and Drill Rig Checklist are completed)	1a. CONTACT: Equipment/property damage. 1b. FALL: Slip/trip/fall hazards.	1a. The drill rig's tower/derrick will be lowered and secured prior to mobilization. 1a. A spotter should be utilized while moving the drill rig. If personnel move into the path of the drill rig, the drill rig will be stopped until the path is again clear. Use a spotter for all required backing operations. 1a. Set-up the work area and position equipment in a manner that eliminates or reduces the need for backing of support trucks and trailers. 1a. When backing up truck rig with an attached trailer use a second spotter if there is tight clearance simultaneously on multiple sides of the equipment or if turning angles limit driver visibility. 1a. Inspect the driving path for uneven terrain. Level or avoid if needed. 1a. Drill rig should have a minimum exclusion zone of 10 feet for non-essential personnel (i.e., driller helper, geologist) when the rig is moving/ in operation. 1b. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 1b. Do not climb over stored materials/equipment; walk around. Practice good housekeeping. 1b. Use established pathways and walk on stable, secure ground.		
2. Raising tower/derrick of drill rig	2a. CONTACT: Overhead hazards. 2b. CONTACT: Pinch Points/Amputation Points when raising the rig and instability of rig	2a. Prior to raising the tower/derrick, the area above the drilling rig will be inspected for wires, tree limbs, piping, or other structures, that could come in contact with the rig's tower and/or drilling rods or tools. 2a. Maintain a safe distance of 10' from overhead structures. 2b. Inspect the equipment prior to use and avoid pinch/amputation points. 2b. Lower out riggers on rig to ensure stability prior to raising rig tower/derrick. 2b. If the rig needs to be mounted, be sure to use three points of contact.		
3. Advancement of drilling equipment and well installation	3a. CONTACT: Flying debris	3a. Be aware of and avoid potential lines of fire and wear required PPE such as eye, ear, and hand protection.		

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Assess ¹ JOB STEPS	Analyze ² POTENTIAL HAZARDS	Act ³ CRITICAL ACTIONS
3. Advancement of drilling equipment and well installation (Continued)	<p>3b. EXPOSURE: Noise and dust.</p> <p>3c. CAUGHT: Limb/extremity pinching; abrasion/crushing.</p> <p>3d. CONTACT: Equipment imbalance during advancement of drill equipment.</p> <p>3e. EXPOSURE: Inhalation of contamination/vapors.</p> <p>3f. FALL: Slip/trip/fall hazards.</p> <p>3g. EXERTION: Potential for muscle strain/injury while lifting and installing well casings, lifting sand bags, and/or lifting rods.</p>	<p>3b. Wet borehole area with sprayer to minimize dust. 3b. Stand upwind and keep body away from rig. 3b. Dust mask should be worn if conditions warrant. 3b. Wear hearing protection when the drill rig is in operation.</p> <p>3c. Always wear leather gloves when making connections and using hand tools; wear cut-resistant (i.e., Kevlar) gloves when handling cutting tools. 3c. Inspect the equipment prior to use for potential pinch/amputation points. Keep hands away from being between pinch/amputation points and use of tools is preferable compared to fingers and hands. 3c. Inspect drill head for worn surface or missing teeth; replace if damaged or blunt. 3c. Ensure all jewelry is removed, loose clothing is secured, and PPE is secured close to the body. 3c. All non-essential personnel should stay away from the immediate work area; position body out of the line-of-fire of equipment. 3c. Drillers and helpers will understand and use the "Show Me Your Hands" Policy. 3c. Spinning rods/casing have an exclusion zone of 10 feet while in operation.</p> <p>3d. Drillers will advance the borehole with caution to avoid causing the rig to become imbalanced and/or tip. 3d. The blocking and leveling devices used to secure the rig will be inspected by drillers and Roux personnel regularly to see if shifting has occurred. 3d. In addition, personnel and equipment that are non-essential to the advancement of the borehole will be positioned away from the rig at a distance that is at least as far as the boom is high (minimum exclusion zone of 10 feet).</p> <p>3e. Air monitoring using a calibrated photoionization detector (PID) will be used to periodically to monitor the breathing zone of the work area. 3e. If a reading of >5ppm is recorded, the Roux field personnel must temporarily cease work, instruct all Site personnel to step away from the area of elevated readings and inform the Roux PM of the condition. The Roux PM will then recommend additional precautions in accordance with the site specific health and safety plan.</p> <p>3f. Contain drill cuttings and drilling water to prevent fall hazards from developing in work area. 3f. See 1b.</p> <p>3g. Keep back straight and bend at the knees. 3g. Utilize team lifting for objects over 50lbs. 3g. Use mechanical lifting device for odd shaped objects.</p>
4. Decontaminate equipment.	<p>4a. EXPOSURE/CONTACT: To contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated groundwater, vapors).</p> <p>4b. EXPOSURE: To chemicals in cleaning solution including ammonia.</p>	<p>4a. Wear chemical-resistant disposable gloves and safety glasses. 4a. Contain decontamination water so that it does not spill. 4a. Use an absorbent pad to clean spills, if necessary. 4a. See 3b.</p> <p>4b. See 4a. Review SDS to ensure appropriate precautions are taken and understood.</p>

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JOB SAFETY ANALYSIS		Ctrl. No.	DATE 1/23/2015	<input type="checkbox"/> NEW <input checked="" type="checkbox"/> REVISED	PAGE 1 of 2
JSA TYPE CATEGORY: Generic		WORK TYPE: Drilling	WORK ACTIVITY (Description): Hollow Stem Auger Soil Borings /Well Installation		
DEVELOPMENT TEAM		POSITION / TITLE	REVIEWED BY:	POSITION / TITLE	
Gina Vanderlin		Project Scientist	Joseph Gentile	CSHM	
REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT					
<input type="checkbox"/> LIFE VEST <input checked="" type="checkbox"/> HARD HAT <input type="checkbox"/> LIFELINE / BODY HARNESS <input checked="" type="checkbox"/> SAFETY GLASSES	<input type="checkbox"/> GOGGLES <input type="checkbox"/> FACE SHIELD <input checked="" type="checkbox"/> HEARING PROTECTION: (as needed) <input checked="" type="checkbox"/> SAFETY SHOES <u>steel or composite toe</u>	<input type="checkbox"/> AIR PURIFYING RESPIRATOR <input type="checkbox"/> SUPPLIED RESPIRATOR <input checked="" type="checkbox"/> PPE CLOTHING: <u>fluorescent sleeved shirt or sleeved shirt and reflective safety vest.</u>	<input checked="" type="checkbox"/> GLOVES: <u>Leather, Nitrile and cut resistant</u> <input checked="" type="checkbox"/> OTHER: <u>Insect Repellant, sunscreen (as needed)</u>		
REQUIRED AND / OR RECOMMENDED EQUIPMENT					
Truck-Mounted Drilling Rig or Track Rig, Saw, Hand Tools, Photoionization Detector, Multi-Gas Meter (or equivalent), Interface Probe, 20 lb. Fire Extinguisher, 42" Cones & Flags, "Work Area" Signs					
COMMITMENT TO LPS - All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.					
EXCLUSION ZONE POLICY – All non-essential personnel shall maintain a 10 foot exclusion zone while drill rig is engaged					
"SHOW ME YOUR HANDS"					
Driller and helper should show that hands are clear from controls and moving parts					
Assess 1JOB STEPS	Analyze 2POTENTIAL HAZARDS	Act 3CRITICAL ACTIONS			
1. Mobilization of drilling rig	1a. CONTACT: Equipment or property damage. 1b. FALL: Slip/trip/fall hazards.	1a. The drill rig's tower/derrick will be lowered and secured prior to mobilization. 1a. A spotter should be utilized while moving or backing the drill rig. If personnel move into the path of the drilling rig, the drilling rig will be stopped until the path is again clear. 1a. Set-up the work area / position equipment in a manner that eliminates or reduces the need for backing of trucks and trailers. 1a. When backing up truck rig with an attached trailer use a second spotter if there is tight clearance simultaneously on multiple sides of the equipment or if turning angles limit driver visibility. 1a. Inspect the driving path for uneven terrain. Level or avoid if needed. 1b. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 1b. Do not climb over stored materials/equipment; walk around. Practice good housekeeping. 1b. Use established pathways and walk on stable, secure ground. 1b. Use three points of contact when mounting or dismounting the rig.			
2. Raising tower/derrick of drilling rig	2a. CONTACT: Overhead hazards. 2b. CONTACT: Pinch points when raising the rig; crushing hazard with stability of rig during set-up	2a. Prior to raising the tower/derrick, area above the drilling rig will be inspected for overhead hazards (wires, tree limbs, piping, or other structures) that may be contacted by the rig's tower or drilling rods. 2a. The tower/derrick must not be raised beneath overhead power lines unless approved by both the ExxonMobil and Roux PMs. 2a. Maintain at a minimum 10' from overhead structures. 2a. Do not move the rig while the tower/derrick is raised. 2b. Inspect the equipment prior to use and avoid placing hands near pinch points. 2b. Lower out riggers on rig to ensure stability prior to raising rig tower derrick. 2b. Inspect the set-up location for uneven terrain. Level or avoid area if needed.			
3. Advancement of augers for soil borings and well material installation.	3a. CONTACT: Flying / spraying debris. 3b. EXPOSURE: Noise and dust.	3a. Wear minimum level D PPE 3a. Be aware of and avoid potential lines of fire. 3b. Wet borehole area with sprayer to minimize dust. Stand upwind and keep body positioned away from rig. 3b. Wear hearing protection while drill rig is operating/or the noise levels exceed 85dBA.			

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Assess ¹ JOB STEPS	Analyze ² POTENTIAL HAZARDS	Act ³ CRITICAL ACTIONS
4. Advancement of augers for soil borings, and well material installation (Continued).	<p>4c. CAUGHT: Limb/extremity pinching, abrasion, and crushing.</p> <p>4d. CONTACT: Equipment imbalance during advancement of drill equipment.</p> <p>4e. EXPOSURE: Inhalation of contamination/vapors.</p> <p>4f. FALL: Slip/trip/fall hazards.</p> <p>4g. EXERTION: Installing well casings and lifting augers.</p> <p>4h. CONTACT: Using hand tools to install well casings and materials</p>	<p>4c. Always wear leather gloves when making connections and using hand tools; wear cut-resistant (i.e., Kevlar) gloves when handling cutting tools.</p> <p>4c. Test all emergency shutdown devices prior to drilling.</p> <p>4c. Inspect drill head for worn surface or missing teeth; replace if damaged or blunt.</p> <p>4c. Inspect augers; do not use if auger flight is damaged or bent.</p> <p>4c. Ensure all jewelry is removed, loose clothing is secured, and PPE is secured close to the body.</p> <p>4c. All non-essential personnel should stay away from the immediate work area; position body out of the line-of-fire of equipment particularly when installing auger flights.</p> <p>4c. Drillers and helpers will understand and use the "Show Me Your Hands" Policy.</p> <p>4c. Spinning augers should have an exclusion zone of 20 feet when in operation.</p> <p>4d. Drillers will advance the borehole with caution to avoid causing the rig to become imbalanced and/or tip.</p> <p>4d. The blocking and leveling devices used to secure the rig will be inspected by drillers and Roux personnel regularly to see if shifting has occurred.</p> <p>4e. Air monitoring using a calibrated photoionization detector (PID) will be used to periodically monitor the breathing zone of the work area.</p> <p>4e. The Action Level for breathing zone air is five parts per million (sustained) as detected by the PID.</p> <p>4e. If a reading of >5ppm is recorded, the Roux field personnel must temporarily cease work, instruct all Site personnel to step away from the area of elevated readings and inform the Roux PM of the condition. The Roux PM will then recommend additional appropriate precautions in accordance with the site specific health and safety plan.</p> <p>4f. See 1b.</p> <p>4f. Remove soil cuttings to avoid a tripping hazard from developing near augers.</p> <p>4g. Keep back straight and bend at the knees.</p> <p>4g. Utilize team lifting for objects over 50lbs.</p> <p>4g. Use mechanical lifting device for odd shaped objects.</p> <p>4h. Wear cut resistant and leather gloves.</p> <p>4h. Secure materials on a level surface before cutting</p> <p>4h. Place hands out of the line of fire</p> <p>4h. Inspect all tools prior to use and remove damaged tools from service</p>
5. Cleaning the auger flights	5a. CONTACT: Cuts/scrapes or puncture wound from contacting rotating auger.	<p>5a. Follow "No Hands" Procedure and make sure auger is out of gear before contacting auger with hands or tool.</p> <p>5b. When using a cleaning tool, pull across your body with handle away from body; do not push toward the auger.</p> <p>5b. Do not clean more than ¾ turn around the auger at a time.</p> <p>5b. Wear cut resistant and leather gloves.</p> <p>5b. Always use two hands when operating cleaning tool.</p> <p>5b. Inspect any tool before use and remove from service if handle or metal are cracked/fatigued.</p> <p>5b. Stand out of the line of fire.</p>
6. Decontaminate equipment.	<p>6a. EXPOSURE/CONTACT: To contamination (e.g., contaminated groundwater, vapors).</p> <p>6b. EXPOSURE: To chemicals in cleaning solution (including ammonia)</p>	<p>6a. Wear chemical-resistant disposable gloves and safety glasses.</p> <p>6a. Contain decontamination water so that it does not spill.</p> <p>6a. Use an absorbent pad to clean spills, if necessary.</p> <p>6b. See 5a.</p>

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JOB SAFETY ANALYSIS		Cntrl. No. GEN-012	DATE: 2/3/2015	<input type="checkbox"/> NEW <input checked="" type="checkbox"/> REVISED	PAGE 1 of 2
JSA TYPE CATEGORY: GENERIC		WORK TYPE: Gauging & Sampling	WORK ACTIVITY (Description): Soil Sampling		
DEVELOPMENT TEAM		POSITION / TITLE	REVIEWED BY:	POSITION / TITLE	
Michael Hodess		Staff Environmental Scientist	Mike Ritorto	Senior Hydrogeologist	
			Leo Kurylo	IL-OHSM	
REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT					
<input type="checkbox"/> LIFE VEST	<input type="checkbox"/> GOGGLES	<input type="checkbox"/> AIR PURIFYING RESPIRATOR	<input checked="" type="checkbox"/> GLOVES: <u>Leather, Nitrile and cut resistant</u>		
<input checked="" type="checkbox"/> HARD HAT	<input type="checkbox"/> FACE SHIELD:	<input type="checkbox"/> SUPPLIED RESPIRATOR	<input checked="" type="checkbox"/> OTHER: <u>Insect repellent, sunscreen (as needed)</u>		
<input type="checkbox"/> LIFELINE / BODY HARNESS	<input checked="" type="checkbox"/> HEARING PROTECTION: (<u>as needed</u>)	<input checked="" type="checkbox"/> PPE CLOTHING: <u>Fluorescent reflective vest or high visibility clothing</u>			
<input checked="" type="checkbox"/> SAFETY GLASSES	<input checked="" type="checkbox"/> SAFETY SHOES: <u>Composite-toe or steel toe boots</u>				
<input checked="" type="checkbox"/> FLAME RESISTANT CLOTHING (<u>as needed</u>)					
REQUIRED AND / OR RECOMMENDED EQUIPMENT					
Recommended Equipment: 42" traffic cones, caution tape, trowel					
COMMITMENT TO LPS - All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.					
EXCLUSION ZONE: A minimum 10' exclusion zone will be maintained around moving equipment, if present.					
Assess 1JOB STEPS	Analyze 2POTENTIAL HAZARDS	Act 3CRITICAL ACTIONS			
1. Secure location	<p>1a. CONTACT: Personnel and vehicular traffic may enter the work area.</p> <p>1b. FALL: Tripping/falling due to uneven terrain or entry/exit from excavations.</p> <p>1c. EXPOSURE: Exposure to sun and excessive heat, possibly causing sunburn, heat exhaustion or heat stroke. Exposure to cold temperatures possibly causing cold stress. Skin burn as a result of fire, if applicable. Exposure to explosive vapors due to tank farm operations, Biological hazards - ticks, bees/wasps, poison ivy, thorns, insects, etc.</p>	<p>1a. If in an area with foot or vehicle traffic, delineate the work area with 42" traffic cones and/or caution tape to prevent exposure to traffic and inform others of work activity.</p> <p>1a. Wear reflective vest and/or high visibility clothing.</p> <p>1a. Face the direction of any vehicular traffic. Position vehicle to protect worker from traffic.</p> <p>1a. Communicate work activity with adjacent work areas.</p> <p>1b. Inspect pathways and work area for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions.</p> <p>1b. Use established pathways and walk on stable, secure ground.</p> <p>1b. Stage equipment and tools in a convenient, stable, and orderly manner. Store equipment at lowest potential energy.</p> <p>1b. Roux employees should stay 5 feet from in-progress excavations and trenches. Should entry to an excavation be appropriate (when stabilization is complete), ladders must be employed for steep embankments, excavations, pits, and trenches.</p> <p>1c. Wear sunscreen with an SPF 15 or greater whenever 30 minutes or more of exposure is expected.</p> <p>1c. Use a tent to shade the work area from direct sunlight particularly when warm temperatures are expected.</p> <p>1c. Be aware of the location of all Site personnel.</p> <p>1c. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing).</p> <p>1c. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse).</p> <p>1c. Take breaks for rest and water as necessary. Move to an area that is well shaded or a climate controlled area (i.e., car, site trailer, etc.).</p> <p>1c. No open flames/heat sources.</p> <p>1c. Flame resistant clothing must be worn when specified by Site policy.</p> <p>1c. Cell phones should be disabled when specified by Site policy.</p> <p>1c. Pre-treat field clothing with Permethrin prior to site visit to kill/repel ticks and insects.</p> <p>1c. Wear long sleeved shirts and tuck in (or tape) pant legs into socks or boots to prevent ticks from reaching skin.</p> <p>1c. Spray insect repellent containing DEET on exposed skin when working in overgrown areas of the Site.</p> <p>1c. Inspect area to avoid contact with biological hazards.</p> <p>1c. Wear cut-resistant gloves when handling branches, shrubs, etc. that may lie within the walking path.</p> <p>1c. Personnel shall examine themselves and co-worker's outer clothing for ticks periodically when onsite.</p> <p>1c. If skin comes in contact with poison ivy, wash skin thoroughly with soap and water. If rash persists after washing, immediately notify your supervisor and the CHSM for possible consultation with a physician at an approved Occupational Health Clinic.</p>			

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Assess ¹ JOB STEPS	Analyze ² POTENTIAL HAZARDS	Act ³ CRITICAL ACTIONS
2. Collect Soil Sample	<p>2a. CONTACT: Personal injury from pinch points, cuts, and abrasions from sampling equipment tools, and material within soil sample. Personal injury from contact with moving equipment while sampling.</p> <p>2b. EXPOSURE: Exposure to contamination (impacted soil) and/or lab preservatives.</p>	<p>2a. Wear cut-resistant (i.e., Kevlar) gloves under chemical-resistant disposable gloves when handling soil samples and sampling jars. 2a. Where possible, use trowel or equivalent tool to avoid contact with soil. 2a. If sampling from bucket of heavy equipment, ensure all equipment is off and operator utilizes the "show me your hands" policy. 2a. See 1a.</p> <p>2b. Wear chemical-resistant disposable gloves over cut resistant gloves to protect hands when handling samples; use containment material or plastic sheeting to protect surrounding areas. 2b. When collecting soil sample from hand auger, put large zip lock bag over entire auger to prevent spillage of soil on to the ground. 2b. Open sample jars slowly and fill carefully to avoid contact with preservatives.</p>
3. Decontaminate equipment	<p>3a. EXPOSURE/CONTACT: Contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated vapors and/or soil).</p> <p>3b. EXPOSURE: Chemicals in cleaning solution including ammonia.</p>	<p>3a. Wear chemical-resistant disposable gloves and safety glasses. 3a. Use an absorbent pad to clean spills. 3a. Properly dispose of used materials/PPE in provided drums in designated drum storage area. 3a. Remain upwind of sample and avoid breathing contaminant vapors, if they are present.</p> <p>3b. Wear chemical-resistant disposable gloves and safety glasses. 3b. Work on the upwind side of decon. area. 3b. Use an absorbent pad to clean spills. 3b. Properly dispose of used materials/PPE in provided drums in designated drum storage area.</p>

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Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

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JOB SAFETY ANALYSIS		Ctrl. No. GEN 007	DATE: 2/3/2015	<input type="checkbox"/> NEW <input checked="" type="checkbox"/> REVISED	PAGE 1 of 1
JSA TYPE CATEGORY Generic		WORK TYPE O&M	WORK ACTIVITY (Description) Movement of 55-Gallon Drums/Drum Handling with Mobile Carrier		
DEVELOPMENT TEAM		POSITION / TITLE	REVIEWED BY:	POSITION / TITLE	
Michael Smith		Senior Technician	Daniel Abberton	SHSM	
			Ray Greenidge	Project Engineer	
REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT					
<input type="checkbox"/> LIFE VEST <input checked="" type="checkbox"/> HARD HAT <input type="checkbox"/> LIFELINE / BODY HARNESS <input checked="" type="checkbox"/> SAFETY GLASSES	<input type="checkbox"/> GOGGLES <input type="checkbox"/> FACE SHIELD <input type="checkbox"/> HEARING PROTECTION <input checked="" type="checkbox"/> SAFETY SHOES: Steel or composite toe	<input type="checkbox"/> AIR PURIFYING RESPIRATOR <input type="checkbox"/> SUPPLIED RESPIRATOR <input checked="" type="checkbox"/> PPE CLOTHING: Fluorescent sleeved shirt or sleeved shirt and reflective safety vest.	<input checked="" type="checkbox"/> GLOVES: Cut-resistant gloves <input type="checkbox"/> OTHER:		
REQUIRED AND / OR RECOMMENDED EQUIPMENT					
Mobile Drum Carrier, safety cones, and caution tape					
Commitment to LPS – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.					
EXCLUSION ZONE: A 10' exclusion zone will be maintained around forklift.					
Assess 1JOB STEPS	Analyze 2POTENTIAL HAZARDS	Act 3CRITICAL ACTIONS			
1. Secure Work Area, Inspect 55-gal drums for proper condition, labeling, check drum ring and bolts for tightness, inspect mobile drum carrier.	1a. FALL: Tripping/falling due to uneven surface terrain 1b. CONTACT/EXPOSURE: Drums could potentially be damaged and contain hazardous material. Mobil drum carrier could potentially not be in good working condition causing malfunctioning during operation. 1c. EXERTION/CAUGHT: Potential pinching/exertion hazards while securing ring/tightening bolts	1a. Inspect walking path for uneven terrain, weather-related hazards (i.e. debris, puddles, ice, etc.), and other obstructions prior to accessing work area. 1a. Use established pathways and walk on stable, secure ground. 1a. Secure work area and coordinate and communicate the planned work activities with other personnel working in the area. 1a. Delineate work area with 42" safety cones. 1b. Prior to inspecting drums don cut-resistant gloves. If drum is not properly labeled, do not open and cease all drum transport activities. Immediately contact project manager and inform him/her of drum situation. 1b. Do not continue drum transport activities until further actions are determined by the project manager. 1b. If the drum is properly labeled, but leaking, improperly sealed or in poor condition, place drum in an over-pack drum. 1b. Inspect mobile drum carrier to ensure the overall integrity of the carrier. Look for rust marks or potential weak points where the drum carrier could malfunction. Inspect the wheels to ensure that they easily turn and nothing is impeding their movement. 1c. Keep back straight and knees slightly bent while securing drum ring/tightening bolt. Wear cut-resistant gloves.			
2. Position drum clamp in between drum ribs, securing drum clamp to drum with chain	2. CAUGHT: Pinching fingers between drum clamp and handle/chain.	2. Attach drum clamp with chain and tighten until snug. Do not place hands between drum clamp and drum as the chain is tightened; wear cut resistant gloves.			
3. Disengage safety latches on handle, pull handle down until drum is lifted off ground and safety latches are reengaged; slightly suspending drum off of the ground	3a. EXERTION/ CONTACT: Potential muscle strain associated with lifting/engaging drum/handle. Drum could shift/slip downward and crush toes. 3b. CAUGHT: Fingers could be pinched while engaging/disengaging safety latches on handle	3a. Ascertain whether the drum is overweight; if it is, then two people are needed to lower handle while drum is secured with clamp so that safety latches can be engaged. Keep body out of the line of fire of the handle (do not position head above handle) as it is being pushed down. Do not allow feet/toes to be positioned under the drum as it is being lifted; wear steel/composite toe boots. 3b. Wear cut-resistant gloves while disengaging/reengaging safety latches.			
4. Transport drums to designated location and disengage drum clamp (repeat Step 3 in reverse order)	4a. FALL: Tripping/ falling due to obstructions and uneven terrain. Potential for drum to fall during transport.	4a. Ensure transport path is free of potential obstructions that may cause the drum/carrier to become unstable. Position drum clamp between the ribs on the drum to prevent possible slipping.			

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Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy source – electricity, pressure, compression/tension.

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JOB SAFETY ANALYSIS Cntrl#: GEN-015		DATE 1/27/15	<input type="checkbox"/> NEW <input checked="" type="checkbox"/> REVISED	PAGE 1 of 2
JSA TYPE CATEGORY: GENERIC		WORK TYPE: Drilling	WORK ACTIVITY (Description): Monitoring and Recovery Well Development	
DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE	
Amy Hoffman	Staff Geologist	Mike Ritorto	Senior Hydrogeologist	
Ron Lombino	Staff Geologist	Daniel Abberton		
REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT				
<input type="checkbox"/> LIFE VEST <input checked="" type="checkbox"/> HARD HAT <input type="checkbox"/> LIFELINE / BODY HARNESS <input checked="" type="checkbox"/> SAFETY GLASSES	<input type="checkbox"/> GOGGLES <input type="checkbox"/> FACE SHIELD <input checked="" type="checkbox"/> HEARING PROTECTION (as needed) <input checked="" type="checkbox"/> SAFETY SHOES: <u>Composite-toe or steel toe boots</u>	<input type="checkbox"/> AIR PURIFYING RESPIRATOR <input type="checkbox"/> SUPPLIED RESPIRATOR <input checked="" type="checkbox"/> PPE CLOTHING: <u>Fluorescent reflective vest or high visibility clothing</u>	<input checked="" type="checkbox"/> GLOVES: <u>Leather, Nitrile and cut resistant</u> <input checked="" type="checkbox"/> OTHER: <u>Insect repellent, sunscreen (as needed)</u>	
REQUIRED AND / OR RECOMMENDED EQUIPMENT				
Required Equipment as needed: Truck Rig or support truck, Trailer, 42 inch Safety cones and flags, Caution Tape, Interface Probe, Power Source, Submersible Pump, Surge Block/Plunger, 20 lb. Fire Extinguisher, Holding Tanks and/or Buckets, Tools as needed: Socket and Pipe Wrench, Screw Driver, Pry Bar, Ratchet, Vault Key.				
COMMITMENT TO LPS - All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.				
Maintain a 20 Foot Exclusion Zone During Development Activities				
“SHOW ME YOUR HANDS”				
Driller and helper should show that hands are clear from controls and moving parts				
Assess 1JOB STEPS	Analyze 2POTENTIAL HAZARDS	Act 3CRITICAL ACTIONS		
1. Mobilization / Demobilization (Review Mobilization and Demobilization JSA)	1a. CONTACT: Equipment/property damage. 1b. FALL: Slip/trip/fall hazards.	1a. The truck rig's tower/derrick will be lowered and secured prior to mobilization. 1a. Set-up the work area / position equipment in a manner that eliminates or reduces the need for backing of trucks and trailers. 1a. All non-essential personnel should maintain an exclusion zone of 20 feet. 1a. Beep horn twice before backing up. 1a. When backing up with an attached trailer use a spotter if there is tight clearance simultaneously on multiple sides of the equipment or if turning angles limit driver visibility. Stay away from the line-of-fire. 1a. Inspect the driving path for uneven terrain. Level or avoid if needed. 1b Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 1b. Do not climb over stored materials/equipment; walk around. Store equipment at lowest potential energy.		
2. Open/close well.	2a. OVEREXERTION: Muscle strain (some wells have large vault covers). 2b. CAUGHT: Pinch points associated with removing/replacing manholes and working with hand tools. 2c. EXPOSURE: Potentially hazardous vapors. 2d. CONTACT: Traffic.	2a. Keep back straight, lift with legs, keep load close to body, and never reach with a load. Ensure that loads are balanced to reduce the potential for muscle strain. Two people are required when lifting objects over 50 lbs or when the shape makes the object difficult to lift. 2b. Wear leather gloves when working with well vault/cover and hand tools. Do not put fingers under well vault/cover. 2b. Use ratchet and pry bar for well cover and inspect before use. 2c. No open flames/heat sources. 2c. Allow well to vent after opening it and before starting development activities to minimize exposure to vapors. Air monitoring must be performed prior to set up and during the well development activities. Work on upwind side of well. 2d. Wear required PPE including high visibility clothing or reflective vest. 2d. Delineate work area with 42" safety cones and/or other barriers. Position vehicle to protect against oncoming traffic. 2d. Face traffic, maintain eye contact with oncoming vehicles, and establish a safe exit route.		

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Assess ¹ JOB STEPS	Analyze ² POTENTIAL HAZARDS	Act ³ CRITICAL ACTIONS
3. Develop well (mechanical surging).	<p>3a. CAUGHT: Cut hazards and finger pinch points.</p> <p>3b. CONTACT/EXPOSURE: Contamination (e.g., SPH, contaminated groundwater, vapors).</p> <p>3c. OVEREXERTION: Muscle strain from lifting equipment.</p> <p>3d. CONTACT: Injury while handling wench line/cable, or with active surging equipment</p>	<p>3a See 2b. 3a. Use required PPE including leather/cut-resistant gloves when handling development equipment. Identify finger/hand pinch points. Keep hands away from active surge equipment. 3a. All non-essential personnel should maintain an exclusion zone of 20 feet.</p> <p>3b. See 2c. 3b. Wear Nitrile gloves and safety glasses. Insert and remove surge block/plunger and line/cable slowly to avoid splashing at the surface. 3b. Use an absorbent pad to clean any spills.</p> <p>3c. See 2a. 3c. Use mechanical device to insert and remove surge block/plunger if greater than 50lb.</p> <p>3d. If using a drill rig, inspect all wench lines/cables for any kinks or if frayed prior to use. Replace any damaged lines/cables. Review Drill Rig checklist prior to development activities.</p> <p>3d. See 3a.</p>
4. Purging well (pumping water to holding tanks/drums/buckets).	<p>4a. CAUGHT: Pinch points associated with connecting hose to tank. Pinch points associated with handling pump and hoses.</p> <p>4b. FALL: Using side mounted ladder when attaching hose to tank. Slip, trip, fall from lines/hoses</p> <p>4c. CONTACT: Contamination (e.g., SPH, contaminated groundwater).</p> <p>4d. EXERTION: Muscle strain from lifting/carrying equipment.</p> <p>4e. FALL: Spilled purge water.</p>	<p>4a. See 3a. 4a. Ensure that fingers are not placed near coupling when attaching and securing hose(s). Do not place fingers under pump/hoses. Wear leather or cut-resistant gloves when handling pump/hose(s). 4a. Keep hands clear from any line of fire.</p> <p>4b. Inspect ladder steps to make sure steps are not bent/damaged and free of debris/fluid. 4b. Use three points of contact at all times when using ladder. 4b. Utilize anti-whip cords on all compressed hoses. Keep hoses and lines coiled and organized out of designated walking paths around the work zone.</p> <p>4c. Secure water hose. 4c. Do not overfill tanks, and purge/transfer liquids in such a manner that they do not splash. (See 3b). 4c. Dispose of used materials/PPE in the designated impacted PPE container.</p> <p>4d. See 2a.</p> <p>4e. Clean up any spills using absorbent pads or spill kits.</p>
5. Decontaminate equipment	<p>5a. CONTACT/EXPOSURE: Contamination (e.g., SPH, contaminated groundwater, vapors).</p> <p>5b. EXPOSURE/CONTACT: Chemicals in cleaning solution</p>	<p>5a. See 3b.</p> <p>5b. Decontaminate equipment in well-ventilated area. Wear nitrile gloves to avoid skin contact with cleaning solutions.</p>

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JOB SAFETY ANALYSIS Ctrl. No. GEN-005		DATE 2/4/2015	<input type="checkbox"/> NEW <input checked="" type="checkbox"/> REVISED	PAGE 1 of 2
JSA TYPE CATEGORY Generic	WORK TYPE: Gauging and Sampling	WORK ACTIVITY (Description): Gauging and Sampling		
DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE	
Gina Masciello	Project Scientist	Joe Gentile	Corp H&S Mgr	
Louis Goldstein	Staff Engineer	Michael Ritorto	Project Hydrogeologist	
		Louis Goldstein (<i>as part of annual review</i>)	Staff Engineer	
REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT				
<input checked="" type="checkbox"/> LIFE VEST <input checked="" type="checkbox"/> HARD HAT <input type="checkbox"/> LIFELINE / BODY HARNESS <input checked="" type="checkbox"/> SAFETY GLASSES	<input type="checkbox"/> GOGGLES <input type="checkbox"/> FACE SHIELD <input type="checkbox"/> HEARING PROTECTION <input checked="" type="checkbox"/> SAFETY SHOES: <u>Composite-toe or steel toe boots</u>	<input type="checkbox"/> AIR PURIFYING RESPIRATOR <input type="checkbox"/> SUPPLIED RESPIRATOR <input checked="" type="checkbox"/> PPE CLOTHING: <u>Fluorescent reflective vest or high visibility clothing</u>	<input checked="" type="checkbox"/> GLOVES: <u>Leather, Nitrile and cut resistant</u> <input checked="" type="checkbox"/> OTHER: <u>Knee pads, Insect Repellant, sunscreen (as needed)</u>	
REQUIRED AND / OR RECOMMENDED EQUIPMENT				
42-inch Safety Cones, Caution Tape, Interface Probe and/or Water Level Meter, 20-lb., Type ABC Fire Extinguisher, Buckets. Tools as needed: Socket Wrench, Screw Driver, Crow Bar, Mallet, and Wire Brush.				
Commitment to LPS – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.				
Assess 1JOB STEPS	Analyze 2POTENTIAL HAZARDS	Act 3CRITICAL ACTIONS		
1. Mobilization to monitoring well(s).	1a. FALL: Personal injury from slip/trip/fall due to uneven terrain and/or obstructions. 1b. CONTACT: With traffic/third parties. 1c. EXPOSURE: To biological hazards.	1a. Inspect pathway and plan for most suitable designated pathway prior to mobilization. 1a. Use established pathways, walk and/or drive on stable, secure ground and avoid steep hills or uneven terrain. 1a. If working near open water with an unguarded edge, wear life vest. 1b. Identify potential traffic sources and delineate work area with 42-inch traffic safety cones. Position vehicle to protect against oncoming traffic. Use caution tape to provide a more visible delineation of the work area if necessary. 1b. Wear appropriate PPE including high visibility clothing or reflective vest. 1b. Face traffic, maintain eye contact with oncoming vehicles, and establish a safe exit route. 1c. Inspect work area for bees and insects. 1c. Use insect/tick repellent as necessary.		
2. Open/close well.	2a. ERGONOMICS: Muscle strain. 2b. CAUGHT: Pinch/crush points associated with removing/replacing manholes and working with hand tools. 2c. CAUGHT: Pinch points associated with placing J-plug back onto PVC pipe. 2d. EXPOSURE: To potential hazardous vapors.	2a. Use proper lifting techniques; keep back straight, lift with legs and bend knees when reaching to open/close well. 2b. Wear leather gloves or cut resistant gloves when working with well cover and hand tools. 2b. Use proper tools (ratchet and pry bar for well cover) and inspect before use. 2b. Do not put fingers under well cover. 2c. See 2b. 2c. Keep fingers out of line-of-fire when securing cap 2d. No open flames/heat sources. 2d. To minimize exposure to vapors allow well to vent after opening it and before sampling activities begin. 2d. Stand up-wind, if possible, to avoid vapors.		
3. Gauge well.	3a. CONTACT: With contamination (e.g. contaminated groundwater). 3b. CONTACT: With traffic.	3a. Wear chemical-resistant disposable gloves (over cut-resistant gloves) and safety glasses when gauging well. 3a. Insert and remove probe slowly to avoid splashing. 3a. Use an absorbent pad to clean probe. 3b. See 1b.		

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Assess ¹ JOB STEPS	Analyze ² POTENTIAL HAZARDS	Act ³ CRITICAL ACTIONS
4. Purge and sample well.	4a. EXPOSURE/CONTACT: To contamination (e.g., SPH, contaminated groundwater, vapors) and/or sample preservatives.	4a. Open and fill sample jars slowly to avoid splashing and contact with preservatives. 4a. Wear cut-resistant gloves and chemical-resistant disposable gloves when sampling. 4a. Fill sample containers over purge container to avoid spilling water onto the ground. 4a. Use an absorbent pad to clean spills. 4a. When using a bailer to purge a well, pull the bailer slowly from the well to avoid splash hazards. 4a. When sampling or purging the water using a bailer, pour out water slowly to reduce the potential for splash hazards with groundwater. 4a. When using a tubing valve always remove the valve slowly after sample collection to release any pressure and avoid pressurized splash hazards 4a. When collecting a groundwater sample always point sampling apparatus (tubing, bailer, etc.) away from face and body.
4. Purge and sample well (Continued).	4b. CONTACT: Personal injury from cuts, abrasions, or punctures by glassware or sharp objects. 4c. ERGONOMICS: Muscle strain while carrying equipment. 4d. CONTACT: With traffic. 4e. CONTACT: Pinch points with groundwater pump components (i.e. wheel, line, clamps) 4f. ERGONOMICS: Muscle strain from repetitive motion of bailing and sampling a well	4b. To avoid spills or breakage, place sample ware on even surface. 4b. Do not over tighten caps on glass sample ware. 4b. Wear chemical-resistant nitrile disposable gloves over cut-resistant (i.e. Kevlar) gloves when sampling and handling glassware (i.e., VOA vials) or when using cutting tools. 4c. Use proper lifting techniques when handling/moving equipment; bend knees and keep back straight. 4c. Use mechanical assistance or team lifting techniques when equipment is 50 lbs. or heavier. 4c. Make multiple trips to carry equipment. 4d. See 1b. 4e. Wear leather gloves when working with groundwater pumps 4e. Never place hands on or near pinch points such as the wheel, clamps or other moving parts during pump operations 4e. Use correct the correct mechanisms, such as a pump reel, to lower pump into well 4e. Never attempt to manually stop any moving part of equipment including hose reels and/or tubing. 4f. See 4c. 4f. Include a stretch break when repetitive motions are part of the task.
5. Management of purge water.	5a. EXPOSURE/CONTACT: To contamination (e.g., SPH, contaminated groundwater, vapors). 5b. ERGONOMICS: Muscle strain from lifting/carrying and moving containers.	5a. Do not overfill container and pour liquids slowly so that they do not splash. 5a. Properly dispose of used materials/PPE in appropriate container in designated storage area. 5b. Use proper lifting techniques when lifting / carrying or moving container(s) (see 4c.). 5b. Do not overfill container(s).
6. Decontaminate equipment.	6a. EXPOSURE/CONTACT: To contamination (e.g., SPH, contaminated groundwater, vapors). 6b. CAUGHT: Pinch points associated with handling hand tools	6a. Work on the upwind side, where possible, of decon area. 6a. Wear chemical-resistant disposable gloves and safety glasses. 6a. Use an absorbent pad to clean spills. 6b. See 2b. 6b. Inspect hand tools for sharp edges before decontaminating

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JOB SAFETY ANALYSIS Ctrl. No. GEN-013		DATE: 01/16/2015	<input type="checkbox"/> NEW <input checked="" type="checkbox"/> REVISED	PAGE 1 of 2
JSA TYPE CATEGORY: GENERIC	WORK TYPE Gauging and Sampling	WORK ACTIVITY (Description) Soil Vapor Sampling (Permanent Monitoring Points)		
DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE	
Jeff Wills	Project Hydrogeologist	Daniel Abberton	SHSM	
		Mike Ritorto	Senior Hydrogeologist	
		Julie Moriarity	Staff Scientist	
REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT				
<input type="checkbox"/> LIFE VEST <input checked="" type="checkbox"/> HARD HAT <input type="checkbox"/> LIFELINE / BODY HARNESS <input checked="" type="checkbox"/> SAFETY GLASSES	<input type="checkbox"/> GOGGLES <input type="checkbox"/> FACE SHIELD <input type="checkbox"/> HEARING PROTECTION <input checked="" type="checkbox"/> SAFETY SHOES: <u>Steel-toe boots</u>	<input type="checkbox"/> AIR PURIFYING RESPIRATOR <input type="checkbox"/> SUPPLIED RESPIRATOR <input checked="" type="checkbox"/> PPE CLOTHING: <u>Fluorescent reflective vest or high visibility clothing</u>	<input checked="" type="checkbox"/> GLOVES: <u>Cut-resistant & Nitriles</u> <input checked="" type="checkbox"/> OTHER: <u>Bug Spray, Sun Screen, Knee Pads or kneeling pad</u>	
REQUIRED AND / OR RECOMMENDED EQUIPMENT				
9/16" Socket and Wrench, Non-Toxic Clay, Teflon-Lined Tubing, Masterflex Tubing, 3-Way Stopcock, Air Pump with Low Flow, Dry Cal, Enclosure (Bucket with 2 holes), Helium Gas Canister, Summa Canisters and Flow Controllers, MultiRae Gas Meters, CO2/O2 Meters, Helium Detector, Tubing Cutter, 42-inch Safety Cones, Caution Tape or Retractable Cone Bars				
COMMITMENT TO LPS - All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.				
Exclusion Zone: Maintain a 5-Foot Exclusion Zone for Non-Essential Personnel				
ACCESS 1JOB STEPS	ANALYZE 2POTENTIAL HAZARDS	ACT 3CRITICAL ACTIONS		
1. Define and secure work area.	1a. FALL: Potential tripping hazards. 1b. CONTACT: Potential contact with moving vehicles or pedestrians. 1c. OVEREXERTION: Muscle strain while lifting and carrying equipment.	1a. Ensure work area is secure and inform others (third party) of work activity. 1a. Remove tripping hazards and inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 1b. If working alongside roads, look both ways before entering roadways, face traffic, and utilize work vehicle to protect employees. 1b. Delineate work area (including vehicles) with traffic safety cones and caution tape or retractable cone bars. 1b. Maintain a 5 foot exclusion zone. 1b. Wear high visibility clothing or reflective safety vest. 1c. When carrying equipment to/from work area, keep back straight, lift with legs, keep load close to body, never reach with a load. Ensure that loads are balanced. Use mechanical assistance/make multiple trips to carry equipment.		
2. Remove well cover / close well cover.	2a. CONTACT/CAUGHT: Pinch points and scrapes associated with hand tools and well covers. 2b. FALL: Potential tripping hazards associated with installing bolts. 2c. OVEREXERTION: Physical exertion to remove bolts that were over torque or stripped.	2a. Keep hands away from pinch points. 2a. Use hand tools with extensions to remove and replace well covers. 2a. Wear cut-resistant gloves. 2a. Use knee pads or kneeling mat when repetitive kneeling on rough ground is anticipated. 2b. Place security bolts in secure location so not to create tripping hazards. Replace security bolts so that they fit flush with monitoring well covers. 2c. Replace any security bolts that show signs of stripping. Do not over tighten. 2c. Use body positioning and bending techniques that minimize muscle strain; keep back straight, bend at the knees. 2c. See 2a.		
3. Remove / replace brass caps at the end of the sample tubing.	3a. CONTACT: Pinch points associated with hand tools and brass caps. 3b. EXPOSURE: Potential pathway for vapors to migrate to land surface.	3a. Use wrench to remove and replace brass caps. 3a. Wear cut-resistant gloves to protect against pinch points and scrapes. 3b. Replace brass caps immediately upon completion to avoid soil vapors migrating to the surface through sample tubing. 3b. Stand up wind of sample point location.		

¹ Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

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³ Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

ACCESS 1JOB STEPS	ANALYZE 2POTENTIAL HAZARDS	ACT 3CRITICAL ACTIONS
4. Set up soil vapor sampling equipment and calibration of meters.	<p>4a. FALL: Potential tripping hazards associated with equipment and tubing.</p> <p>4b. CONTACT: Pinch points associated with handling equipment.</p> <p>4c. EXPOSURE: Inhalation of calibration gas and helium.</p>	<p>4a. Place equipment in one area close to the sampling location.</p> <p>4a. Keep tubing slack to a minimum and locate the summa canister as close to the sampling location as possible.</p> <p>4a. Avoid stepping over equipment and tubing.</p> <p>4b. Do not place fingers/hands under sampling equipment.</p> <p>4b. Make multiple trips when unloading equipment in work area.</p> <p>4b. Wear cut-resistant gloves to protect against pinch points while handling sampling equipment.</p> <p>4c. Review SDS for each type of calibration gas used before calibrating.</p> <p>4c. Calibrate meters in a well vented area and keep air flow regulator away from face.</p> <p>4c. Close valve on canisters after use to avoid inhalation of excess helium or calibration gas.</p> <p>4c. Stand up wind of bucket during helium tracer gas test.</p>
5. Screen sample tubing with multiple gas and CO ₂ /O ₂ meters.	<p>5a. FALL: Potential tripping hazards associated with equipment.</p> <p>5b. EXPOSURE: Inhalation of soil vapor</p>	<p>5a. See 4a</p> <p>5a. Identify area where equipment is to be stored within the work area (away from main walking path).</p> <p>5a. Don't leave equipment on the ground. Return equipment to storage area between uses.</p> <p>5b. See 3b.</p> <p>5b. Use master flex to connect tubing to meter.</p> <p>5b. Stand on opposite side of meter vent and upwind of soil vapor point during screening activities.</p>
6. Cleaning Work Area.	<p>6a. FALL: Potential tripping hazards associated with equipment and tubing.</p> <p>6b. CONTACT: Storing and transport of equipment in car.</p>	<p>6a. See 4a.</p> <p>6a. See 5a.</p> <p>6b. Ensure that equipment is placed securely in the vehicle. Do not stack equipment on top of each other. Secure equipment so that it will not slide while being transported.</p> <p>6b. Wear cut-resistant gloves while handling/loading equipment.</p>

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JOB SAFETY ANALYSIS		Ctrl. No. GEN-006	DATE 5/14/2015	<input type="checkbox"/> NEW <input checked="" type="checkbox"/> REVISED	PAGE 1 of 2
JSA TYPE CATEGORY Generic		WORK TYPE Surveying		WORK ACTIVITY (Description) Elevation Surveying	
DEVELOPMENT TEAM		POSITION / TITLE		REVIEWED BY:	POSITION / TITLE
Mark M Emmons		Project Engineer		Daniel Abberton	Health and Safety Officer
Bjorn Wespestad		Senior Engineer		Michael Ritorto	Project Hydrogeologist
REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT					
<input type="checkbox"/> LIFE VEST <input checked="" type="checkbox"/> HARD HAT <input type="checkbox"/> LIFELINE / BODY HARNESS <input checked="" type="checkbox"/> SAFETY GLASSES	<input type="checkbox"/> GOGGLES <input type="checkbox"/> FACE SHIELD <input type="checkbox"/> HEARING PROTECTION <input checked="" type="checkbox"/> SAFETY SHOES: <u>Steel-toe boots</u>	<input type="checkbox"/> AIR PURIFYING RESPIRATOR <input type="checkbox"/> SUPPLIED RESPIRATOR <input checked="" type="checkbox"/> PPE CLOTHING: <u>Fluorescent reflective vest or high visibility clothing</u>	<input checked="" type="checkbox"/> GLOVES: <u>Cut-resistant or leather</u> <input checked="" type="checkbox"/> OTHER: <u>Long sleeve Shirt</u>		
REQUIRED AND / OR RECOMMENDED EQUIPMENT					
Surveying equipment (i.e., leveling rod/measuring ruler, tripod and scope).					
COMMITMENT TO LPS - All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.					
Assess 1JOB STEPS	Analyze 2POTENTIAL HAZARDS	Act 3CRITICAL ACTIONS			
1. Check in with Site manager/ property owner.	1a. CONTACT/EXPOSURE/FALL: Lack of communication could result in H&S incident.	1a. Inform Site personnel of work scope, timeline and location(s). 1a. Inquire about other activities taking place at the Site. 1a. If applicable, obtain General Work permit for the day.			
2. Locate surveying position for instrument and rod and set-up work area	2a. FALL: Slip/trip hazards. 2b. CONTACT: Traffic (surveying locations could potentially be located in parking areas and sidewalks). 2c. OVEREXERTION: Hazard due to carrying, lifting, and bending while transporting equipment. 2d. CAUGHT/CONTACT: Pinch Points / sharp edges associated with setting up the tripod.	2a. Inspect area for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to setting up at the survey location. Keep eyes engaged with walking surface while in movement. Remember "Walking is Working" 2a. Conduct housekeeping and maintain clear paths to walk in and remove debris as required. 2b. Be aware of oncoming traffic. Utilize a flagman / spotter for locations in streets or high-traffic areas. 2b. Place 42 inch cones around the work area, and delineate work zone with caution tape, snow fencing or safety bars, if necessary. 2b. Wear appropriate PPE including long sleeve high visibility clothing and or reflective safety vest. 2b. Face traffic, maintain eye contact with oncoming vehicles, and establish a safe exit route. 2c. Use proper body positioning and lifting techniques; keep back straight, lift with legs, keep load close to body, and never reach with a load. 2c. Avoid carrying too much equipment at one time and team-lift equipment that is more than 50 lb. 2d. Wear cut resistant gloves when handling the tripod and keep fingers away from pinch points located near moving parts of the tripod. Don't carry tripod by the pointed ends.			
3. Open / close manhole cover to well that is being surveyed (if necessary).	3a. OVEREXERTION: Muscle strain 3b. CAUGHT: Pinch points associated with removing / replacing manholes and working with hand tools. 3c. EXPOSURE: To potentially hazardous vapors. To biological hazards. 3d. CONTACT: With traffic.	3a. See 1c. Bend knees when reaching to open well. Use manhole lifting hook or pry bar to avoid bending. 3b. Wear leather gloves or cut resistant gloves when working with well cover and hand tools. 3b. Use proper tools (ratchet and crowbar or pry bar for well cover) and inspect before use. 3b. Do not put fingers under well cover. 3c. No open flames/heat sources. 3c. To minimize exposure to vapors allow well to vent after opening it and before survey activities begin. 3c. Work on the upwind side of manhole/well. 3c. Use caution while opening up lids to inspect work area for bees and insects inside of covers. 3c. Use insect/tick repellent as necessary. 3d. See 2b.			

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Assess ¹ JOB STEPS	Analyze ² POTENTIAL HAZARDS	Act ³ CRITICAL ACTIONS
4. Perform survey.	4a. FALL: Slip/trip hazards 4b. CONTACT: Traffic (surveying locations could be potentially located in parking areas and sidewalks)	4a. See 2a. 4b. See 2b. 4b. Personnel using the scope will be devoting most of their attention to the surveying activity and shall be aware of vehicular and pedestrian traffic. Personnel holding the measuring stick should be extra vigilant of survey personnel and communicate any potential hazards to the instrument person via handheld radio or similar means. Ensure reflective safety vest is worn.
5. Break down work area.	5a. CONTACT: Traffic (surveying locations can potentially be located in parking areas and sidewalks). 5b. EXERTION: Hazard due to carrying, lifting, and bending while transporting equipment	5a. See 2b. 5b. See 2c.

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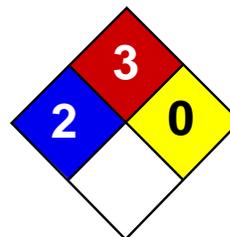
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Site-Specific Health and safety Plan
211 West 29th Street, Manhattan, New York

APPENDIX B

**Hazard Communication MSDS / SDS for
Chemicals Used**



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet Benzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Benzene

Catalog Codes: SLB1564, SLB3055, SLB2881

CAS#: 71-43-2

RTECS: CY1400000

TSCA: TSCA 8(b) inventory: Benzene

CI#: Not available.

Synonym: Benzol; Benzine

Chemical Name: Benzene

Chemical Formula: C6-H6

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Benzene	71-43-2	100

Toxicological Data on Ingredients: Benzene: ORAL (LD50): Acute: 930 mg/kg [Rat]. 4700 mg/kg [Mouse]. DERMAL (LD50): Acute: >9400 mg/kg [Rabbit]. VAPOR (LC50): Acute: 10000 ppm 7 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of eye contact (irritant), of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. **MUTAGENIC EFFECTS:** Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Classified Reproductive system/toxin/female [POSSIBLE]. The substance is toxic to blood, bone marrow, central nervous system (CNS). The substance may be toxic to liver, Urinary System. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 497.78°C (928°F)

Flash Points: CLOSED CUP: -11.1°C (12°F). (Setaflash)

Flammable Limits: LOWER: 1.2% UPPER: 7.8%

Products of Combustion: These products are carbon oxides (CO, CO₂).

Fire Hazards in Presence of Various Substances:

Highly flammable in presence of open flames and sparks, of heat. Slightly flammable to flammable in presence of oxidizing materials. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Explosive in presence of oxidizing materials, of acids.

Fire Fighting Media and Instructions:

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:

Extremely flammable liquid and vapor. Vapor may cause flash fire. Reacts on contact with iodine heptafluoride gas. Dioxygenyl tetrafluoroborate is as very powerful oxidant. The addition of a small particle to small samples of benzene, at ambient temperature, causes ignition. Contact with sodium peroxide with benzene causes ignition. Benzene ignites in contact with powdered chromic anhydride. Vigorous or incandescent reaction with hydrogen + Raney nickel (above 210 C) and bromine trifluoride.

Special Remarks on Explosion Hazards:

Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction

of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid (or its explosive anhydride, dimanganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powerful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 0.5 STEL: 2.5 (ppm) from ACGIH (TLV) [United States] TWA: 1.6 STEL: 8 (mg/m³) from ACGIH (TLV) [United States] TWA: 0.1 STEL: 1 from NIOSH TWA: 1 STEL: 5 (ppm) from OSHA (PEL) [United States] TWA: 10 (ppm) from OSHA (PEL) [United States] TWA: 3 (ppm) [United Kingdom (UK)] TWA: 1.6 (mg/m³) [United Kingdom (UK)] TWA: 1 (ppm) [Canada] TWA: 3.2 (mg/m³) [Canada] TWA: 0.5 (ppm) [Canada] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor:

Aromatic. Gasoline-like, rather pleasant. (Strong.)

Taste: Not available.

Molecular Weight: 78.11 g/mole

Color: Clear Colorless. Colorless to light yellow.

pH (1% soln/water): Not available.

Boiling Point: 80.1 (176.2°F)

Melting Point: 5.5°C (41.9°F)

Critical Temperature: 288.9°C (552°F)

Specific Gravity: 0.8787 @ 15 C (Water = 1)

Vapor Pressure: 10 kPa (@ 20°C)

Vapor Density: 2.8 (Air = 1)

Volatility: Not available.

Odor Threshold: 4.68 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; $\log(\text{oil/water}) = 2.1$

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:

Miscible in alcohol, chloroform, carbon disulfide oils, carbon tetrachloride, glacial acetic acid, diethyl ether, acetone. Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, incompatibles.

Incompatibility with various substances: Highly reactive with oxidizing agents, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid (or its explosive anhydride, dimanganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powerful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 930 mg/kg [Rat]. Acute dermal toxicity (LD50): >9400 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 10000 7 hours [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. **MUTAGENIC EFFECTS:** Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. **DEVELOPMENTAL TOXICITY:** Classified Reproductive system/toxin/female [POSSIBLE]. Causes damage to the following organs: blood, bone marrow, central nervous system (CNS). May cause damage to the following organs: liver, Urinary System.

Other Toxic Effects on Humans:

Very hazardous in case of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive effects (female fertility, Embryotoxic and/or foetotoxic in animal) and birth defects. May affect genetic material (mutagenic). May cause cancer (tumorigenic, leukemia) Human: passes the placental barrier, detected in maternal milk.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Causes skin irritation. It can be absorbed through intact skin and affect the liver, blood, metabolism, and urinary system. Eyes: Causes eye irritation. Inhalation: Causes respiratory tract and mucous membrane irritation. Can be absorbed through the lungs. May affect behavior/Central and Peripheral nervous systems (somnolence, muscle weakness, general anesthetic, and other symptoms similar to ingestion), gastrointestinal tract (nausea), blood metabolism, urinary system. Ingestion: May be harmful if swallowed. May cause gastrointestinal tract irritation including vomiting. May affect behavior/Central and Peripheral nervous systems (convulsions, seizures, tremor, irritability, initial CNS stimulation followed by depression, loss of coordination, dizziness, headache, weakness, pallor, flushing), respiration (breathlessness and chest constriction), cardiovascular system, (shallow/rapid pulse), and blood.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Benzene UNNA: 1114 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Benzene California prop. 65 (no significant risk level): Benzene: 0.007 mg/day (value) California prop. 65: This product contains the following ingredients

for which the State of California has found to cause cancer which would require a warning under the statute: Benzene Connecticut carcinogen reporting list.: Benzene Connecticut hazardous material survey.: Benzene Illinois toxic substances disclosure to employee act: Benzene Illinois chemical safety act: Benzene New York release reporting list: Benzene Rhode Island RTK hazardous substances: Benzene Pennsylvania RTK: Benzene Minnesota: Benzene Michigan critical material: Benzene Massachusetts RTK: Benzene Massachusetts spill list: Benzene New Jersey: Benzene New Jersey spill list: Benzene Louisiana spill reporting: Benzene California Director's list of Hazardous Substances: Benzene TSCA 8(b) inventory: Benzene SARA 313 toxic chemical notification and release reporting: Benzene CERCLA: Hazardous substances.: Benzene: 10 lbs. (4.536 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):

R11- Highly flammable. R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes. R45- May cause cancer. R62- Possible risk of impaired fertility. S2- Keep out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S46- If swallowed, seek medical advice immediately and show this container or label. S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

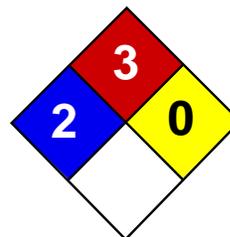
References: Not available.

Other Special Considerations: Not available.

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Last Updated: 11/06/2008 12:00 PM

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Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet Toluene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Toluene

Catalog Codes: SLT2857, SLT3277

CAS#: 108-88-3

RTECS: XS5250000

TSCA: TSCA 8(b) inventory: Toluene

CI#: Not available.

Synonym: Toluol, Tolu-Sol; Methylbenzene; Methacide; Phenylmethane; Methylbenzol

Chemical Name: Toluene

Chemical Formula: C6-H5-CH3 or C7-H8

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Toluene	108-88-3	100

Toxicological Data on Ingredients: Toluene: ORAL (LD50): Acute: 636 mg/kg [Rat]. DERMAL (LD50): Acute: 14100 mg/kg [Rabbit]. VAPOR (LC50): Acute: 49000 mg/m 4 hours [Rat]. 440 ppm 24 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, the nervous system, liver, brain, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 480°C (896°F)

Flash Points: CLOSED CUP: 4.4444°C (40°F). (Setaflash) OPEN CUP: 16°C (60.8°F).

Flammable Limits: LOWER: 1.1% UPPER: 7.1%

Products of Combustion: These products are carbon oxides (CO, CO₂).

Fire Hazards in Presence of Various Substances:

Flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

Flammable liquid, insoluble in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards:

Toluene forms explosive reaction with 1,3-dichloro-5,5-dimethyl-2,4-imidazolididione; dinitrogen tetraoxide; concentrated nitric acid, sulfuric acid + nitric acid; N₂O₄; AgClO₄; BrF₃; Uranium hexafluoride; sulfur dichloride. Also forms an explosive mixture with tetranitromethane.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:

Toxic flammable liquid, insoluble or very slightly soluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage**Precautions:**

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.

Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 200 STEL: 500 CEIL: 300 (ppm) from OSHA (PEL) [United States] TWA: 50 (ppm) from ACGIH (TLV) [United States] SKIN TWA: 100 STEL: 150 from NIOSH [United States] TWA: 375 STEL: 560 (mg/m³) from NIOSH [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweet, pungent, Benzene-like.

Taste: Not available.

Molecular Weight: 92.14 g/mole

Color: Colorless.

pH (1% soln/water): Not applicable.

Boiling Point: 110.6°C (231.1°F)

Melting Point: -95°C (-139°F)

Critical Temperature: 318.6°C (605.5°F)

Specific Gravity: 0.8636 (Water = 1)

Vapor Pressure: 3.8 kPa (@ 25°C)

Vapor Density: 3.1 (Air = 1)

Volatility: Not available.

Odor Threshold: 1.6 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; $\log(\text{oil/water}) = 2.7$

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:

Soluble in diethyl ether, acetone. Practically insoluble in cold water. Soluble in ethanol, benzene, chloroform, glacial acetic acid, carbon disulfide. Solubility in water: 0.561 g/l @ 25 deg. C.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources (flames, sparks, static), incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Incompatible with strong oxidizers, silver perchlorate, sodium difluoride, Tetranitromethane, Uranium Hexafluoride. Frozen Bromine Trifluoride reacts violently with Toluene at -80 deg. C. Reacts chemically with nitrogen oxides, or halogens to form nitrotoluene, nitrobenzene, and nitrophenol and halogenated products, respectively.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 636 mg/kg [Rat]. Acute dermal toxicity (LD50): 14100 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 440 24 hours [Mouse].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, the nervous system, liver, brain, central nervous system (CNS).

Other Toxic Effects on Humans:

Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals:

Lowest Published Lethal Dose: LDL [Human] - Route: Oral; Dose: 50 mg/kg LCL [Rabbit] - Route: Inhalation; Dose: 55000 ppm/40min

Special Remarks on Chronic Effects on Humans:

Detected in maternal milk in human. Passes through the placental barrier in human. Embryotoxic and/or foetotoxic in animal. May cause adverse reproductive effects and birth defects (teratogenic). May affect genetic material (mutagenic)

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Causes mild to moderate skin irritation. It can be absorbed to some extent through the skin. Eyes: Causes mild to moderate eye irritation with a burning sensation. Splash contact with eyes also causes conjunctivitis, blepharospasm, corneal edema, corneal abrasions. This usually resolves in 2 days. Inhalation: Inhalation of vapor may cause respiratory tract irritation causing coughing and wheezing, and nasal discharge. Inhalation of high concentrations may affect behavior and cause central nervous system effects characterized by nausea, headache, dizziness, tremors, restlessness, lightheadedness, exhilaration, memory loss, insomnia, impaired reaction time, drowsiness, ataxia, hallucinations, somnolence, muscle contraction or spasticity, unconsciousness and coma. Inhalation of high concentration of vapor may also affect the cardiovascular system (rapid heart beat, heart palpitations, increased or decreased blood pressure, dysrhythmia,), respiration (acute pulmonary edema, respiratory depression, apnea, asphyxia), cause vision disturbances and dilated pupils, and cause loss of appetite. Ingestion: Aspiration hazard. Aspiration of Toluene into the lungs may cause chemical pneumonitis. May cause irritation of the digestive tract with nausea, vomiting, pain. May have effects similar to that of acute inhalation. Chronic Potential Health Effects: Inhalation and Ingestion: Prolonged or repeated exposure via inhalation may cause central nervous system and cardiovascular symptoms similar to that of acute inhalation and ingestion as well liver damage/failure, kidney damage/failure (with hematuria, proteinuria, oliguria, renal tubular acidosis), brain damage, weight loss, blood (pigmented or nucleated red blood cells, changes in white blood cell count), bone marrow changes, electrolyte imbalances (Hypokalemia, Hypophosphatemia), severe, muscle weakness and Rhabdomyolysis. Skin: Repeated or prolonged skin contact may cause defatting dermatitis.

Section 12: Ecological Information

Ecotoxicity:

Ecotoxicity in water (LC50): 313 mg/l 48 hours [Daphnia (daphnia)]. 17 mg/l 24 hours [Fish (Blue Gill)]. 13 mg/l 96 hours [Fish (Blue Gill)]. 56 mg/l 24 hours [Fish (Fathead minnow)]. 34 mg/l 96 hours [Fish (Fathead minnow)]. 56.8 ppm any hours [Fish (Goldfish)].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Toluene UNNA: 1294 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Toluene California prop. 65 (no significant risk level): Toluene: 7 mg/day (value) California prop. 65 (acceptable daily intake level): Toluene: 7 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Toluene Connecticut hazardous material survey.: Toluene Illinois

toxic substances disclosure to employee act: Toluene Illinois chemical safety act: Toluene New York release reporting list: Toluene Rhode Island RTK hazardous substances: Toluene Pennsylvania RTK: Toluene Florida: Toluene Minnesota: Toluene Michigan critical material: Toluene Massachusetts RTK: Toluene Massachusetts spill list: Toluene New Jersey: Toluene New Jersey spill list: Toluene Louisiana spill reporting: Toluene California Director's List of Hazardous Substances.: Toluene TSCA 8(b) inventory: Toluene TSCA 8(d) H and S data reporting: Toluene: Effective date: 10/04/82; Sunset Date: 10/0/92 SARA 313 toxic chemical notification and release reporting: Toluene CERCLA: Hazardous substances.: Toluene: 1000 lbs. (453.6 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):

R11- Highly flammable. R20- Harmful by inhalation. S16- Keep away from sources of ignition - No smoking. S25- Avoid contact with eyes. S29- Do not empty into drains. S33- Take precautionary measures against static discharges.

HMS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

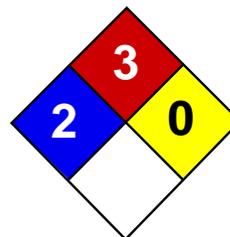
References: Not available.

Other Special Considerations: Not available.

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Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet

Ethylbenzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Ethylbenzene

Catalog Codes: SLE2044

CAS#: 100-41-4

RTECS: DA0700000

TSCA: TSCA 8(b) inventory: Ethylbenzene

CI#: Not available.

Synonym: Ethyl Benzene; Ethylbenzol; Phenylethane

Chemical Name: Ethylbenzene

Chemical Formula: C₈H₁₀

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Ethylbenzene	100-41-4	100

Toxicological Data on Ingredients: Ethylbenzene: ORAL (LD50): Acute: 3500 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

Potential Chronic Health Effects:

Slightly hazardous in case of skin contact (irritant, sensitizer). **CARCINOGENIC EFFECTS:** Classified 2B (Possible for human.) by IARC. **MUTAGENIC EFFECTS:** Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance may be toxic to central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 432°C (809.6°F)

Flash Points:

CLOSED CUP: 15°C (59°F). (Tagliabue.) OPEN CUP: 26.667°C (80°F) (Cleveland) (CHRIS, 2001) CLOSED CUP: 12.8 C (55 F) (Bingham et al, 2001; NIOSH, 2001) CLOSED CUP: 21 C (70 F) (NFPA)

Flammable Limits: LOWER: 0.8% - 1.6%UPPER: 6.7% - 7%

Products of Combustion: These products are carbon oxides (CO, CO₂).

Fire Hazards in Presence of Various Substances: Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of heat.

Fire Fighting Media and Instructions:

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:

Vapor may travel considerable distance to source of ignition and flash back. Vapors may form explosive mixtures with air. When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards: Vapors may form explosive mixtures in air.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Sensitive to light. Store in light-resistant containers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 100 STEL: 125 (ppm) from OSHA (PEL) [United States] TWA: 435 STEL: 545 from OSHA (PEL) [United States] TWA: 435 STEL: 545 (mg/m³) from NIOSH [United States] TWA: 100 STEL: 125 (ppm) from NIOSH [United States] TWA: 100 STEL: 125 (ppm) from ACGIH (TLV) [United States] TWA: 100 STEL: 125 (ppm) [United Kingdom (UK)] TWA: 100 STEL: 125 (ppm) [Belgium] TWA: 100 STEL: 125 (ppm) [Finland] TWA: 50 (ppm) [Norway] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweetish. Gasoline-like. Aromatic.

Taste: Not available.

Molecular Weight: 106.16 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 136°C (276.8°F)

Melting Point: -94.9 (-138.8°F)

Critical Temperature: 617.15°C (1142.9°F)

Specific Gravity: 0.867 (Water = 1)

Vapor Pressure: 0.9 kPa (@ 20°C)

Vapor Density: 3.66 (Air = 1)

Volatility: 100% (v/v).

Odor Threshold: 140 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; $\log(\text{oil/water}) = 3.1$

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:

Easily soluble in diethyl ether. Very slightly soluble in cold water or practically insoluble in water. Soluble in all proportions in Ethyl alcohol. Soluble in Carbon tetrachloride, Benzene. Insoluble in Ammonia. Slightly soluble in Chloroform. Solubility in Water: 169 mg/l @ 25 deg. C.; 0.014 g/100 ml @ 15 deg. C.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources (flames, sparks, static), incompatible materials, light

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity:

Can react vigorously with oxidizing materials. Sensitive to light.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation.

Toxicity to Animals: Acute oral toxicity (LD50): 3500 mg/kg [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. May cause damage to the following organs: central nervous system (CNS).

Other Toxic Effects on Humans:

Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

Special Remarks on Toxicity to Animals:

Lethal Dose/Conc 50% Kill: LD50 [Rabbit] - Route: Skin; Dose: 17800 ul/kg Lowest Published Lethal Dose/Conc: LDL[Rat] - Route: Inhalation (vapor); Dose: 4000 ppm/4 H

Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive effects and birth defects (teratogenic) based on animal test data. May cause cancer based on animals data. IARC evidence for carcinogenicity in animals is sufficient. IARC evidence of carcinogenicity in humans inadequate. May affect genetic material (mutagenic).

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Can cause mild skin irritation. It can be absorbed through intact skin. Eyes: Contact with vapor or liquid can cause severe eye irritation depending on concentration. It may also cause conjunctivitis. At a vapor exposure level of 85 - 200 ppm, it is mildly and transiently irritating to the eyes; 1000 ppm causes further irritation and tearing; 2000 ppm results in immediate and severe irritation and tearing; 5,000 ppm is intolerable (ACGIH, 1991; Clayton and Clayton, 1994). Standard draize test for eye irritation using 500 mg resulted in severe irritation (RTECS) Inhalation: Exposure to high concentrations can cause nasal, mucous membrane and respiratory tract irritation and can also result in chest constriction and, trouble breathing, respiratory failure, and even death. It can also affect behavior/Central Nervous System. The effective dose for CNS depression in experimental animals was 10,000 ppm (ACGIH, 1991). Symptoms of CNS depression include

headache, nausea, weakness, dizziness, vertigo, irritability, fatigue, lightheadedness, sleepiness, tremor, loss of coordination, judgement and consciousness, coma, and death. It can also cause pulmonary edema. Inhalation of 85 ppm can produce fatigue, insomnia, headache, and mild irritation of the respiratory tract (Haley & Berndt, 1987). Ingestion: Do not drink, pipet or siphon by mouth. May cause gastrointestinal/digestive tract irritation with Abdominal pain, nausea, vomiting. Ethylbenzene is a pulmonary aspiration hazard. Pulmonary aspiration of even small amounts of the liquid may cause fatal pneumonitis. It may also affect behavior/central nervous system with

Section 12: Ecological Information

Ecotoxicity:

Ecotoxicity in water (LC50): 14 mg/l 96 hours [Fish (Trout)] (static). 12.1 mg/l 96 hours [Fish (Fathead Minnow)] (flow-through)]. 150 mg/l 96 hours [Fish (Blue Gill/Sunfish)] (static). 275 mg/l 96 hours [Fish (Sheepshead Minnow)]. 42.3 mg/l 96 hours [Fish (Fathead Minnow)](soft water). 87.6mg/l 96 hours [Shrimp].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Ethylbenzene UNNA: 1175 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Connecticut hazardous material survey.: Ethylbenzene Illinois toxic substances disclosure to employee act: Ethylbenzene Illinois chemical safety act: Ethylbenzene New York release reporting list: Ethylbenzene Rhode Island RTK hazardous substances: Ethylbenzene Pennsylvania RTK: Ethylbenzene Minnesota: Ethylbenzene Massachusetts RTK: Ethylbenzene Massachusetts spill list: Ethylbenzene New Jersey: Ethylbenzene New Jersey spill list: Ethylbenzene Louisiana spill reporting: Ethylbenzene California Director's List of Hazardous Substances: Ethylbenzene TSCA 8(b) inventory: Ethylbenzene TSCA 4(a) proposed test rules: Ethylbenzene TSCA 8(d) H and S data reporting: Ethylbenzene: Effective Date: 6/19/87; Sunset Date: 6/19/97 SARA 313 toxic chemical notification and release reporting: Ethylbenzene

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASSE D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):

R11- Highly flammable. R20- Harmful by inhalation. S16- Keep away from sources of ignition - No smoking. S24/25- Avoid contact with skin and eyes. S29- Do not empty into drains.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information**References:**

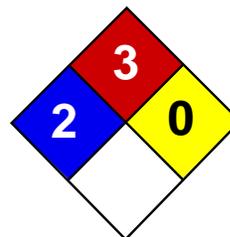
-Manufacturer's Material Safety Data Sheet. -Fire Protection Guide to Hazardous Materials, 13th ed., National Fire Protection Association (NFPA) -Registry of Toxic Effects of Chemical Substances (RTECS) -Chemical Hazard Response Information System (CHRIS) -Hazardous Substance Data Bank (HSDB) -New Jersey Hazardous Substance Fact Sheet -Ariel Global View -Reprotext System

Other Special Considerations: Not available.

Created: 10/09/2005 05:28 PM

Last Updated: 11/06/2008 12:00 PM

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Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet

Xylenes MSDS

Section 1: Chemical Product and Company Identification

Product Name: Xylenes

Catalog Codes: SLX1075, SLX1129, SLX1042, SLX1096

CAS#: 1330-20-7

RTECS: ZE2100000

TSCA: TSCA 8(b) inventory: Xylenes

CI#: Not available.

Synonym: Xylenes; Dimethylbenzene; xylol; methyltoluene

Chemical Name: Xylenes (o-, m-, p- isomers)

Chemical Formula: C₆H₄(CH₃)₂

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Xylenes	1330-20-7	100

Toxicological Data on Ingredients: Xylenes: ORAL (LD50): Acute: 4300 mg/kg [Rat]. 2119 mg/kg [Mouse]. DERMAL (LD50): Acute: >1700 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, liver, mucous membranes, bone marrow, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 464°C (867.2°F)

Flash Points: CLOSED CUP: 24°C (75.2°F). (Tagliabue.) OPEN CUP: 37.8°C (100°F).

Flammable Limits: LOWER: 1% UPPER: 7%

Products of Combustion: These products are carbon oxides (CO, CO₂).

Fire Hazards in Presence of Various Substances:

Highly flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of open flames and sparks, of heat.

Fire Fighting Media and Instructions:

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Vapors may travel to source of ignition and flash back.

Special Remarks on Explosion Hazards:

Vapors may form explosive mixtures with air. Containers may explode when heated. May polymerize explosively when heated. An attempt to chlorinate xylene with 1,3-Dichloro-5,5-dimethyl-2,4-imidazolidindione (dichlorohydrantoin) caused a violent explosion

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined

areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 100 (ppm) [Canada] TWA: 435 (mg/m³) [Canada] TWA: 434 STEL: 651 (mg/m³) from ACGIH (TLV) [United States]
TWA: 100 STEL: 150 (ppm) from ACGIH (TLV) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweetish.

Taste: Not available.

Molecular Weight: 106.17 g/mole

Color: Colorless. Clear

pH (1% soln/water): Not available.

Boiling Point: 138.5°C (281.3°F)

Melting Point: -47.4°C (-53.3°F)

Critical Temperature: Not available.

Specific Gravity: 0.864 (Water = 1)

Vapor Pressure: 0.9 kPa (@ 20°C)

Vapor Density: 3.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 1 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; $\log(\text{oil/water}) = 3.1$

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:

Insoluble in cold water, hot water. Miscible with absolute alcohol, ether, and many other organic liquids.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, incompatibles

Incompatibility with various substances: Reactive with oxidizing agents, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Store away from acetic acid, nitric acid, chlorine, bromine, and fluorine.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2119 mg/kg [Mouse]. Acute dermal toxicity (LD50): >1700 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 5000 4 hours [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, liver, mucous membranes, bone marrow, central nervous system (CNS).

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals:

Lowest Lethal Dose: LDL [Human] - Route: Oral; Dose: 50 mg/kg LCL [Man] - Route: Oral; Dose: 10000 ppm/6H

Special Remarks on Chronic Effects on Humans:

Detected in maternal milk in human. Passes through the placental barrier in animal. Embryotoxic and/or foetotoxic in animal. May cause adverse reproductive effects (male and female fertility (spontaneous abortion and fetotoxicity)) and birth defects based animal data.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Causes skin irritation. Can be absorbed through skin. Eyes: Causes eye irritation. Inhalation: Vapor causes respiratory tract and mucous membrane irritation. May affect central nervous system and behavior (General anesthetic/CNS depressant with effects including headache, weakness, memory loss, irritability, dizziness, giddiness, loss of coordination and judgement, respiratory depression/arrest or difficulty breathing, loss of appetite, nausea, vomiting, shivering, and possible coma and death). May also affects blood, sense organs, liver, and peripheral nerves. Ingestion: May cause gastrointestinal irritation including abdominal pain, vomiting, and nausea. May also affect liver and urinary system/kidneys. May cause effects similar to those of acute inhalation. Chronic Potential Health Effects: Chronic inhalation may affect the urinary system (kidneys) blood (anemia), bone marrow (hyperplasia of bone marrow) brain/behavior/Central Nervous system. Chronic inhalation may also cause mucosal bleeding. Chronic ingestion may affect the liver and metabolism (loss of appetite) and may affect urinary system (kidney damage)

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification : Xylenes UNNA: 1307 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Connecticut hazardous material survey.: Xylenes Illinois chemical safety act: Xylenes New York acutely hazardous substances: Xylenes Rhode Island RTK hazardous substances: Xylenes Pennsylvania RTK: Xylenes Minnesota: Xylenes Michigan critical material: Xylenes Massachusetts RTK: Xylenes Massachusetts spill list: Xylenes New Jersey: Xylenes New Jersey spill list: Xylenes Louisiana spill reporting: Xylenes California Director's List of Hazardous Substances: Xylenes TSCA 8(b) inventory: Xylenes SARA 302/304/311/312 hazardous chemicals: Xylenes SARA 313 toxic chemical notification and release reporting: Xylenes CERCLA: Hazardous substances.: Xylenes: 100 lbs. (45.36 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):

R10- Flammable. R21- Harmful in contact with skin. R36/38- Irritating to eyes and skin. S2- Keep out of the reach of children. S36/37- Wear suitable protective clothing and gloves. S46- If swallowed, seek medical advice immediately and show this container or label.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/11/2005 12:54 PM

Last Updated: 11/06/2008 12:00 PM

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Site-Specific Health and safety Plan
211 West 29th Street, Manhattan, New York

APPENDIX C

Roux Health and Safety
Lessons Learned / Accident Report Forms

HEALTH & SAFETY LESSONS LEARNED ROUX REPORT FORM

Roux Associates, Inc. Remedial Engineering, P.C.
(Check applicable company name)

PART 1: ADMINISTRATIVE INFORMATION

Office: <input type="checkbox"/> New York <input type="checkbox"/> Massachusetts <input type="checkbox"/> New Jersey <input type="checkbox"/> Illinois <input type="checkbox"/> CA - Los Angeles <input type="checkbox"/> CA - Oakland	
Project Manager:	Project Principal:
Project Name:	Project Location:

PART 2: LESSONS LEARNED INCIDENT DETAILS

Date\Time Occurred (MM/DD/YYYY HH:MM):	Date\Time Submitted (MM/DD/YYYY HH:MM):
LESSONS LEARNED INCIDENT TYPE - What could have happened? - Select all that apply (1-7)	
1. <input type="checkbox"/> Fire / Explosion 3. <input type="checkbox"/> Security (e.g. theft, trespassing, vandalism) 4. <input type="checkbox"/> Environmental (spill, permit exceedance, etc.) 6. <input type="checkbox"/> Property/Equipment Damage 2. <input type="checkbox"/> Injury / Illness 5. <input type="checkbox"/> Transportation of personnel (vehicle accident) 7. <input type="checkbox"/> Business Interruption	
Event Leading to Potential Injury/Illness:	
Job Task*:	Equipment Involved*:

WHAT HAPPENED? Do not include individuals' names. Ensure photos, sketches, etc. are not personally identifiable unless written consent has been obtained.

Summary (1-2 sentences. Provide brief description of the incident. Provide facts only, no speculation or opinion):

Incident Details (Brief factual details of what, where, when; include photos, sketches, etc. as attachments):

Immediate Corrective Actions Taken:

SERIOUS INJURY OR FATALITY (SIF): IF AN ACTUAL SIF, USE EXISTING ROUX ACCIDENT REPORTING FORM

Could this have resulted in a SIF? Yes No

A potential SIF is defined as likely to have caused an injury resulting in significant physical body damage with probable long term and/or life altering complications.

INCIDENT INVOLVED:			
Roux Employee: <input type="checkbox"/> Yes <input type="checkbox"/> No		Subcontractor Company Name:	
INVESTIGATION TEAM			
NAME	JOB TITLE	NAME	JOB TITLE

PART 3: INCIDENT INVESTIGATION FINDINGS AND REPORT QUALITY REVIEW

Date Investigation Team Assigned (mm/dd/yyyy):

INVESTIGATION SUMMARY: Determine from list below what behaviors and/or conditions may have contributed to the H&S Lessons Learned Incident. Then, use the "Multiple-Why Technique" for each of these behaviors/conditions; provide a narrative for each that explains how the associated Root Cause(s) was determined. Do not include individuals' names.

ROOT CAUSES: HOW TO REDUCE POSSIBILITY OF INCIDENT RECURRING

Selection of RCs and solutions reflects the analysis of investigation team. It is not meant as a legally binding conclusion as to causal factors and/or solutions.

PERSONAL FACTORS: A. LACK OF SKILL OR KNOWLEDGE B. DOING THE JOB ACCORDING TO PROCEDURES OR ACCEPTABLE PRACTICES TAKES MORE TIME OR EFFORT C. SHORT-CUTTING PROCEDURES OR ACCEPTABLE PRACTICES IS POSITIVELY REINFORCED OR TOLERATED D. IN PAST, DID NOT FOLLOW PROCEDURES OR ACCEPTABLE PRACTICES AND NO INCIDENT OCCURRED	JOB FACTORS: E. LACK OF OR INADEQUATE PROCEDURES F. INADEQUATE COMMUNICATION OF EXPECTATIONS REGARDING PROCEDURES OR ACCEPTABLE STANDARDS G. INADEQUATE TOOLS OR EQUIPMENT (available, maintained, etc.)
--	--

Health & Safety Lessons Learned Incident Report – Page 2

Behavior / Condition	Root Cause	Solution(s) (Must Match Root Cause)	Person Responsible for Completion	Completion Target Date	Completion Actual Date

QUALITY REVIEW Correct root cause(s) identified? Do root cause(s) and solution(s) match? Are solution(s) feasible / maintainable?

Name:

Job Title:

PART 4: Date Solutions were Implemented & Validated (Were Solutions Effective?)

Date	Solution	Verifier / Validator Name and Job Title	Details (of I & V performed)

JOB TASK - Select the most appropriate one (primary job associated with incident-related work activity, avoid "Other" if possible)

- | | | | |
|----------------------------|---|--------------------------|--|
| 1. Carbon Change | 7. Gauging | 12. Pavement Cutting | 18. System Startup |
| 2. Construction | 8. Geoprobe / Direct Push | 13. Pump Test | 19. UST Removal (includes exposure and backfill) |
| 3. Demolition | 9. Mobil Remediation (includes vacuum event and chemical injection) | 14. Sampling | 20. Waste Management |
| 4. Dewatering | 10. NAPL Recovery | 15. Site Visit / Survey | 21. Well Abandonment |
| 5. Drilling (well install) | 11. O&M (remediation system) | 16. Subsurface Clearance | 22. Other: |
| 6. Excavation / Trenching | | 17. System Install | |

EQUIPMENT INVOLVED THAT CONTRIBUTED TO H&S LESSONS LEARNED - Select all that apply

- | | | | |
|--------------------------------|-----------------------------|------------------------------------|--|
| 1. Air Stripper | 25. Fire Extinguisher | 51. Maintenance Tool, General | 77. Safety Shoes / Boots |
| 2. API Separator | 26. Forklift | 52. Manifold | 78. Safety Vest / Clothing |
| 3. Automobile | 27. Front End Loader | 53. Manlift/Basket/Cherry Picker | 79. Rope |
| 4. Boom Material | 28. Grader | 54. Motor, Electric | 80. Bailer |
| 5. Bulldozer | 29. Hammer | 55. Oxidizer | 81. Geoprobe |
| 6. Cable | 30. Knife | 56. Pallet | 82. Hand Auger |
| 7. Carbon Drum / Vessel | 31. Non-Powered Equipment | 57. Piping | 83. PID |
| 8. Chain Block | 32. Powered Equipment | 58. Piping, Hose | 84. Multi-Gas Meter |
| 9. Compressor, Air | 33. Drill | 59. Piping, Injection/Mixing Point | 85. Sample Container |
| 10. Control Panel (local) | 34. Grinder | 60. Hydrojet | 86. Split-Spoon Sampler |
| 11. Crane (mobile) | 35. Hydraulic Torque Wrench | 61. Centrifugal Pump | 87. Sling |
| 12. Drill Rig | 36. Powered Saw | 62. Diaphragm Pump | 88. Snow Blower |
| 13. Drilling Equipment, Vacuum | 37. Impact Wrench | 63. Reciprocating Pump | 89. Snow Plow |
| 14. Drum, Vertical | 38. Saw | 64. Regenerative Pump | 90. Space Heater |
| 15. Dump Truck | 39. Screwdriver | 65. Rotary Pump | 91. Air Sparging System |
| 16. Electric Heater | 40. Shears | 66. Transfer Pump | 92. Carbon Treatment System |
| 17. Electrical Power Supply | 41. Shovel | 67. Submersible Pump | 93. Chemical Oxidation System |
| 18. Engine, Combustion | 42. Snip | 68. Face Shield | 94. Dual Phase Product Recovery System |
| 19. Equipment Safety Grounding | 43. Wrench | 69. Fall Protection | 95. Groundwater Pump and Treat System |
| 20. Excavator / Power Shovel | 44. Hoist | 70. Gloves | 96. POET System |
| 21. Exclusion Zone Equipment | 45. Hook/Clamp/Buckle, etc. | 71. Hard Hat / Helmet | 97. Shed or Trailer |
| 22. Fan / Blower | 46. Jack | 72. Hearing Protection | |
| 23. Fencing | 47. Ladder, Extension | 73. Respiratory PPE (Chemical) | |
| 24. Filter | 48. Ladder, Platform | 74. Respiratory PPE (Particulate) | |
| | 49. Ladder, Step | 75. Safety Glasses | |
| | 50. Lock Out / Tag Out | 76. Safety Goggles | |
| | | | 98. Vapor Extraction System |
| | | | 99. Vapor-Phase Treatment System |
| | | | 100. Other System, Type: _____ |
| | | | 101. Surge Tank |
| | | | 102. Underground Tank |
| | | | 103. Telemetry System |
| | | | 104. Testing Devices |
| | | | 105. Tractor Trailer |
| | | | 106. Truck, Flatbed |
| | | | 107. Truck, Pickup |
| | | | 108. Truck, Tank Truck |
| | | | 109. Truck, Vacuum |
| | | | 110. Safety Valve |
| | | | 111. Block Valve |
| | | | 112. Extraction Well |
| | | | 113. Monitoring Well |
| | | | 114. Recovery Well |
| | | | 115. Winch |
| | | | 116. Wire Rope |
| | | | 117. No Equipment Involved |
| | | | 118. MPT – Traffic Control Devices |
| | | | 119. Not in List (describe): _____ |

Site-Specific Health and safety Plan
211 West 29th Street, Manhattan, New York

APPENDIX D

Health and Safety
Briefing / Meeting Log and Daily Site Safety Checklist

HEALTH AND SAFETY BRIEFING / TAILGATE MEETING FORM

Site Name / Location _____

Date: _____ Weather Forecast: _____

Names of Personnel Attending Briefing

_____	_____	_____
_____	_____	_____
_____	_____	_____

Planned Work

Instrument Calibration: Instrument/Time/Cal. Gas/Cal. Concentration/Actual Concentration

Items Discussed

Work Permit Type and Applicable Restrictions

Signatures of Attending Personnel

_____	_____	_____
_____	_____	_____
_____	_____	_____

Roux Heavy Equipment Exclusion Zone Policy

FINAL

STANDARD OPERATING PROCEDURE 1.13
HEAVY EQUIPMENT EXCLUSION ZONE POLICY

CORPORATE HEALTH AND SAFETY MANAGER : Joseph W. Gentile
EFFECTIVE DATE : February 2014
REVISION NUMBER : 1

Objective

The purpose of the Exclusion Zone Policy is to establish the minimum clearance distance that must be maintained between workers and heavy equipment while equipment is in operation (i.e., engaged or moving). The intent is to have no personnel or other equipment entering the Exclusion Zone while the equipment is in operation/moving to ensure that Roux and Subcontractor employees are not unnecessarily exposed to the hazards of the equipment.

A. Definition

For the purpose of this policy, heavy equipment includes, but is not necessarily limited to: excavation equipment, drill rigs, vacuum trucks, forklifts, lull telehandlers, man lifts, bobcats, delivery trucks, etc.

B. Requirements

1. Exclusion Zones must be established and maintained during activities involving the movement/operation of heavy equipment. The Exclusion Zone requirements apply to all personnel on the site but are primarily focused on those personnel who are required to be working in the vicinity of the equipment. The exclusion zone is in effect when heavy equipment is moving or engaged (ex. movement of an arm or bucket of an excavator, rotation of an auger, lifting of a load with a forklift, raising/lowering of a man lift, etc.).

2. The Exclusion Zone must meet the following minimum requirements:

- A minimum distance of 10 feet from all heavy equipment and loads being moved by the equipment;
- Greater than the swing/reach radius of any moving part on the heavy equipment (i.e., for large equipment this may mean an exclusion zone distance larger than 20 feet);
- Greater than the tip-over distance of the heavy equipment; and
- Greater than the radius of blind spots.

3. The size of the Exclusion Zone will need to be determined on a task-specific basis considering the size of the heavy equipment in use and the task being performed. Prior to all heavy equipment operations, the Exclusion Zone(s) distance must be specifically identified in the Job Safety Analysis (JSA).

4. The spotter (or another individual) should be assigned responsibility for enforcing the Exclusion Zone. This spotter should be positioned immediately outside of the Exclusion Zone within a clear line of sight of the equipment operator. The spotter must signal the operator to stop work if anyone or anything has the potential to enter or compromise the Exclusion Zone. The operator should stop work if the spotter is not within his/her line of sight. If multiple pieces of equipment are being used, each piece of equipment must have its own Exclusion Zone and spotter. For large excavation and demolition projects the spotter should be in constant radio contact (not cell phone) with the machine driver.

5. If an individual must enter the Exclusion Zone, the designated Spotter must signal the Equipment Operator to stop the equipment. Once the equipment is no longer moving (ex. movement of an arm of an excavator is STOPPED, lifting of a load with a forklift STOPPED, raising/lowering of a man lift is STOPPED, etc.), the operator must **DISENGAGE THE CONTROLS and STOP and SIGNAL BY “SHOWING HIS HANDS”**. This signal will indicate that it is safe for the personnel to enter the limits of the Exclusion

Zone to perform the required activity. The equipment must remain completely stopped/disengaged until all personnel have exited the limits of the Exclusion Zone and the designated Spotter has signaled by “SHOWING HIS HANDS” to the Equipment Operator that it is safe to resume.

6. When entering the limits of the Exclusion Zone, personnel must at a minimum:
 - Establish eye contact with the operator and approach the heavy equipment in a manner that is in direct line of sight to the Equipment Operator;
 - Never walk under any suspended loads or raised booms/arms of the heavy equipment; and
 - Identify a travel path that is free of Slip/Trip/Fall hazards.

7. The Exclusion Zone should be delineated using cones with orange snow fence or solid poles between the cones, barrels, tape or other measures. For work in rights-of-way rigid barriers, such as Jersey barriers or temporary chain link fence should be used. For certain types of wide-spread or moving/mobile equipment operations, such delineation may not be practicable around pieces of equipment or individual work areas. In such instances it is expected that the entire operation will be within a larger secure work area or that additional means will be utilized to ensure security of the work zone.

C. Exceptions

It is recognized that certain heavy equipment activities may require personnel to work within the limits of the Exclusion Zone as specified in this policy. Such activities may include certain excavation clearance tasks, drill crew activities or construction tasks. However, any such activity must be pre-planned with emphasis on limiting the amount and potential exposure of any activity required within the zone. The critical safety steps to mitigate the hazards associated with working within the Exclusion Zone must be defined in the JSA and potentially other project-specific plans (i.e., critical lift plans, etc.), and approved by the Roux Project Principal and client representative, if required, prior to implementation.

D. Responsibilities

1. Corporate Health and Safety Manager
 - Overall responsibility for administration, implementation and auditing of this policy.

2. Office Managers
 - Responsible for communicating this policy to all of their employees who perform or may perform field work involving heavy equipment.

3. Office Health and Safety Managers
 - Providing training to office field staff in this policy.

4. Project Principals
 - a. Responsible for ensuring their projects address heavy equipment exclusion zones.
 - b. Approving exceptions to this policy.

5. Project Managers

- a. Responsible for incorporating this policy into their project HASPs and applicable procedures to include JSAs.
- b. Communicating to and enforcing the policy requirements for subcontractors who work on their projects.

6. Field Workers

- a. Attending training in the policy.
- b. Following the requirements of the policy.

E. Project and Site-Specific Orientation and Training

Many Roux projects have different requirements that are client-specific or site-specific in nature. It is the responsibility of the Project Principal (or Project Manager if delegated this responsibility by the Project Principal) to ensure that the workers assigned to his/her projects are provided orientation and training with respect to these client and/or site-specific requirements.

F. Subcontractors

All subcontractors who provide heavy equipment operations to field projects must implement a policy that meets or exceeds the expectations described above as well as any additional requirements that may be required on a client or site-specific basis.

Roux Subsurface Utility Clearance Procedure

STANDARD OPERATING PROCEDURE 1.17
SUBSURFACE UTILITY CLEARANCE

CORPORATE HEALTH AND SAFETY MANAGER : Joseph W. Gentile
EFFECTIVE DATE : 2/04/15
REVISION NUMBER : 0

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 A. Example of a Completed One-Call Report

 B. Roux Subsurface Utility Clearance Checklist and Utility Verification / Site Walkthrough Record

1.0 PURPOSE

Roux Associates, Inc. (Roux Associates) has instituted the following Standard Operating Procedure (SOP) for completing proper utility mark-outs and for conducting subsurface clearance activities. The SOP establishes a method to ensure, to the greatest extent possible, that utilities have been identified and contact and/or damage to underground utilities and other subsurface structures will be avoided.

2.0 SCOPE AND APPLICABILITY

This SOP applies to all Roux Associates employees, its contractors and subcontractors. Employees are expected to follow the SOP for all intrusive work involving Roux Associates or other personnel (e.g., contractors/subcontractors) working for Roux Associates unless the client's requirements are more stringent. Deviation from the SOP regardless of the specific work activity or work location must be pre-approved per Section 4.3 of this SOP.

3.0 DEFINITIONS

Intrusive Work Activities	All activities such as digging or scraping the surface, including but not limited to, excavation, test pitting or trenching, soil vapor sampling or the installation of soil borings, soil vapor monitoring points and wells, or monitoring wells, and drilling within the basement slab of a recently demolished building.
Mark-out / Stake Out	The process of contracting with a competent and qualified company to confirm the presence or absence of underground utilities and structures. This process will clearly mark-out and delineate utilities that are identified so that intrusive work activities can be performed without causing disturbance or damage to the subsurface utilities and structures. After utility mark-outs are completed the soft digging will be completed prior to intrusive work.
Tolerance Zone	Defined as two feet on either side of the designated centerline of an identified utility, plus half of the diameter or half of the greatest dimension (for elliptical sewers, duct backs and other non-cylindrical utilities) of that utility and two feet from the outside edge of any subsurface structure.
Structure	For the purpose of this SOP a structure is defined as any underground feature that may present potential source(s) of energy such as, but not limited to, utility vaults, bunkers, piping, electrical boxes, wires, conduits, culverts, utility lines, underground tanks and ducts.
Soft Digging	The safest way to remove material from unknown obstructions or services is by using tools such as a vactor or air knife, non-mechanical tools, or hand tools. The methods are clean and non-evasive and used for uncovering and exposing buried services and excavating and for providing a quick method of soil removal from sensitive areas.
Verification	Exploratory test-hole dug with hand tools within the Tolerance Zone to expose and verify the location, type, size, direction-of-run and depth of a utility or subsurface structure. Vacuum excavation (soft dig) methods can further facilitate exposure of a subsurface utility and accurately provide its location and identification prior to intrusive work approaching the Tolerance Zone.

4.0 RESPONSIBILITIES

It shall be the responsibility of all Roux Associates employees who oversee or perform intrusive field activities to ensure adequate mark-outs of underground utilities and structures have been provided, reviewed and discussed with the field team. This includes documenting that the mark-out was correctly performed by completing the Mark-out / Stake-out Request Information Sheet (Appendix A) and using the Roux Subsurface Clearance Checklist (Appendix B). Additionally the following personnel have specific responsibilities for implementing this SOP.

4.1 Corporate Health and Safety Manager (CHSM)

- The CHSM has the responsibility of ensuring that a program has been established and is in place to provide guidance for performing adequate utility mark-outs and subsurface utility clearance activities.
- The CHSM has the overall responsibility of implementing this SOP and communicating the contents of this SOP to Office Managers (OMs) and Office Health and Safety Managers (OHSMs).
- The CHSM will periodically, quarterly at a minimum, communicate learnings from mark-outs and subsurface utility clearance incidents and follow-up actions taken to all personnel via Clarity®.
- The CHSM will periodically review and evaluate the effectiveness of this SOP on a quarterly basis.

4.2 Office Manager (OM)

- Each OM will designate an individual to serve as the respective office's OHSM. The OHSM will be vested with the responsibility of assisting in implementation of this SOP's requirements.
- Each OM will ensure that their respective office's staff are made aware of and abide by the requirements of this SOP.

4.3 Project Principals (PPs)

- PPs are responsible for ensuring this SOP is followed for intrusive work performed at their sites. This SOP recognizes that Roux may only be in the position of suggesting, discussing and requesting that this SOP be implemented to our clients.
- PPs have the authority to consider exceptions to this SOP based on their client's site knowledge, site experience and the client's willingness for the use of this SOP. Any and all exceptions, however, will be documented and pre-approved by the OM.

4.4 Project Manager (PM)

- It shall be the PM's responsibility to ensure this SOP is properly implemented. The PM has the responsibility for sharing all Lessons Learned from subsurface utility clearance incidents with the project team.
- The PM has the responsibility of reviewing and editing draft reports of subsurface utility clearance incidents and for filing the finalized reports in the appropriate project files.

4.5 Office Health and Safety Manager (OHSM)

- Each OHSM will ensure that their respective office's staff is trained in this SOP.
- It is the responsibility of the OHSM to review Lessons Learned and Accident Reporting Forms (existing Roux forms) for utility mark-outs and subsurface utility clearance incidents and to assist project teams in finalizing reports.
- The OHSM will review final draft incident reports of subsurface utility clearance incidents, ensure they are finalized and provide the finalized report to the CHSM, OM and the PM for inclusion in the project files as appropriate.
- The OHSM will track all subsurface utility clearance incidents until completed.
- The OHSM will provide the CHSM with all finalized reports of subsurface utility clearance incidents containing follow-up actions for sharing throughout the firm

4.6 All Personnel

- All personnel are responsible for ensuring Public Utility Mark-outs were requested by the subcontractor, performed for all known or suspected utility types and document the process by completion of Roux Subsurface Utility Clearance Checklist and Utility Verification / Site Walkthrough Record.

5.0 PROCEDURES

5.1 Before Intrusive Activities

During the project kick-off meeting for intrusive activities the PM will review the Roux Subsurface Utility Clearance Checklist and Utility Verification / Site Walkthrough Record (Appendix B) and the below bullet points with the project field team:

(Please note that these are intended as general reminders only and should not be solely relied upon.)

- Ensure the Mark-out / Stake-out Request Information Sheet (or one-call report is complete and accurate for the site including address and cross streets) is completed and review for missing utilities (note utility mark-out organizations do not have contracts with all utilities and it is often necessary to contact certain utilities separately such as the local water and sewer authorities).
- Have written confirmation prior to mobilizing to the site that the firm or Roux personnel performing the intrusive activity has correctly completed the mark-out notification process including requesting mark-outs, waiting for mark-outs to be applied to ground surfaces at the site, and receiving written confirmation of findings (via fax or email) from utility operators for all known or suspected utilities in the proposed area of intrusive activity, and provided utility owner written confirmation to Roux Associates personnel for review and project files documentation.
- Do not begin any intrusive activity until any utilities mark-out has been completed (i.e., did all utilities mark-out the site?) and any unresolved mark-out issues are finalized. Perform a site walk to review the existing utilities and determine if said utilities have been located by the utility locators.
 - (Note: The Tolerance Zone is defined as two feet plus half of the diameter or half of the greatest dimension (for elliptical sewers, duct banks and other non-cylindrical utilities) of a utility and two feet from the outside edge of any subsurface structure.)
- Install Pre-Clearance exploratory test holes (e.g., hand-dug test holes or other soft digging techniques) for the first 5-ft below land surface (BLS) at each location prior to conducting mechanized intrusive activities. The size of the pre-clearance exploratory test hole should be at a minimum twice the diameter of any downhole tool or boring device. (Note: Pre-Clearance exploratory test holes should be defined in the SOW/proposal as being provided to the client to prevent project delays and to allow adequate time for PM and PP to evaluate alternative approaches for the project. Alternative approaches will need to be pre-approved by the OM.
- For excavations, all utilities need to be marked and then exposed by hand following the protocols in this SOP. Pre-clearing for excavations may be performed by the “moat” technique (i.e., soft digging around the perimeter). In these cases, dig in small lifts (<12” for first 5 feet) using a dedicated spotter.) For Tolerance Zone work, unless

otherwise agreed upon with the Utility Operator, work within the tolerance zone requires verification by means of hand-dug test holes performed to expose the utility. Once structures have been verified a minimum clearance of two feet must be maintained between the utility and any powered equipment.

- In addition, the following activities should be conducted:
 - Review the work scope to be performed with the site owner/tenant to determine if it may impact any utilities,
 - Attempt to procure any utility maps or historic drawings of subsurface conditions of the site,
 - **Determine the need for utility owner companies to be contacted or to have their representatives on site,**
 - Where mark-outs terminate at the property boundary, consider the use of private utility locating / GPR / Geophysical-type services which may be helpful in locating utilities. Use of private utility locating firms, however, does not eliminate the legal requirement for the Excavator firm to submit a request for Public Utility Mark-outs. Also, the information provided by the service may be inaccurate and unable to locate subsurface utilities and structures in urban areas, landfills, urban fill areas and below reinforced slabs, etc. They should not be relied upon as the only means of performing utility clearance.

5.2 During Intrusive Activities

The PM, field team lead or personnel performing oversight is to:

- Ensure the mark-out remains valid. (In certain states there are limits regarding the duration of time after the mark-out was applied to the ground surface work can be started or interrupted.) Additionally, the mark-outs must be maintained, documented, and in many cases refreshed periodically to be considered valid.
- Ensure intrusive activities are only performed within the safe boundaries of the mark-out as detailed in the One-Call Report.
- Halt all work if intrusive activities must take place outside of the safe boundaries of a mark-out and only proceed after new mark-outs are performed.
- Halt the intrusive activities and immediately consult with the PP if an unmarked utility is encountered.
- Completing any subsurface utility clearance incident reports that are necessary.

6.0 APPENDICES

- Example Completed One-Call Report (Appendix A)
- Roux Subsurface Clearance Checklist and Utility Verification / Site Walkthrough Record (Appendix B)

APPENDIX A

APPENDIX B

Roux Subsurface Utility Clearance Checklist

Date of Revision – 12/3/14

Work site set-up and work execution

ACTIVITY	Yes	No	N/A	COMMENTS INCLUDING JUSTIFICATION IF RESPONSE IS NO OR NOT APPLICABLE
Daily site safety meeting conducted, SPSAs performed, JSAs reviewed, appropriate work permits obtained				
HASP is available and reviewed by site workers / visitors				
Subsurface Utility Clearance Procedure has been reviewed with all site workers				
Work area secured; traffic control established as needed. Emergency shut-off switch located. Fire extinguishers / other safety equipment available as needed				
Utility mark-outs (public / private) clear and visible. Provide Excavator's Stake-Out Reference Number / Request Date / Time				
Tolerance zone work identified				
Work execution plan reviewed and adhered to (ground disturbance methods, clearance depths, any special utility protection requirements, or any other execution requirements; especially for Tolerance Zone work)				
Verbal endorsement received from Roux PM for any required field deviations to work execution plan				

Key reminders for execution:

The Subsurface Utility Clearance Protocol should be referenced to determine all requirements while executing subsurface work. The bullet points below are intended as general reminders only and should not be solely relied upon.

- Tolerance zone is defined as two feet plus half of the diameter or half of the greatest dimension (for elliptical sewers, duct banks and other non-cylindrical utilities) of a utility and two feet from the outside of any subsurface structure.
- Install Pre-Clearance exploratory test holes (e.g., hand-dug test holes or vacuum excavation) must be performed for the first five feet below land surface (BLS) at each location prior to conducting mechanized intrusive activities. The size of the pre-clearance exploratory test hole

should be at a minimum twice the diameter of any downhole tool or boring device. (Note: Pre-clearance exploratory test holes should be defined in the SOW/proposal as being provided to the client to prevent project delays and to allow adequate time for PM and PP to evaluate alternative approaches for the project. Alternate approaches will need to be pre-approved by the OM.

- For excavations, all utilities need to be marked and then exposed by hand following the protocols in this SOP. Pre-clearing for excavations may be performed by the “moat” technique (i.e., soft digging around the perimeter). In these cases, dig in small lifts (<12” for first five feet) using a dedicated spotter.) For Tolerance Zone work, unless otherwise agreed upon with the Utility Operator, work within the tolerance zone requires verification by means of hand-dug test holes to expose the utility. Once structures have been verified a minimum clearance of two feet must be maintained between the utility and any powered equipment.

Utility Verification / Site Walkthrough Record

Employee Name: _____

Date: _____

Instructions: For each utility suspected at the job site, indicate location on the job site, approximate burial depth, and means of detecting the utility. Leave blank if that utility is not believed to be present.

Utility	Description of Utility Location Identified On-site	Approx. Depth (bls)	Method / Instrumentation used to determine Utility Location	Utility Owner Response (Date/Time)	Mark Out Indicates (Clear / Conflict)
Electrical Lines					
Gas Lines					
Pipelines					
Steam Lines					
Water Lines					
Sanitary & Storm-water Sewer lines					
Pressured Air-Lines					
Tank Vent Lines					
Fiber Optic Lines					
Underground Storage Tanks					
Phone Lines/ Other					

bls - Below land surface

Site Sketch Showing Utilities:



	Color Code
	ELECTRIC
	Gas-oil Steam
	Communications CATV
	WATER
	Reclaimed Water
	SEWER
	Temp. Survey Markings
Proposed Excavation	

Other Comments / Findings:

--

Completed by: _____

Signature: _____ Date: _____

Site-Specific Health and safety Plan
211 West 29th Street, Manhattan, New York

APPENDIX G

ACORD® Automobile Loss Notice Form



AUTOMOBILE LOSS NOTICE

DATE (MM/DD/YYYY)

AGENCY AJ Gallagher Risk Management Services 377 Oak Street Garden City, NY 11530		INSURED LOCATION CODE	DATE OF LOSS AND TIME AM: <input type="text"/> PM: <input type="text"/>
CONTACT NAME Teresa Garza PHONE (AG, No, Ext): 616.622.2418 FAX (AG, No): E-MAIL ADDRESS: CODE: SUBCODE:		CARRIER Great Divide Insurance Company	NAIC CODE 25224
AGENCY CUSTOMER ID: ROUXASS-01		POLICY NUMBER BAP154979912	POLICY TYPE Commercial Automobile

INSURED NAME OF INSURED (First, Middle, Last) Roux Associates, Inc.			INSURED'S MAILING ADDRESS 209 Shafter Street Islandia, NY 11749
DATE OF BIRTH	FEIN (if applicable) 11-2579482	MARITAL STATUS / CIVIL UNION (if applicable)	PRIMARY E-MAIL ADDRESS: legaldept@rouxinc.com SECONDARY E-MAIL ADDRESS: Fax Notice of Loss to: 631.232.1525
PRIMARY PHONE # <input type="checkbox"/> HOME <input checked="" type="checkbox"/> BUS <input type="checkbox"/> CELL 631.232.2600	SECONDARY PHONE # <input type="checkbox"/> HOME <input type="checkbox"/> BUS <input type="checkbox"/> CELL		

CONTACT CONTACT INSURED		NAME OF CONTACT (First, Middle, Last) Cindy Albanese	CONTACT'S MAILING ADDRESS Cindy Albanese 209 Shafter Street Islandia, NY 11749
PRIMARY PHONE # <input type="checkbox"/> HOME <input checked="" type="checkbox"/> BUS <input type="checkbox"/> CELL	SECONDARY PHONE # <input type="checkbox"/> HOME <input type="checkbox"/> BUS <input type="checkbox"/> CELL	PRIMARY E-MAIL ADDRESS: legaldept@rouxinc.com SECONDARY E-MAIL ADDRESS: Fax Notice of Loss to 631.232.1525	
WHEN TO CONTACT			

LOSS LOCATION OF LOSS STREET: CITY, STATE, ZIP: COUNTRY:	POLICE OR FIRE DEPARTMENT CONTACTED REPORT NUMBER
DESCRIBE LOCATION OF LOSS IF NOT AT SPECIFIC STREET ADDRESS: DESCRIPTION OF ACCIDENT (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)	

INSURED VEHICLE		VEH # YEAR MAKE MODEL:	BODY TYPE V.I.N.:	PLATE NUMBER STATE
OWNER'S NAME AND ADDRESS <input type="checkbox"/> (Check if same as insured)		PRIMARY PHONE # <input type="checkbox"/> HOME <input type="checkbox"/> BUS <input type="checkbox"/> CELL	SECONDARY PHONE # <input type="checkbox"/> HOME <input type="checkbox"/> BUS <input type="checkbox"/> CELL	PRIMARY E-MAIL ADDRESS: SECONDARY E-MAIL ADDRESS:
DRIVER'S NAME AND ADDRESS <input type="checkbox"/> (Check if same as owner)		PRIMARY PHONE # <input type="checkbox"/> HOME <input type="checkbox"/> BUS <input type="checkbox"/> CELL	SECONDARY PHONE # <input type="checkbox"/> HOME <input type="checkbox"/> BUS <input type="checkbox"/> CELL	PRIMARY E-MAIL ADDRESS: SECONDARY E-MAIL ADDRESS:
RELATION TO INSURED (Employee, family, etc.)	DATE OF BIRTH	DRIVER'S LICENSE NUMBER	STATE PURPOSE OF USE	USED WITH PERMISSION? (Y/N)
DESCRIBE DAMAGE				
1. WAS A STANDARD CHILD PASSENGER RESTRAINT SYSTEM (CHILD SEAT) INSTALLED IN THE VEHICLE AT THE TIME OF THE ACCIDENT?				Y/N
2. WAS THE CHILD PASSENGER RESTRAINT SYSTEM (CHILD SEAT) IN USE BY A CHILD DURING THE TIME OF THE ACCIDENT?				Y/N
3. DID THE CHILD PASSENGER RESTRAINT SYSTEM (CHILD SEAT) SUSTAIN A LOSS AT THE TIME OF THE ACCIDENT?				Y/N
ESTIMATE AMOUNT:	WHERE CAN VEHICLE BE SEEN?:	WHEN CAN VEHICLE BE SEEN?:		
OTHER INSURANCE ON VEHICLE - CARRIER:			POLICY NUMBER:	

OTHER VEHICLE / PROPERTY DAMAGED NON - VEHICLE?

AGENCY CUSTOMER ID: _____

VEH #	YEAR	MAKE: MODEL:	BODY TYPE: VIN:	PLATE NUMBER	STATE
DESCRIBE PROPERTY (Other Than Vehicle)					OTHER VEH/PROP INS? (Y/N) <input type="checkbox"/>
CARRIER OR AGENCY NAME		NAIC CODE	POLICY NUMBER		
OWNER'S NAME AND ADDRESS			PRIMARY PHONE #	<input type="checkbox"/> HOME <input type="checkbox"/> BUS <input type="checkbox"/> CELL	
			SECONDARY PHONE #	<input type="checkbox"/> HOME <input type="checkbox"/> BUS <input type="checkbox"/> CELL	
DRIVER'S NAME AND ADDRESS <input type="checkbox"/> (Check if same as owner)			PRIMARY E-MAIL ADDRESS:		
			SECONDARY E-MAIL ADDRESS:		
			PRIMARY PHONE #	<input type="checkbox"/> HOME <input type="checkbox"/> BUS <input type="checkbox"/> CELL	
			SECONDARY PHONE #	<input type="checkbox"/> HOME <input type="checkbox"/> BUS <input type="checkbox"/> CELL	
			PRIMARY E-MAIL ADDRESS:		
			SECONDARY E-MAIL ADDRESS:		
DESCRIBE DAMAGE					
ESTIMATE AMOUNT		WHERE CAN DAMAGE BE SEEN?			

INJURED

NAME & ADDRESS	PHONE (A/C, No)	PED	INS VEH	OTH VEH	AGE	EXTENT OF INJURY
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

WITNESSES OR PASSENGERS

NAME & ADDRESS	PHONE (A/C, No)	INS VEH	OTH VEH	OTHER (Specify)
		<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	

REPORTED BY	REPORTED TO
-------------	-------------

REMARKS (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

APPLICABLE IN ALABAMA

Any person who knowingly presents a false or fraudulent claim for payment of a loss or benefit or who knowingly presents false information in an application for insurance is guilty of a crime and may be subject to restitution fines or confinement in prison, or any combination thereof.

APPLICABLE IN ALASKA

A person who knowingly and with intent to injure, defraud, or deceive an insurance company files a claim containing false, incomplete, or misleading information may be prosecuted under state law.

APPLICABLE IN ARIZONA

For your protection, Arizona law requires the following statement to appear on this form. Any person who knowingly presents a false or fraudulent claim for payment of a loss is subject to criminal and civil penalties.

**APPLICABLE IN ARKANSAS, DELAWARE, KENTUCKY, LOUISIANA, MAINE, MICHIGAN, NEW JERSEY,
NEW MEXICO, NORTH DAKOTA, PENNSYLVANIA, RHODE ISLAND, SOUTH DAKOTA, TENNESSEE,
TEXAS, VIRGINIA, AND WEST VIRGINIA**

Any person who knowingly and with intent to defraud any insurance company or another person, files a statement of claim containing any materially false information, or conceals for the purpose of misleading, information concerning any fact, material thereto, commits a fraudulent insurance act, which is a crime, subject to criminal prosecution and civil penalties. In LA, ME, TN, and VA, insurance benefits may also be denied.

APPLICABLE IN CALIFORNIA

For your protection, California law requires the following to appear on this form: Any person who knowingly presents a false or fraudulent claim for payment of a loss is guilty of a crime and may be subject to fines and confinement in state prison.

APPLICABLE IN COLORADO

It is unlawful to knowingly provide false, incomplete, or misleading facts or information to an insurance company for the purpose of defrauding or attempting to defraud the company. Penalties may include imprisonment, fines, denial of insurance, and civil damages. Any insurance company or agent of an insurance company who knowingly provides false, incomplete, or misleading facts or information to a policy holder or claimant for the purpose of defrauding or attempting to defraud the policy holder or claimant with regard to a settlement or award payable from insurance proceeds shall be reported to the Colorado Division of Insurance within the Department of Regulatory Agencies.

APPLICABLE IN THE DISTRICT OF COLUMBIA

Warning: It is a crime to provide false or misleading information to an insurer for the purpose of defrauding the insurer or any other person. Penalties include imprisonment and/or fines. In addition, an insurer may deny insurance benefits, if false information materially related to a claim was provided by the applicant.

APPLICABLE IN FLORIDA

Pursuant to S. 817.234, Florida Statutes, any person who, with the intent to injure, defraud, or deceive any insurer or insured, prepares, presents, or causes to be presented a proof of loss or estimate of cost or repair of damaged property in support of a claim under an insurance policy knowing that the proof of loss or estimate of claim or repairs contains any false, incomplete, or misleading information concerning any fact or thing material to the claim commits a felony of the third degree, punishable as provided in S. 775.082, S. 775.083, or S. 775.084, Florida Statutes.

APPLICABLE IN HAWAII

For your protection, Hawaii law requires you to be informed that presenting a fraudulent claim for payment of a loss or benefit is a crime punishable by fines or imprisonment, or both.

APPLICABLE IN IDAHO

Any person who knowingly and with the intent to injure, defraud, or deceive any insurance company files a statement of claim containing any false, incomplete or misleading information is guilty of a felony.

APPLICABLE IN INDIANA

A person who knowingly and with intent to defraud an insurer files a statement of claim containing any false, incomplete, or misleading information commits a felony.

APPLICABLE IN KANSAS

Any person who, knowingly and with intent to defraud, presents, causes to be presented or prepares with knowledge or belief that it will be presented to or by an insurer, purported insurer, broker or any agent thereof, any written statement as part of, or in support of, an application for the issuance of, or the rating of an insurance policy for personal or commercial insurance, or a claim for payment or other benefit pursuant to an insurance policy for commercial or personal insurance which such person knows to contain materially false information concerning any fact material thereto; or conceals, for the purpose of misleading, information concerning any fact material thereto commits a fraudulent insurance act.

APPLICABLE IN MARYLAND

Any person who knowingly or willfully presents a false or fraudulent claim for payment of a loss or benefit or who knowingly or willfully presents false information in an application for insurance is guilty of a crime and may be subject to fines and confinement in prison.

APPLICABLE IN MINNESOTA

A person who files a claim with intent to defraud or helps commit a fraud against an insurer is guilty of a crime.

APPLICABLE IN NEVADA

Pursuant to NRS 686A.291, any person who knowingly and willfully files a statement of claim that contains any false, incomplete or misleading information concerning a material fact is guilty of a felony.

APPLICABLE IN NEW HAMPSHIRE

Any person who, with purpose to injure, defraud or deceive any insurance company, files a statement of claim containing any false, incomplete or misleading information is subject to prosecution and punishment for insurance fraud, as provided in RSA 638:20.

APPLICABLE IN NEW YORK

Any person who knowingly and with intent to defraud any insurance company or other person files an application for commercial insurance or a statement of claim for any commercial or personal insurance benefits containing any materially false information, or conceals for the purpose of misleading, information concerning any fact material thereto, and any person who in connection with such application or claim knowingly makes or knowingly assists, abets, solicits or conspires with another to make a false report of the theft, destruction, damage or conversion of any motor vehicle to a law enforcement agency, the Department of Motor Vehicles or an insurance company, commits a fraudulent insurance act, which is a crime, and shall also be subject to a civil penalty not to exceed five thousand dollars and the value of the subject motor vehicle or stated claim for each violation.

APPLICABLE IN OHIO

Any person who, with intent to defraud or knowing that he/she is facilitating a fraud against an insurer, submits an application or files a claim containing a false or deceptive statement is guilty of insurance fraud.

APPLICABLE IN OKLAHOMA

WARNING: Any person who knowingly and with intent to injure, defraud or deceive any insurer, makes any claim for the proceeds of an insurance policy containing any false, incomplete or misleading information is guilty of a felony.

APPLICABLE IN WASHINGTON

It is a crime to knowingly provide false, incomplete, or misleading information to an insurance company for the purpose of defrauding the company. Penalties include imprisonment, fines and denial of insurance benefits.

Site-Specific Health and safety Plan
211 West 29th Street, Manhattan, New York

APPENDIX H

Job Safety and Health Protection Poster

You Have a Right to a Safe and Healthful Workplace.

IT'S THE LAW!

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in the inspection.
- You can file a complaint with OSHA within 30 days of discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.
- You have a right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violation.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records or records of your exposure to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.



The *Occupational Safety and Health Act of 1970 (OSH Act)*, P.L. 91-596, assures safe and healthful working conditions for working men and women throughout the Nation. The Occupational Safety and Health Administration, in the U.S. Department of Labor, has the primary responsibility for administering the *OSH Act*. The rights listed here may vary depending on the particular circumstances. To file a complaint, report an emergency, or seek OSHA advice, assistance, or products, call 1-800-321-OSHA or your nearest OSHA office: • Atlanta (404) 562-2300 • Boston (617) 565-9860 • Chicago (312) 353-2220 • Dallas (214) 767-4731 • Denver (303) 844-1600 • Kansas City (816) 426-5861 • New York (212) 337-2378 • Philadelphia (215) 861-4900 • San Francisco (415) 975-4310 • Seattle (206) 553-5930. Teletypewriter (TTY) number is 1-877-889-5627. To file a complaint online or obtain more information on OSHA federal and state programs, visit OSHA's website at www.osha.gov. If your workplace is in a state operating under an OSHA-approved plan, your employer must post the required state equivalent of this poster.

1-800-321-OSHA

www.osha.gov

APPENDIX 6

**MANUFACTURER SPECIFICATION & CONSTRUCTION DETAILS &
CONSTRUCTION DETAILS FOR VAPOR BARRIER**

PREPRUFE® 300R & 160R

Pre-applied waterproofing membranes that bond integrally to poured concrete for use below slabs or behind basement walls on confined sites

Description

Preprufe® 300R & 160R membranes are unique composite sheets comprising a thick HDPE film, an aggressive pressure sensitive adhesive and a weather resistant protective coating.

Unlike conventional non-adhering membranes, which are vulnerable to water ingress tracking between the unbonded membrane and structure, the unique Preprufe bond to concrete prevents ingress or migration of water around the structure.

The Preprufe R System includes:

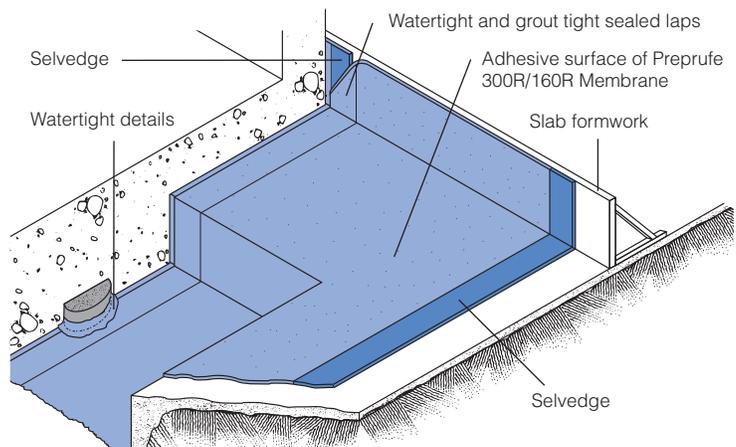
- **Preprufe 300R**—heavy-duty grade for use below slabs and on rafts (i.e. mud slabs). Designed to accept the placing of heavy reinforcement using conventional concrete spacers.
- **Preprufe 160R**—thinner grade for blindside, zero property line applications against soil retention systems.
- **Preprufe Tape LT**—for covering cut edges, roll ends, penetrations and detailing (temperatures between 25°F (-4°C) and 86°F (+30°C)).
- **Preprufe Tape HC**—as above for use in Hot Climates (minimum 50°F (10°C)).
- **Bituthene® Liquid Membrane**—for sealing around penetrations, etc.
- **Adcor™ ES**—waterstop for joints in concrete walls and floors
- **Preprufe Tieback Covers**—preformed cover for soil retention wall tieback heads
- **Preprufe Preformed Corners**—preformed inside and outside corners

Preprufe 300R & 160R membranes are applied either horizontally to smooth prepared concrete, carton forms or well rolled and compacted earth or crushed stone substrate; or vertically to permanent formwork or adjoining structures. Concrete is then cast directly against the adhesive side of the membranes. The specially developed Preprufe adhesive layers work together to form a continuous and integral seal to the structure.

Preprufe can be returned up the inside face of slab formwork but is not recommended for conventional twin-sided formwork on walls, etc. Use Bituthene self-adhesive membrane or Procor® fluid applied membrane to walls after removal of formwork for a fully bonded system to all structural surfaces.

Advantages

- **Forms a unique continuous adhesive bond to concrete poured against it**—prevents water migration and makes it unaffected by ground settlement beneath slabs
- **Fully-adhered watertight laps** and detailing
- **Provides a barrier to water, moisture and gas**—physically isolates the structure from the surrounding ground
- **BBA Certified** for basement Grades 2, 3, & 4 to BS 8102:1990
- **Zero permeance** to moisture
- **Solar reflective**—reduced temperature gain
- **Simple and quick to install**—requiring no priming or fillets
- **Can be applied to permanent formwork**—allows maximum use of confined sites
- **Self protecting**—can be trafficked immediately after application and ready for immediate placing of reinforcement
- **Unaffected by wet conditions**—cannot activate prematurely
- **Inherently waterproof, non-reactive system:**
 - not reliant on confining pressures or hydration
 - unaffected by freeze/thaw, wet/dry cycling
- **Chemical resistant**—effective in most types of soils and waters, protects structure from salt or sulphate attack



Drawings are for illustration purposes only. Please refer to graceconstruction.com for specific application details.

Installation

The most current application instructions, detail drawings and technical letters can be viewed at graceconstruction.com. For other technical information contact your local Grace representative.

Preprufe 300R & 160R membranes are supplied in rolls 4 ft (1.2 m) wide, with a selvedge on one side to provide self-adhered laps for continuity between rolls. The rolls of Preprufe Membrane and Preprufe Tape are interwound with a disposable plastic release liner which must be removed before placing reinforcement and concrete.

Substrate Preparation

All surfaces—It is essential to create a sound and solid substrate to eliminate movement during the concrete pour. Substrates must be regular and smooth with no gaps or voids greater than 0.5 in. (12 mm). Grout around all penetrations such as utility conduits, etc. for stability (see Figure 1).

Horizontal—The substrate must be free of loose aggregate and sharp protrusions. Avoid curved or rounded substrates. When installing over earth or crushed stone, ensure substrate is well compacted to avoid displacement of substrate due to traffic or concrete pour. The surface does not need to be dry, but standing water must be removed.

Vertical—Use concrete, plywood, insulation or other approved facing to sheet piling to provide support to the membrane. Board systems such as timber lagging must be close butted to provide support and not more than 0.5 in. (12 mm) out of alignment.

Membrane Installation

Preprufe can be applied at temperatures of 25°F (-4°C) or above. When installing Preprufe in cold or marginal weather conditions 55°F (<13°C) the use of Preprufe Tape LT is recommended at all laps and detailing. Preprufe Tape LT should be applied to clean, dry surfaces and the release liner must be removed immediately after application. Alternatively, Preprufe Low Temperature (LT) is available for low temperature condition applications. Refer to Preprufe LT data sheet for more information.

Horizontal substrates—Place the membrane HDPE film side to the substrate with the clear plastic release liner facing towards the concrete pour. End laps should be staggered to avoid a build up of layers. Leave plastic release liner in position until overlap procedure is completed (see Figure 2).

Accurately position succeeding sheets to overlap the previous sheet 3 in. (75 mm) along the marked selvedge. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Peel back the plastic release liner from between the overlaps as the two layers are bonded together. Ensure a continuous bond is achieved without creases and roll firmly with a heavy roller. Completely remove the plastic liner to expose the protective coating. Any initial tack will quickly disappear.

Refer to Grace Tech Letter 15 for information on suitable rebar chairs for Preprufe.

Vertical substrates—Mechanically fasten the membrane vertically using fasteners appropriate to the substrate with the clear plastic release liner facing towards the concrete pour. The membrane may be installed in any convenient length. Fastening can be made through the selvedge using a small and low profile head fastener so that the membrane lays flat and allows firmly rolled overlaps. Immediately remove the plastic release liner.

Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to

overlap. Roll firmly to ensure a watertight seal.

Roll ends and cut edges—Overlap all roll ends and cut edges by a minimum 3 in. (75 mm) and ensure the area is clean and free from contamination, wiping with a damp cloth if necessary. Allow to dry and apply Preprufe Tape LT (or HC in hot climates) centered over the lap edges and roll firmly (see Figure 3). Immediately remove printed plastic release liner from the tape.

Details

Refer to Preprufe Field Application Manual, Section V Application Instructions or visit graceconstruction.com. This manual gives comprehensive guidance and standard details.

Membrane Repair

Inspect the membrane before installation of reinforcement steel, formwork and final placement of concrete. The membrane can be easily cleaned by power washing if required. Repair damage by wiping the area with a damp cloth to ensure the area is clean and free from dust, and allow to dry. Repair small punctures (0.5 in. (12 mm) or less) and slices by applying Preprufe Tape centered over the damaged area and roll firmly. Remove the release liner from the tape. Repair holes and large punctures by applying a patch of Preprufe membrane, which extends 6 in. (150 mm) beyond the damaged area. Seal all edges of the patch with Preprufe Tape, remove the release liner from the tape and roll firmly. Any areas of damaged adhesive should be covered with Preprufe Tape. Remove printed plastic release liner from tape. Where exposed selvedge has lost adhesion or laps have not been sealed, ensure the area is clean and dry and cover with fresh Preprufe Tape, rolling firmly. Alternatively, use a hot air gun or similar to activate adhesive and firmly roll lap to achieve continuity.

Pouring of Concrete

Ensure the plastic release liner is removed from all areas of Preprufe membrane and tape.

It is recommended that concrete be poured within 56 days (42 days in hot climates) of application of the membrane. Following proper ACI guidelines, concrete must be placed carefully and consolidated properly to avoid damage to the membrane. Never use a sharp object to consolidate the concrete.

Removal of Formwork

Preprufe membranes can be applied to removable formwork, such as slab perimeters, elevator and lift pits, etc. Once the concrete is poured the formwork must remain in place until the concrete has gained sufficient compressive strength to develop the surface bond. Preprufe membranes are not recommended for conventional twin-sided wall forming systems.

A minimum concrete compressive strength of 1500 psi (10 N/mm²) is recommended prior to stripping formwork supporting Preprufe membranes. Premature stripping may result in displacement of the membrane and/or spalling of the concrete.

Refer to Grace Tech Letter 17 for information on removal of formwork for Preprufe.

Figure 1

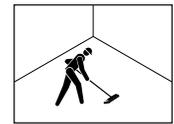


Figure 2

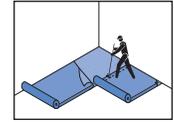
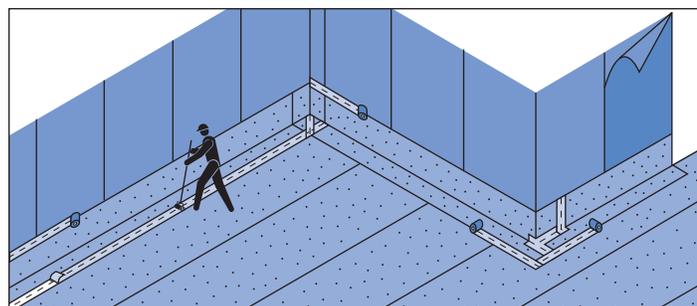
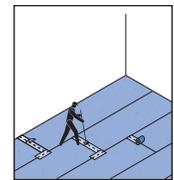


Figure 3

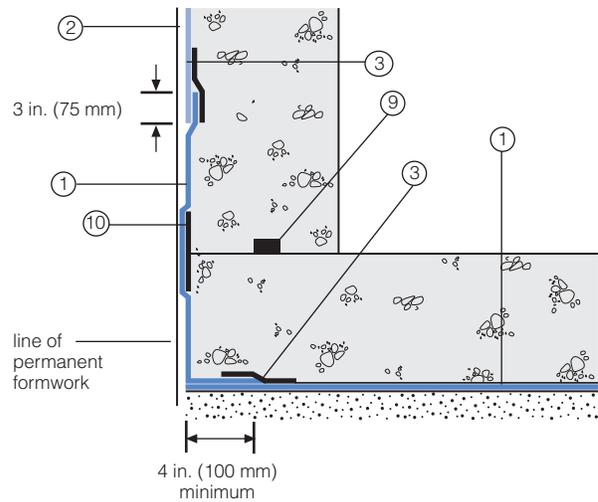


Detail Drawings

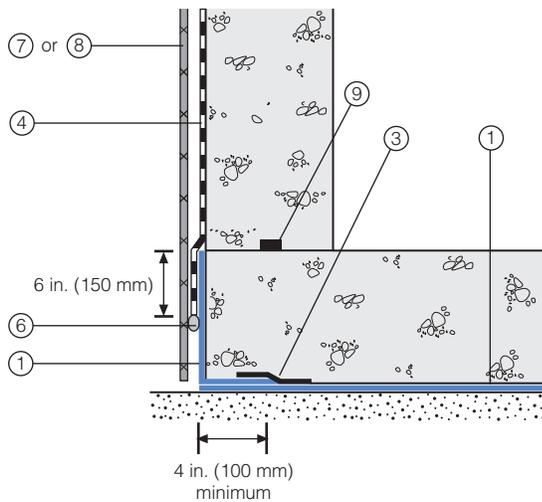
Details shown are typical illustrations and not working details. For a list of the most current details, visit us at graceconstruction.com.

For technical assistance with detailing and problem solving please call toll free at 866-333-3SBM (3726).

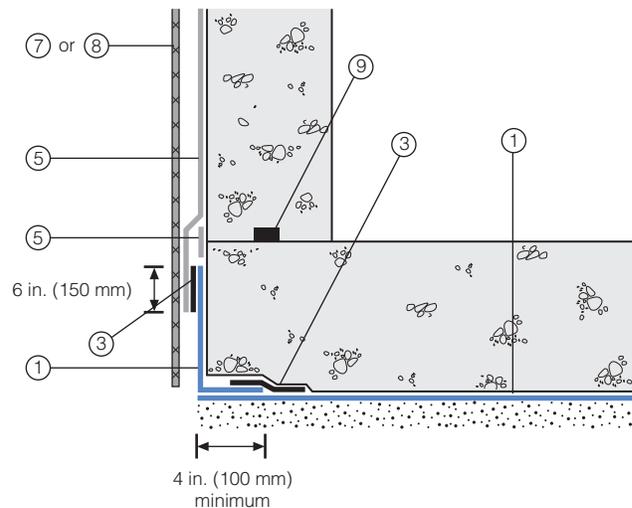
Wall base detail against permanent shutter



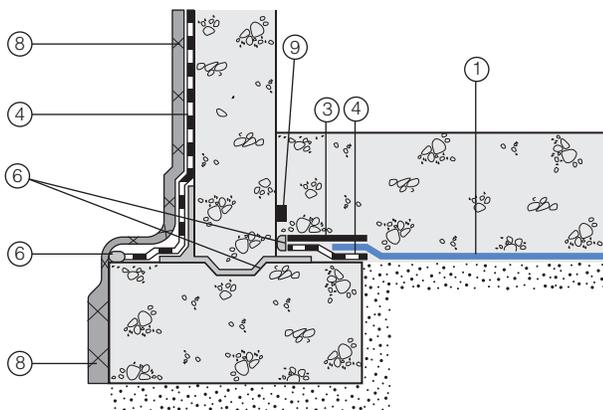
Bituthene wall base detail (Option 1)



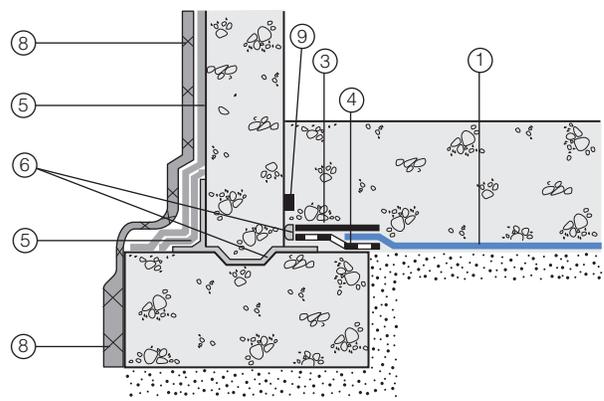
Procor wall base detail (Option 1)



Bituthene wall base detail (Option 2)



Procor wall base detail (Option 2)



- 1 Preprufe 300R
- 2 Preprufe 160R
- 3 Preprufe Tape
- 4 Bituthene

- 5 Procor
- 6 Bituthene Liquid Membrane
- 7 Protection

- 8 Hydroduct®
- 9 Adcor ES
- 10 Preprufe CJ Tape

Supply

Dimensions (Nominal)	Preprufe 300R Membrane	Preprufe 160R Membrane	Preprufe Tape (LT or HC*)
Thickness	0.046 in. (1.2 mm)	0.032 in. (0.8 mm)	
Roll size	4 ft x 98 ft (1.2 m x 30 m)	4 ft x 115 ft (1.2 m x 35 m)	4 in. x 49 ft (100 mm x 15 m)
Roll area	392 ft ² (36 m ²)	460 ft ² (42 m ²)	
Roll weight	108 lbs (50 kg)	92 lbs (42 kg)	4.3 lbs (2 kg)
Minimum side/end laps	3 in. (75 mm)	3 in. (75 mm)	3 in. (75 mm)
* LT denotes Low Temperature (between 25°F (-4°C) and 86°F (+30°C)) HC denotes Hot Climate (50°F (>+10°C))			
Ancillary Products			
Bituthene Liquid Membrane—1.5 US gal (5.7 liter) or 4 US gal (15.1 liter)			

Physical Properties

Property	Typical Value 300R	Typical Value 160R	Test Method
Color	white	white	
Thickness	0.046 in. (1.2 mm)	0.032 in. (0.8 mm)	ASTM D3767
Lateral Water Migration Resistance	Pass at 231 ft (71 m) of hydrostatic head pressure	Pass at 231 ft (71 m) of hydrostatic head pressure	ASTM D5385, modified ¹
Low temperature flexibility	Unaffected at -20°F (-29°C)	Unaffected at -20°F (-29°C)	ASTM D1970
Resistance to hydrostatic head	231 ft (71 m)	231 ft (71 m)	ASTM D5385, modified ²
Elongation	500%	500%	ASTM D412, modified ³
Tensile strength, film	4000 psi (27.6 MPa)	4000 psi (27.6 MPa)	ASTM D412
Crack cycling at -9.4°F (-23°C), 100 cycles	Unaffected, Pass	Unaffected, Pass	ASTM C836
Puncture resistance	221 lbs (990 N)	100 lbs (445 N)	ASTM E154
Peel adhesion to concrete	5 lbs/in. (880 N/m)	5 lbs/in. (880 N/m)	ASTM D903, modified ⁴
Lap peel adhesion	5 lbs/in. (880 N/m)	5 lbs/in. (880 N/m)	ASTM D1876, modified ⁵
Permeance to water vapor transmission	0.01 perms (0.6 ng/(Pa × s × m ²))	0.01 perms (0.6 ng/(Pa × s × m ²))	ASTM E96, method B
Water absorption	0.5%	0.5%	ASTM D570

Footnotes:

- Lateral water migration resistance is tested by casting concrete against membrane with a hole and subjecting the membrane to hydrostatic head pressure with water. The test measures the resistance of lateral water migration between the concrete and the membrane.
- Hydrostatic head tests of Preprufe Membranes are performed by casting concrete against the membrane with a lap. Before the concrete cures, a 0.125 in. (3 mm) spacer is inserted perpendicular to the membrane to create a gap. The cured block is placed in a chamber where water is introduced to the membrane surface up to the head indicated.
- Elongation of membrane is run at a rate of 2 in. (50 mm) per minute.
- Concrete is cast against the protective coating surface of the membrane and allowed to properly dry (7 days minimum). Peel adhesion of membrane to concrete is measured at a rate of 2 in. (50 mm) per minute at room temperature.
- The test is conducted 15 minutes after the lap is formed (per Grace published recommendations) and run at a rate of 2 in. (50 mm) per minute.

Specification Clauses

Preprufe 300R or 160R shall be applied with its adhesive face presented to receive fresh concrete to which it will integrally bond. Only Grace Construction Products approved membranes shall be bonded to Preprufe 300R/160R. All Preprufe 300R/160R system materials shall be supplied by Grace Construction Products, and applied strictly in accordance with their instructions. Specimen performance and formatted clauses are also available.

NOTE: Use Preprufe Tape to tie-in Procor with Preprufe.

Health and Safety

Refer to relevant Material Safety data sheet. Complete rolls should be handled by a minimum of two persons.

www.graceconstruction.com

For technical assistance call toll free at 866-333-3SBM (3726)

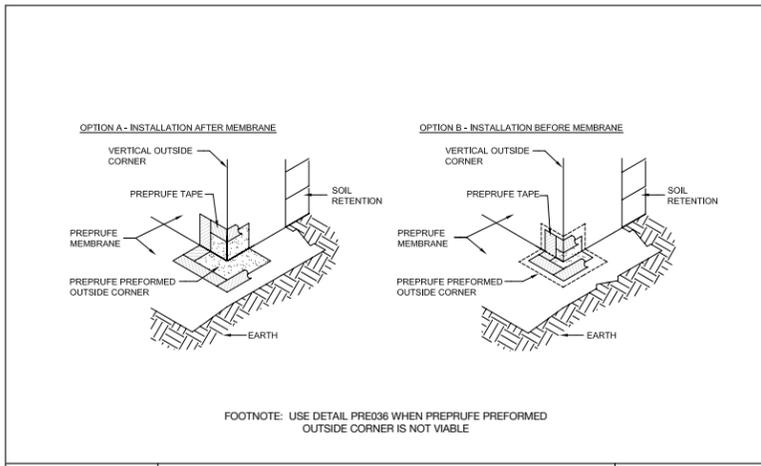
Adcor is a trademark and Preprufe, Bituthene and Hydroduct are registered trademarks of W. R. Grace & Co.—Conn. Procor is a U.S. registered trademark of W. R. Grace & Co.—Conn., and is used in Canada under license from PROCOR LIMITED.

We hope the information here will be helpful. It is based on data and knowledge considered to be true and accurate and is offered for the users' consideration, investigation and verification, but we do not warrant the results to be obtained. Please read all statements, recommendations or suggestions in conjunction with our conditions of sale, which apply to all goods supplied by us. No statement, recommendation or suggestion is intended for any use which would infringe any patent or copyright. W. R. Grace & Co.—Conn., 62 Whittemore Avenue, Cambridge, MA 02140. In Canada, Grace Canada, Inc., 294 Clements Road, West, Ajax, Ontario, Canada L1S 3C6.

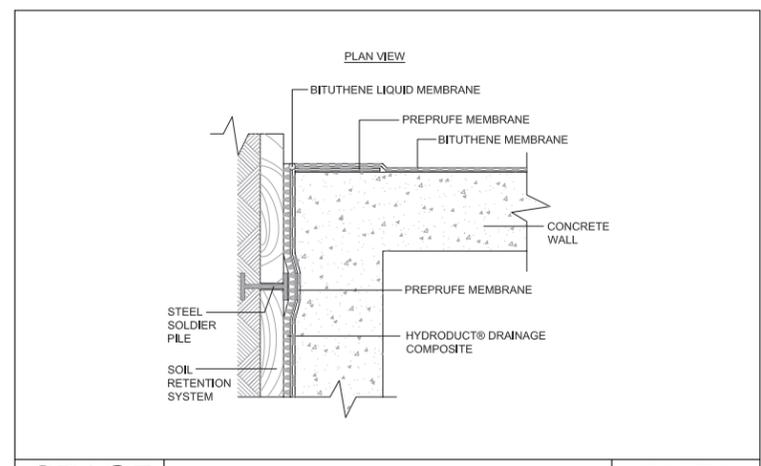
This product may be covered by patents or patents pending.
PF-111H Printed in U.S.A. 07/12

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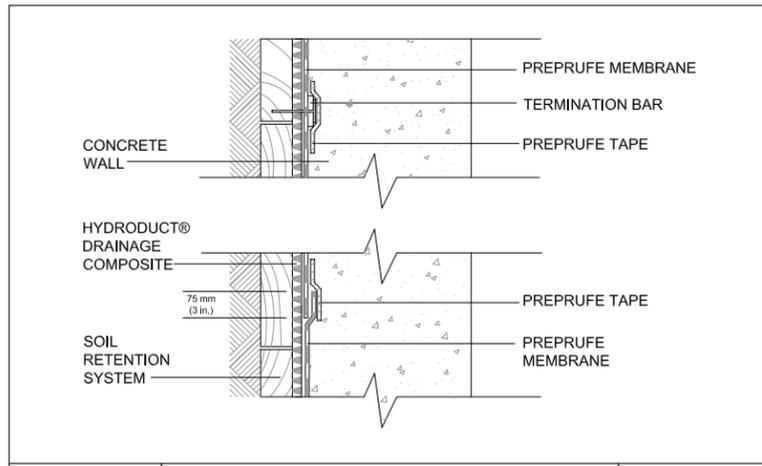
GRACE



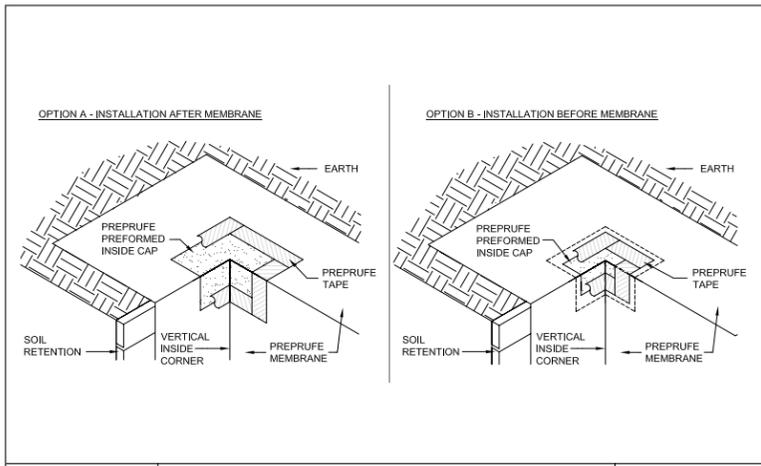
GRACE www.graceconstruction.com toll free 866-333-3726	PREPRUFE® PREFORMED CORNER OUTSIDE CORNER (OPTIONS A AND B) PREPRUFE® WATERPROOFING SYSTEM	DRAWING: PRE-054
		SCALE: NOT TO SCALE
		EFFECTIVE DATE: 06/01/10
		SUPERCEDES: 03/22/10



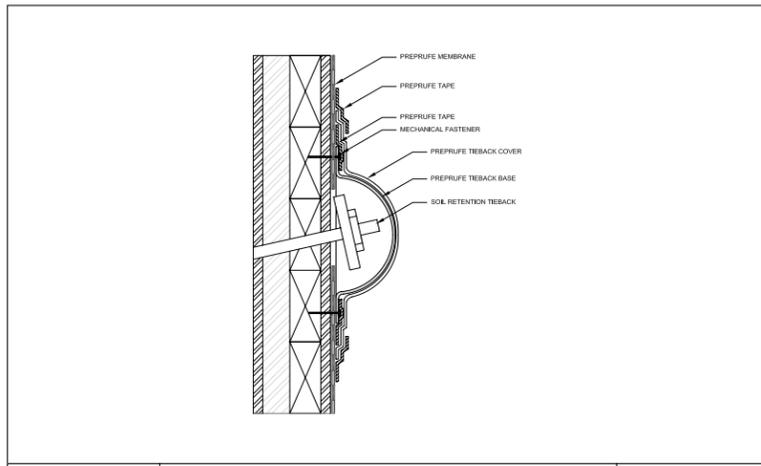
GRACE www.graceconstruction.com toll free 866-333-3726	TIE INTO BITUTHENE® WALL WATERPROOFING PLAN VIEW PREPRUFE® WATERPROOFING SYSTEM	DRAWING: PRE-045
		SCALE: NOT TO SCALE
		EFFECTIVE DATE: 03/31/07
		SUPERCEDES: 05/05/03



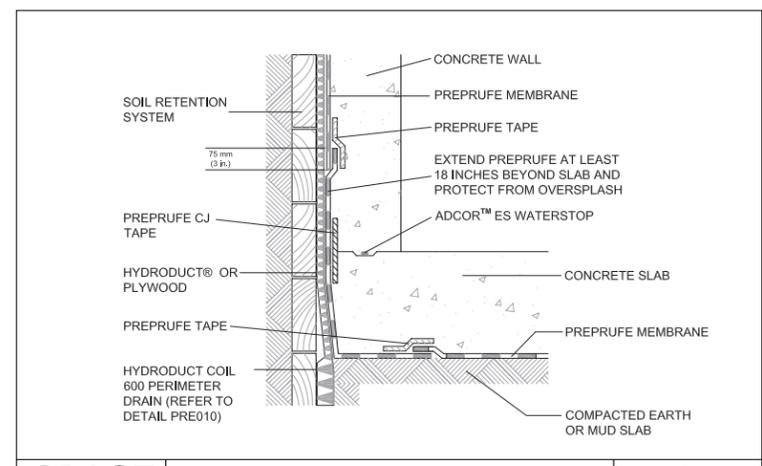
GRACE www.graceconstruction.com toll free 866-333-3726	TOP TERMINATION AND END LAP PREPRUFE® WATERPROOFING SYSTEM	DRAWING: PRE-048
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		EFFECTIVE DATE: 03/31/07
		SUPERCEDES: 05/05/03



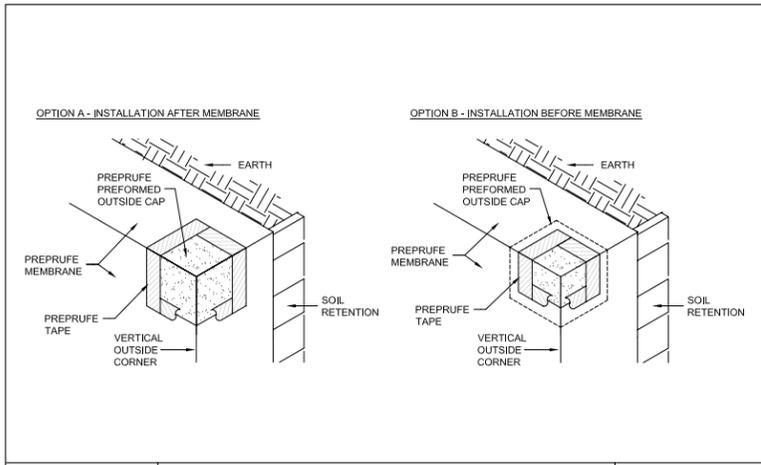
GRACE www.graceconstruction.com toll free 866-333-3726	PREPRUFE® PREFORMED CORNER INSIDE CAP (OPTIONS A AND B) PREPRUFE® WATERPROOFING SYSTEM	DRAWING: PRE-055
		SCALE: NOT TO SCALE
		EFFECTIVE DATE: 06/01/10
		SUPERCEDES: NEW



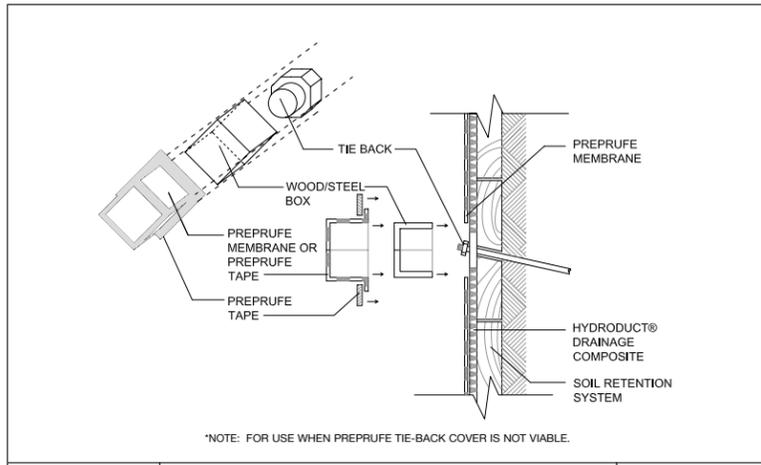
GRACE www.graceconstruction.com toll free 866-333-3726	PREPRUFE® TIE-BACK COVER PREPRUFE® WATERPROOFING SYSTEM	DRAWING: PRE-046
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		EFFECTIVE DATE: 03/31/07
		SUPERCEDES: NEW



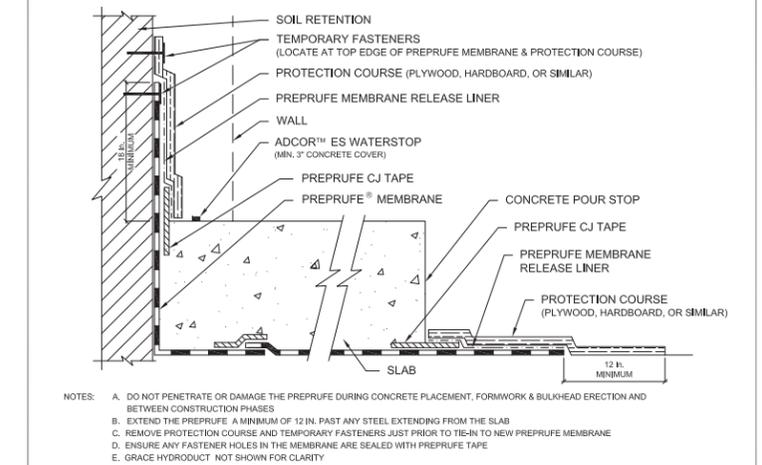
GRACE www.graceconstruction.com toll free 866-333-3726	BLIND SIDE WALL TO SLAB TIE-IN PREPRUFE® WATERPROOFING SYSTEM	DRAWING: PRE-009
		SCALE: NOT TO SCALE
		EFFECTIVE DATE: 06/01/10
		SUPERCEDES: 03/01/09



GRACE www.graceconstruction.com toll free 866-333-3726	PREPRUFE® PREFORMED CORNER OUTSIDE CAP (OPTIONS A AND B) PREPRUFE® WATERPROOFING SYSTEM	DRAWING: PRE-056
		SCALE: NOT TO SCALE
		EFFECTIVE DATE: 06/01/10
		SUPERCEDES: NEW



GRACE www.graceconstruction.com toll free 866-333-3726	SOIL RETENTION TIE-BACK COVER CUSTOM BOX COVER PREPRUFE® WATERPROOFING SYSTEM	DRAWING: PRE-047
		SCALE: NOT TO SCALE
		EFFECTIVE DATE: 06/01/10
		SUPERCEDES: 03/31/07



GRACE Construction Products www.graceconstruction.com toll free 866-333-3726	PREPRUFE® WATERPROOFING SYSTEM TEMPORARY PROTECTION DURING CONSTRUCTION SEQUENCING	DRAWING: PRE-060
		SCALE: Not to scale
		EFFECTIVE DATE: 03/26/13
		SUPERCEDES: NEW

**PASSIVE HOUSE
211 WEST 29TH STREET
NEW YORK, NY 10001**

OWNER:	
SEA FOAM PROPERTY, LLC 150 West 30th Street, 20th Floor New York, NY 10001	T: 212.594.1414 E: 211seafoam@gmail.com
CODE AND ZONING CONSULTANT	
CODE LLC 40 Worth Street, Suite 800 New York, NY 10013	T: 212.766.8100 F: 212.766.1368 E: rkapp@codenyc.com
STRUCTURAL ENGINEER:	
SILMAN 32 Old Slip, 10th Floor New York, NY 10005	T: 212.620.7970 F: 212.620.8157 E: arnett@silman.com
MECHANICAL/ ELECTRICAL/ PLUMBING/ SPRINKLER ENGINEER:	
EP ENGINEERING 100 William Street, 32nd Floor New York, NY 10038	T: 212.257.6191 F: 212.994.8991 E: robert@epengineer.com
GEOTECHNICAL ENGINEER:	
MUESER RUTLEDGE CONSULTING ENGINEERS 14 Penn Plaza - 225 West 34th Street New York, NY 10122-0002	T: 917.339.9443 E: clddy@mrcce.com
ENERGY/FACADE CONSULTANT/ACCESSIBILITY:	
STEVEN WINTER ASSOCIATES 307 Seventh Avenue, Suite 1701 New York, NY 10001	T: 212.564.5800 F: 212.741.8673 E: wzoeller@swinter.com

CIVIL ENGINEER:	
MARIN ARCHITECTS 57 West 38th Street, 10th Floor New York, NY 10018	T: 212.463.8480 F: 212.463.9040 E: gramirez@marinarchitects.com

ENVIRONMENTAL CONSULTANT:	
ROUX ASSOCIATES, INC. 209 Shafter Street Islanda, NY 11749	T: 632.232.2600 F: 212.463.9040 E: maxwell@rouxinc.com

LIGHTING CONSULTANT:	
LIGHTING WORKSHOP 20 Jay Street, Suite 500, Brooklyn, NY 11201	T: 212.796.6510 F: 212.796.2072 E: drussell@lightingworkshop.com

ACOUSTIC CONSULTANT:	
ROBERT J. HANSEN ASSOCIATES 124 East 40th Street, Suite 701 New York, NY 10016	T: 212.687.2672 F: 212.661.0898 E: rjh@hansenacoustics.com

NO.	DATE	REVISIONS

NO.	DATE	ISSUED FOR
1	1 APR 2016	DOB FILING
2	30 JUNE 2016	DOB FILING COMMENTS 2



**DRAWING TITLE:
FOUNDATION AIR AND VAPOR
BARRIER INSTALLATION AND
TRANSITION DETAILS**

DATE: 1 APR 2016
PROJECT NO: 15-0009
DRAWN BY: DS / AG / GF / AM
CHK BY: SZ / MH

DWG NO:
A-561.00

DOB APPLICATION NUMBER:

APPENDIX 7

PASSIVE HOUSE INFORMATION

David Bligh

From: David Bligh
Sent: Wednesday, July 20, 2016 1:02 AM
To: Hiralkumar Patel (hiralkumar.patel@dec.ny.gov); ADuchesne@dep.nyc.gov
Cc: shaminderc@dep.nyc.gov; Moore, Hannah; Jeremy Levine (jeremy@jbspm.com); Robert Kovacs
Subject: FW: DRAFT RAWP: 211 West 29th Street, Manhattan - OER Project # 16EHAN062M - Spill # 1505845
Attachments: 160719_A-560_Preprufe_Installation_and_Penetration_Details.pdf; 160719_A-561_Preprufe_Transition_Details.pdf; Preprufe 300R & 160R.pdf

Kumar/ Amanda:

As requested, ZH Architects provided additional information regarding passive house design, and can be found in the emails below. Also, attached is the cut sheet for the selected vapor barrier as well as installation details provided by ZH Architects that will be followed to ensure the vapor barrier is air tight in accordance with the passive house design.

Regarding B-3P, we believe the proposed hot spot excavation at B-3P will be protective of human health, with the SCOs proposed in the RAWP achieved. However, we don't think it's practical to collect the B-3P end point samples because it won't be possible to chase impacts vertically or horizontally for structural reasons (i.e., concerns relating to the structural integrity of the building located on the adjacent property to the west of the Site) in the unlikely event that the impacts are not fully addressed by the proposed B-3P hot spot excavation. Furthermore, we believe the impacts are isolated to the B-3P vicinity and not migrating; groundwater concentrations in downgradient well MW-3 met AWQSGVs with no free-product detected.

Lastly, as requested, daily reports will be submitted to NYSDEC during active excavation work.

Please don't hesitate to call or email Rob or me with any questions or concerns.

Regards,

David T. Bligh, P.E. | Senior Engineer | ROUX ASSOCIATES, INC. & REMEDIAL ENGINEERING, P.C.

Main: 631.232.2600 | Direct: 631.630.2357 | Mobile: 631.379.2281

Email: dbligh@rouxinc.com | Website: www.rouxinc.com

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From: Deniz Seclimis [mailto:ds@zh-architects.com]

Sent: Tuesday, July 19, 2016 11:58 AM

To: David Bligh

Cc: Jeremy Levine; Robert Kovacs; Stas Zakrzewski; Jeremy Katich; Marianne Hyde

Subject: Re: DRAFT RAWP: 211 West 29th Street, Manhattan - OER Project # 16EHAN062M - Spill # 1505845

David and Robert,

As discussed please find below additional information about Passive House Certification, Testing, the team and third party certification.

PREPRUFE DETAILS

Please find attached sheets A-560 and A-561 that illustrate the relevant manufacturers recommended details for installation of the Preprufe membrane below the slab, the pile caps, penetrations, transitions and blind side at the foundation walls. Currently these include options on installation at the grade beam and at tie backs. I've asked for team feedback but didn't want to delay getting this out to you so both sets of options are included in the detail sheets.

TEXT

The new residential rental building being designed and built at 211 W 29th Street is pursuing Passive House Certification. The Passive House standard is now widely accepted as a viable framework for the specification and building of very low energy and comfortable buildings. The standard calls for high performing building envelopes, with excellent insulation, minimal thermal bridging and extremely low air leakage rates, as well as emphasis on ventilation with heat recovery, and building orientation. The building envelope or enclosure is the barrier that separates the always variable and sometimes harsh outdoor environment from the constant comfort of the indoor environment. It is the most important building component in determining overall durability, and one of the most important contributors in addressing building energy efficiency; the building performance efficacy of which is primarily determined not only in the planning phase but more so by adherence to proven methodologies during construction.

In order to meet the Passive House Standard there is a significant amount of additional effort in detailing, modeling, consulting review and testing incorporated into this project. The project team on board includes ZH Architects as the principal designers, Steven Winter Associates as additional consultants, and the Passive House Academy as the Passive House Certification Body. The contractor selected for the project will also be required to have a Certified Passive House Tradespersons on their staff.

As the principal designers, the ZH architects team consists of, among others, two Certified Passive House Consultants and a Passive House Tradesperson. ZH Architects (ZH) considers the overall performance targets and the performance of each building

components in designing and detailing the building. With the aid of its consultants ZH is responsible for product selection, performance specifications and construction drawings. ZH designs a continuous thermal and air barrier wrapping around the building envelope from foundation to façade to roof. Each penetration including but not limited to vent pipes, louvers, window openings and cladding attachment is carefully considered to minimize thermal bridging and air leakage. The project design, construction details, climate and site context are modeled in the latest version of the Passive House Planning Package (PHPP), the essential energy modeling tool required to plan Passive House projects.

Steven Winter Associates (SWA) acts as supplemental consultants to the principal PH consultant on the project. They provide support on the mechanical design side as well as façade consulting and will be helping the team develop their field Quality Assurance and Quality Control procedures and performing the PH verification tasks necessary for certification. In addition to field inspections throughout the course of the project, Steven Winter Associates will also be providing Envelope, Enclosure and Mechanical Systems Commissioning services. SWA's envelope commissioning services begin with conceptual design development reviews, follow through with detailed CD reviews, construction field verification, and component/assembly testing where required to verify that the building envelope was constructed to meet the desired specifications. Commissioning services provide a systematic quality assurance process for the integration of the building's systems. The low air leakage rates that are required in the Passive House standard must be proven for the building by means of a "blower door" air tightness test which will be conducted on site with SWA. The air change rate must be below 0.6 air changes per hour under test conditions. More information about the stringent blower door testing guides and their reference standards can be found at <http://www.greenbuild.ie/PassiveHouseBlowerDoorTesting.pdf>

Passive House Academy (PHA) is accredited by the German Passivhaus Institut as a Passive House Certification body, since they are outside of the design team they act as an auditor in the certification process. Engaging with the certification team at PHA in having a project certified is an iterative process from the initial design stage through to project completion. Performance certificates for key elements of the project must be submitted to PHA by the design team, along with photographic evidence of construction details and on-site independent test results for such aspects as airtightness and balancing of ventilation equipment.

A contractor has not been selected for the project at this time. The construction contracts for 211 W 29th St will require that the General Contractor have Certified Passive House Tradespeople on their construction management team. Having design, construction and third party certification team that are all well versed in the goals and requirements of Passive House will aid the project in meeting its Passive House Certification.

Thank you,
Deniz



Zakrzewski + Hyde Architects

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From: David Bligh <dbligh@rouxinc.com>
Date: Thursday, July 14, 2016 at 4:33 PM
To: Deniz Secilmis <ds@zh-architects.com>
Cc: Jeremy Levine <jeremy@jbspm.com>, Robert Kovacs <rkovacs@rouxinc.com>, Stas Zakrzewski <sz@zh-architects.com>, Jeremy Katich <jk@zh-architects.com>, Marianne Hyde <mh@zh-architects.com>
Subject: RE: DRAFT RAWP: 211 West 29th Street, Manhattan - OER Project # 16EHAN062M - Spill # 1505845

Deniz,

As discussed, can you please provide additional details in an email discussing the testing and third party oversight planned for this project to ensure the building is constructed in strict conformance with the passive house building standards? Can you please clarify whether this project will be certified and if it will have monitors to measure air tightness? Lastly, can you please provide drawings referencing the vapor barrier products to be used as well as construction details for ensuring the building foundation is air tight?

Thanks,

David T. Bligh, P.E. | Senior Engineer | ROUX ASSOCIATES, INC. & REMEDIAL ENGINEERING, P.C.

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From: Deniz Seclimis [<mailto:ds@zh-architects.com>]

Sent: Monday, July 11, 2016 2:58 PM

To: Jeremy Levine; Stas Zakrzewski; Marianne Hyde; Jeremy Katich

Cc: David Bligh; Robert Kovacs

Subject: Re: DRAFT RAWP: 211 West 29th Street, Manhattan - OER Project # 16EHAN062M - Spill # 1505845

Jeremy and David,

This is excerpted from the NYPH Website. It's a fairly comprehensive description of what Passive House is. I believe from our acoustic consultant they also already have info about the high performance triple glazed windows. If they don't let us know and we can expand on that point below.

Thank you,
Deniz

Passive House is a building standard. It is a voluntary international building standard developed by the Passive House Institute (PHI), located in Darmstadt, Germany – referred to also as The Passive House Standard. The Passive House Standard is composed of several strict performance requirements for new building construction. For the renovation of existing buildings PHI developed a similar if slightly more lenient performance standard. The resulting performance represents a roughly 90% reduction in heating and cooling energy usage and up to a 75% reduction in primary energy usage from existing building stock – meant to aggressively meet the climate crisis carbon reduction imperative while making a comfortable, healthy and affordable built environment.

The Passive House Standard for new buildings addresses energy usage and building airtightness:

- Space Heating Energy Demand: 15 kilowatt hours per square meter of Treated Floor Area[1] per year or 10 Watts per square meter peak demand. (Or in Imperial units 4.75 kBtu/sf*yr and 3.2 BTU/hr*sf respectively.)
- Space Cooling Energy Demand: matches the heat demand requirements but with a small additional allowance for dehumidification.
- Primary Energy Demand: total energy to be used in the building operations (heating + cooling + lighting + equipment + hot water + plug loads, etc...) is limited to 120 kilowatt hours per square meter of Treated Floor Area per year. (Or in Imperial units 38.0 BTU/sf*yr.)
- Airtight Enclosure: Allowable limit of 0.6 air changes per hour at 50 Pascals pressure (ACH50) that is verified with an onsite blower door test (pressurized and depressurized).[2]
(For a building with a volume above 4,000 cubic meters (or 140,000 cubic feet) measurement relative to surface area is recommended, with maximum leakage of 0.6m³/hr*m² or 0.033CFM/ft² at 50 Pascals pressure.)

Passive House is a methodology to achieve the rigorous requirements of the standard. When designing a Passive House one first looks to minimize the heating and cooling loads as much as possible through passive measures like orientation, massing, insulation, heat recovery, passive use of solar energy, solar shading, elimination of thermal bridges, and incidental internal heat sources. Because the building is airtight, a continuous supply of low volume filtered fresh air is supplied to living/working spaces and stale air is exhausted from services spaces – providing balanced and controlled ventilation with high-efficiency heat exchange. The methodology requires that all necessary building information be entered into the Passive House Planning Package (PHPP) which calculates the building energy balance (heat losses and gains). The PHPP is the essential design tool in making a successful Passive House.

To help practitioners achieve the criteria, PHI has developed Passive House Certified Components for such critical items as windows and heat-recovery ventilation units and Certified Passive House Consultants training and Certified Passive House Tradespersons training, to help ensure that the design and construction of Passive Houses are done with the highest competence possible.

A Passive House is a building that is constructed with the Passive House methodology and meets the Passive House Standard criteria. A Passive House can be any type of building: an apartment building, a school, an office building, a factory, a supermarket. Passive Houses are exceptionally comfortable, healthy and affordable to occupy.

A Passive House may become a Certified Passive House. Certification is provided by PHI or another certifier accredited by PHI. A Certified Passive House must also meet additional Passive House comfort criteria and submit extensive documentation including the completed PHPP. Certification is recommended for the unsurpassed quality assurance it provides, bringing to the process expertise in cost optimization, detailing and execution. There are different certifications for residential and non-residential as well as building renovations.

However if the building was designed and built with the Passive House methodology, incorporates Passive House components but just missed the required criteria, such as the final airtightness test results, the building may be called a Passive House Project, or more generically a high-performance low-energy building.

The result of all this is a Passive House building with the following qualities:

- Very Energy Efficient: Providing dramatic energy reduction, up to 90% for heating and cooling demand from average existing building stock – in an effort to offer a proportional response to the climate crises.
- Healthy: Fresh, high-quality indoor air, free of mold and dangerous levels of typical indoor air contaminants.
- Comfortable: A quiet interior environment with steady temperatures and no drafts.
- Affordable: Added construction costs for high performance are substantially offset by a reduction in systems sizing. Because the reduced energy use translates into lower bills and protection from future energy shocks, occupancy is affordable.
- Predictable: An integrated methodology and energy model provides predictability – an essential element in optimizing system sizing and costing.
- Resilient: Passive House buildings help provide resiliency in three ways. 1) By indefinitely maintaining habitable interior temperatures in freezing weather without power – allowing people to shelter-in-place. 2) By reducing power demand, which allows power distribution systems to be better managed. 3) By reducing power demand to make Net Zero Energy building readily achievable with rooftop photovoltaic solar panels and/or other renewables.

[1] Treated Floor Area is a specifically defined term and area, that is smaller than gross area or even net interior area – similar but not identical to what one might think of as “carpetable area” where interior walls, stairs and unusable space is not included.

[2] The volume used for the airtightness calculation refers to the occupied volume – finish surface to finish surface of each space, where floors and walls are excluded.



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From: Patel, Hiralkumar R (DEC) [<mailto:hiralkumar.patel@dec.ny.gov>]
Sent: Tuesday, July 05, 2016 1:00 PM
To: David Bligh <dbligh@rouxinc.com>
Cc: shaminderc@dep.nyc.gov; Jeremy Levine <jeremy@jbspm.com>; ADuchesne@dep.nyc.gov; Robert Kovacs <rkovacs@rouxinc.com>
Subject: RE: DRAFT RAWP: 211 West 29th Street, Manhattan - OER Project # 16EHAN062M - Spill # 1505845

Hello David,

The Department received a Draft Remedial Action Work Plan for the above referenced site. After reviewing the draft work plan, it was noted that it does not include any details about passive house design and explanation for not collecting endpoint samples after removal of contaminated materials from the area of well B-3P. Please submit these information. Also it does not include submission of daily reports to DEC. Please include that in the final RAWP.

Feel free to contact me if you have any questions. Thanks

- Kumar

From: David Bligh [<mailto:dbligh@rouxinc.com>]
Sent: Thursday, June 30, 2016 11:24 PM
To: Patel, Hiralkumar R (DEC) <hiralkumar.patel@dec.ny.gov>
Cc: shaminderc@dep.nyc.gov; Jeremy Levine (jeremy@jbspm.com) <jeremy@jbspm.com>; ADuchesne@dep.nyc.gov;