

Remedial Action Plan

For

507 West 24th Street, New York, NY

Block 696, Lot 28

NYC Voluntary Cleanup Project: 12CVCP047M

E- Project Number 09EH-N109M

E-Designation E-142

CEQR Number 03DCP069M

West Chelsea Zoning Resolution

FINAL

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REMEDIAL ACTION PLAN

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ACRONYMS

Acronym	Definition
AST	Aboveground Storage Tank
CAMP	Community Air Monitoring Plan
C&D	Construction & Demolition
CEQR	City Environmental Quality Review
CFR	Code of Federal Regulations
CHASP	Construction Health and Safety Plan
CO	Certificate of Occupancy
CPC	City Planning Commission
DSNY	Department of Sanitation
“E”	E-Designation
EAS	Environmental Assessment Statement
EIS	Environmental Impact Statement
ESA	Environmental Site Assessment
EC/IC	Engineering Control and Institutional Control
ELAP	Environmental Laboratory Accreditation Program
FDNY	New York City Fire Department
GPR	Ground Penetrating Radar
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations Emergency Response
IDW	Investigation Derived Waste
Notice – NNO	Notice of No Objection
Notice – NTP	Notice To Proceed
Notice – NOS	Notice Of Satisfaction
Notice – FNOS	Final Notice of Satisfaction
NYC BSA	New York City Board of Standards and Appeals
NYC DCP	New York City Department of City Planning
NYC DEP	New York City Department of Environmental Protection
NYC DOB	New York City Department of Buildings
NYC DOF	New York City Department of Finance
NYC HPD	New York City Housing Preservation and Development
NYCRR	New York Codes Rules and Regulations
NYC OER	New York City Office of Environmental Remediation

Acronym	Definition
NYS DEC	New York State Department of Environmental Conservation
NYS DEC DER	New York State Department of Environmental Conservation Division of Environmental Remediation
NYS DEC PBS	New York State Department of Environmental Conservation Petroleum Bulk Storage
NYS DOH	New York State Department of Health
NYS DOT	New York State Department of Transportation
OSHA	United States Occupational Health and Safety Administration
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PE	Professional Engineer
PID	Photo Ionization Detector
PM	Particulate Matter
QEP	Qualified Environmental Professional
RA	Registered Architect
RAP	Remedial Action Plan
RCA	Recycled Concrete Aggregate
RCR	Remedial Closure Report
RD	Restrictive Declaration
RI	Remedial Investigation
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SSDS	Sub-Slab Depressurization System
SVOCs	Semivolatile Organic Compounds
USCS	Unified Soil Classification System
USGS	United States Geological Survey
UST	Underground Storage Tank
TAL	Target Analyte List
TCL	Target Compound List
TCO	Temporary Certificate of Occupancy
VB	Vapor Barrier
VOCs	Volatile Organic Compounds

CERTIFICATION

I, Charlie McGuckin, am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the 507 West 24th Street Site, Site #12CVCP047M.

I, Nathan Epler am a Qualified Environmental Professional as defined in §43-140. I have primary direct responsibility for implementation of the remedial action for the 507 West 24th Street Site, Site #12CVCP047M.

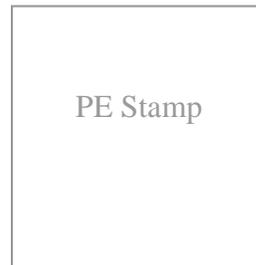
I certify that this Remedial Action Plan (RAP) has a plan for handling, transport and disposal of soil, fill, fluids and other materials removed from the property in accordance with applicable City, State and Federal laws and regulations. Importation of all soil, fill, and other material from off-Site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

Charles J. McGuckin
Name

NYS Professional Engineer #069509
NYS PE License Number

Signature

March 21, 2012
Date



Nathan Epler
QEP Name

QEP Signature

March 21, 2012
Date

EXECUTIVE SUMMARY

507 West 24th Street, LLC has established this plan to remediate a 3,500-square foot site located at 507 West 24th Street in Manhattan, New York. A Phase II Subsurface Investigation (Phase II) was performed to compile and evaluate data and information necessary to develop this Remedial Action Plan (RAP). The remedial action described in this document achieves the remedial objectives, complies with applicable environmental standards, criteria, and guidance, and conforms with applicable laws and regulations.

Site Location and Current Usage

The Site is located at 507 West 24th Street in the Chelsea section of New York City, New York, and is also identified as Block 696, Lot 28 on the New York County tax map (Appendix A). The Site consists of a vacant lot containing approximately 3,500 square feet (35 feet fronting West 24th Street and extending 100 feet north). The Site is located beneath elevated railroad tracks formerly used by various rail transportation companies. The elevated railroad track is no longer in use and is currently a park referred to as the Highline.

According to the most recent NYCDOB Certificate of Occupancy (CO) issued June 9, 1999 (CO Number 117191), the Site is zoned M1-5 (manufacturing and commercial) and the permissible use and occupancy is for motor vehicle sales, a tool shed, and auto repair. None of these activities currently occur at the Site.

The Site is bordered to the south by West 24th Street. Further south, across West 24th Street, is a car wash and a building lot currently under construction. The Site is bordered to the west by an art gallery. An auto body shop borders the Site to the north. A residential building borders the east side of the Site. Further to the east is a gasoline filling station (formerly Getty Service Station #341) currently operating as Lukoil located at 239 10th Avenue.

Summary of Proposed Redevelopment Plan

The planned redevelopment of the Site will involve the construction of an art gallery (the Chelsea Gallery). The Chelsea Gallery will be located underneath the elevated Highline structure, which is currently a public park.

The proposed gallery structure will contain one open space gallery on the ground floor. The existing Highline columns penetrate from above and into the space. The space will open up in the rear, creating a 28-foot high exhibition area. Offices, workshops, archive, lavatories, and a storage area are proposed for the basement level, the floor of which will lie approximately 12 feet below street level.

The proposed gallery will include excavation of the entire site lot down to a depth of approximately 15 feet below current grade for the construction of the foundation.

Summary of the Remedy

The proposed site redevelopment includes removal of existing paving/asphalt, excavation to a depth of approximately 15.5 feet below grade, and construction of a 2-story structure with a basement level.

The building foundation excavation will extend to a depth ranging approximately six to seven feet below the water table, effectively removing soil exhibiting historical fill impacts within the building footprint. The building foundation will be equipped with a water-proofing and vapor barrier as discussed in Appendix J. The barrier will be protective of potential vapor intrusion resulting from potential volatilization of low level VOCs and SVOCs detected in soil and groundwater. In addition, the building basement will include a mechanical ventilation system consistent with the New York City Building Code.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and implementation of a Citizen Participation Plan.
2. Performance a Community Air Monitoring Program for particulates and volatile organic carbon compounds during all remedial activities.
3. Establish Track 4 Soil Cleanup Objectives (SCOs) for SVOCs and metals.
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking and staking excavation areas.
5. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.

6. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
7. Excavation and removal of soil/fill exceeding Track 4 SCOs.
8. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID.
9. Removal of any underground storage tanks and closure of petroleum spills that may be encountered during site work in compliance with applicable local, State and Federal laws and regulations.
10. Transportation and off-Site disposal of all soil/fill material at 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 onsite.
11. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
12. Demarcation of residual soil/fill.
13. Installation of a vapor barrier/waterproofing barrier system beneath the building slab and along foundation sidewalls.
14. Construction and maintenance of an engineered composite cover consisting of the building foundation slab and sidewalls and integrated vapor barrier system/waterproofing membrane to prevent human exposure to residual soil/fill remaining under the Site.
15. Submission of a RAR that describes the remedial activities, certifies that the remedial requirements have been achieved, and lists any changes from this RAWP.
16. Submission of an approved Site Management Plan (SMP) 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.
17. Recording of a Declaration of Covenants and Restrictions that includes a listing of Engineering Controls and a requirement that management of these controls must be in compliance with an approved SMP; and Institutional Controls including 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.

REMEDIAL ACTION PLAN

1.0 SITE BACKGROUND

This Remedial Action Plan (RAP) and site-specific Construction Health and Safety Plan (CHASP) have been developed for 507 West 24th Street in the West Chelsea section of Manhattan, New York (the Site). This project has been assigned Project number 09EH-N109M and VCP Site #12CVCP047M by OER. This RAP describes the remediation and/or mitigation activities to be implemented at the Site in coordination with the New York City Office of Environmental Remediation (OER) for the purposes of satisfying the requirements of the Hazardous Materials E-Designation Program and obtaining a Notice to Proceed. An E-Designation for Hazardous Materials (E-142) was placed on the Site by the New York City Department of City Planning (DCP) as part of the West Chelsea Zoning Resolution - CEQR #03DCP069M. The site-specific CHASP (Appendix B) addresses site-specific hazards, identified contaminants of concern and safety requirements associated with remediation and mitigation activities in accordance with ASTM and OSHA guidelines.

1.1 Site Location and Current Usage

The Site is located in the West Chelsea section of Manhattan, New York and is identified as Block number and Lot(s) number(s) on the New York City Tax Map. Figure 1 is a Site location map. The Site is 3,500-square feet and is bounded to the south by West 24th Street. Further south, across West 24th Street, is a car wash and a building lot currently under construction. The Site is bordered to the west by an art gallery. A residential building borders the east side of the Site. Further to the east is a gasoline filling station (formerly Getty Service Station #341) currently operating as Lukoil located at 239 10th Avenue (see Figure 2). Currently, the Site is a vacant lot.

The Site consists of Block 696, Lot 28 in Manhattan, New York, CD 4 and is listed in the West Chelsea Zoning Resolution under CEQR #03DCP069M and OER # 09EH-N109M.

1.2 Proposed Redevelopment Plan

The proposed use of the Site will consist of an art gallery. Layout of the proposed site development is presented in Figure 3. According to the most recent NYCDOB Certificate of

Occupancy (CO) issued June 9, 1999 (CO Number 117191), the Site is zoned M1-5 (manufacturing and commercial) and the permissible use and occupancy is for motor vehicle sales, a tool shed, and auto repair. None of these activities currently occur at the Site. A copy of the most recent NYCDOB CO (as well as historical NYCDOB COs) is provided in Appendix C.

The planned redevelopment of the Site will involve the construction of an art gallery (the Chelsea Gallery). The Chelsea Gallery will be located underneath the elevated Highline structure, which is currently being transformed into a public park. The proposed gallery floor plans are provided in Appendix D.

The proposed gallery structure will contain one open space gallery on the ground floor. The existing Highline columns penetrate from above and into the space. The space will open up in the rear, creating a 28-foot high exhibition area. Offices, workshops, archive, lavatories, and a storage area are proposed for the basement level, the floor of which will lie approximately 12 feet below street level.

The proposed gallery will include excavation of the entire site lot down to a depth of approximately 15 feet below current grade for the construction of the foundation.

1.3 Description of Surrounding Property

The Site is bordered to the south by West 24th Street. Further south, across West 24th Street, is a car wash and a building lot currently under construction. The Site is bordered to the west by an art gallery. An auto body shop borders the Site to the north. A building lot currently under construction borders the east side of the Site. Further to the east is a gasoline filling station (formerly Getty Service Station #341) currently operating as Lukoil located at 239 10th Avenue (see Figure 2).

1.4 Environmental Investigation Reports

The following environmental work plans and reports were developed for the Site:

- Hydro Tech Environmental Corp. (Hydro Tech) performed a Phase II subsurface investigation of the Site and adjacent properties in June 2004. The results of the Hydro Tech Phase II investigation were presented in a Subsurface Assessment Report dated June 4, 2004 (Hydro Tech, 2004).

- Roux Associates' 2008 investigation included the installation and sampling of two groundwater monitoring wells on the Site and the collection of soil vapor samples from two onsite locations. The results were first presented to OER in an April 24, 2009 Phase I/II Remedial Investigation Report and Remedial Action Plan and are discussed in this section.
- Langan Engineering and Environmental Services PC prepared a Geotechnical Engineering Report (Appendix G) in April 2008, in which they completed two borings (one to 34 feet and one to 50 feet depth) at the Site. They determined that the upper 12 to 13 feet of the material beneath the Site is fill of undocumented origin.
- Moretrench sampled Monitoring Well GW-2 (Appendix F) on January 31, 2012. No VOCs or SVOCs were detected in groundwater during that sampling event.

The Hydro Tech report is provided in Appendix G. Note that the soil samples summarized in the Hydro Tech report that were obtained on the 507 West 24th Street property are highlighted in red.

The results of the Roux Associates soil vapor and groundwater sampling are presented in Appendices E and F, respectively.

1.4.1 Hydro Tech Phase II Investigation

Hydro Tech Environmental Corp. (Hydro Tech) performed a Phase II subsurface investigation of the Site and adjacent properties in June 2004 in accordance with the New York State Department of Environmental Conservation (NYSDEC) Bureau of Spill Prevention & Response Sampling Guidelines and Protocols (March 1991) and the NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation (December 2002). The Hydro Tech investigation involved the completion of a geophysical survey using ground penetrating radar (GPR) to search for potential USTs and the collection and analysis of soil and groundwater samples from the Site and adjacent lots. The results of the Hydro Tech Phase II investigation were presented in a Subsurface Assessment Report dated June 4, 2004 (Hydro Tech, 2004) and are summarized below.

1.4.1.1 Hydro Tech GPR Survey

The geophysical survey utilized a GSSR SIR-3000 GPR control unit equipped with a 400-megahertz antenna over a grid pattern. The GPR was run at a setting of 50 scans per linear foot. The results of the GPR survey (Figure 3 of the Hydro Tech report [Appendix G]) indicated

that a geophysical anomaly (#3) was observed beneath the adjacent property to the west, and beneath a portion of the western portion of the subject property. This anomaly turned out to be related to the presence of several underground storage tanks that were located beneath the adjacent property to the west (511 West 24th street). Further discussion of the USTs is provided below in Section 1.4.2.

1.4.1.2 Hydro Tech Soil Sampling

Five soil borings (SP-5 through SP-8 and SP-10) were installed by Hydro Tech on the Site. One shallow and one deep soil sample was collected from each of the soil borings for a total of ten soil samples collected from the Site. The shallow samples were from either 0 to 2 feet or 2 to 4 below land surface (ft bls) and the deep samples averaged 8 to 10 ft bls. The soil samples were analyzed for volatile organic compounds (VOCs) using USEPA Method 8260, semivolatile organic compounds (SVOCs) using USEPA Method 8270, polychlorinated biphenyls (PCBs) using USEPA Method 8082, pesticides using USEPA Method 8081, and Target Analyte List (TAL) metals. Summaries of the soil data obtained by Hydro Tech are provided in Tables 6 through 10.

VOCs, PCBs, and Pesticides - No VOCs, PCBs, or pesticides were detected in the soil samples collected from soil borings SP-5 through SP-8 and SP-10 at concentrations above NYSDEC Part 375 unrestricted use criteria.

SVOCs - Two soil samples collected from the Site (SP-6 2 to 4 ft bls and SP-7 8 to 10 ft bls) contained one benzo[a]pyrene at concentrations above NYSDEC Part 375 Restricted Use Criteria (Commercial). Seven SVOCs in three samples (SP-6 2 to 4 ft bls; SP-7 8 to 10 ft bls; and, SP-8 4 to 6 ft bls) were detected at concentrations above NYSDEC Part 375 unrestricted use criteria. The SVOCs detected above criteria were polycyclic aromatic hydrocarbons (PAHs). The types of PAHs found, and the concentrations at which they were identified, are commonly associated with historical fill of undocumented origin found in urban areas and are not necessarily indicative of an onsite source.

TAL Metals - Four metals (barium, cadmium, copper and mercury) were detected in soil at concentrations above NYSDEC Part 372 Restricted Use (Commercial) Criteria (Table 8).

- Barium was detected above the Criteria only in sample SP-5 (0 to 2 ft bls) at 1,533 milligrams per kilogram (mg/kg).
- Cadmium was detected above the Criteria in SP-5 (8 to 10 ft bls), SP-6 (2 to 4 ft bls) and SP-8 (8 to 10 ft bls) at concentrations from 9.8 to 33.3 mg/kg.
- Copper was detected above the Criteria in SP-5 (0 to 2 ft bls), SP-6 (2 to 4 and 8 to 10 ft bls), SP-7 (8 to 10 ft bls) and SP-10 (0 to 2 ft bls) at concentrations ranging from 298 to 3,060 mg/kg.
- Mercury was detected above the Criteria in SP-5 (0 to 2 ft bls), SP-7 (2 to 4 and 8 to 10 ft bls) and SP-8 (4 to 6 and 8 to 10 ft bls) at concentrations ranging from 6.29 mg/kg to 25.7 mg/kg.

1.4.1.3 Hydro Tech Groundwater Sampling

The Hydro Tech investigation also involved the installation of four groundwater monitoring wells (MW-1 through MW-4) on adjacent lots east, west, and north of the Site, but none on the lot comprising the Site. MW-2 is the closest to the site lot, approximately 15 feet west. Depth to groundwater ranged between 8.3 and 9.7 feet below grade. The four groundwater monitoring wells were surveyed and, in conjunction with groundwater elevations, a groundwater contour map was generated. Based on the Hydro Tech groundwater flow map, the direction of groundwater flow was northwest. One groundwater sample was collected from each of the four monitoring wells and analyzed for VOCs, SVOCs, PCBs, Pesticides, and TAL Metals.

SVOCs, PCBs, and Pesticides - No SVOCs, PCBs, or pesticides were detected in the four groundwater samples at concentrations exceeding their respective NYSDEC Ambient Water Quality Standards and Guidance Values (AWQSGVs).

VOCs - Three of the four groundwater monitoring wells (MW-2 through MW-4) did not contain any VOCs at concentrations above their respective NYSDEC AWQSGVs. The groundwater sample from MW-1 contained VOCs at concentrations exceeding their NYSDEC AWQSGVs. The VOCs identified included ethylbenzene and other petroleum-hydrocarbon-related constituents and cis-1,2-dichloroethene, which is a degradation product of tetrachloroethene. MW-1 is hydraulically cross gradient of the Site based on the Hydro Tech interpretation of flow

and immediately downgradient of the Lukoil gasoline filling station located 75 feet to the east of the Site, where there is a known spill.

TAL Metals - Two of the monitoring wells (MW-1 and MW-4) did not contain any TAL metals at concentrations above their respective NYSDEC AWQSGVs. Monitoring wells MW-2 and MW-3 contained cadmium, chromium, lead, and magnesium at concentrations slightly exceeding their respective NYSDEC AWQSGVs. It is likely that these detections were the result of excess turbidity in the samples and, therefore, are not necessarily indicative of groundwater quality.

1.4.2 Tank Removal and Post-Excavation Soil Sampling 507-511 West 24th Street

On February 16, 2005, a spill was reported to the NYSDEC for the property immediately to the west of the site (511 West 24th Street), in response to observations of potentially impacted soil (i.e., staining and petroleum odors) during the removal of several underground storage tanks (USTs). The potentially impacted soil was stockpiled adjacent to the excavation and covered with plastic sheeting. A total of five USTs (one 2,000-gallon tank and four 550-gallon tanks) were removed from the excavation and staged onsite.

Following removal of the tanks and excavation of the potentially impacted soil, the NYSDEC was notified of the observations made at the site and Spill Number 04-12228 was issued. NYSDEC requested that post-excavation soil samples be collected. On February 18, 2005, Roux Associates mobilized to the site and collected six post-excavation soil samples. A site map showing the sample locations is provided as Figure 1 in the March 9, 2005 report (Appendix G). A total of six post-excavation samples were collected. One soil sample was collected from each of the four sidewalls of the excavation (Samples PX-1 through PX-4) and two samples were collected from the bottom of the excavation (Samples PX-5 and PX-6). Three additional quality assurance/quality control (QA/QC) samples were submitted for analysis: field blank sample (FB-1), duplicate sample (PX-2DUP), and a trip blank.

Low concentrations of VOCs were detected in all of the post-excavation samples collected. The VOCs detected included acetone, benzene, toluene, ethylbenzene, and xylenes. None of the

samples contained concentrations of VOCs exceeding NYSDEC Part 375 unrestricted residential criteria.

Low concentrations of SVOCs were detected in all of the post-excavation samples collected, except for sample PX-3. Samples PX-1, PX-2 (and duplicate), PX-4, PX-5, and PX-6 contained several polycyclic aromatic hydrocarbons (PAHs) at concentrations above their respective Part 375 unrestricted residential criteria. The PAHs detected at concentrations exceeding the unrestricted residential criteria included benzo[a]anthracene, fluoranthene, phenanthrene, pyrene, and benzo[a]pyrene. These concentrations of SVOCs have been observed consistently in fill at other sites in the surrounding area and are attributable to the historical nature of the fill in an urban area.

Subsequent to submittal of the report summarized above, the NYSDEC closed Spill No. 04-12228. The spill record documenting this is provided in Appendix G.

1.4.3 Roux Associates Environmental Investigation

To update environmental quality at the Site, and because Hydro Tech's groundwater investigation did not include monitoring wells placed directly on the site lot, Roux Associates' 2008 investigation included the installation and sampling of two groundwater monitoring wells (Appendix F) on the Site and the collection of soil vapor samples (Appendix E) from two onsite locations.

1.4.3.1 Roux Associates Soil Vapor Sampling

On February 14, 2008, Roux Associates installed two soil vapor sampling points (SVP-1 and SVP-2) on the Site. Soil vapor point SVP-1 was installed on the west side of the Site and SVP-2 was installed on the east side of the Site (see Figure 2). A ½-inch diameter hole was drilled through the asphalt into the soil surface and extended approximately two-feet below grade. Acetate-lined Teflon tubing was inserted into a stainless steel screened rod, which was then inserted into the hole. The hole was filled with sand to just beneath grade. The hole was then topped off with cement grout up to grade to prevent ambient air from entering the soil-vapor sampling point. The soil vapor sampling was conducted using two individually-certified-clean

Summa canisters equipped with two-hour regulators. At the conclusion of the two-hour sampling period, the Summa canisters were disconnected from the sampling points and transported under chain-of-custody procedures for laboratory analysis at Test America Laboratories (TAL) in Shelton, Connecticut. STL is a New York State Department of Health (NYSDOH)-certified environmental testing laboratory. The samples were analyzed for VOCs using laboratory method TO-15. The chain of custody and the soil vapor laboratory results are provided in Appendix E.

A review of the results (Appendix E) indicated that no VOCs were detected in soil vapor on the west side of the Site (SVP-1). Several VOCs were detected in soil vapor on the east side of the Site (SVP-2). Those VOCs detected included benzene at 12 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$); toluene at $66 \mu\text{g}/\text{m}^3$; and trichloroethene at $40 \mu\text{g}/\text{m}^3$. The State of New York does not have any standards, criteria, or guidance values for concentrations of VOCs in subsurface soil vapor. However, the detections are most likely attributable to the known spills at the gasoline service station east of the Site.

1.4.3.2 Roux Associates Groundwater Sampling

On February 14, 2008, Roux Associates installed two groundwater monitoring wells (GW-1 and GW-2) at the Site (Figure 2). The two groundwater monitoring wells were installed in borings completed with a Geoprobe and were constructed of 10 feet of pre-packed 2-inch diameter PVC screen and five-foot blank PVC riser and secured with locking caps. On February 25, 2008, Roux Associates collected one groundwater sample from each of the monitoring wells. The samples were analyzed for VOCs, SVOCs, PCBs, and TAL metals. GW-2 ran dry during sampling; therefore, due to insufficient quantity, the TAL metals analysis was not run on the sample from GW-2. A copy of the Chain of Custody and the groundwater results are provided in Appendix F.

A review of the groundwater results for GW-1 indicated no VOCs, SVOCs, or PCBs detected at concentrations above their respective AWQSGVs. Two metals (manganese and sodium) exceeded their respective AWQSGVs.

A review of groundwater results for GW-2 indicated no VOCs or PCBs detected at concentrations above their respective AWQSGVs. Several PAHs were detected at concentrations above their respective AWQSGVs.

1.5 Summary of Regulatory Correspondence

The following is a summary of pertinent regulatory correspondence related to the Site:

- July 1, 2008 letter from the New York City Department of Environmental Protection.
- July 25, 2009 email from Zach Schreiber, Ph.D., Project Manager, Sustainability Coordinator Office of Environmental Remediation, Mayor's Office of Operations.
- March 2, 2012 email from Zach Schreiber, Ph.D., Project Manager, Sustainability Coordinator Office of Environmental Remediation, Mayor's Office of Operations.

Digital (PDF) copies of the above referenced regulatory correspondence are included as Appendix H.

1.6 Findings of Environmental Investigation

The findings of the environmental investigations are summarized below.

A review of the results of the Phase I ESA, GPR survey, soil, soil vapor, and groundwater investigations (see Tables 1 through 10) indicated the following:

- The Site is underlain by historical urban fill of undocumented origin;
- Impacted soil associates with the presence of five former USTs beneath 511 west 24th street was excavated in 2005 and the associated spill was closed;
- Soil/fill samples collected during the RI detected no Volatile Organic Compounds (VOCs), pesticides or PCBs. Several SVOCs (specifically PAHs) were identified in site soil. Five SVOCs including benzo[a]pyrene and benzo(a)anthracene were detected above Track 2 Restricted Residential SCOs and mostly were found in the shallow soil horizon. The types of PAHs found and the concentrations at which they were identified are commonly found in urban areas with historical fill and are not indicative of an onsite source. Metals including barium, cadmium, copper, lead, mercury and zinc were detected in soil at concentrations above Track 1 SCOs, and of these barium, cadmium, copper and mercury were above Track 2 Restricted Residential SCOs. Mercury exceeded Track 2 Restricted Residential SCOs in five soil samples with concentrations ranging up to 25 ppm (4'-6' depth) and is associated with historic fill. Overall, the Site is lightly to moderately contaminated by historical fill materials and the RI did not reveal any contaminant source areas on this property.

- Groundwater samples collected during the RI detected no VOCs, pesticides or PCBs. Several SVOC were identified in one well at relatively low concentrations above 6NYCRR Part 703.5 Class GA groundwater quality standards (GQS). These SVOCs may be a residual impact associated with the closed spill on the site. Dissolved concentrations of manganese and sodium and lead (in one sample) were detected above GQS. Lead was not detected above Track 1 SCOs in onsite soils. A separate sampling event at the same area did not detect lead.
- Soil vapor samples collected during the RI showed low levels of toluene, benzene and petroleum related compounds. Most petroleum compounds were detected at trace concentrations and almost all were below 10 ug/m³. TCE was detected at 40 µg/m³ at one location and toluene was detected at 66 ug/m³. Neither TCE nor toluene was detected within any of the soil and groundwater samples collected at the Site.

For environmental investigation data, consult reports listed in Section 1.4. Based on an evaluation of the environmental data and information, disposal of significant amounts of hazardous waste is not suspected at this site. However, mercury was detected in soil at concentrations up to 25.7 mg/kg (Table 8). Disposal requirements for soil impacted with mercury will be determined based upon pre-excavation waste characterization data to be collected.

2.0 DESCRIPTION OF REMEDIATION

2.1 Objectives

The Site remediation and mitigation objectives are:

Soil

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

Groundwater

- Prevent direct exposure to contaminated groundwater.
- Prevent exposure to contaminants volatilizing from contaminated groundwater.

Soil Vapor

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

Remedial and mitigation measures described herein will be performed in accordance with applicable laws and regulations, and the site-specific CHASP. This remedy is protective of public health and/or the environment for the intended use.

3.0 REMEDIAL ALTERNATIVE ANALYSIS

Two remedial action alternatives are considered in this alternatives analysis for the site. Alternative 1 is Track 1 alternatives that involve establishment of Track 1 soil cleanup objectives (SCOs) and complete removal of all soil and fill material that exceed the unrestricted Track 1 SCOs. Alternative 2 is Track 4 alternative that involves establishment of Track 4 SCOs and removal of the soil and fill material that exceed the Track 4 SCOs. Following soil removal the entire Site will be covered with a cover layer consisting of the building slab. This cover layer will serve as an engineering control to reduce exposure to contaminants in the groundwater and any residual contaminant in soils. Soil vapors from offsite would be managed by installation of a vapor barrier/waterproofing barrier system beneath the building slab and along foundation sidewalls. Institutional controls would also include groundwater use restrictions, a deed notice and a site management plan.

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.

The Track 1 alternative would result in removal of all soil/fill with contaminant concentrations above Track 1 SCOs. As such, this alternative would be consistent with the RAOs and provide overall protection of public health and the environment in consideration of current and potential future land use by:

- Eliminating the potential for direct contact with contaminated on-site soils and groundwater; and,
- Eliminating potential sources for on-site production of soil vapors.

Alternative 2 would achieve comparable protections of human health and the environment by removing soil/fill with contaminant concentrations above Track 4 SCOs as well as placement of

institutional and engineering controls, including a composite cover system, a vapor barrier and SSDS. As such, this alternative would be consistent with the RAOs and would provide overall protection of public health and the environment in consideration of current and potential future land use by

- Minimizing the potential for direct contact with contaminated on-site soils by implementing an approved soil and materials management plan and CAMP during remediation and by establishing a composite cover system over the entire site once construction is complete;
- Eliminating the potential for direct contact with contaminated soil or groundwater by placement of composite cover system and via institutional controls;
- Minimizing the potential for migration of soil vapor into occupied structures and associated inhalation exposures by installation of a vapor barrier/waterproofing barrier system beneath the building slab and along foundation sidewalls.

3.2 Balancing Criteria

Compliance with Standards, Criteria and Guidance (SCGs)

Alternative 1 would comply with the SCG, as all soil/fill in excess of Track 1 SCOs would be removed. All soil/fill excavated from the Site would be managed and disposed of in accordance with all applicable regulations.

Alternative 2 would address the chemical-specific SCGs for soil by establishment of Track 4 SCOs. Similar to the Track 1 alternative, 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.

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 effects on public health and the environment during implementation of the remedial action, including protection of the community, environmental impacts, time until remedial response objectives are achieved, and protection of workers during remedial actions.

The Track 1 alternative would provide short-term effectiveness with the removal of all soil/fill above Track 1 SCOs. All potential exposure pathways for site-derived contaminants would be incomplete following construction. Implementation of this RAWP would prevent unacceptable exposure during remediation and construction activities.

Alternative 2 would result in fewer short-term impacts associated with excavation, handling, load out of materials, and truck traffic than a Track 1 remediation. However, focused attention to means and methods during the remedial action during a Track 1 removal action, including community air monitoring and appropriate truck routing, would minimize or negate the overall impact of these activities.

The Track 1 and Track 4 Alternatives would both employ appropriate measures to prevent short term impacts, including a Community Air Monitoring Plan (CAMP) and a Soil/Materials Management Plan (SMMP), during all on-site soil disturbance activities and would effectively prevent the release of significant contaminants into the environment. Construction workers operating under appropriate management procedures and a Health and Safety Plan (HASP) will be protected from on-site contaminants (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 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 Engineering Controls.

Alternative 1 would provide the highest level of long-term effectiveness with the removal of all soil/fill above Track 1 SCOs.

Alternative 2 would also be effective over the long-term by attaining Track 4 SCOs through the placement of a concrete slab under the building, establishing use restrictions, establishing a Site

Management Plan to ensure long-term management of Institutional and Engineering Controls, and placing a deed restriction to memorialize these controls for the long term. Groundwater use restrictions will eliminate potential exposure to groundwater and establishment of an SMP and a deed restriction will ensure that this protection remains effective for the long-term. The SMP will ensure long-term effectiveness of all Engineering and Institutional Controls by requiring periodic inspection and certification that these controls and use restrictions continue to be in place and functioning as they were intended assuring that protections designed into the remedy will provide continued high level of protection in perpetuity. Migration of soil vapor from offsite into occupied structures and associated inhalation exposures would be prevented by installation of a vapor barrier/waterproofing barrier system beneath the building slab and along foundation sidewalls.

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 the total volume of contaminated media.

Alternative 1 would permanently eliminate the toxicity, mobility, and volume of contaminants from on-site soil by removing all soil in excess of unrestricted use SCOs.

Alternative 2 would greatly reduce the toxicity, mobility, and volume of contaminants from on-site soil by excavation to approximately 15 feet below grade and removal of soil/fill that exceed Track 4 SCOs. For Alternative 2, placement of a building slab and vapor barrier will reduce toxicity by eliminating potential exposures with remaining soil, groundwater, and vapors. Groundwater use restrictions will reduce toxicity by ensuring that there is no use of on-Site groundwater for potable purposes.

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 Track 1 cleanup is feasible and implementable. The remedial methods used are easily implemented using standard construction technologies.

Similarly, the Track 4 alternative is also both feasible and implementable. It uses standard materials and services and well established technology. The reliability of the remedy is also high. There are no special difficulties associated with any of the activities proposed, which utilize standard industry methods. Installation of the waterproofing/vapor barrier system will be conducted in accordance with standard methods utilized to install waterproofing membranes.

For implementation of both remedies, standard construction equipment utilized for the overall earthwork would be used. OSHA trained personnel will complete all activities that include excavation and handling of impacted soils. No special permits other than earthwork permits required for completion of the required site redevelopment scope are required for implementation of the remedy.

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.

The capital costs associated with the Track 1 alternative are higher than the Track 4 alternative in that a higher volume of soil/fill will be excavated for off-site disposal to achieve a Track 1 status

over the entire site. In both cases, appropriate public health and environmental protections are achieved.

Both alternatives satisfy the threshold balancing criterion and other criterion listed here, and each is fully protective of public health and the environment, will control migration of contaminants, will comply with SCGs, are effective for the short-term and long-term, are implementable, and reduces both mobility and toxicity.

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.

Based on the overall goals of the remedial program and initial permitting associated with the proposed site development, no adverse community opinion is anticipated for either alternative. Cleanup to the most stringent Track 1 cleanup criteria is anticipated to be a preferred remedial option for the community. This RAWP will be subject to and undergo public review under the NYC BCP and will provide the opportunity for detailed public input on the remedial alternatives and the selected remedial action. This public comment will be considered by OER prior to approval of this plan.

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.

Both Alternatives are appropriate with respect to the proposed use and to land uses in the vicinity of the Site. The proposed use is consistent with the existing zoning designation for the property and is consistent with recent development patterns. The Site is surrounded by commercial and mixed-use commercial/residential properties and the proposed cleanup provides comprehensive protection of public health and the environment for these uses. Improvements in the current condition of the property achieved by both cleanup alternatives is also consistent with the City's goals for cleanup of contaminated land and bringing such properties into productive reuse and is protective of natural resources and cultural resources. This RAWP will be subject to undergo public review under the NYC VCP and will provide the opportunity for detailed public input on the land use factors described in this section. This public comment will be considered by OER prior to approval of this plan.

4.0 REMEDIAL ACTION

4.1 Summary of Preferred Remedial Action

The preferred remedial action alternative is Track 4 cleanup Alternative across the site. The preferred remedial action alternative 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 is cost effective and implementable and uses standards methods that are well established in the industry.

The proposed plan achieves all of the remedial action goals established for the project. The proposed site redevelopment includes removal of existing paving/asphalt, excavation to a depth of approximately 15.5 feet below grade, and construction of a 2-story structure with a basement level. The building will serve as an art gallery.

The building foundation excavation will extend to a depth ranging approximately six to seven feet below the water table, effectively removing soil exhibiting historical fill impacts within the building footprint. This will eliminate the potential for direct contact with underlying soil and eliminate the potential for soil in the unsaturated zone to serve as a source of VOCs in soil gas. The Site will be entirely covered by either building or pavement. The building foundation will be equipped with a water-proofing and vapor barrier as discussed in Appendix J. The barrier will be protective of potential vapor intrusion resulting from potential volatilization of low level VOCs and SVOCs detected in soil and groundwater. In addition, the building basement will include a mechanical ventilation system consistent with the New York City Building Code.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and implementation of a Citizen Participation Plan.
2. Performance a Community Air Monitoring Program for particulates and volatile organic carbon compounds during all remedial activities.
3. Establish Track 4 Soil Cleanup Objectives (SCOs) for SVOCs and metals.

4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking and staking excavation areas.
5. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
6. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
7. Excavation and removal of soil/fill exceeding Track 4 SCOs.
8. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID.
9. Removal of any underground storage tanks and closure of petroleum spills that may be encountered during site work in compliance with applicable local, State and Federal laws and regulations.
10. Transportation and off-Site disposal of all soil/fill material at 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 onsite.
11. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
12. Demarcation of residual soil/fill.
13. Installation of a vapor barrier/waterproofing barrier system beneath the building slab and along foundation sidewalls.
14. Construction and maintenance of an engineered composite cover consisting of the building foundation slab and sidewalls and integrated vapor barrier system/waterproofing membrane to prevent human exposure to residual soil/fill remaining under the Site.
15. Submission of a RAR that describes the remedial activities, certifies that the remedial requirements have been achieved, and lists any changes from this RAWP.
16. Submission of an approved Site Management Plan (SMP) 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.
17. Recording of a Declaration of Covenants and Restrictions that includes a listing of Engineering Controls and a requirement that management of these controls must be in compliance with an approved SMP; and Institutional Controls including 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 4 SCOs are proposed for this project. The SCOs for this Site are listed below. 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 I. As part of the proposed remediation effort, entire Site will be excavated to a depth of 15 plus -feet b.g.s. to allow for the construction of the cellar level.

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 I.

Discrete contaminant sources (such as hotspots) identified during the remedial action will be horizontally and vertically identified by GPS or surveyed. This information will be provided in the RCR.

Contaminant	SCOs (ppm)
Total SVOCs	300 ppm
barium	750 ppm
mercury	2.5 ppm
lead	800 ppm
copper	250 ppm

ppm - parts per million

4.2.1 Estimated Soil/Fill Removal Quantities

The total quantity of soil/fill expected to be excavated and disposed off-Site is anticipated to be approximately 2,500-tons. Disposal facilities will be reported to OER when they are identified and prior to the start of remedial action. A pre-approval letter from all disposal facilities will be

provided to OER prior to any soil/fill material removal from the site. If a different or additional disposal facility(ies) for the soil/fill material is selected, OER will be notified in advance and documentation of the facility permitting and acceptance criteria, rationale for acceptance and final disposal documentation will be provided in the RAR.

4.2.2 End-Point Sampling

Removal actions under this plan will be performed in conjunction with remedial end-point sampling. End-point sampling frequency will consist of the following:

In situ sampling to delineate excavation geometry prior to excavation may be utilized in lieu of sampling described below. The criterion presented below is generic plan for post excavation sampling. For larger excavations, sampling frequency may be modified with documentation specifying why the altered sample frequency is appropriate. Describe all methods below.

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 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.

New York State Department of Health ELAP certified labs will be used for all end-point sample analyses. Labs for end-point sample analyses will be reported in the RCR. The RCR will provide a tabular and map summary of all end-point sample results. End-point samples will be analyzed for trigger analytes (those for which SCO exceedance is identified) utilizing the following methodology:

Soil analytical methods for Full List will include:

- Volatile organic compounds by EPA Method 8260;
- Semi-volatile organic compounds by EPA Method 8270;
- Pesticides/PCBs by EPA Method 8081/8082; and
- Target Analyte List metals.

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.

4.2.3 Quality Assurance/Quality Control

Endpoint soil samples will be containerized in laboratory-prepared jars, labeled, sealed, and placed in a chilled cooler for shipment to the laboratory. Chain of Custody procedures outlined in the RIWP will followed. Soil samples were analyzed by an ELAP-certified laboratory approved by the NYSDOH. For every 20 soil samples, one duplicate soil sample will also be collected and analyzed for all parameters.

4.2.4 Import and Reuse of Soils

The entire Site footprint is to contain a building. Therefore, it is not expected that import of soils onto the property and reuse of soils already onsite will be necessary. Any soil that is to be imported or reused onsite will be in conformance with the Soil/Materials Management Plan in Appendix I.

4.3 ENGINEERING CONTROLS

Engineering Controls will be employed in the remedial action to address residual contamination remaining at the site. The Site has two primary Engineering Control (EC) Systems. These are:

- concrete covered sidewalks, and concrete building slabs;
- a vapor barrier system.

4.3.1 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 is comprised of:

- concrete covered sidewalks; and
- concrete building foundation slab and sidewalls.

The proposed development plans in Appendix D show the configuration of the proposed concrete building foundation slab and sidewalls.

The composite cover system is a permanent engineering control for the Site.

4.3.2 Waterproofing / Vapor Barrier System

The depth to water beneath the Site averages approximately 9 feet. The proposed building foundation is to extend to a depth of approximately 3.5 feet below the water table. The building design requires the foundation to have an exterior waterproofing system to prevent infiltration of groundwater into the structure below grade. The water proofing capabilities of the materials that are selected during the design process will meet ASTM E96, Standard Test Methods for Water Vapor Transmission of Materials, and will be compatible with chemicals potentially found in the soil and groundwater. The foundation waterproofing will function as a vapor barrier. The system is WR Grace's structural below-grade waterproofing, comprised of high-density polyethylene (HDPE) "Preprufe 300R" below horizontal foundation work, and "Preprufe 160R" for vertical work (pre-applied to formwork or mud slab, before foundation concrete placement), "Bituthene 3000" or "Bituthene 4000" (self-adhering rubberized asphalt sheet with HDPE facer) for post-applied waterproofing, and their associated installation products (waterstops, tapes and edge detailing mastics, and primer for Bituthenes). Below slabs that will not see a hydrostatic head of

water (on this project, the first floor near the street, presumably) the HDPE "Florprufe" product could be used instead. Florprufe is being used for vapor barrier at the 508 W 25th St project, to the north of this project's site.

Details regarding the vapor barrier material and a plan showing penetration details are provided in Appendix J.

4.4 Institutional Controls

Institutional Controls (IC) have been incorporated in this remedial action to manage residual soil/fill and render the Site protective of public health and the environment. Institutional Controls are listed below. Long-term employment of EC/ICs will be established in a Declaration of Covenant and Restrictions (DCR) assigned to the property by the title holder and will be implemented under a site-specific Site Management Plan (SMP) that will be included in the RAR.

Institutional Controls for this remedial action are:

- Recording of an OER-approved Declaration of Covenant and Restrictions (DCR) with the City Register or county clerk, as appropriate. The DCR will include a description of all ECs and ICs, will summarize the requirements of the Site Management Plan, and will note that the property owner and property owner's successors and assigns must comply with the DCR and the approved SMP. The recorded DCR will be submitted in the Remedial Action Report. The DCR will be recorded prior to OER issuance of the Notice of Completion;
- Submittal of a Site Management Plan in the RAR for approval by OER that provides procedures for appropriate operation, maintenance, monitoring, inspection, reporting and certification of ECs. 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 annually and will comply with RCNY §43-1407(1)(3).
- Vegetable gardens and farming on the Site are prohibited;
- 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;

4.5 Site Management plan

Site Management is the last phase of remediation and begins 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 the DCR and 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 DCR and 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 Brownfield Cleanup Agreement with OER. This includes a plan for: (1) implementation of ECs and ICs; (2) implementation of monitoring programs; (3) operation and maintenance of ECs; (4) inspection and certification of ECs; and (5) reporting.

Site management activities, reporting, and EC/IC certification will be scheduled on an periodic basis to be established in 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 March 31 of the year following the reporting period.

4.6 qualitative human health exposure assessment

Investigations reported in the Remedial Investigation Report (RIR) are sufficient to complete a Qualitative Human Health Exposure Assessment (QHHEA). As part of the BCP 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 by characterizing the exposure setting, identifying exposure pathways, and evaluating contaminant fate and transport. This EA 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.

4.6.1 Known and Potential Sources

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

Soil:

- Metals, including barium, cadmium, copper, lead, mercury and zinc exceeded Track 2 Restricted residential SCOs;
- Five SVOCs (all PAHs) exceeded Track 2 Restricted Residential SCOs;
- Groundwater:
- The SVOC slightly exceeding GQS;
- Dissolved metals including manganese, sodium and lead above GQS;
- Soil Vapor:
- VOCs detected at low levels of TCE and toluene.

4.6.2 Nature, Extent, Fate and Transport of Contaminants

Soil: Metals and SVOCs are present throughout the site. Only lead was found in dissolved groundwater samples above GQS, indicating that the property is not contributing to groundwater standard violation.

Groundwater: The RI identified several SVOCs at low concentrations above its GQS. These SVOCs may be residual impacts associated with closed spill.

Soil Vapor: TCE and toluene were found in one soil vapor sampling location, but neither TCE or toluene were found in soil or groundwater above their respective UUSCOs, groundwater protection standards for soil or GQSs.

4.6.3 Potential Routes of Exposure

The five elements of an exposure pathway are (1) a contaminant source, (2) contaminant release and transport mechanisms, (3) a point of exposure, (4) a route of exposure, and (5) a receptor population. An exposure pathway is considered complete when all five elements of an exposure

pathway are documented. A potential exposure pathway exists when any one or more of the five elements comprising an exposure pathway cannot be documented. An exposure pathway may be eliminated from further evaluation when any one of the five elements comprising an exposure pathway has not existed in the past, does not exist in the present, and will never exist in the future. Three potential primary routes exist by which chemicals can enter the body:

- Ingestion of water, fill, or soil;
- Inhalation of vapors and particulates; and
- Dermal contact with water, fill, soil, or building materials.

4.6.4 Existence of Human Health Exposure

Current Conditions: As the site is currently capped with asphalt paving, there are no potential exposure pathways from soil/ fill. Groundwater is not exposed at the site, and because the site is served by the public water supply, groundwater is not used at the site.

Construction/ Remediation Activities: The potential exposure pathways to onsite contamination are by ingestion, dermal, or inhalation exposure by onsite workers during the remedial action. During the remedial action, worker and community exposure to constituents including metals (e.g., mercury) in soil will be managed and mitigated by preventing site access and implementation of soil/ materials management, storm water pollution prevention, and dust controls, employment of a community air monitoring plan, and implementation of a Construction Health and Safety Plan. A Soil Management Plan is discussed in Appendix I.

Proposed Future Conditions: The proposed site redevelopment includes removal of existing paving/asphalt, excavation to a depth of approximately 15.5 feet below grade and below water table, and construction of a 2-story structure with a basement level. This will eliminate the potential for direct contact with underlying soil and eliminate the potential for soil in the unsaturated zone to serve as a source of VOCs in soil gas. The Site will be entirely covered by either building or pavement. Engineering controls will prevent potential for inhalation via soil vapor intrusion. The site is served by the public water supply, 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.

As a precautionary measure, the building foundation will be equipped with a water-proofing and vapor barrier as discussed in Appendix J. The barrier will be protective of potential vapor intrusion resulting from potential volatilization of low level VOCs and SVOCs detected in soil and groundwater. In addition, the building basement will include a mechanical ventilation system consistent with the New York City Building Code.

4.6.5 Receptor Populations

On-Site Receptors: The site is currently vacant. Therefore the only potential human receptors are potential trespassers.

Off-Site Receptors: Potential off-site receptors within a 0.25 mile radius of the Site include: adult and child residents; commercial and construction workers; pedestrians; trespassers; and cyclists, based on the following:

1. Commercial Businesses (up to 0.25 mile) - existing and future
2. Residential Buildings (up to 0.25 mile) - existing and future
3. Building Construction/ Renovation (up to 0.25 mile) - existing and future
4. Pedestrians, Trespassers, Cyclists (up to 0.25 mile) - existing and future
5. Schools (up to 0.25 mile) - existing and future

4.6.6 Overall Human Health Exposure Assessment

Complete on-site exposure pathways appear to be present only during the construction and remediation phase. During the remedial action, on-site exposure pathways will be eliminated by preventing access to the site, through implementation of soil/materials management, stormwater pollution prevention, and dust controls, employment of a community air monitoring plan, and implementation of a Construction Health and Safety Plan.

5.0 REMEDIAL ACTION MANAGEMENT

5.1 Project Organization and Oversight

The Professional Engineer (PE) and Qualified Environmental Professionals (QEP) for this project are Charles McGuckin, P.E. and Nathan Epler, Ph.D., both from Roux Associates.

5.2 Site Security

Site access will be controlled by gated entrances to the fenced property.

5.3 Work Hours

The hours for operation of remedial construction will be from 7:00 AM to 3:30 PM. These hours conform to the New York City Department of Buildings construction code requirements.

5.4 Construction Health and Safety Plan

The site-specific Construction Health and Safety Plan (CHASP) is included in Appendix B. The Site Safety Coordinator will be named at a later date. Remedial work performed under this RAP 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 CHASP and applicable laws and regulations. The CHASP pertains to remedial and invasive work performed at the Site until the issuance of the Notice of Satisfaction.

All field personnel involved in remedial activities will participate in training required under 29 CFR 1910.120, including 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 CHASP and be required to sign a CHASP acknowledgment. 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 baling/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. Exceedances 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.

5.5.1 VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (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.

5.5.2 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/m^3) 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 remediation and construction have been or will be obtained prior to the start of remediation and construction. Acceptance of this RAP by OER does not constitute satisfaction of these requirements and will not be a substitute for any required permit.

5.7 Site Preparation

5.7.1 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.

5.7.2 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.

5.7.3 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 to assure safety. Utility companies and other responsible authorities will be contacted to locate and mark the locations, and a copy of the Markout 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 RAP. 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 RAP.

5.7.4 Dewatering

Temporary dewatering discharge is required for the construction of a new one story building located at 507 West 24th St. in New York, NY Project Name: 507 West 24th St. There will be one pump running at a time at a maximum discharge rate of 300 gallons per minute (gpm). The duration of discharge is expected to be up to one year. The flow meter used will be a MW500 manufactured by McCrometer. Pretreatment will consist of a 6,000-gallon settling tank. The proposed discharge pipe will be an underground 8-inch pipe connected to existing 4' x 2'8" combined sewer located on West 24th Street.

5.7.5 Equipment and Material Staging

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

5.7.6 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 roads 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.

5.7.7 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 potable water will be utilized for the removal of soil from vehicles and equipment, as necessary.

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.

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

5.10.1 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 day. Those reports will include:

- Project number and statement of the activities and an update of progress made and locations of 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 excursions, if any;
- 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 RAP or other sensitive or time critical information. However, such information will be included in the daily reports. Emergency conditions and changes to the RAP will be communicated directly to the OER project manager by personal communication. Daily reports will be included as an Appendix in the RCR.

5.10.2 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 RCR 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 Plan

All changes to the RAP will be reported to the OER Project Manager and will be documented in daily reports and reported in the RCR. The process to be followed if there are any deviations from the RAP will include a request for approval for the change from OER noting the following:

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

6.0 REMEDIAL CLOSURE REPORT

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

- Information required by this RAP;
- As-built drawings for all constructed remedial elements, required certifications, manifests and other written and photographic documentation of remedial work performed under this remedy;
- Site Management Plan;
- Description of any changes in the remedial action from the elements provided in this RAP and associated design documents;
- Tabular summary of all end point sampling results and all material 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 contaminated material removed from the Site including a map showing source areas;
- Account 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.
- Reports and supporting material will be submitted in digital form.

Remedial Closure Report Certification

The following certification will appear in front of the Executive Summary of the Remedial Closure Report. The certification will include the following statements:

I, _____, am currently a professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for the 570 West 24th Street Site, Site number 12CVCP047M.

I, _____, am a qualified Environmental Professional. I had primary direct responsibility for implementation remedial program for the 570 West 24th Street Site, Site number 12CVCP047M. (Optional)

I certify that the OER-approved Remedial Action Plan dated month day year and Stipulations in a letter dated month day, year; if any 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.

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 12-month remediation period is anticipated.

Schedule Milestone	Weeks from Remedial Action Start	Duration (weeks)
OER Approval of RAP	0	4
Mobilization	4	2
Remedial Construction	6	8
Demobilization	14	2
Submit Remedial Closure Report	16	4

Table 1. Summary of Volatile Organic Compounds in Soil Gas, 507 West 24th Street, New York, New York

Parameter (Concentrations in ug/m3)	Sample Designation:	SVP-1	SVP-2
	Sample Date:	2/14/2008	2/14/2008
Dichlorodifluoromethane		9.9 U	9.9 U
1,2-Dichloro-1,1,2,1-tetrafluoroethane		14 U	14 U
Chloromethane		10 U	10 U
Vinyl chloride		5.1 U	5.1 U
Bromomethane		7.8 U	7.8 U
Chloroethane		5.3 U	5.3 U
Trichlorofluoromethane		11 U	11 U
1,1-Dichloroethene		7.9 U	7.9 U
1,1,2-Trichloro-1,2,2-trifluoroethane		15 U	15 U
Methylene chloride		17 U	17 U
1,1-Dichloroethane		8.1 U	8.1 U
cis-1,2-Dichloroethene		7.9 U	7.9 U
Chloroform		9.8 U	9.8 U
1,1,1-Trichloroethane		11 U	11 U
Carbon tetrachloride		13 U	13 U
Benzene		6.4 U	12
1,2-Dichloroethane		8.1 U	8.1 U
Trichloroethene		11 U	40
1,2-Dichloropropane		9.2 U	9.2 U
cis-1,3-Dichloropropene		9.1 U	9.1 U
Toluene		7.5 U	66
trans-1,3-Dichloropropene		9.1 U	9.1 U
1,1,2-Trichloroethane		11 U	11 U
Tetrachloroethene		14 U	14 U
1,2-Dibromoethane (EDB)		15 U	15 U
Chlorobenzene		9.2 U	9.2 U
Ethylbenzene		8.7 U	8.7 U
m&p-Xylene		8.7 U	8.7 U
o-Xylene		8.7 U	8.7 U
Styrene		8.5 U	8.5 U
1,1,2,2-Tetrachloroethane		14 U	14 U
1,3,5-Trimethylbenzene		9.8 U	9.8 U
1,2,4-Trimethylbenzene		9.8 U	9.8 U
1,3-Dichlorobenzene		12 U	12 U
1,4-Dichlorobenzene		12 U	12 U
1,2-Dichlorobenzene		12 U	12 U
Benzyl chloride		21 U	21 U
1,2,4-Trichlorobenzene		74 U	74 U
Hexachlorobutadiene		110 U	110 U

U - Indicates that the compound was analyzed for but not detected

ug/m3 - Micrograms per cubic meter

Bold data indicates that parameter was detected

Table 2. Summary of Volatile Organic Compounds in Groundwater, 507 West 24th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC	Sample Designation:	GW-1	GW-2	GW-2
	AWQSGVs (µg/L)	Sample Date:	2/25/2008	2/25/2008	1/31/2012
1,1,1-Trichloroethane	5		5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5		5 U	5 U	NA
1,1,2-Trichloroethane	1		5 U	5 U	NA
1,1-Dichloroethane	5		5 U	5 U	NA
1,1-Dichloroethene	5		5 U	5 U	NA
1,2-Dichloroethane	0.6		5 U	5 U	NA
1,2-Dichloropropane	1		5 U	5 U	NA
1,4-Dichlorobenzene	3		NA	NA	5 U
2-Hexanone	50		10 U	10 U	NA
Acetone	50		10 U	10 U	NA
Benzene	1		5 U	5 U	5 U
Bromodichloromethane	50		5 U	5 U	NA
Bromoform	50		5 U	5 U	NA
Bromomethane	5		5 U	5 U	NA
Carbon disulfide	60		5 U	5 U	NA
Carbon tetrachloride	5		5 U	5 U	5 U
Chlorobenzene	5		5 U	5 U	NA
Chloroethane	5		5 U	5 U	NA
Chloroform	7		5 U	5 U	5 U
Chloromethane	--		5 U	5 U	NA
cis-1,2-Dichloroethene	5		5 U	5 U	NA
cis-1,3-Dichloropropene	5		5 U	5 U	NA
Dibromochloromethane	50		5 U	5 U	NA
Ethylbenzene	5		5 U	5 U	5 U
m&p-Xylene	5		NA	NA	10 U
Methyl Ethyl Ketone	50		10 U	10 U	NA
Methyl isobutyl ketone	--		10 U	10 U	NA
Methyl tert-butyl ether (MTBE)	10		NA	NA	5 U
Methylene Chloride	5		5 U	5 U	NA
o-Xylene	5		NA	NA	5 U
Styrene	5		5 U	5 U	NA
Tetrachloroethene	5		5 U	5 U	5 U
Toluene	5		5 U	0.29 J	5 U
trans-1,2-Dichloroethene	5		5 U	5 U	NA
trans-1,3-Dichloropropene	--		5 U	5 U	NA
Trichloroethene	5		5 U	5 U	NA
Vinyl chloride	2		5 U	5 U	NA
Xylenes, Total	5		5 U	5 U	15 U

NYSDEC - New York State Department of Environmental Conservation

AWQSGVs - Ambient Water-Quality Standards and Guidance Values

µg/L -Micrograms per liter

J - Estimated Value

U - Compound was analyzed for but not detected

-- No NYSDEC AWQSGV available

Bold data indicates that parameter was detected above the NYSDEC AWQSGVs

NA - Compound was not analyzed by laboratory

Table 3. Summary of Semivolatile Organic Compounds in Groundwater, 507 West 24th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation: Sample Date:	GW-1 2/25/2008	GW-2 2/25/2008	GW-2 1/31/2012
1,2,4-Trichlorobenzene	5		11 U	11 U	5 U
1,2-Dichlorobenzene	3		11 U	11 U	NA
1,3-Dichlorobenzene	3		11 U	11 U	NA
1,4-Dichlorobenzene	3		11 U	11 U	NA
2,2'-oxybis[1-chloropropane]	5		11 U	11 U	NA
2,4,5-Trichlorophenol	--		55 U	56 U	NA
2,4,6-Trichlorophenol	--		11 U	11 U	NA
2,4-Dichlorophenol	5		11 U	11 U	NA
2,4-Dimethylphenol	50		11 U	11 U	NA
2,4-Dinitrophenol	10		55 U	56 U	NA
2,4-Dinitrotoluene	5		11 U	11 U	NA
2,6-Dinitrotoluene	5		11 U	11 U	NA
2-Chloronaphthalene	10		11 U	11 U	NA
2-Chlorophenol	--		11 U	11 U	NA
2-Methylnaphthalene	--		11 U	11 U	NA
2-Methylphenol	--		11 U	11 U	NA
2-Nitroaniline	5		55 U	56 U	NA
2-Nitrophenol	--		11 U	11 U	NA
3,3'-Dichlorobenzidine	5		11 U	11 U	NA
3-Nitroaniline	5		55 U	56 U	NA
4,6-Dinitro-2-methylphenol	--		55 U	56 U	NA
4-Bromophenyl phenyl ether	--		11 U	11 U	NA
4-Chloro-3-methylphenol	--		11 U	11 U	NA
4-Chloroaniline	5		11 U	11 U	NA
4-Chlorophenyl phenyl ether	--		11 U	11 U	NA
4-Methylphenol	--		11 U	11 U	NA
4-Nitroaniline	5		22 U	22 U	NA
4-Nitrophenol	--		55 U	56 U	NA
Acenaphthene	20		11 U	11 U	NA
Acenaphthylene	20		11 U	11 U	NA
Anthracene	50		11 U	0.65 J	NA
Benzo[a]anthracene	0.002		11 U	1.6 J	NA
Benzo[a]pyrene	0		11 U	1.3 J	NA
Benzo[b]fluoranthene	0.002		11 U	1.6 J	NA
Benzo[g,h,i]perylene	--		11 U	0.85 J	NA
Benzo[k]fluoranthene	0.002		11 U	0.51 J	NA
Benzyl alcohol	--		11 U	11 U	NA
Bis(2-chloroethoxy)methane	5		11 U	11 U	NA
Bis(2-ethylhexyl) phthalate	5		11 U	16	NA
Bis(2-chloroethyl)ether	1		11 U	11 U	NA
Butyl benzyl phthalate	50		11 U	11 U	NA
Carbazole	--		11 U	11 U	NA
Chrysene	0.002		11 U	1.4 J	NA
Dibenz(a,h)anthracene	--		11 U	11 U	NA
Dibenzofuran	--		11 U	11 U	NA
Diethyl phthalate	50		11 U	11 U	NA
Dimethyl phthalate	50		11 U	11 U	NA
Di-n-butyl phthalate	50		11 U	11 U	NA

Table 3. Summary of Semivolatile Organic Compounds in Groundwater, 507 West 24th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation:		GW-1	GW-2	GW-2
		Sample Date:		2/25/2008	2/25/2008	1/31/2012
Di-n-octyl phthalate	--			11 U	11 U	NA
Fluoranthene	50			11 U	2.8 J	NA
Fluorene	50			11 U	11 U	NA
Hexachlorobenzene	0.04			11 U	11 U	NA
Hexachlorobutadiene	0.5			11 U	11 U	NA
Hexachlorocyclopentadiene	5			11 U	11 U	NA
Hexachloroethane	5			11 U	11 U	NA
Indeno[1,2,3-cd]pyrene	0.002			11 U	0.84 J	NA
Isophorone	50			11 U	11 U	NA
Naphthalene	10			11 U	11 U	5 U
Nitrobenzene	0.4			11 U	11 U	NA
N-Nitrosodi-n-propylamine	--			11 U	11 U	NA
N-Nitrosodiphenylamine	50			11 U	11 U	NA
Pentachlorophenol	1			55 U	56 U	NA
Phenanthrene	50			11 U	2.1 J	NA
Phenol	1			11 U	11 U	NA
Pyrene	50			11 U	3.3 J	NA

NYSDEC - New York State Department of Environmental Conservation

AWQSGVs - Ambient Water-Quality Standards and Guidance Values

µg/L -Micrograms per liter

J - Estimated Value

U - Compound was analyzed for but not detected

-- No NYSDEC AWQSGV available

Bold data indicates that parameter was detected above the NYSDEC AWQSGVs

NA - Compound was not analyzed by laboratory

Table 4. Summary of Metals in Groundwater, 507 West 24th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation: Sample Date:	GW-1 2/25/2008	GW-2 2/25/2008	GW-2 1/31/2012
Aluminum	--		500 U	500 U	NA
Antimony	3		20 U	20 U	NA
Arsenic	25		20 U	20 U	NA
Barium	1000		87	110	NA
Beryllium	3		3 U	3 U	NA
Cadmium	5		5 U	5 U	3 U
Calcium	--		95900	111000	NA
Chromium	50		10 U	10 U	NA
Chromium, Hexavalent	--		NA	NA	10 U
Cobalt	--		10 U	10 U	NA
Copper	200		6 J	9.6 J	163
Iron	--		200 U	200 U	NA
Lead	25		10 U	10 U	112
Magnesium	--		31600	18400	NA
Manganese	300		1000	620	NA
Mercury	0.7		NR	NR	0.2 U
Nickel	100		10 U	3.1 J	15
Potassium	--		19400	20900	NA
Selenium	10		30 U	30 U	NA
Silver	50		5 U	5 U	NA
Sodium	20000		27400	103000	NA
Thallium	0.5		30 U	30 U	NA
Vanadium	--		5 U	5 U	NA
Zinc	2000		50 U	17 J	230

NYSDEC - New York State Department of Environmental Conservation
 AWQSGVs - Ambient Water-Quality Standards and Guidance Values
 µg/L -Micrograms per liter
 J - Estimated Value
 U - Compound was analyzed for but not detected
 - - No NYSDEC AWQSGV available
 Bold data indicates that parameter was detected above the NYSDEC AWQSGVs
 NA - Compound was not analyzed by laboratory

Table 5. Summary of Polychlorinated Biphenyls in Groundwater, 507 West 24th Street, New York, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation:	GW-2	GW-2
		Sample Date:	2/25/2008	1/31/2012
PCB-1016	--		0.5 U	0.05 U
PCB-1221	--		1 U	0.05 U
PCB-1232	--		0.5 U	0.05 U
PCB-1242	--		0.5 U	0.05 U
PCB-1248	--		0.5 U	0.05 U
PCB-1254	--		0.5 U	0.05 U
PCB-1260	--		0.5 U	0.05 U
PCB-1261	--		NA	0.05 U
PCB-1268	--		NA	0.05 U
Total PCBs	0.09		0	0

NYSDEC - New York State Department of Environmental Conservation

AWQSGVs - Ambient Water-Quality Standards and Guidance Values

µg/L -Micrograms per liter

J - Estimated Value

U - Compound was analyzed for but not detected

-- No NYSDEC AWQSGV available

Bold data indicates that parameter was detected above the NYSDEC AWQSGVs

NA - Compound was not analyzed by laboratory

Table 6. Summary of Volatile Organic Compounds in Soil, 507 West 24th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	Sample Designation: Sample Date: Sample Depth (ft bls):	SP-05	SP-05	SP-06	SP-06	SP-07	SP-07	SP-08
	Part 375 Unrestricted Use		0' - 2'	8' - 10'	2' - 4'	8' - 10'	2' - 4'	8' - 10'	4' - 6'
1,1,1,2-Tetrachloroethane	--		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1,1-Trichloroethane	680		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1,2,2-Tetrachloroethane	--		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1,2-Trichloroethane	--		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
1,1-Dichloroethane	270		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1-Dichloroethene	330		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1-Dichloropropene	--		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,2,3-Trichlorobenzene	--		5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,2,3-Trichloropropane	--		5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,2,4-Trichlorobenzene	--		5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,2,4-Trimethylbenzene	3600		1.00 U	1.00 U	1.00 U	2.39	1.00 U	3.38	1.00 U
1,2-Dibromo-3-chloropropane	--		5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,2-Dibromoethane	--		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,2-Dichlorobenzene	1100		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,2-Dichloroethane	20		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,2-Dichloropropane	--		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,3,5-Trimethylbenzene	8400		5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
1,3-Dichlorobenzene	2400		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,3-Dichloropropane	--		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,4-Dichlorobenzene	1800		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
2,2-Dichloropropane	--		5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
2-Chlorotoluene	--		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
4-Chlorotoluene	--		5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
4-Isopropyltoluene	--		1.00 U	1.00 U	1.00 U	1.97	1.00 U	1.00 U	1.00 U
Benzene	60		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Bromobenzene	--		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Bromochloromethane	--		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Bromodichloromethane	--		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Bromoform	--		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Bromomethane	--		5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
Carbon Tetrachloride	760		5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
Chlorobenzene	1100		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Chloroethane	--		5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
Chloroform	370		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Chloromethane	--		5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
cis-1,2-Dichloroethene	250		5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U

Table 6. Summary of Volatile Organic Compounds in Soil, 507 West 24th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	Sample Designation: Sample Date: Sample Depth (ft bls):	SP-05	SP-05	SP-06	SP-06	SP-07	SP-07	SP-08
	Part 375 Unrestricted Use		0' - 2'	8' - 10'	2' - 4'	8' - 10'	2' - 4'	8' - 10'	4' - 6'
cis-1,3-Dichloropropene	--		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Dibromochloromethane	--		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Dibromomethane	--		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Dichlorodifluoromethane	--		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Ethylbenzene	1000		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Hexachlorobutadiene	--		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Isopropylbenzene	--		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
m&p-Xylene	--		2.68	1.00 U	1.00 U	1.00 U	1.00 U	1.84	1.00 U
Methylene Chloride	50		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Methyl-Tert-Butyl-Ether (MTBE)	930		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Naphthalene	12000		5.00 U	5.00 U	5.00 U	6.33	5.00 U	153	5.00 U
n-Butylbenzene	12000		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
n-Propylbenzene	3900		1.00 U	1.00 U	1.00 U	1.33	1.00 U	1.00 U	1.00 U
o-Xylene	--		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	5.07	1.00 U
sec-Butylbenzene	11000		1.00 U	1.00 U	1.00 U	1.45	1.00 U	1.00 U	1.00 U
Styrene	--		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
tert-Butylbenzene	5900		5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
Tetrachloroethene	1300		1.00 U	1.00 U	1.00 U	1.00 U	2.74	1.0 U1	1.00 U
Toluene	700		3.88	1.00 U	2.21	1.00 U	1.00 U	1.71	1.00 U
trans-1,2-Dichloroethene	190		5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
trans-1,3-Dichloropropene	--		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	470		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Trichlorofluoromethane	--		1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Vinyl Chloride	20		5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
Total VOCs	--		6.56	5.00 U	2.21	13.47	2.74	165	5.00 U

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

µg/kg - Micrograms per kilogram

ft bls - Feet below land surface

NYSDEC - New York State Department of Environmental Conservation

-- No NYSDEC Part 375 Unrestricted Use Standards available

Bold data indicates that parameter was detected above the NYSDEC

Part 375 Unrestricted Use Standards

NA - Compound was not analyzed by laboratory

Table 6. Summary of Volatile Organic Compounds in Soil, 507 West 24th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	Sample Designation:	SP-08	SP-10	SP-10
	Part 375 Unrestricted Use	Sample Date: Sample Depth (ft bls):	8' - 10'	0' - 2'	8' - 10'
1,1,1,2-Tetrachloroethane	--		1.00 U	1.00 U	1.00 U
1,1,1-Trichloroethane	680		1.00 U	1.00 U	1.00 U
1,1,2,2-Tetrachloroethane	--		1.00 U	1.00 U	1.00 U
1,1,2-Trichloroethane	--		5.0 U	5.0 U	5.0 U
1,1-Dichloroethane	270		1.00 U	1.00 U	1.00 U
1,1-Dichloroethene	330		1.00 U	1.00 U	1.00 U
1,1-Dichloropropene	--		1.00 U	1.00 U	1.00 U
1,2,3-Trichlorobenzene	--		5.00 U	5.00 U	5.00 U
1,2,3-Trichloropropane	--		5.00 U	5.00 U	5.00 U
1,2,4-Trichlorobenzene	--		5.00 U	5.00 U	5.00 U
1,2,4-Trimethylbenzene	3600		1.00 U	18.2	1.00 U
1,2-Dibromo-3-chloropropane	--		5.00 U	5.00 U	5.00 U
1,2-Dibromoethane	--		1.00 U	1.00 U	1.00 U
1,2-Dichlorobenzene	1100		1.00 U	1.00 U	1.00 U
1,2-Dichloroethane	20		1.00 U	1.00 U	1.00 U
1,2-Dichloropropane	--		1.00 U	1.00 U	1.00 U
1,3,5-Trimethylbenzene	8400		5.00 U	26.1	5.00 U
1,3-Dichlorobenzene	2400		1.00 U	1.00 U	1.00 U
1,3-Dichloropropane	--		1.00 U	1.00 U	1.00 U
1,4-Dichlorobenzene	1800		1.00 U	1.00 U	1.00 U
2,2-Dichloropropane	--		5.00 U	5.00 U	5.00 U
2-Chlorotoluene	--		1.00 U	1.00 U	1.00 U
4-Chlorotoluene	--		5.00 U	5.00 U	5.00 U
4-Isopropyltoluene	--		1.00 U	1.00 U	1.00 U
Benzene	60		1.00 U	1.00 U	1.00 U
Bromobenzene	--		1.00 U	1.00 U	1.00 U
Bromochloromethane	--		1.00 U	1.00 U	1.00 U
Bromodichloromethane	--		1.00 U	1.00 U	1.00 U
Bromoform	--		1.00 U	1.00 U	1.00 U
Bromomethane	--		5.00 U	5.00 U	5.00 U
Carbon Tetrachloride	760		5.00 U	5.00 U	5.00 U
Chlorobenzene	1100		1.00 U	1.00 U	1.00 U
Chloroethane	--		5.00 U	5.00 U	5.00 U
Chloroform	370		1.00 U	1.00 U	1.00 U
Chloromethane	--		5.00 U	5.00 U	5.00 U
cis-1,2-Dichloroethene	250		5.00 U	5.00 U	5.00 U

Table 6. Summary of Volatile Organic Compounds in Soil, 507 West 24th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	Sample Designation: SP-08	SP-10	SP-10	
	Part 375 Unrestricted Use				
		Sample Date:			
		Sample Depth (ft bls):	8' - 10'	0' - 2'	8' - 10'
cis-1,3-Dichloropropene	--		1.00 U	1.00 U	1.00 U
Dibromochloromethane	--		1.00 U	1.00 U	1.00 U
Dibromomethane	--		1.00 U	1.00 U	1.00 U
Dichlorodifluoromethane	--		1.00 U	1.00 U	1.00 U
Ethylbenzene	1000		1.00 U	10.9	1.00 U
Hexachlorobutadiene	--		1.00 U	1.00 U	1.00 U
Isopropylbenzene	--		1.00 U	1.00 U	1.00 U
m&p-Xylene	--		1.00 U	28.2	1.00 U
Methylene Chloride	50		1.00 U	1.00 U	1.00 U
Methyl-Tert-Butyl-Ether (MTBE)	930		1.00 U	1.00 U	1.00 U
Naphthalene	12000		12.3	5.00 U	5.00 U
n-Butylbenzene	12000		1.00 U	1.00 U	1.00 U
n-Propylbenzene	3900		1.00 U	1.00 U	1.00 U
o-Xylene	--		1.00 U	10.9	1.00 U
sec-Butylbenzene	11000		1.00 U	1.00 U	1.00 U
Styrene	--		1.00 U	1.00 U	1.00 U
tert-Butylbenzene	5900		5.00 U	5.00 U	5.00 U
Tetrachloroethene	1300		1.00 U	1.00 U	1.00 U
Toluene	700		1.00 U	82.6	1.00 U
trans-1,2-Dichloroethene	190		5.00 U	5.00 U	5.00 U
trans-1,3-Dichloropropene	--		1.0 U	1.0 U	1.0 U
Trichloroethene	470		1.00 U	1.00 U	1.00 U
Trichlorofluoromethane	--		1.00 U	1.00 U	1.00 U
Vinyl Chloride	20		5.00 U	5.00 U	5.00 U
Total VOCs	--		12.3	176.9	5.00 U

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

µg/kg - Micrograms per kilogram

ft bls - Feet below land surface

NYSDEC - New York State Department of Environmental Conservation

-- No NYSDEC Part 375 Unrestricted Use Standards available

Bold data indicates that parameter was detected above the NYSDEC

Part 375 Unrestricted Use Standards

NA - Compound was not analyzed by laboratory

Table 7. Summary of Semivolatile Organic Compounds in Soil, 507 West 24th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	Sample Designation: Sample Date: Sample Depth (ft bls):	SP-05	SP-05	SP-06	SP-06	SP-07	SP-07	SP-08	SP-08
	Part 375 Unrestricted Use		0' - 2'	8' - 10'	2' - 4'	8' - 10'	2' - 4'	8' - 10'	4' - 6'	8' - 10'
2,4,5-Trichlorophenol	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
2,4,6-Trichlorophenol	--		33.3 U	33.3 U	33.3 U	33.3 U	33.3 U	200 U	2300 U	33.3 U
2,4-Dichlorophenol	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
2,4-Dimethylphenol	--		333 U	333 U	333 U	333 U	333 U	200 U	200 U	333 U
2,4-Dinitrophenol	--		167 U	167 U	167 U	167 U	167 U	1000 U	1000 U	167 U
2,4-Dinitrotoluene	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
2,6-Dinitrotoluene	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
2-Chloronaphthalene	--		33.3 U	33.3 U	33.3 U	33.3 U	33.3 U	200 U	200 U	33.3 U
2-Chlorophenol	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
2-Methyl-4,6-dinitrophenol	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
2-Methylnaphthalene	--		33.3 U	33.3 U	33.3 U	33.3 U	33.3 U	207	200 U	33.3 U
2-Methylphenol	330		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
2-Nitroaniline	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
2-Nitrophenol	--		167 U	167 U	167 U	167 U	167 U	1000 U	1000 U	167 U
3,3-Dichlorobenzidene	--		167 U	167 U	167 U	167 U	167 U	1000 U	1000 U	167 U
3,4-Methylphenol	330		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
3-Nitroaniline	--		167 U	167 U	167 U	167 U	167 U	1000 U	1000 U	167 U
4-Bromophenyl phenyl ether	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
4-Chloro-3-methylphenol	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
4-Chloroaniline	--		167 U	167 U	167 U	167 U	167 U	1000 U	1000 U	167 U
4-Chlorophenol phenyl ether	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
4-Nitroaniline	--		33.3 U	33.3 U	33.3 U	33.3 U	33.3 U	200 U	200 U	33.3 U
4-Nitrophenol	--		167 U	167 U	167 U	167 U	167 U	1000 U	1000 U	167 U
Acenaphthene	20000		33.3 U	33.3 U	196	33.3 U	122	508	200 U	74.9
Acenaphthylene	100000		33.3 U	33.3 U	33.3 U	33.3 U	33.3 U	368	200 U	33.3 U
Anthracene	100000		66.6 U	66.6 U	460	66.6 U	302	1630	508	162
Benzo(a)anthracene	1000		186	66.6 U	1110	66.6 U	633	3380	840	191
Benzo(a)pyrene	1000		33.3 U	33.3 U	1060	33.3 U	652	2370	200 U	33.3 U
Benzo(b)fluoranthene	1000		167 U	167 U	673	167 U	167 U	1420	1000 U	167 U
Benzo(g,h,i)perylene	100000		33.3 U	1140	33.3 U	565	33.3 U	2800	200 U	33.3 U
Benzo(k)fluoranthene	800		66.6 U	66.6 U	592	66.6 U	66.6 U	1900	400 U	66.6 U
bis(2-Chloroethoxy)methane	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
bis(2-Chloroethyl)ether	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
bis(2-Chloroisopropyl)ether	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
bis(2-Ethylhexyl)phthalate	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
Butyl benzyl phthalate	--		167 U	167 U	167 U	167 U	167 U	1000 U	1000 U	167 U
Chrysene	1000		206	66.6 U	1350	66.6 U	763	3320	1180	262

Table 7. Summary of Semivolatile Organic Compounds in Soil, 507 West 24th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC Part 375 Unrestricted Use	Sample Designation: Sample Date: Sample Depth (ft bls):	SP-05 0' - 2'	SP-05 8' - 10'	SP-06 2' - 4'	SP-06 8' - 10'	SP-07 2' - 4'	SP-07 8' - 10'	SP-08 4' - 6'	SP-08 8' - 10'
	Dibenzo(a,h)anthracene	330		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U
Dibenzofuran	7000		33.3 U	33.3 U	33.3 U	33.3 U	33.3 U	200 U	200 U	33.3 U
Diethyl phthalate	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
Dimethyl phthalate	--		33.3 U	33.3 U	48.3	33.3 U	33.3 U	200 U	200 U	33.3 U
Di-n-butylphthalate	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
Di-n-octylphthalate	--		167 U	167 U	167 U	167 U	167 U	1000 U	1000 U	167 U
Fluoranthene	100000		332	66.6 U	1690	66.6 U	1180	5290	1650	366
Fluorene	30000		66.6 U	66.6 U	198	66.6 U	115	400 U	400 U	100
Hexachlorobenzene	330		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
Hexachlorocyclopentadiene	--		167 U	167 U	167 U	167 U	167 U	1000 U	1000 U	167 U
Hexachloroethane	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
Indeno(1,2,3-cd)pyrene	500		66.6 U	66.6 U	910	66.6 U	467	2650	400 U	66.6 U
Isophorone	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
Nitrobenzene	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
N-Nitrosodi-n-propylamine	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
N-Nitrosodiphenylamine	--		66.6 U	66.6 U	66.6 U	66.6 U	66.6 U	400 U	400 U	66.6 U
Pentachlorophenol	800		167 U	167 U	167 U	167 U	167 U	1000 U	1000 U	167 U
Phenanthrene	100000		173	66.6 U	2490	66.6 U	1460	36000	2010	600
Phenol	330		33.3 U	33.3 U	33.3 U	33.3 U	33.3 U	200 U	200 U	33.3 U
Pyrene	100000		501	66.6 U	9060	66.6 U	4710	157000	8990	2170
Total SVOCs			1398	167 U	20977	167 U	10969	218843	15178	3925.9

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

µg/kg - Micrograms per kilogram

ft bls - Feet below land surface

NYSDEC - New York State Department of Environmental Conservation

-- No NYSDEC Part 375 Unrestricted Use Standards available

Bold data indicates that parameter was detected above the NYSDEC

Part 375 Unrestricted Use Standards

NA - Compound was not analyzed by laboratory

Table 7. Summary of Semivolatile Organic Compounds in Soil, 507 West 24th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	Sample Designation:	SP-10	SP-10
	Part 375 Unrestricted Use		Sample Date:	0' - 2'
		Sample Depth (ft bls):		
2,4,5-Trichlorophenol	--		66.6 U	66.6 U
2,4,6-Trichlorophenol	--		33.3 U	33.3 U
2,4-Dichlorophenol	--		66.6 U	66.6 U
2,4-Dimethylphenol	--		333 U	333 U
2,4-Dinitrophenol	--		167 U	167 U
2,4-Dinitrotoluene	--		66.6 U	66.6 U
2,6-Dinitrotoluene	--		66.6 U	66.6 U
2-Chloronaphthalene	--		33.3 U	33.3 U
2-Chlorophenol	--		66.6 U	66.6 U
2-Methyl-4,6-dinitrophenol	--		66.6 U	66.6 U
2-Methylnaphthalene	--		33.3 U	33.3 U
2-Methylphenol	330		66.6 U	66.6 U
2-Nitroaniline	--		66.6 U	66.6 U
2-Nitrophenol	--		167 U	167 U
3,3-Dichlorobenzidene	--		167 U	167 U
3,4-Methylphenol	330		66.6 U	66.6 U
3-Nitroaniline	--		167 U	167 U
4-Bromophenyl phenyl ether	--		66.6 U	66.6 U
4-Chloro-3-methylphenol	--		66.6 U	66.6 U
4-Chloroaniline	--		167 U	167 U
4-Chlorophenol phenyl ether	--		66.6 U	66.6 U
4-Nitroaniline	--		33.3 U	33.3 U
4-Nitrophenol	--		167 U	167 U
Acenaphthene	20000		33.3 U	33.3 U
Acenaphthylene	100000		58.6	33.3 U
Anthracene	100000		89.9	66.6 U
Benzo(a)anthracene	1000		313	66.6 U
Benzo(a)pyrene	1000		396	33.3 U
Benzo(b)fluoranthene	1000		167 U	167 U
Benzo(g,h,i)perylene	100000		33.3 U	33.3 U
Benzo(k)fluoranthene	800		66.6 U	66.6 U
bis(2-Chloroethoxy)methane	--		66.6 U	66.6 U
bis(2-Chloroethyl)ether	--		66.6 U	66.6 U
bis(2-Chloroisopropyl)ether	--		66.6 U	66.6 U
bis(2-Ethylhexyl)phthalate	--		66.6 U	66.6 U
Butyl benzyl phthalate	--		167 U	167 U
Chrysene	1000		426	66.6 U

Table 7. Summary of Semivolatile Organic Compounds in Soil, 507 West 24th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	Sample Designation: Sample Date: Sample Depth (ft bls):	SP-10	SP-10
	Part 375 Unrestricted Use		0' - 2'	8' - 10'
Dibenzo(a,h)anthracene	330		66.6 U	66.6 U
Dibenzofuran	7000		33.3 U	33.3 U
Diethyl phthalate	--		66.6 U	66.6 U
Dimethyl phthalate	--		33.3 U	33.3 U
Di-n-butylphthalate	--		66.6 U	66.6 U
Di-n-octylphthalate	--		167 U	167 U
Fluoranthene	100000		335	66.6 U
Fluorene	30000		66.6 U	66.6 U
Hexachlorobenzene	330		66.6 U	66.6 U
Hexachlorocyclopentadiene	--		167 U	167 U
Hexachloroethane	--		66.6 U	66.6 U
Indeno(1,2,3-cd)pyrene	500		66.6 U	66.6 U
Isophorone	--		66.6 U	66.6 U
Nitrobenzene	--		66.6 U	66.6 U
N-Nitrosodi-n-propylamine	--		66.6 U	66.6 U
N-Nitrosodiphenylamine	--		66.6 U	66.6 U
Pentachlorophenol	800		167 U	167 U
Phenanthrene	100000		455	66.6 U
Phenol	330		33.3 U	33.3 U
Pyrene	100000		1440	66.6 U
Total SVOCs			3513.5	167 U

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

µg/kg - Micrograms per kilogram

ft bls - Feet below land surface

NYSDEC - New York State Department of Environmental Conservation

-- No NYSDEC Part 375 Unrestricted Use Standards available

Bold data indicates that parameter was detected above the NYSDEC

Part 375 Unrestricted Use Standards

NA - Compound was not analyzed by laboratory

Table 8. Summary of Metals in Soil, 507 West 24th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC	Sample Designation:	SP-05	SP-05	SP-06	SP-06	SP-07	SP-07	SP-08	SP-08
	Part 375 Unrestricted Use		Sample Date:	0' - 2'	8' - 10'	2' - 4'	8' - 10'	2' - 4'	8' - 10'	4' - 6'
		Sample Depth (ft bls):								
Aluminum	--		9180	4650	5040	5920	5250	2650	4640	7830
Antimony	--		0.227 U	0.250 U	4.85	0.083	0.458	2.04	0.85	0.208 U
Arsenic	13		12.8	8.15	5.08	0.125 U	5.42	1.09	1.8	1.08
Barium	350		1533	63	119	26.7	39.6	62.3	125	111
Beryllium	7.2		0.5	0.05	0.154	0.125	0.167	0.136	0.15	0.208
Cadmium	2.5		4.32	9.8	14.5	2.42	3.12	3.04	2.25	33.29
Calcium	--		3750	1090	4350	662	5120	3500	6300	3630
Chromium	30		16	17.8	12.2	8.58	17	11.9	10.4	13.9
Cobalt	--		6.5	3	3.27	3.5	3.54	3.64	3.1	4.96
Copper	50		3060	47.4	473	299	90	298	21.6	39.9
Iron	--		10700	22300	10800	8210	8540	8910	7150	5280
Lead	63		434	16	823	10.5	942	189	352	235
Magnesium	--		3250	1720	2020	1970	2620	2650	2610	2150
Manganese	1600		253	58.5	205	95	225	173	198	271
Mercury	0.18		8.74	0.037	2.76	0.028	12.3	6.29	25.7	7.18
Nickel	30		21.1	8.5	13.6	14	17	13.5	9.6	14.7
Potassium	--		144	700	188	194	123	234	250	185
Selenium	3.9		0.136 U	0.150 U	0.115 U	0.125 U	0.125 U	0.136 U	0.150 U	0.125 U
Silver	2		0.591	0.100 U	0.231	0.083 U	0.083 U	0.091 U	0.100 U	0.083 U
Sodium	--		41.8	416	66.5	12.4	33	22.3	104	36
Thallium	--		0.091 U	0.100 U	0.077 U	0.083 U	0.083 U	0.091 U	0.100 U	0.083 U
Vanadium	--		21.1	27.6	16.2	12.2	30.1	15.4	17.5	20.1
Zinc	109		1440	34.2	431	91.7	283	240	135	126

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

mg/kg - Milligrams per kilogram

ft bls - Feet below land surface

NYSDEC - New York State Department of Environmental Conservation

-- No NYSDEC Part 375 Unrestricted Use Standards available

Bold data indicates that parameter was detected above the NYSDEC

Part 375 Unrestricted Use Standards

NA - Compound was not analyzed by laboratory

Table 8. Summary of Metals in Soil, 507 West 24th Street, New York, New York

Parameter (Concentrations in mg/kg)	NYSDEC	Sample Designation:	SP-10	SP-10
	Part 375 Unrestricted Use			
Aluminum	--		4790	8620
Antimony	--		0.781	0.250 U
Arsenic	13		3.27	0.17
Barium	350		131	46.9
Beryllium	7.2		0.169	0.28
Cadmium	2.5		8.35	3.84
Calcium	--		3620	2390
Chromium	30		10.1	17.5
Cobalt	--		4.64	6.22
Copper	50		974	78.4
Iron	--		12200	11200
Lead	63		738	77.7
Magnesium	--		2370	2810
Manganese	1600		155	382
Mercury	0.18		0.995	0.117
Nickel	30		26	16.5
Potassium	--		161	190
Selenium	3.9		0.115 U	0.150 U
Silver	2		0.1	0.100 U
Sodium	--		51.8	12.8
Thallium	--		0.077 U	0.100 U
Vanadium	--		19.1	21.3
Zinc	109		2080	334

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

mg/kg - Milligrams per kilogram

ft bls - Feet below land surface

NYSDEC - New York State Department of Environmental Conservation

-- No NYSDEC Part 375 Unrestricted Use Standards available

Bold data indicates that parameter was detected above the NYSDEC

Part 375 Unrestricted Use Standards

NA - Compound was not analyzed by laboratory

Table 9. Summary of Pesticides in Soil, 507 West 24th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	Sample Designation:	SP-05	SP-05	SP-06	SP-06	SP-07	SP-07	SP-08	SP-08
	Part 375 Unrestricted Use									
			0' - 2'	8' - 10'	2' - 4'	8' - 10'	2' - 4'	8' - 10'	4' - 6'	8' - 10'
a BHC	20		0.33 U	0.33 U						
Aldrin	5		0.33 U	0.33 U						
b BHC	36		0.33 U	0.33 U						
Chlordane	--		0.33 U	0.33 U						
d BHC	40		0.33 U	0.33 U						
Dieldrin	5		1.67 U	1.67 U						
Endosulfan I	2400		0.33 U	0.33 U						
Endosulfan II	2400		1.67 U	1.67 U						
Endosulfan Sulfate	2400		1.67 U	1.67 U						
Endrin	14		1.67 U	1.67 U						
Endrin aldehyde	--		1.67 U	1.67 U						
Endrin Ketone	--		0.136 U	0.150 U	0.115 U	0.125 U	0.125 U	0.136 U	0.150 U	0.125 U
G BHC	100		0.33 U	0.33 U						
Heptachlor	42		0.33 U	0.33 U						
Heptachlor Epoxide	--		0.33 U	0.33 U						
Methoxychlor	--		0.33 U	0.33 U						
p,p-DDD	3.3		1.67 U	1.67 U						
p,p-DDE	3.3		1.67 U	1.67 U						
p,p-DDT	3.3		1.67 U	1.67 U						
Toxaphene	--		0.33 U	0.33 U						

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

µg/kg - Micrograms per kilogram

ft bls - Feet below land surface

NYSDEC - New York State Department of Environmental Conservation

-- No NYSDEC Part 375 Unrestricted Use Standards available

Bold data indicates that parameter was detected above the NYSDEC

Part 375 Unrestricted Use Standards

NA - Compound was not analyzed by laboratory

Table 9. Summary of Pesticides in Soil, 507 West 24th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	Sample Designation: Sample Date: Sample Depth (ft bls):	SP-10	SP-10
	Part 375 Unrestricted Use		0' - 2'	8' - 10'
a BHC	20		0.33 U	0.33 U
Aldrin	5		0.33 U	0.33 U
b BHC	36		0.33 U	0.33 U
Chlordane	--		0.33 U	0.33 U
d BHC	40		0.33 U	0.33 U
Dieldrin	5		1.67 U	1.67 U
Endosulfan I	2400		0.33 U	0.33 U
Endosulfan II	2400		1.67 U	1.67 U
Endosulfan Sulfate	2400		1.67 U	1.67 U
Endrin	14		1.67 U	1.67 U
Endrin aldehyde	--		1.67 U	1.67 U
Endrin Ketone	--		0.115 U	0.150 U
G BHC	100		0.33 U	0.33 U
Heptachlor	42		0.33 U	0.33 U
Heptachlor Epoxide	--		0.33 U	0.33 U
Methoxychlor	--		0.33 U	0.33 U
p,p-DDD	3.3		1.67 U	1.67 U
p,p-DDE	3.3		1.67 U	1.67 U
p,p-DDT	3.3		1.67 U	1.67 U
Toxaphene	--		0.33 U	0.33 U

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

µg/kg - Micrograms per kilogram

ft bls - Feet below land surface

NYSDEC - New York State Department of Environmental Conservation

-- No NYSDEC Part 375 Unrestricted Use Standards available

Bold data indicates that parameter was detected above the NYSDEC

Part 375 Unrestricted Use Standards

NA - Compound was not analyzed by laboratory

Table 10. Summary of Polychlorinated Biphenyls in Soil, 507 West 24th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	Sample Designation: Sample Date: Sample Depth (ft bls):	SP-05	SP-05	SP-06	SP-06	SP-07	SP-07	SP-08	SP-08
	Part 375 Unrestricted Use		0' - 2'	8' - 10'	2' - 4'	8' - 10'	2' - 4'	8' - 10'	4' - 6'	8' - 10'
Aroclor 1016	--		3.33 U	3.33 U						
Aroclor 1221	--		3.33 U	3.33 U						
Aroclor 1232	--		3.33 U	3.33 U						
Aroclor 1242	--		3.33 U	3.33 U						
Aroclor 1248	--		3.33 U	3.33 U						
Aroclor 1254	--		3.33 U	3.33 U						
Aroclor 1260	--		3.33 U	3.33 U						
Total PCBs	100		0	0	0	0	0	0	0	0

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

µg/kg - Micrograms per kilogram

ft bls - Feet below land surface

NYSDEC - New York State Department of Environmental Conservation

-- No NYSDEC Part 375 Unrestricted Use Standards available

Bold data indicates that parameter was detected above the NYSDEC

Part 375 Unrestricted Use Standards

NA - Compound was not analyzed by laboratory

Table 10. Summary of Polychlorinated Biphenyls in Soil, 507 West 24th Street, New York, New York

Parameter (Concentrations in µg/kg)	NYSDEC	Sample Designation: Sample Date: Sample Depth (ft bls):	SP-10	SP-10
	Part 375 Unrestricted Use		0' - 2'	8' - 10'
Aroclor 1016	--		3.33 U	3.33 U
Aroclor 1221	--		3.33 U	3.33 U
Aroclor 1232	--		3.33 U	3.33 U
Aroclor 1242	--		3.33 U	3.33 U
Aroclor 1248	--		3.33 U	3.33 U
Aroclor 1254	--		3.33 U	3.33 U
Aroclor 1260	--		3.33 U	3.33 U
Total PCBs	100		0	0

J - Estimated value

U - Indicates that the compound was analyzed for but not detected

µg/kg - Micrograms per kilogram

ft bls - Feet below land surface

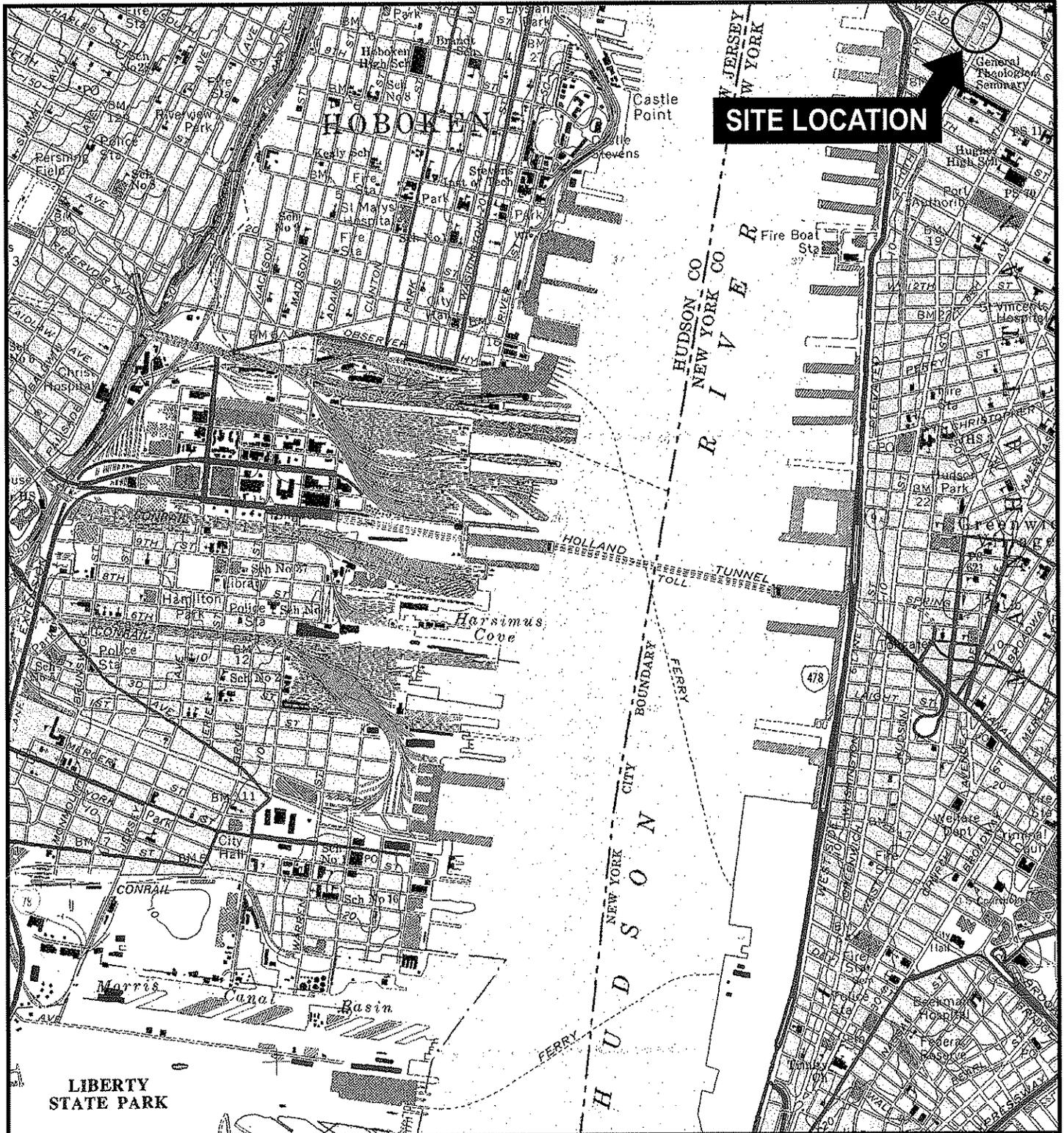
NYSDEC - New York State Department of Environmental Conservation

-- No NYSDEC Part 375 Unrestricted Use Standards available

Bold data indicates that parameter was detected above the NYSDEC

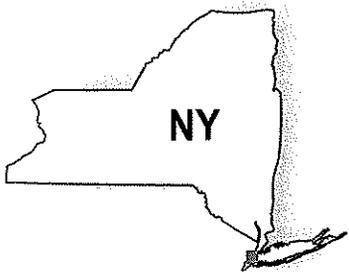
Part 375 Unrestricted Use Standards

NA - Compound was not analyzed by laboratory



SITE LOCATION

QUADRANGLE LOCATION



SOURCE:
USGS; 1981, Jersey City, NY-NJ
7.5 Minute Topographic Quadrangle

SITE LOCATION PLAN

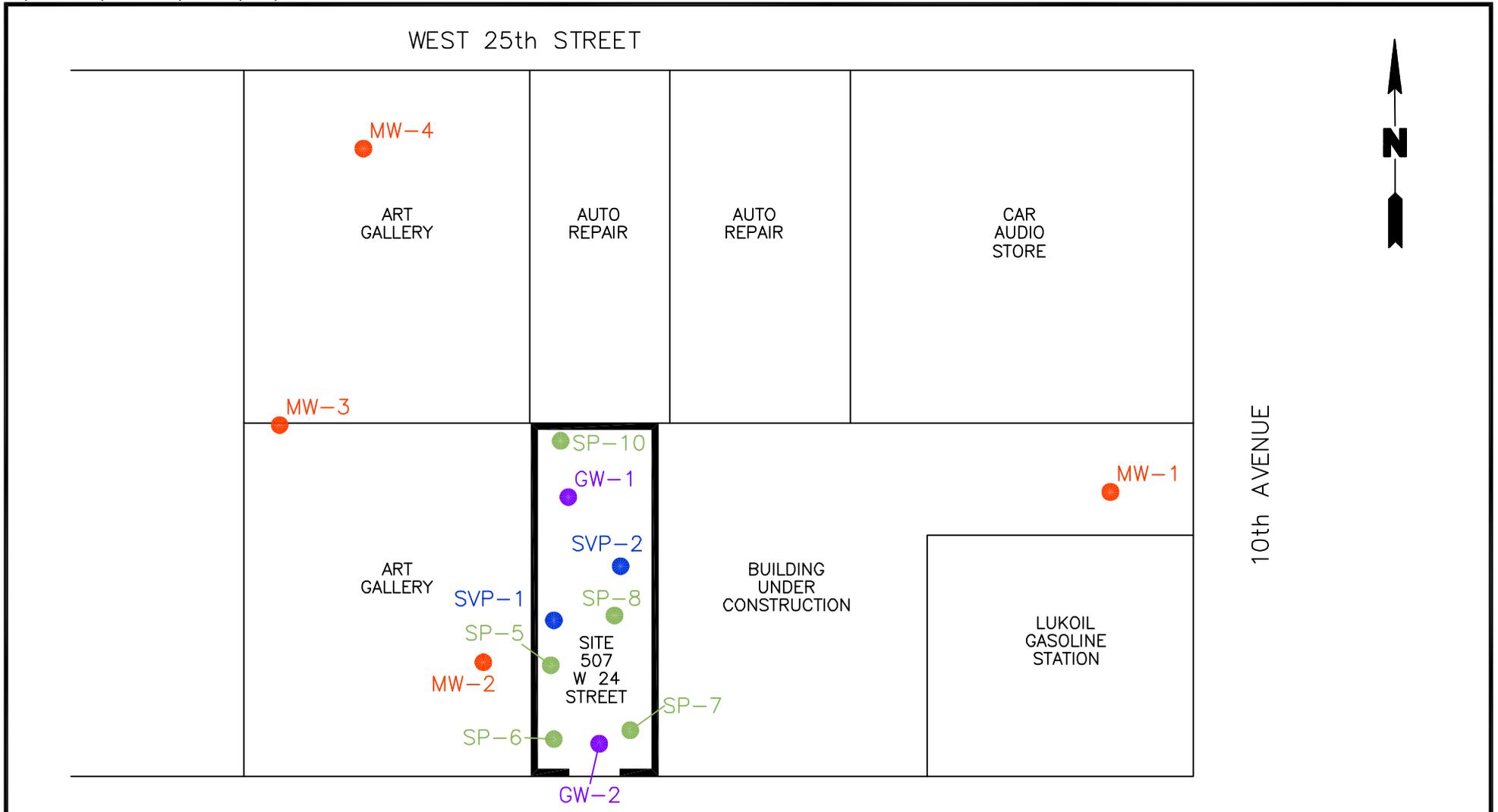
507 WEST 24th STREET
NEW YORK, NEW YORK

Prepared for:
HIGHLINE PARTNERS, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting
& Management

Compiled by: BH	Date: 21FEB08	FIGURE 1
Prepared by: RK	Scale: AS SHOWN	
Project Mgr: BH	Office: NY	
File No.: 0110003.CDR	Project No.: 172801Y	

N:\PROJECTS\172801Y\10\010003.CDR



LEGEND	
MW-1	● HYDRO TECH 2004 GROUNDWATER SAMPLE LOCATIONS
SP-6	● HYDRO TECH 2004 SOIL SAMPLE LOCATIONS
SVP-1	● ROUX 2008 SOIL VAPOR SAMPLE LOCATIONS
GW-1	● ROUX 2008 GROUNDWATER SAMPLE LOCATIONS

SITE UNDER CONSTRUCTION CAR WASH

Title:			
SAMPLE LOCATION MAP			
507 WEST 24TH STREET NEW YORK, NEW YORK			
Prepared For:			
HIGHLINE PARTNERS, LLC			
 ROUX ASSOCIATES, INC. <i>Environmental Consulting & Management</i>	Compiled by: B.H.	Date: 21FEB08	FIGURE 3
	Prepared by: R.K.	Scale: AS SHOWN	
	Project Mgr: B.H.	Office: NY	
	File No: HPL0110002	Project: 172801Y	

APPENDIX A

Tax Map

Construction Health and Safety Plan

March 9, 2012

**SITE-SPECIFIC CONSTRUCTION
HEALTH AND SAFETY PLAN (HASP)**

**507 West 24th Street
New York, New York**

Prepared for

**507 WEST 24TH STREET, LLC
375 Park Avenue, Suite 2703
New York, New York 10152**

ROUX ASSOCIATES, INC.

Environmental Consulting & Management



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

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

FIGURE

1. Hospital Route Map

APPENDICES

- A. Job Safety Analysis
- B. Material Safety Data Sheets
- C. Heat Stress Guidelines
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- E. Excavation Check List and Procedures
- F. Medical Surveillance Program
- G. Example Decontamination Station Layout
- H. Accident Investigation Report
- I. Accident/Incident Report OSHA 3000
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Completed Job Safety Analysis Forms Included in Appendix A (to be provided by the Construction Health and Safety Officer):

1.0 INTRODUCTION

This Site-specific Construction Health and Safety Plan (HASP) has been prepared in accordance with 29 FR 1910.120 Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) & 1926.62 OSHA guidelines. It addresses all activities to be performed during the implementation of the Remedial Action Plan (RAP) activities at the 507 West 24th Street Development Site, located on the north side of West 24th Street between 10th Avenue and 11th Avenue, New York, New York (Site). The HASP will be implemented by the designated Site Health and Safety Officer (SHSO) during work at the Site. This HASP attempts to identify all potential hazards at the Site; however, site conditions are dynamic and new hazards may appear constantly. Personnel must remain alert to existing and potential hazards as site conditions change and protect themselves accordingly.

Compliance with this HASP is required of all persons and subcontractors who perform work at, or enter the Site. The content of this HASP may change or undergo revisions based upon additional information made available to health and safety personnel, monitoring results, or changes in the technical scope of work. Any changes proposed must be reviewed and approved by the Project Principal, Corporate Health and Safety Manager (CHSM), with the SHSO implementing the changes to the HASP.

Upon entering the Site, all visitors are required to sign in. All visitors entering the Exclusion Zone (EZ) (defined in Section 8.1.1), the Contamination Reduction Corridor (CRC) (defined in Section 8.1.2), or the Remediated Zone (RZ) (defined in Section 8.1.3) will be required to read and comply with the applicable provisions of this HASP, which visitors must sign and acknowledge. Occasional site visitors (inspectors, owners, etc.) do not need to comply with the training and medical monitoring requirements if they sign a statement acknowledging that they have received Site-specific health and safety training and will comply with the applicable requirements of the HASP. In the event that a visitor does not adhere to the applicable provisions of this HASP, he or she will be required to leave the Site immediately.

1.1 Scope of Work

The proposed Site redevelopment includes excavation of a basement to a depth of approximately 15.5 feet below land surface and construction of a two-story art gallery.

The building foundation excavation will extend to a depth ranging approximately 6 to 7 feet below the water table, effectively removing soil exhibiting historical fill impacts within the building footprint. Due to the limited contamination encountered in the historical fill material, the environmental and human exposures are expected to be minimal during both redevelopment activities and after redevelopment activities are completed.

The building foundation will be equipped with a water and vapor proof barrier. The barrier will be protective of potential vapors that may arise from the presence of low level volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) detected in soil at depth. In addition, the building basement will include a mechanical ventilation system consistent with the New York City Building Code.

1.2 Emergency Numbers

Provided below is a list of telephone numbers for use in the event of an emergency onsite.

1.2.1 Emergency Phone Numbers

- Emergency Medical Service911
- Police: New York City Police Department (NYPD)911
- Hospital: NYU Langone Medical Center(212) 263-7300
- National Response Center.....(800) 424-8802
- Poison Control Center.....(717) 534-6111
- Chemtrec(800) 424-9555
- Fire: New York City Fire Department (FDNY).....911
- New York City Office of Emergency Management911
- Center for Disease Control.....(404) 488-4100
- USEPA (Region II).....(212) 637-5000
- NYSDEC Emergency Spill Response(800) 457-7362

1.2.2 Project Management/Health and Safety Personnel

Title	Contact	Phone	Cell
General Superintendent	TBD		
Site Superintendent	TBD		

Title	Contact	Phone	Cell
Assistant Site Superintendent	TBD		
Corporate Safety Supervisor	TBD		

TBD – To Be Determined

1.2.3 Other Important Phone Numbers

New York City Emergency Response Team911

Project Field Office TrailerTBD

1.2.4 Directions to NYU Langone Medical Center

Main Entrance (Valet Parking)

550 First Avenue

New York, NY 10016

Emergency Room (Harris Building): Located north of main entrance

Directions from the Site to NYU Langone Medical Center

1. Travel east on West 21st Street to 10th Avenue
2. Turn right at 2nd cross street onto 9th Avenue
3. Turn left on West 23rd Street
4. Turn left on 3rd Avenue
5. Turn right on East 26th Street
6. Turn left on 1st Ave
7. Arrive at NYU Langone Medical Center

Directions to the hospital are provided on Figure 1.

1.3 Emergency Equipment

Emergency Equipment List to be kept on Site:

- First Aid Kits
- ABC Fire Extinguisher
- Absorbent Boom Emergency Spill Equipment

- Absorbent Pads
- Air Horns
- Oil Dry
- Eye Wash

2.0 HEALTH AND SAFETY STAFF

This section briefly describes all Site personnel and their health and safety responsibilities relating to the implementation of the RAP and foundation construction work to be implemented at the Site. All personnel are responsible for ensuring compliance with the HASP.

2.1 General Superintendent (GS) - TBD

- Has the overall responsibility for the health and safety of Site personnel.
- Ensures that adequate resources are provided to the field health and safety staff to carry out their responsibilities as outlined below.

2.2 Corporate Health and Safety Manager (CHSM) - TBD

- Implements the HASP.
- Performs or oversees site-specific training and approves revised or new safety protocols or field operations.
- Coordinates revisions of this HASP with Project Superintendent.
- Responsible for the development of new task safety protocols and procedures and resolution of any outstanding safety issues which may arise during the conduction of site work.
- Reviews and approves all health and safety training and medical surveillance records for personnel and subcontractors.

2.3 Site Health and Safety Officer (SHSO) - TBD

- Directs and coordinates health and safety monitoring activities.
- Ensures that field teams utilize proper personal protective equipment (PPE).
- Conducts initial onsite specific training prior to personnel and/or subcontractors commencing work.
- Conducts and documents periodic safety briefings.
- Completes and maintains Accident/Incident Report Forms.
- Ensures that field team members comply with this HASP. Completes and maintains Accident/Incident Report Forms.
- Immediately notifies the GS and CHSM of all accident/incidents.

- Communicates at the end of each day to the designated representative the tasks completed, the next day's planned activities, any third party issues, changes of work plans and/or changes in level of PPE.
- Maintains contact with subcontractors.
- Determines upgrade or downgrade of personal protective equipment (PPE) based on Site conditions and/or real time monitoring results.
- Ensures that monitoring instruments are calibrated daily or as manufacturer's instructions determine.
- Reports to the CHSM to provide summaries of field operations and progress.
- Submits and maintains health and safety field log books, daily safety logs, training logs, air monitoring result reports, and weekly safety report.

2.4 Field Personnel and Subcontractors

- Reports any unsafe or potentially hazardous conditions to the SHSO.
- Maintains knowledge of the information, instructions, and emergency response actions contained in the HASP.
- Complies with rules, regulations, and procedures as set forth in this HASP and any revisions that are instituted.
- Prevents admittance to work Site by unauthorized personnel.

3.0 SITE BACKGROUND

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

3.1 Site Description and Setting

The Site contains one 3,500 square foot vacant lot located at 507 West 24th Street in Manhattan, New York. The Site is bordered to the north by an auto body shop, to the east by a multi-story residential building under construction, and a gasoline filling station (Lukoil), to the west by an art gallery, and to the south by West 24th Street, a car wash and a building lot currently under construction. Around the Site are several buildings and operations, including several art galleries, warehouses, auto repair shops, and parking garages.

3.2 Site History

Based on the findings of the two Phase I Environmental Site Assessments (ESAs), historical uses of the Site have included manufacture of gas and electric fixtures and truck parking.

3.3 Summary of Environmental Conditions

Environmental conditions at the Site are summarized below.

- No volatile organic compounds (VOCs), Polychlorinated biphenyls (PCBs), or pesticides were identified in Site soil at concentrations exceeding NYSDEC Recommended Soil Cleanup Objectives (RSCOs);
- No VOCs, PCBs, or pesticides were detected in Site groundwater sampled by Roux Associates in February 2008 at concentrations above NYSDEC Ambient Water Quality Standards and Guidance Values (AWQSGVs);
- Several SVOCs were identified in one well on Site sampled by Roux Associates in February 2008 at relatively low concentrations above NYSDEC AWQSGVs;
- Several SVOCs (specifically PAHs) were identified in Site soil. The types and concentrations at which they were identified are commonly found in urban areas with historic fill, and not indicative of an on-site source;
- Mercury was identified at a maximum concentration of 25 ppm in Site soil; and
- One soil vapor sample collected onsite (nearest to the Lukoil service station) contained VOCs including benzene, trichloroethene, and toluene. The second soil vapor sample did not contain any detectable concentrations of VOCs.

4.0 WASTE DESCRIPTION/CHARACTERIZATION

This section provides a brief summary of the wastes that are potentially present at the Site.

4.1 General

The following information is presented in order to identify the types of materials that may be encountered at the Site. The detailed information on these materials was obtained from:

- Sax's Dangerous Properties of Industrial Materials - Lewis Eight Edition
- Chemical Hazards of the Workplace - Proctor/Hughes
- Condensed Chemical Dictionary - Hawley
- Rapid Guide to Hazardous Chemical in the Workplace - Lewis 1990
- NIOSH Pocket Guide to Chemical Hazards - 1996
- ACGIH TLV Values and Biological Exposure Indices - OSHA 29 CFR 1910.1000

4.2 Chemical Data Sheets

The following is a listing of chemicals that may potentially be present in soils and groundwater at the Site based on previous soil sampling results and historic operations conducted at or adjacent to the Site.

VOCs	SVOCs/PAHs	Metals
Benzene	Acenaphthylene	Arsenic
Ethylbenzene	Anthracene	Barium
Toluene	Naphthalene	Chromium
Xylene	Pyrene	Lead
2-Butanone (MEK)	Indeno(1,2,3-cd)pyrene	Mercury
2-Methylnaphthalene	Benzo(a)anthracene	Selenium
	Benzo(a)pyrene	
	Benzo(b)fluoranthene	
	Benzo(g,h,i)perylene	
	Benzo(k)fluoranthene	
	Bis(2-ethylhexyl)phthalate	
	Carbazole	
	Chrysene	
	Dibenzo(a,h)anthracene	

VOCs	SVOCs/PAHs	Metals
	Dibenzofuran	
	Fluoranthene	
	Fluorene	

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 excavation/earth moving activities with impacted soils. Material Safety Data Sheets (MSDSs) for the above mentioned analytes that may be found at the Site are available in Appendix B.

4.2.1 Contaminants of Concern

Soil and groundwater contaminants that may be encountered during excavation and foundation construction activities include both organic and inorganic compounds. The chemical hazards posed by the Site are VOCs, SVOCs and metals.

- Waste Types

Liquid	<input checked="" type="checkbox"/>	Solid	<input checked="" type="checkbox"/>	Gas	<input type="checkbox"/>
Sludge	<input type="checkbox"/>	Semi-Solid	<input type="checkbox"/>	Other (describe) _____	

- Waste Characteristics

Corrosive	<input type="checkbox"/>	Ignitable	<input type="checkbox"/>	Volatile	<input checked="" type="checkbox"/>
Radioactive	<input type="checkbox"/>	Inert	<input type="checkbox"/>	Toxic	<input checked="" type="checkbox"/>

- Waste Containment

Pit	<input checked="" type="checkbox"/>	Pond	<input type="checkbox"/>	Sedimentation trap	<input type="checkbox"/>
Lake	<input type="checkbox"/>	Process Vessel	<input type="checkbox"/>	Tank	<input checked="" type="checkbox"/>
Piping	<input type="checkbox"/>	Drum	<input type="checkbox"/>	Other	<input type="checkbox"/>

5.0 HAZARD ASSESSMENT

The potential to encounter chemical hazards is dependent upon the work activity performed (intrusive versus non-intrusive) and the duration and location of the work activity. Such hazards could include inhalation and/or skin contact with chemicals/gases that could cause: dermatitis, skin burns, being overcome by vapors or asphyxiation.

Physical hazards that may be encountered during Site work include: heat and cold stress, exposure to excessive noise, loss of limbs, being crushed, head injuries, punctures, cuts, falls, electrocution, bruises, and other physical hazards due to motor vehicle operation, heavy equipment, and power tools.

Biological hazards may exist during Site activities. These hazards include exposure to insect bites/stings and bloodborne pathogens.

Prior to the beginning of each new phase of work, an activity hazard analysis will be prepared by the SHSO with assistance from the CHSM. The analysis will address the hazards for each activity performed in the phase and will present the procedures and safeguards necessary to eliminate the hazards or reduce the risk. The Job Safety Analysis Sheets are located in Appendix A.

Note: Hazard assessment is documented in section 5.4

5.1 Chemical Hazards

The potential for personnel and subcontractors to be exposed to chemical hazards may occur during the following tasks:

- Excavation Activities
- Dewatering of the excavation
- Installation of foundation piles
- Installation of sheet piling and shoring
- Decontamination station activities (equipment)

For chronic and acute toxicity data, refer to Table 1 for further details on compound characteristics.

5.1.1 Exposure Pathways and Assessment

Exposure to these compounds during ongoing activities may occur through inhalation of contaminated dust particles, inhalation of VOCs, SVOCs, elemental mercury and by way of dermal absorption and accidental ingestion of the contaminant by either direct or indirect cross-contamination activities.

Inhalation of contaminated dust particles (VOCs, SVOCs, and inorganics) can occur during adverse weather conditions (high or changing wind directions) or during operations that may generate airborne dust such as excavation and loading of contaminated soils. Dust control measures such as applying water to roadways and excavations will be implemented where visible dust is generated in accordance with the remediation contractor's work plans. Where dust control measures are not feasible or effective, respiratory protection will be used (see Section 9.2.2 for monitoring procedures and action levels).

5.1.2 Operational Action Levels

A decision-making protocol for an upgrade in levels of protection and/or withdrawal of personnel from an area based on atmospheric hazards will be determined by continuous air monitoring by our Industrial Hygienist and safety personnel as indicated in Section 8.2.2.

5.1.3 Additional Precautions

Dermal absorption or skin contact with chemical compounds is possible during intrusive activities at the Site. The use of PPE in accordance with Section 8.2 and strict adherence to proper decontamination procedures should significantly reduce the risk of skin contact.

The potential for accidental ingestion of potentially hazardous chemicals is expected to be remote when good hygiene practices are used.

5.2 Physical Hazards

A variety of physical hazards may be present during Site activities. These hazards include typical construction activities: operation of motor vehicles and heavy equipment, the use of power and hand tools, roping and rigging of steel sheeting, walking on objects, tripping over objects, working on surfaces which have the potential to promote falling, skin burns, crushing of

fingers, toes, limbs, head injuries caused by falling objects, temporary loss of one's hearing and/or eyesight. The referenced hazards are not unique and are generally familiar to most workers at construction sites. An Activity Hazard Analysis shall be submitted to the Construction Supervisor prior to the beginning of each phase of work (i.e., definable task). Task specific safety requirements for each phase will be covered during safety briefings. Job Safety Analysis summaries are contained in Appendix A.

5.2.1 Noise

Noise is a potential hazard associated with operation of heavy equipment, power tools, pumps, and generators. High noise equipment operators will be evaluated at the discretion of the SHSO. Employees with an 8-hour time weighted average exposure exceeding 85 dB[-]A will be included in the hearing conservation program in accordance with 29 CFR 1910.95 and 1926.52.

It is mandated that employees working around heavy equipment or using power tools that dispense noise levels exceeding 90 dB[-]A are to wear hearing protection that shall consist of earplugs or protective earmuffs.

5.2.2 Heat Stress

Heat stress is a significant potential hazard associated with the use of protective equipment in a hot weather environment. The human body is designed to function at a certain internal temperature. When metabolism or external sources (fire or hot summer day) cause the body temperature to rise, the body seeks to protect itself by triggering cooling mechanisms. The SHSO will monitor the air temperature (as described later in this section) to determine potential adverse affects the weather can cause onsite personnel. Excess heat is dissipated by two means:

- Changes in blood flow to dissipate heat by convection, which can be seen as “flushing” or reddening of the skin in extreme cases.
- Perspiration, which is the release of water through skin and sweat glands. While working in hot environments, evaporation of perspiration is the primary cooling mechanism.

Protective clothing worn to guard against chemical contact effectively stops the evaporation of perspiration. Thus the use of protective clothing increases heat stress problems.

The major disorders due to heat stress are heat cramps, heat exhaustion, and heat stroke. Heat cramps are painful spasms that occur in the skeletal muscles of workers who sweat profusely in the heat and may drink large quantities of water, but fail to replace the body's lost salts or electrolytes. Drinking water while continuing to lose salt tends to dilute the body's extracellular fluids. Soon, water seeps by osmosis into active muscles and causes pain. Muscles fatigued from work are usually most susceptible to cramps.

Extreme weakness or fatigue, dizziness, nausea, and headache characterize heat exhaustion. In serious cases, a person may vomit or lose consciousness. The skin is clammy and moist, complexion pale or flushed, and body temperature normal or slightly higher than normal. The treatment is to rest in a cool place and replacement of body water lost by perspiration. Mild cases may recover spontaneously with this treatment; severe cases may require care for several days. There are no permanent effects.

Heat stroke is a very serious condition caused by the breakdown of the body's heat-regulating mechanisms. The skin is very dry and hot with red mottled or bluish appearance. Unconsciousness, mental confusion, and/or convulsions may occur. Without quick and adequate treatment, the result can be death or permanent brain damage. As a first aid treatment, the person should be moved to a cool place. Body heat should be reduced artificially, but not too rapidly, by soaking the person's clothes in water and fanning them.

Steps that can be taken to reduce heat stress are:

- Acclimate the body. Allow a period of adjustment to make further heat exposure endurable.
- Drink more liquids to replace the body water lost during sweating.
- Take frequent breaks to rest and recover from the effects of heat stress.
- Wear personal cooling devices. These are two basic designs: units with pockets for holding frozen packets and units that circulate fluid from a reservoir through tubes to different parts of the body. Both designs can be in the form of a vest, jacket, or coverall. Some circulating units also have a cap for cooling the head.
- Wear long cotton underwear under chemical protective clothing. The cotton will absorb perspiration and will hold it close to the skin. This will provide the body with the maximum cooling available from the limited evaporation that takes place beneath

chemical resistant clothing. It also allows for rapid cooling of the body when the protective clothing is removed.

Heat stress is a significant hazard associated with using protective equipment in hot weather environments. Local weather conditions may produce a situation that requires restricted work schedules in order to protect employees.

Appendix C contains procedures for heat stress; these will be used as a guideline and to provide additional information.

5.2.3 Cold Stress

Cold temperatures are a significant potential hazard. Examples of cold temperature hazards are frostbite and hypothermia.

Frostbite is the most common injury resulting from exposure to cold. The extremities of the body are most often affected. The signs of frostbite are:

- The skin turns white or grayish-yellow.
- Pain is sometimes felt early but subsides later. Often there is no pain.
- The affected parts feel intensely cold and numb.

Hypothermia is characterized by shivering, numbness, drowsiness, muscular weakness, and a low internal body temperature when the body feels extremely cold. This can lead to unconsciousness and death. With both frostbite and hypothermia, the affected areas need to be warmed quickly. Immersion in warm water is an effective means of warming the effected areas quickly. In such cases, medical assistance will be sought.

To prevent these effects from occurring, persons working in the cold should wear adequate clothing and reduce the time spent in the cold area. The SHSO will monitor this and determine the appropriate time personnel should spend in adverse weather conditions.

Additional information about Cold Stress Control Guidelines is provided in Appendix D.

5.2.4 Lockout/Tagout

The remediation contractor will develop a lockout/tagout plan in the event of the repair of electrical, pneumatic, hydraulic, mechanical systems, per OSHA requirements under 29 CFR 1910.147.

5.2.5 Excavation Safety

All excavation work will be accomplished in strict conformance with 29 CFR 1926 .650 - 652. Site and safety controls will be implemented to insure both the safety of the person(s) excavating and all general personnel as specified in Appendix E.

5.2.6 Confined Space Entry

The remediation contractor and its subcontractor's personnel will not be permitted to enter confined spaces at any time until the space has been thoroughly evaluated and all provisions of 29 CFR 1910.146 are satisfied.

5.3 Biological Hazards

The biological hazards, which have the potential to cause adverse health effects, are from exposure to domestic flies, mosquitoes, insects, and bloodborne pathogens. The Job Safety Analysis (Appendix A) suggests controls for various hazards to be potentially encountered onsite.

5.3.1 Insect Stings

Stings from insects are often painful, 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.

Those individuals susceptible to severe allergic reaction to bee stings should carry on their person their own medication and the SHSO should be notified. If the victim has a history of allergic reaction, he should be taken to the nearest medical facility. If the victim has medication to reverse the effects of the sting, it should be taken immediately.

If the victim experiences a severe reaction, a constricting band should be placed between the sting and the heart. The bitten area should be kept below the heart if possible. A physician should be contacted immediately for further instructions.

5.3.2 Bloodborne Pathogens

The majority of the occupational tasks onsite will not involve a significant risk of exposure to blood, blood components, or body fluids. The highest risk of acquiring any bloodborne pathogen for employees onsite will be following an injury. When administering first aid care, there are potential hazards associated with bloodborne pathogens that cause diseases such as Human Immunodeficiency Virus (HIV), Hepatitis A (HAV), Hepatitis B (HBV), Hepatitis C (HCV), or the Herpes Simplex Virus (HSV). An employee who has not received the appropriate certification should never perform first aid and/or 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.
- 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.
- Never pick up broken glass or possible contaminated material with your unprotected hands.

5.4 Hazard Assessment

Task	Hazards	Risk of Exposure
Mobilization/ Demobilization	Inhalation/Skin Contact	Low
	Heat Stress/Cold Stress	Low
	Noise	Moderate
	Physical Injury	High
Decontamination/ Dewatering	Inhalation/Skin Contact	Moderate
	Heat Stress/Cold Stress	Moderate
	Physical Injury	Moderate
	Noise	Moderate
Earthwork/Drilling	Inhalation/Skin Contact	Low
	Heat Stress/Cold	Moderate
	Stress Noise	Moderate
	Physical Injury	High
Sheeting and Shoring	Inhalation/Skin Contact	Moderate
	Heat Stress/Cold Stress	Moderate
	Noise	High
	Physical Injury	High

Activity	Hazard	Action Taken
Excavating	Struck by Ground Stability	Safe work zone with clearance
	Hearing Loss	Inspection by competent person Ear Protection
Trucking	Struck by	Traffic control by flagmen
	Contamination/ Decontamination	(wash down)
Formwork Installation	Falls	All personnel will be 100% fall protected at a height of 6' or more
Rebar Installation	Impalement	All rebar with impalement potential will be properly protected
Concrete Installation	Burns	All personnel will wear proper attire (long sleeves, long pants, boots, gloves)
	Eye Damage	All personnel will utilize eye protection when working with concrete

General Conditions:

1. Hard hats will be worn at all times;
2. Eye protection will be worn at all times;
3. Steel-toed and shanked safety boots will be worn at all times; and
4. Hearing protection will be used when required.

All other safety requirements are as per OSHA 1926 - NYDOB - NYDOT

6.0 TRAINING

This section details the training requirement for all personnel working on the Site.

6.1 General Health and Safety Training

In accordance with the remediation contractor's corporate policies, and pursuant to 29 CFR 1910.120, all Site workers that will be involved with intrusive activities or other Site activities that would require work with impacted material shall, at the time of the job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations. At a minimum, the training shall have consisted of instruction in the topics outlined in this HASP. Personnel who have not met the requirements for initial training will not be allowed to work in any Site activities that could potentially result in exposure to chemical or physical hazards. Completion of a 40-hour Health and Safety Training Course for Hazardous Waste Operations or an approved equivalent will fulfill the requirements of this section. In addition to the required initial training, each employee shall have received three days of directly supervised on-the-job training. This training will address the duties the employees are expected to perform.

Based on the dynamic conditions that will be present at the Site, portions of the Site will be established in which the risk of exposure to impacted materials will be prevented by removal of the impacted material and/or the installation of engineering controls, creating a "remediated zone." Remediation activities may be occurring on other portions of the Site where the risk for exposure has not been mitigated (non-remediated zone). Forty-hour training will not be required for workers within the remediated zone, but an additional SHSO will be assigned to oversee workers within that area and perform air monitoring as necessary to assure that the workers in the remediated zone are not exposed to hazardous material. No intrusive work will be performed within the remediated zone while untrained workers are present. A detailed description of the establishment procedures for the remediated zone is provided in Section 8.1.4.

The remediation contractor has the responsibility of ensuring that the personnel assigned to this project comply with these requirements. Written certification of completion of the required training will be provided to the Project Manager.

6.2 Manager/Supervisor Training

In accordance with 29 CFR 1910.120, onsite management and supervisors who will be directly responsible for, or who supervise employees engaged in hazardous waste operations shall receive training as required by Section 6.1 of the HASP. Also, an additional 8 hours of specialized training on managing such operations are required prior to job assignment.

6.3 Annual Eight-Hour Refresher Training

Annual 8-hour refresher training will be required of all hazardous waste Site field personnel in order to maintain their qualifications for fieldwork. The following topics will be reviewed: toxicology, respiratory protection, including air-purifying devices and self-contained breathing apparatus (SCBA), medical surveillance, decontamination procedures, and personnel protective clothing. In addition, topics deemed necessary by the remediation contractor's Health and Safety Director may be added to the above list.

6.4 Site-Specific Training

Prior to commencement of field activities, the SHSO or CHSM will provide Site-specific training to all personnel assigned to the Site for remedial/construction activities. Site personnel will receive training that will specifically address the activities, procedures, monitoring, and equipment for Site operations. It will include Site and facility layout, hazards, first aid equipment locations and emergency services at the Site, and will highlight all provisions contained within this HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity.

6.5 Onsite Safety Meetings

Daily safety meetings will be presented each morning to discuss potential safety concerns for the upcoming activities. At a minimum, at least one formal safety meeting will be conducted daily, or when a new crew begins work, by the appropriate field supervisors or foremen for all workers. A copy of the daily safety meeting will be provided to the PM and onsite Owner's Representative.

The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety audits by the remediation contractor or other involved parties. In addition, when activities are to be conducted which are not specifically addressed by this HASP, a Job Safety Analysis (JSA) will be performed to determine the appropriate level of health and safety required (Appendix A). Observed safety violations will be addressed by coaching or progressive discipline based on the nature and severity of the violation.

6.6 First Aid and CPR

The SHSO will identify those individuals having first aid and CPR training in order to ensure that emergency medical treatment is available during field activities. The training will be consistent with the requirements of the American Red Cross. Certification and appropriate training documentation will be kept with the Site personnel records.

6.7 Additional Training

The CHSM may require additional or specialized training throughout the project. Such training may include the safe operation of heavy or power tool equipment or hazard communication training or other topic, as deemed appropriate.

6.8 Subcontractor Training

All subcontractor personnel involved with intrusive work or other activities that could result in exposure to impacted material (work within the EZ or CRZ) shall have completed the 40-hour training requirement and meet the medical surveillance requirements found in Section 7.1. Subcontractor training shall be performed in accordance with 29 CFR 1910.120 and HASP specifications. In certain unique situations (e.g., mechanical failure of equipment), the non-trained individual performing emergency repairs may be allowed, at the discretion of the SHSO, to perform repairs within the EZ when no intrusive activities are being performed and provisions have been made to mitigate potential exposure.

Visitors onsite must be made aware of the hazards onsite in a Site-specific safety briefing and sign a statement indicating that they will comply with the applicable requirements of this HASP.

7.0 MEDICAL SURVEILLANCE PROCEDURES

This section provides a description of the medical surveillance procedures required for all Site workers involved with remediation or other intrusive work.

7.1 General

A Medical Surveillance Program has been established as part of this plan and is included in Appendix F. The remediation contractor and subcontractor personnel performing remediation work at the Site are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120(f) and 1926.62 CFR. A physician's medical release for work will be confirmed by the SHSO before an employee can begin Site activities. Such examinations shall include a statement as to the worker's present health status, the ability to work in a hazardous environment (including any required PPE, which may be used during temperature extremes), and the worker's ability to wear respiratory protection.

A Medical Data Sheet (Appendix F) will be completed by all permanent, onsite personnel and will be kept in the administrative trailer during the conduct of Site operations. Completion is required in addition to compliance with the remediation contractor's Health and Safety Program. This data sheet will accompany any personnel when medical assistance is needed or if transport to hospital facilities is required.

8.0 SITE CONTROL, PERSONAL PROTECTIVE EQUIPMENT, AND COMMUNICATIONS

This section provides a detailed description of the Site control measures, personal protective equipment and communications procedures to be implemented at the Site.

8.1 Site Control

Based on the Site history and field-testing, hazardous material may exist onsite. A four-zone approach will be employed in order to prevent the spread of contamination from the disturbed areas onsite and to protect non-remediation (non-trained) workers from exposure to hazardous materials. The four-zones include the EZ, the CRZ, the Remediated Zone (RZ) and the Support Zone (SZ). A stepped remedial approach will be managed and the zones modified as the work progresses. Each of the areas will be defined through the use of control barricades and/or construction/hazard fencing. A clearly marked delineation between the zones will be maintained. Signage will be posted to further identify and delineate these areas.

8.1.1 Exclusion Zone

All areas where excavation and handling of contaminated materials take place are considered the EZ. This zone will be clearly delineated by hay bales or construction fence. Safety tape may be used as a secondary delineation within the EZ. The zone delineation markings may be opened in areas for varying lengths of time to accommodate equipment operation or specific construction activities. The SHSO may establish more than one EZ where different levels of protection may be employed or where different hazards exist. Personnel are not allowed in the EZ without:

- A buddy (co-worker).
- Appropriate PPE,
- Medical authorization, and
- Training certification.

Occasional visitors within this area of the Site are addressed in Sections 1.0 and 6.9.

8.1.2 Contamination Reduction Zone

A CRZ is established between the EZ and the SZ. The CRZ contains the Contamination Reduction Corridor (CRC) and provides an area for decontamination of personnel and equipment.

The CRZ will be used for general Site entry and egress, in addition to access for heavy equipment and emergency support services. Personnel are not allowed in the CRZ without:

- A buddy (co-worker),
- Appropriate PPE,
- Medical authorization, and
- Training certification.

Occasional visitors within this area of the Site are addressed in Sections 1.0 and 6.9.

8.1.3 Remediated Zone

A Remediated Zone (RZ) is established in portions of the Site where the remediation has been completed and only general construction work remains to be performed. Setup of the RZ consists of implementing several measures designed to reduce the risk of workers' exposure and prevent non-trained workers from entering the non-remediated zone. Non-trained workers will work only in areas where the potential for exposure has been minimized by installing a 3-inch concrete slab (mud mat), a minimum 6 mil vapor barrier, and/or the installation of a minimum six inches of clean fill over any potentially impacted soils in the RZ. The remediated zone will then be separated from the non-remediated zone by installing and maintaining temporary plywood or other construction fences along the boundary between the two zones. If potentially impacted material is uncovered in the RZ, all non-trained workers will be removed and the SHSO will assess the potential risks. If, at any other time the risk of exposure increases while non-trained workers are present in the RZ, the non-trained workers will be removed. At all times, when non-trained workers are present in the RZ, air monitoring for the presence of VOCs will be conducted in the RZ, as well as at the fence line of the non-remediated zone.

8.1.4 Support Zone

The SZ is an uncontaminated area that will be the field support area for Site operations. The SZ will contain the temporary office trailers and provides for field team communications and staging for emergency response. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated personnel or materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples. Meteorological

conditions will be observed and noted from this zone, as well as those factors pertinent to heat and cold stress.

8.2 Personal Protective Equipment

Provided below is a description of the basic PPE requirements for onsite workers.

8.2.1 General

The level of protection worn by field personnel will be enforced by the SHSO. Levels of protection for general operations are provided below and are defined in this section. Levels of protection may be upgraded at the discretion of the SHSO. All decisions on the level of protection will be based upon a conservative interpretation by the SHSO of the information provided by air monitoring results, environmental results, and other appropriate information. Any changes in the level of protection shall be recorded in the health and safety field logbook.

8.2.2 Personal Protective Equipment Specifications

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
 - Fire retardant coveralls ⁽¹⁾
 - Cotton gloves (or leather work gloves);
 - Boots/shoes, leather or chemical-resistant, steel toe and shank;
 - Ice cleats ⁽²⁾;
 - Boots (outer), chemical-resistant (disposable)*;
 - Chemical resistant gloves – nitriles*;
 - Chemical resistant clothing (e.g., Tyveks)*;
 - 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) Fire retardant coveralls required in areas of hot work/areas with potential for flash (i.e., truck flammable loading rack, within tank berms)
- (2) Ice Cleats to be worn with approved safety shoes when working in areas with snow/ice cover.
- (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 HNu 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., Draeger 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.

2. 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.

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 HNu or other comparable instrument), benzene and furfural readings utilizing colorimetric indicator tubes (e.g., Draeger 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 limit, 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
- 2-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 HNu 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.

Action Levels for Respiratory Protection

ORGANIC VAPOR CONCENTRATIONS		
PID¹	BENZENE/FURFURAL²	ACTION³
< 5 ppm	Non-detect	No Action
< 5 ppm	Detect - < 5 ppm	Level C
≥ 5 ppm - < 25 ppm	< 5 ppm	Level C
≥ 5 ppm - < 25 ppm	≥ 5 ppm	Level B
≥ 25 ppm - < 100 ppm	≥ 5 ppm	Level B

¹ Based on relative response/sensitivity of PID to benzene

² Colorimetric indicator tube readings.

³ Measured air concentrations of known organic vapors will be reduced by the respirator to at or below one half the permissible exposure limit, and the individual and combined compound concentrations are within the service limit of the respirator cartridge.

Action Levels for Oxygen Levels and Combustible Gases

COMBUSTIBLE GASES¹	
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
OXYGEN¹	
20.8% O ₂	Oxygen level normal
< 20.8 O ₂ – > 19.5% O ₂	Oxygen enriched/deficient - Notify SHSO
>23.5% > 19.5% O ₂	Oxygen enriched/deficient Interrupt task/Evacuate area

¹ Action levels based on Environmental Protection Agency Standard Operating Safety Guides; Table 5-1, Atmospheric Hazard Action Guides

Action Levels for Mercury Vapor Levels

TWA ¹ 0.0 - 0.02 mg/m ³	Continue monitoring
0.02 – 0.025 mg/m ³	Notify SHSO
0.025 mg/m ³ or greater ²	Potential inhalation hazard Interrupt task/Evacuate Area

- 1 TWA- Time weighted average
- 2 Action levels based American Conference of Governmental Industrial Hygienists (ACGIH) (see Table 1)

8.2.3 Initial Levels of Protection

Levels of protection for the proposed scope of work may be upgraded or downgraded depending on direct-reading instruments or personnel monitoring. The following are the initial levels of protection that shall be used for each planned field activity:

Activity	Initial level of PPE
Mobilization/Demobilization	D
Decontamination/Dewatering	D
Excavation	D/C (Based on Monitoring)
Sheeting/Shoring	D
Asphalt and Concrete Work	D
Earthwork	D
Site Restoration	D

8.3 Communications

While working in level C/B respiratory protection, personnel may find that communication becomes more difficult to accomplish. Distance and space further complicate this. In order to address this problem, electronic instruments, mechanical devices, or hand signals will be used as follows:

Telephones – Mobile telephones will be carried by designated personnel for communication with emergency support services/facilities. Separate hard-wired telephone lines will be established in the field office trailers.

Radios – Two-way radios will be utilized onsite for communication between field personnel in areas where visual contact cannot be maintained and where hand signals cannot be employed.

Air Horn – Available as posted in the Site trailer. An additional air horn will be located in the SZ to alert field personnel to an emergency situation. The emergency signal will be the sharp blasts of the air horn.

Hand Signals – This communication method will be employed by members of the field team, along with use of the buddy system. Signals become especially important when in the vicinity of heavy moving equipment and when using Level B respiratory equipment. The signals shall become familiar to the entire field team before Site operations commence and will be reinforced and reviewed during site-specific training.

Signal:	Meaning:
Hand gripping throat	Out of air; can't breathe
Grip partner's wrist	Leave area immediately; no debate
Hands on top of head	Need assistance
Thumbs up	OK; I'm all right; I understand
Thumbs down	No; Unable to understand you, I'm not all right

9.0 MONITORING PROCEDURES

This section provided as description of the monitoring procedures that will be implemented while performing the remediation and foundation construction activities at the Site.

9.1 General

Ambient air monitoring will be conducted in the various work areas by the remediation contractor during all intrusive tasks, or as mandated by the SHSO. Monitoring will be performed to verify the adequacy of respiratory protection, to aid in Site layout, and to document worker exposure. If air monitoring in these areas indicates the presence of potentially hazardous materials, control measures will be implemented in accordance with the remediation contractor's work plans. All monitoring instruments shall be operated by qualified personnel only and will be calibrated daily prior to use or more often, as necessary. No intrusive activity will be performed without the presence of the SHSO or designated approved substitute, and without air monitoring. When a "remediated zone" has been established, additional monitoring will be conducted within this area to prevent non-trained workers from exposure to any hazardous materials that could potentially migrate from within the EZ. Air monitoring will be performed in conjunction with the OSHA 29 CFR1926.62 lead in construction air monitoring protocols.

9.2 Exclusion Zone Monitoring

9.2.1 Instrumentation

The following monitoring instruments supplied by the remediation contractor will be available for use during field operations as necessary. There will be a minimum of one of each piece of equipment on the Site at all times:

- Photoionization Detector (PID) with 10.6 EV probe or Flame Ionization Detector (FID) or equivalent.
- Multi-Gas Meter: Combustible Gas Indicator (CGI)/Oxygen (O₂)/Hydrogen Sulfide (H₂S)/Carbon Monoxide (CO) Meter, (e.g., MSA Trimeter) - for Confined Space Entry, or when the SHSO deems necessary.
- Dust/Particulate Monitor (DM), MIE Miniram, or equivalent.
- Mercury Vapor Analyzer (MVA). Jerome model 431 or equivalent must be capable of reading within at least the range of 0.000 to 0.999 mg/m³.

A PID shall be used to monitor VOCs in active work areas, during intrusive activities. VOCs shall also be measured upwind of the work areas to determine background concentrations.

A CGI/O2 meter shall be used to monitor for combustible gases and oxygen content during confined space entry or when the HSO deems necessary.

A particulate monitor shall be used to measure concentrations of dust and particulate matter.

The MVA shall be used to monitor mercury vapor concentrations in active work areas, during intrusive activities.

Calibration records shall be documented and recorded daily and included in the daily air monitoring report. This report will be specific to work area monitoring. All instruments shall be calibrated before and after each daily use in accordance with the manufacturer's procedures.

9.2.2 Action Levels

Action levels for the upgrading of PPE requirements in the HASP will apply to all Site work during remediation and foundation construction activities at the Site. Action levels are for known contaminants using direct reading instruments in the Breathing Zone (BZ) for VOCs, particulates, and mercury vapor and at the source for combustible gases. The BZ will be determined by the SHSO, but is typically 4 to 5 feet above the work area surface or elevation.

An air horn will be readily available in the Site trailer. An additional air horn will be located in the work area to alert Site Workers to an emergency situation. In the event of an emergency or the need to upgrade the level of personal protection, sharp blasts of the air horn will be sounded. If the level of respiratory protection needs to be upgraded, the Contractor will immediately contact the Construction Manager and Owner's Representative.

9.2.3 Monitoring During Field Activities

Intrusive Operations - Continuous Personnel Breathing Zone Air Monitoring will be performed by the SHSO during implementation of all intrusive activities at the Site. The highest reading will be recorded on the daily air-monitoring log every 30 minutes during intrusive activities.

Real-time monitoring for all onsite activities will be accomplished as follows (prior to the start of daily activities an upwind background reading will be taken and recorded):

- Monitoring of VOCs in and around the work zones.
- Monitoring for particulates in and around the work zones

The frequency of monitoring may be modified by the SHSO after consultation with the Project Manager. The rationale for any modification must be documented in the HASP.

A PID and/or flame ionization detector (FID) equipped organic vapor meter will be utilized to monitor the BZ.

Excavation/Confined Space Operations - Monitoring will be performed during all excavations. A PID and/or FID and a DM shall be utilized to monitor the breathing zone when in the area being excavated. A CGI/O₂ meter shall be used to monitor the confined space for the presence of combustible gases/oxygen deficiency, CO, and H₂S.

9.3 Meteorological Monitoring

The remediation contractor will obtain at a minimum, the daily temperature, wind direction, wind speed and rain accumulations from the onsite meteorological station. This information will be used to assist with the determination of daily health and safety measures, and locations of both work zone and perimeter monitoring devices. All meteorological data will be kept in a daily record.

10.0 SAFETY CONSIDERATIONS

This section provides a detailed description of the general Site safety considerations as well as the safety procedures for certain specific activities.

10.1 General

In addition to the specific requirements of this HASP, common sense should be used at all times.

The following general safety rules and practices will be in effect at the Site.

- Signs will be posted around the perimeter of the Site (STATING: RESTRICTED AREA - AUTHORIZED PERSONNEL ONLY). In addition, hay bales will be utilized to delineate the work zones. Caution tape may be used for secondary marking or delineation. These items will restrict/control unauthorized visitors, but not hinder emergency services if needed.
- All open excavations, trenches, and obstacles will be properly barricaded in accordance with Site needs and requirements. Proximity to traffic ways, both pedestrian and vehicular, and location of the open excavation, trench, or obstacle will determine these needs.
- All excavation and other Site work will be planned and performed with consideration for underground utilities.
- Smoking and ignition sources in the vicinity of potentially flammable or contaminated material are strictly prohibited.
- Drilling, boring, and use of cranes and drilling rigs, erection of towers, movement of vehicles and equipment, and other activities will be planned and performed with consideration for the location, height, and relative position of aboveground utilities and fixtures, including signs, lights, canopies, buildings and other structures and construction, and natural features such as trees, boulders, bodies of water, and terrain.
- When working in areas where flammable vapors may be present, particular care shall be exercised with tools and equipment that may be sources of ignition. All tools and equipment provided must be properly bonded and/or grounded.
- Approved and appropriate safety equipment (as specified in this HASP), such as eye protection, hard hats, foot protection, and respirators, must be worn in areas where required. In addition, eye protection must be worn when sampling soil or water that may be contaminated.
- All site personnel may be called upon to use respirator protection in some situations. Fit testing will be necessary for all persons using respirators. The criteria for facial hair will be determined by the SHSO. In general, the guideline is that facial hair cannot impede the fit of the respirator.

- No smoking, eating, chewing tobacco, gum chewing, applying cosmetics or drinking will be allowed outside the SZ.
- Contaminated tools and hands must be kept away from the face.
- Personnel must use personal hygiene safe guards (washing up) prior to eating and drinking and at the end of the shift.
- All soil or groundwater samples collected from the Site must be treated and handled as though the samples are contaminated.
- Persons with long hair and/or loose-fitting clothing that could become entangled in power equipment must take adequate precautions.
- Horseplay is prohibited in the work area.
- Work while under the influence of intoxicants, narcotics, or controlled substances is strictly prohibited.

10.2 Posted Signs

Danger signs will be posted where an immediate hazard exists. Caution signs will be posted to warn against potential hazards and to caution against unsafe practices. Traffic control methods and barricades will be used as needed. Wooden stakes and flagging tape or equally effective material will be used to demarcate all restricted areas.

10.3 Intrusive Operations

The SHSO will be present during all intrusive work activities. Intrusive work is defined as any work being conducted in an area of known contamination that may disturb the impacted material and/or expose the worker to the contaminants. He/she will ensure that appropriate monitoring, levels of protection, and safety procedures are followed. All personnel will keep a safe distance from the edge of the excavation and out of the swing radius of the excavation equipment.

The proximity of water, sewer, electrical lines, and other subsurface utilities will be identified prior to intrusive operations. Properly sized containment systems will be utilized and consideration of the potential volume of liquid or waste disposed during Site operations will be discussed with the Project Manager to minimize the quantity of stored aqueous materials. Emergency evacuation procedures and the location of safety equipment will be established prior

to start-up operations. The use of protective clothing, especially hard hats, boots, and gloves will be mandatory during excavation and other heavy equipment work.

10.4 Dewatering Sampling

Sampling personnel must wear prescribed protective clothing and equipment including eye protection, chemical resistant gloves and splash aprons (where appropriate) when sampling soils and liquids. Sample bottles are to be labeled prior to sampling to ease decontamination. Personnel must be aware of the location of emergency equipment, including spill containment materials prior to sampling. Personnel are to practice contamination avoidance at all times, as well as to utilize the buddy system and maintain communications with the SHSO.

10.5 Sample Handling

Personnel responsible for handling of samples will wear the prescribed level of protection. Samples are to be identified as to their hazard and packaged as to prevent spillage or breakage. Any unusual sample conditions shall be noted. Laboratory personnel and all field personnel shall be advised of sample hazard levels and the potential contaminants present. This can be accomplished by a phone call to the lab coordinator and/or including a written statement with the samples reviewing lab safety procedures in handling in order to assure that the practices are appropriate for the suspected contaminants in the sample.

10.6 Heavy Equipment Decontamination

Equipment will be dry decontaminated in the EZ first. This shall consist of the gross removal of the contaminated material from the augers, buckets, wheels, blades, etc., using hand tools. If wet decontamination is required, the equipment will be taken to the designated decontamination pad. Personnel performing the decontamination of equipment shall use the prescribed level of protection. Initially, this task usually employs modified Level D as described in Section 8.2.2. The equipment decontamination shall be restricted to authorized personnel only. Special consideration will be given to wind speed and direction. Downwind areas are to be kept free of personnel to avoid unnecessary exposure to potential airborne contamination.

11.0 DECONTAMINATION AND DISPOSAL PROCEDURES

This section details the specific decontamination and waste disposal procedures to be implemented at the Site during the remediation/foundation construction phase.

11.1 Contamination Prevention

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 directly handle or touch contaminated materials.
- Make sure that there are no cuts, or tears or other signs of damage to PPE.
- Fasten all closures in suits; cover with tape, if necessary.
- Particular care should be taken to protect any skin injuries.
- Stay upwind of airborne contaminants.
- Do not carry cigarettes, cosmetics, gum, etc., into contaminated areas.

Sampling/Monitoring

- When required by the SHSO, cover instruments with clear plastic, leaving openings for sampling ports.
- Bag sample containers prior to emplacement of sample material.

Heavy Equipment

- Care should be taken to limit the amount of potentially impacted material that comes in contact with heavy equipment (e.g., tires, augers).
- If contaminated tools are to be placed on non-contaminated equipment for transport to a decontamination area, plastic should be used to keep the equipment clean.
- Dust control measures, including water misting, will be used on roads inside the Site boundaries, as described in the remediation contractor's work plans.

11.2 Personnel Decontamination

All personnel shall pass through an outlined decontamination procedure when exiting the EZ at each location. The procedure is outlined in Appendix G. A field wash for equipment and PPE shall be set up and maintained for all persons exiting the EZ. The system will include a wash and rinse for all disposable clothing and boots worn in the EZ. As necessary, equipment and facilities will be available for personnel to wash their hands, arms, neck and face before entering the SZ.

11.3 Equipment Decontamination

All potentially contaminated equipment used at the Site will be decontaminated to prevent contaminants from leaving the Site. Heavy equipment will be decontaminated at the decontamination pad and inspected by the SHSO or designated individual before it leaves the Site. A certificate of decontamination will be issued for each piece of equipment that has been inspected before it leaves the Site. The decontamination area will provide for the containment of all wastewater from the decontamination process. Respirators, airline and any other PPE that comes in contact with contaminated materials shall pass through a field wash on the decontamination pad and a final, thorough decontamination at the end of the day. All decontamination rinse water will be collected and managed in accordance with the Technical Specifications.

11.4 Decontamination During Medical Emergencies

If emergency life-saving first aid and/or medical treatment are required, normal decontamination procedures may need to be abbreviated or omitted. The Site SHSO or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination, when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment, or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed, a plastic barrier between the individual and clean surfaces should be used to help prevent contaminating the inside of ambulances and/or medical personnel. Outer garments are then removed at the medical facility. No attempt will be made to wash or rinse the victim, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material, which could also cause severe injury or loss of life to emergency response personnel. For minor medical problems (ambulatory) or injuries, the normal decontamination procedures

will be followed. Note that heat stroke requires prompt treatment to prevent irreversible damage or death. Protective clothing must be promptly removed. Less serious forms of heat stress also require prompt attention and removal of protective clothing immediately. Unless the victim is obviously contaminated, decontamination should be omitted or minimized and treatment begun immediately.

11.5 Disposal Procedures

A system of segregating all waste will be developed by the SHSO.

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 (e.g., clothing, gloves, etc.) will be bagged or drummed as necessary, labeled and segregated for disposal. All non-contaminated materials shall be collected and bagged for appropriate disposal as domestic waste.

All excavated soils will be stabilized, as necessary for moisture control, and direct loaded to transport vehicles for immediate offsite disposal at an Owner-approved permitted waste treatment/disposal facility. All transport vehicles will be properly decontaminated prior to departing the Site.

All encountered construction water, storm water and decontamination water will be collected and managed in accordance with the Technical Specifications.

12.0 EMERGENCY PLAN

Should an emergency occur, the emergency plan, outlined in this section, will be understood by the remediation contractor and all subcontractors prior to the start of work. The emergency plan will be available for use at all times during Site work. The plan provides the phone numbers for the fire, police, ambulance, hospital, poison control centers and directions to the hospital from the Site. This information is to be found in Section 1.2 of the HASP and shall be conspicuously posted in the job's construction Site trailer.

Various individual Site characteristics will determine preliminary actions taken to assure that this emergency plan is successfully implemented in the event of a Site emergency. Careful consideration must be given to the proximity of neighborhood housing or places of employment and to the relative possibility of Site release of vapors that could affect the surrounding community.

The emergency coordinator/project manager shall make contact with local fire, police, and other emergency units prior to beginning work onsite. In these contacts, the emergency coordinator will inform the emergency units about the nature and duration of work expected to the Site and the type of contaminants and possible health or safety effects of emergencies involving these contaminants. At this time, the emergency coordinator and the emergency response units shall make necessary arrangements to be prepared for any emergencies that could occur.

The emergency coordinator shall implement the contingency plan whenever conditions at the Site warrant such action. The coordinator will be responsible for coordination of the evacuation, emergency treatment and transport of Site personnel as necessary, and notification of emergency response units and the appropriate management staff.

In cases where the project manager is not available, the SHSO shall serve as the alternate emergency coordinator.

The SHSO, during an emergency, will perform air monitoring as needed, as well as lend assistance and provide health and safety information to responding emergency personnel.

Site Personnel will endeavor to keep non-essential personnel away from the incident until the appropriate emergency resources arrive. At that time, the responders will take control of the Site. Site personnel may be asked to lend assistance to emergency personnel such as during evacuations, help with the injured, etc.

12.1 Evacuation

Evacuation procedures will be discussed prior to the start of work and periodically during safety meetings. In the event of an emergency situation such as fire, or explosion, an air horn or other appropriate device will be sounded for three (3) sharp blasts indicating the initiation of evacuation procedures. The emergency evacuation route shall be clearly posted in the crew, contractor's, and all other office trailers. 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 project manager must ensure that access for emergency equipment is provided and that all combustion apparatuses have been shut down once the alarm has been sounded. All Site personnel will assemble in the CSC, or nearest safe location. Once the safety of all personnel is established, the fire department and other emergency response groups will be notified by telephone of the emergency.

12.2 Personnel Injury

Emergency first aid shall be applied onsite as appropriate. If necessary, the individual shall be decontaminated and transported to the nearest hospital. The SHSO will supply medical data sheets to medical personnel and complete the accident/incident reports in accordance with Section 13.5 of the HASP.

The ambulance/rescue squad shall be contacted for transport as necessary in an emergency. However, since some situations may require transport of an injured party by other means, the injured person shall be escorted to the hospital. A map to this facility is shown in Figure 1.

12.3 Accident/Incident Reporting

As soon as first aid and/or emergency response needs have been met, the following parties are to be contacted by telephone:

	Office	Cell
General Superintendent	TBD	
Safety Supervisor	TBD	
Site Safety Officer	TBD	
Owners Representative	TBD	
Owner's Onsite Representative	TBD	

Written confirmation of verbal reports are to be submitted within 24 hours. The report form entitled "Accident Investigation Report" (Appendix H) is to be used for this purpose. All representatives contacted by telephone are to receive a copy of this report. If the employee involved is not an employee of the remedial contractor, his employer shall receive a copy of the report.

For reporting purposes, the term accident refers to fatalities, lost-time injuries, restricted duty, medical treatment, spill, or exposure to hazardous materials (radioactive materials, toxic materials, explosive or flammable materials), fire, explosion, property damage, or potential occurrence of the above.

Any information released from the health care provider, which is not deemed confidential patient information, is to be attached to the appropriate form. Any medical information, which is released by patient consent, is to be filed in the individual's medical record and treated as confidential.

12.3 Personnel Exposure

Skin and Eye Contact: Use copious amounts of soap and water. Wash/rinse affected area thoroughly, and then provide appropriate medical attention. Eyes should be rinsed for 15 minutes upon chemical contamination.

Inhalation: Move to fresh air and/or, if necessary, decontaminate/transport to hospital.

Ingestion: Decontamination and transport to emergency medical facility.

Puncture
Wound or
Laceration: Decontamination and transport to emergency medical facility.

12.4 Adverse Weather Conditions

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

- Potential for heat stress and heat-related injuries;
- Potential for cold stress and cold-related injuries;
- Treacherous weather-related conditions;
- Limited visibility and;
- Electrical storm potential.

Site activities will be limited to daylight hours and acceptable weather conditions. Inclement working conditions include heavy rain, fog, high winds, and lightning. Observe daily weather reports and evacuate if necessary in case of inclement weather conditions.

13.0 LOGS, REPORTS AND RECORD KEEPING

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

13.1 Daily Operations Log

A daily operations log shall be completed by the SHSO and reviewed by the project manager, with a copy provided to the owner's onsite representative. The original will be kept in the project file.

13.2 Medical And Training Records

The employer keeps medical and training records. The subcontractor employer must provide verification of training and medical qualifications to the SHSO. The SHSO will keep a log of personnel meeting appropriate training and medical qualifications for Site work. The log will be kept in the project file. The remediation contractor will maintain medical records in accordance with 29 CFR 1910.20.

13.3 Exposure Records

Any personal monitoring results, laboratory reports, calculations, and air sampling data sheets are part of an employee exposure record. These records will be kept by the remediation contractor in accordance with 29 CFR 1910.20 and 29 CFR 1926.62.

13.4 Accident/Incident Reports

An accident/incident report must be completed following procedures given in Appendix H. The originals will be sent to the remediation contractor for maintenance. Copies will be distributed as stated. A copy of all completed forms will be kept in the project file.

13.5 OSHA Form 300

An OSHA Form 300 (Log of Occupational Injuries and Illnesses) will be kept at the Site. All reportable injuries or illnesses will be recorded on this form (Appendix I). At the end of the project, the original will be sent to the owner's representative for maintenance. Subcontractor employers must also meet the requirements of maintaining an OSHA 300 form for their company.

13.6 Training Logs

The Training Logs will be completed by the SHSO and submitted to the project manager prior to allowing personnel onsite upon request.

13.7 Daily Safety Logs

The Daily Safety Log form in Appendix J will be completed daily by the SHSO and submitted to the project manager and owner's onsite representative upon request.

13.8 Air Monitoring Log

The Air Monitoring Log form in Appendix K or equivalent documentation will be completed by the SHSO. Weekly reports will be submitted to the Project Construction Supervisor or project manager and owner's onsite representative upon request.

13.9 Weekly Safety Reports

The Weekly Safety Reports will be completed by the SHSO and submitted to the owner's onsite representative upon request.

13.10 Close-Out Safety Report

At the completion of the work, the remediation contractor will submit a closeout Safety Report that will include all logs and reports generated during the project. The report will be signed and dated by the SHSO and submitted to the Safety Manager and/or owner's onsite representative upon request.

14.0 SANITATION AT TEMPORARY WORK STATIONS

Provisions shall be made for access to portable sanitary systems. Provisions are required for the removal of accumulated waste products within those units.

If a commercial/industrial laundry is used to clean or laundered clothing that is potentially contaminated, they shall be informed of the potential harmful effects of exposure to hazardous substances related to the affected clothing.

Personnel and subcontractors assigned to the Site shall follow decontamination procedures described in the HASP or as directed by the SHSO. This will generally include, at a minimum, Site-specific training in cleanup, personal hygiene requirements, and the donning/doffing of protective equipment/clothing.

SHSO CERTIFICATION OF HOSPITAL DIRECTIONS

Name of SHSO:

Date:

This is to certify that on _____, I personally drove the route to the St. Vincent's Hospital as listed in the HASP. The Map Routing and Directions were/were not as listed in the plan. Listed below were conditions that resulted in different directions.

TBD
Site Health and Safety Officer

16.0 APPROVALS

By their signature, the undersigned certify that this Construction Health and Safety Plan (HASP) is approved and will be utilized at the project Site located at 507 West 24th Street, New York, New York.

General Superintendent

Date

Site Superintendent

Date

Assistant Site Superintendent

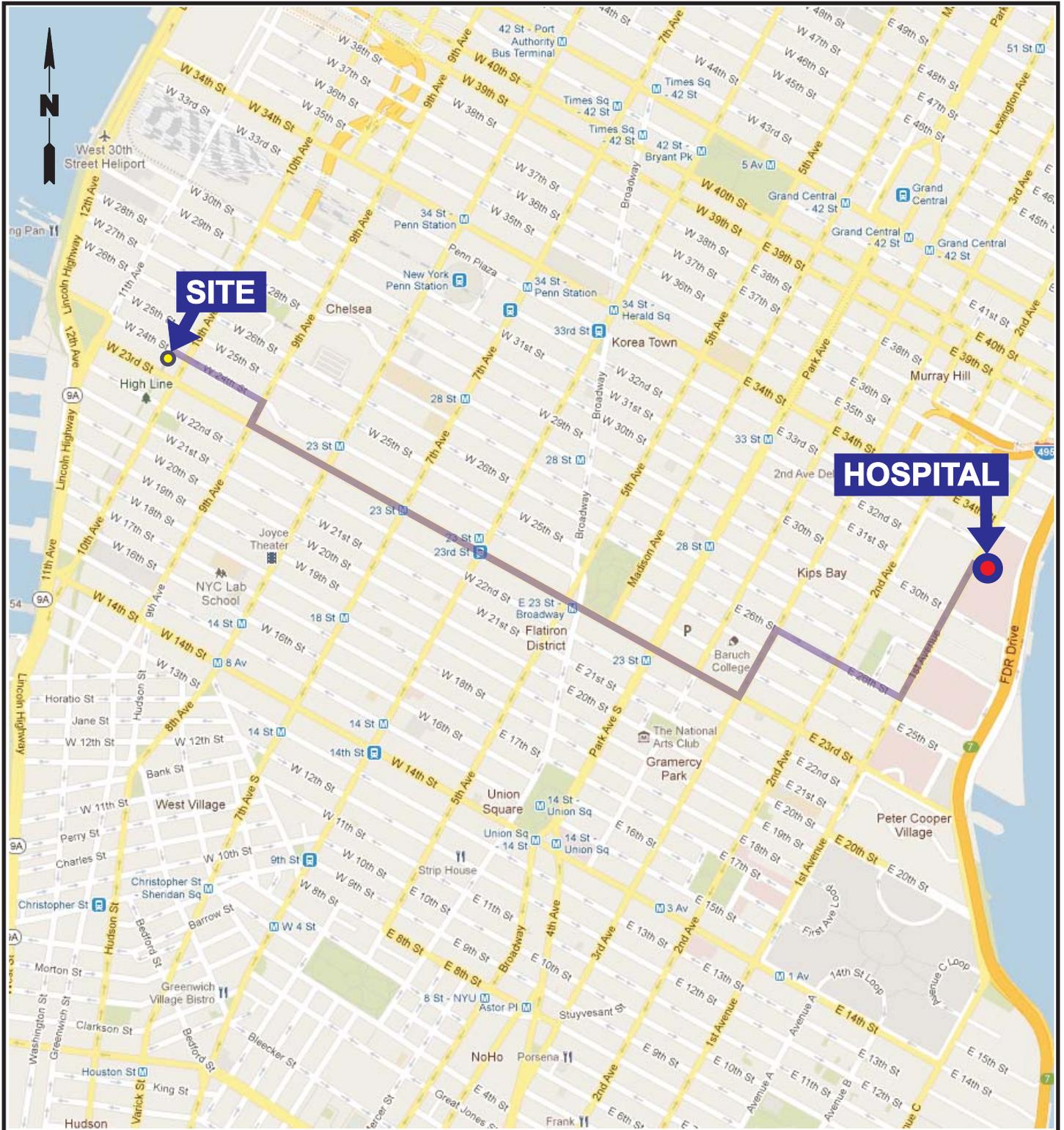
Date

Corporate Safety Supervisor

Date

Site Health and Safety Officer

Date



DIRECTIONS TO NYU LANGONE MEDICAL CENTER

- Head EAST on West 24th Street to 10th Avenue
- Turn RIGHT at 2nd cross street onto 9th Avenue
- Turn LEFT on West 23rd Street
- Turn LEFT on 3rd Avenue
- Turn RIGHT on East 26th Street
- Turn LEFT on 1st Avenue
- Arrive at NYU Langone Medical Center
550 First Avenue
New York, New York 10016

Title:

HOSPITAL ROUTE MAP

507 WEST 24TH STREET
NEW YORK, NEW YORK

Prepared for:

507 WEST 24TH



ROUX ASSOCIATES, INC.
Environmental Consulting
& Management

Compiled by: K.S.	Date: 21FEB12
Prepared by: J.A.D.	Scale: AS SHOWN
Project Mgr.: N.E.	Project No.: 00101Y965
File: 00101Y965.01.CDR	

FIGURE

1

Job Safety Analysis

JOB SAFETY ANALYSIS

COMPANY/ PROJECT NAME or ID/ LOCATION (City, State)		DATE	<input checked="" type="checkbox"/> NEW <input type="checkbox"/> REVISED	PAGE 1 of _____
WORK ACTIVITY (Description):				
DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE	
MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR TASK-SPECIFIC REQUIREMENTS)				
<input type="checkbox"/> REFLECTIVE VEST <input type="checkbox"/> HARD HAT <input type="checkbox"/> LIFELINE / 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 _____	
¹JOB STEPS	²POTENTIAL HAZARDS	³CRITICAL ACTIONS TO MITIGATE HAZARDS		
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				

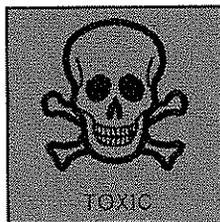
¹ Each Job or Operation consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the associated hazards in Column 2

² A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **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. Specify the hazards and do not limit the description to a single word such as "Caught"

³ Aligning with the first two columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable and quantified terms. Avoid subjective general statements such as, "be careful" or "use as appropriate".

Material Safety Data Sheets

Safety data for selenium



Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms:
Molecular formula: Se
CAS No: 7782-49-2
EC No:

Physical data

Appearance: dark grey to dark red powder or crystals
Melting point: 144 C
Boiling point: 685 C
Vapour density:
Vapour pressure:
Specific gravity: 4.81
Flash point:
Explosion limits:
Autoignition temperature:

Stability

Stable. Incompatible with strong acids, strong oxidizing agents and most common metals. Combustible.

Toxicology

This is a trace element in foods, and appears to be required by the body at very low levels. At higher levels it is a poison. Highly toxic - may be fatal if inhaled, ingested or absorbed through skin. Note low LD50 value below.
Irritant.

Toxicity data

(The meaning of any abbreviations which appear in this section is given [here](#).)

IVN-RAT LD50 6 mg kg⁻¹

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)

R26 R27 R28.

Personal protection

Safety glasses; gloves. Effective ventilation.

[Return to [Physical & Theoretical Chemistry Lab. Safety home page](#).]

This information was last updated on August 25, 2005. We have tried to make it as accurate and useful as possible, but can take no responsibility for its use, misuse, or accuracy. We have not verified this information, and cannot guarantee that it is up-to-date.

Note also that the information on the PTCL Safety web site, where this page was hosted, has been copied onto many other sites, often without permission. If you have any doubts about the veracity of the information that you are viewing, or have any queries, please check the URL that your web browser displays for this page. If the URL **begins** "http://msds.chem.ox.ac.uk/" the page is maintained by the Safety Officer in Physical Chemistry at Oxford University. If not, this page is a copy made by some other person and we have no responsibility for it.

Material Safety Data Sheet

Mercury, 99.999%

ACC# 96252

Section 1 - Chemical Product and Company Identification

MSDS Name: Mercury, 99.999%**Catalog Numbers:** AC193480000, AC193480500**Synonyms:** Colloidal mercury; Hydrargyrum; Metallic mercury; Quick silver; Liquid silver**Company Identification:**

Acros Organics N.V.

One Reagent Lane

Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01**For emergencies in the US, call CHEMTREC:** 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7439-97-6	Mercury	99.999	231-106-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: silver liquid.

Danger! Corrosive. Harmful if inhaled. May be absorbed through intact skin. Causes eye and skin irritation and possible burns. May cause severe respiratory tract irritation with possible burns. May cause severe digestive tract irritation with possible burns. May cause liver and kidney damage. May cause central nervous system effects. This substance has caused adverse reproductive and fetal effects in animals. Inhalation of fumes may cause metal-fume fever. Possible sensitizer.

Target Organs: Blood, kidneys, central nervous system, liver, brain.

Potential Health Effects

Eye: Exposure to mercury or mercury compounds can cause discoloration on the front surface of the lens, which does not interfere with vision. Causes eye irritation and possible burns. Contact with mercury or mercury compounds can cause ulceration of the conjunctiva and cornea.

Skin: May be absorbed through the skin in harmful amounts. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Causes skin irritation and possible burns. May cause skin rash (in milder cases), and cold and clammy skin with cyanosis or pale color.

Ingestion: May cause severe and permanent damage to the digestive tract. May cause perforation of the digestive tract. May cause effects similar to those for inhalation exposure. May cause systemic effects.

Inhalation: Causes chemical burns to the respiratory tract. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. May cause central nervous system effects including vertigo, anxiety, depression, muscle incoordination, and emotional instability. Aspiration may lead to pulmonary edema. May cause systemic effects. May cause

respiratory sensitization.

Chronic: May cause liver and kidney damage. May cause reproductive and fetal effects. Effects may be delayed. Chronic exposure to mercury may cause permanent central nervous system damage, fatigue, weight loss, tremors, personality changes. Chronic ingestion may cause accumulation of mercury in body tissues. Prolonged or repeated exposure may cause inflammation of the mouth and gums, excessive salivation, and loosening of the teeth.

Section 4 - First Aid Measures

Eyes: Get medical aid immediately. Do NOT allow victim to rub eyes or keep eyes closed. Extensive irrigation with water is required (at least 30 minutes).

Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.

Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately. Wash mouth out with water.

Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.

Notes to Physician: The concentration of mercury in whole blood is a reasonable measure of the body-burden of mercury and thus is used for monitoring purposes. Treat symptomatically and supportively. Persons with kidney disease, chronic respiratory disease, liver disease, or skin disease may be at increased risk from exposure to this substance.

Antidote: The use of d-Penicillamine as a chelating agent should be determined by qualified medical personnel. The use of Dimercaprol or BAL (British Anti-Lewisite) as a chelating agent should be determined by qualified medical personnel.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Extinguishing Media: Substance is nonflammable; use agent most appropriate to extinguish surrounding fire. Use water spray, dry chemical, carbon dioxide, or appropriate foam.

Flash Point: Not applicable.

Autoignition Temperature: Not applicable.

Explosion Limits, Lower: Not available.

Upper: Not available.

NFPA Rating: (estimated) Health: 3; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up

spills immediately, observing precautions in the Protective Equipment section. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Keep container tightly closed. Do not get on skin or in eyes. Do not ingest or inhale. Use only in a chemical fume hood. Discard contaminated shoes. Do not breathe vapor.

Storage: Keep container closed when not in use. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from metals. Store protected from azides.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Mercury	0.025 mg/m ³ TWA; Skin - potential significant contribution to overall exposure by the cutaneous route	0.05 mg/m ³ TWA (vapor) 10 mg/m ³ IDLH	0.1 mg/m ³ Ceiling

OSHA Vacated PELs: Mercury: 0.05 mg/m³ TWA (vapor)

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance: silver

Odor: odorless

pH: Not available.

Vapor Pressure: 0.002 mm Hg @ 25C

Vapor Density: 7.0

Evaporation Rate: Not available.

Viscosity: 15.5 mP @ 25 deg C

Boiling Point: 356.72 deg C

Freezing/Melting Point: -38.87 deg C

Decomposition Temperature: Not available.

Solubility: Insoluble.

Specific Gravity/Density:13.59 (water=1)

Molecular Formula:Hg

Molecular Weight:200.59

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: High temperatures, incompatible materials.

Incompatibilities with Other Materials: Metals, aluminum, ammonia, chlorates, copper, copper alloys, ethylene oxide, halogens, iron, nitrates, sulfur, sulfuric acid, oxygen, acetylene, lithium, rubidium, sodium carbide, lead, nitromethane, peroxyformic acid, calcium, chlorine dioxide, metal oxides, azides, 3-bromopropyne, alkynes + silver perchlorate, methylsilane + oxygen, tetracarbonylnickel + oxygen, boron diiodophosphide.

Hazardous Decomposition Products: Mercury/mercury oxides.

Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:

CAS# 7439-97-6: OV4550000

LD50/LC50:

Not available.

Carcinogenicity:

CAS# 7439-97-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: Intraperitoneal, rat: TDLo = 400 mg/kg/14D-I (Tumorigenic - equivocal tumorigenic agent by RTECS criteria - tumors at site of application).

Teratogenicity: Inhalation, rat: TCLo = 1 mg/m³/24H (female 1-20 day(s) after conception) Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus).

Reproductive Effects: Inhalation, rat: TCLo = 890 ng/m³/24H (male 16 week(s) pre-mating) Paternal Effects - spermatogenesis (incl. genetic material, sperm morphology, motility, and count).; Inhalation, rat: TCLo = 7440 ng/m³/24H (male 16 week(s) pre-mating) Fertility - post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants).

Mutagenicity: Cytogenetic Analysis: Unreported, man = 150 ug/m³.

Neurotoxicity: The brain is the critical organ in humans for chronic vapor exposure; in severe cases, spontaneous degeneration of the brain cortex can occur as a late sequela to past exposure.

Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 0.16-0.90 mg/L; 96 Hr; UnspecifiedFish: Bluegill/Sunfish: LC50 = 0.16-0.90 mg/L; 96 Hr; UnspecifiedFish: Channel catfish: LC50 = 0.35 mg/L; 96 Hr; UnspecifiedWater flea Daphnia: EC50 = 0.01 mg/L; 48 Hr; Unspecified In aquatic systems, mercury appears to bind to dissolved matter or fine particulates, while the transport of mercury bound to dust particles in the atmosphere or bed sediment particles in rivers and lakes is generally less substantial. The conversion, in aquatic environments, of inorganic mercury compd to methyl mercury implies that recycling of mercury from sediment to water to air and back could be

a rapid process.

Environmental: Mercury bioaccumulates and concentrates in food chain (concentration may be as much as 10,000 times that of water). Bioconcentration factors of 63,000 for freshwater fish and 10,000 for salt water fish have been found. Much of the mercury deposited on land, appears to revaporize within a day or two, at least in areas substantially heated by sunlight.

Physical: All forms of mercury (Hg) (metal, vapor, inorganic, or organic) are converted to methyl mercury. Inorganic forms are converted by microbial action in the atmosphere to methyl mercury.

Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.

RCRA U-Series:

CAS# 7439-97-6: waste number U151.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	DOT regulated - small quantity provisions apply (see 49CFR173.4)	MERCURY
Hazard Class:		8
UN Number:		UN2809
Packing Group:		III

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 7439-97-6 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

CAS# 7439-97-6: Section 5

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 7439-97-6: 1 lb final RQ; 0.454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 7439-97-6: immediate, delayed.

Section 313

This material contains Mercury (CAS# 7439-97-6, 99.999%), which is subject to the reporting

requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 7439-97-6 (listed as Mercury compounds) is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

CAS# 7439-97-6 is listed as a Priority Pollutant under the Clean Water Act. CAS# 7439-97-6 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 7439-97-6 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

WARNING: This product contains Mercury, a chemical known to the state of California to cause developmental reproductive toxicity.

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T

Risk Phrases:

R 23 Toxic by inhalation.

R 33 Danger of cumulative effects.

Safety Phrases:

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 7 Keep container tightly closed.

WGK (Water Danger/Protection)

CAS# 7439-97-6: 3

Canada - DSL/NDSL

CAS# 7439-97-6 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2A, E.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 7439-97-6 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/15/1999

Revision #5 Date: 3/16/2007

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the

possibility of such damages.

MATERIAL SAFETY DATA SHEET

SRM Supplier: National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Mail Stop 232
Gaithersburg, Maryland 20899-232

SRM Number: 991
MSDS Number: 991
SRM Name: Lead-206 Assay and Isotopic
Solution

MSDS Coordinator: Carmen S. Davis
Phone: (301) 975-6776
ChemTrec: 1-800-424-9300

Date of Issue: 31 August 2004
FAX: (301) 926-4751
E-mail: SRMMSDS@nist.gov

SECTION I. MATERIAL IDENTIFICATION

Material Name: Lead-206 Assay and Isotopic Standard

Description: The isotopic composition:

²⁰⁴ Pb, Atom Percent	< 0.0003
²⁰⁶ Pb, Atom Percent	99.979
²⁰⁷ Pb, Atom Percent	0.008 ± 0.001
²⁰⁸ Pb, Atom Percent	0.013 ± 0.001

SRM 991 consists of a solution of lead nitrate sealed in quartz ampoules. Each ampoule contains a nominal 15 g of solution, 0.5 N in nitric acid.

Other Designations: Lead Nitrate (lead dinitrate; lead (II) nitrate; lead (II) salt; lead nitrate crystal) in Nitric Acid (aqua fortis; hydrogen nitrate; azotic acid; engraver's acid)

Name	Chemical Formula	CAS Registry Number
Lead Nitrate	Pb(NO ₃) ₂	10099-74-8
Nitric Acid	HNO ₃	7697-37-2

DOT Classification: Corrosive Liquid, Poisonous
N.O.S. (Nitric Acid and Lead Compounds) UN 2922

SECTION II. HAZARDOUS INGREDIENTS

Hazardous Components	Nominal Concentration	Exposure Limits and Toxicity Data
Lead Nitrate (Inorganic fumes as Pb)		ACGIH TLV-TWA: 0.05 mg/m ³
Pb(NO ₃) ₂	106 mg/kg	OSHA TLV-TWA (8 hours): 50 µg/m ³
Pb	66 mg/kg	OSHA Action Level (8 hours): 30 µg/m ³
		Woman, Oral: TD _{LO} : 450 mg/kg/6 yrs
		Rat, Intravenous: LD ₅₀ : 93 mg/kg
		Mouse, Intraperitoneal: LD ₅₀ : 74 mg/kg
Nitric Acid	0.5 N	ACGIH TLV-TWA: 2 mg/kg or 5 mg/m ³
		OSHA TLV-TWA: 2 mg/kg or 5 mg/m ³
		Human, Oral: LD _{LO} : 430 mg/kg

SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

Nitric Acid	Lead Nitrate
Appearance and Odor: a white to slightly yellow liquid that darkens to a brownish color upon aging and exposure to light; pungent odor	Appearance and Odor: solid, translucent, colorless to yellow crystals
Relative Molecular Mass: 63.02	Relative Molecular Mass: 331.21
Boiling Point: 83 °C	Boiling Point: not applicable
Freezing Point: -42 °C	Melting Point: not available
Density: 1.05 g/mL (10 % nitric acid)	Density: 4.53 g/mL
Water Solubility: soluble	Water Solubility (@ °C): 38 %
Solvent Solubility: miscible in ether	Solvent Solubility: alcohol, alkali, ammonia; insoluble in concentrated nitric acid

NOTE: The physical and chemical data provided are for the pure components. Physical and chemical data for this lead nitrate/nitric acid solution do not exist. The actual behavior of the solution may differ from the individual components.

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point: Not applicable **Method Used:** Not applicable **Autoignition Temperature:** Not applicable

Flammability Limits in Air (Volume %): **UPPER:** Not applicable
LOWER: Not applicable

Unusual Fire and Explosion Hazards: Iron nitrate is a negligible fire hazard; however, it is an oxidizer that may ignite or explode on contact with combustible materials. Although nitric acid does not burn, it is a powerful oxidizing agent that can react with combustible materials to cause fires.

Extinguishing Media: Use extinguishing media that is appropriate to the surrounding fire. Use a water spray to dilute nitric acid and to absorb liberated oxides of nitrogen.

Special Fire Procedures: Fire fighters should wear a self-contained breathing apparatus (SCBA) with a full face piece in the pressure demand or positive mode and other protective clothing.

SECTION V. REACTIVITY DATA

Stability: X Stable _____ Unstable

Stable at normal temperature and pressure.

Conditions to Avoid: Avoid contact with moisture and incompatible materials.

Incompatibility (Materials to Avoid): Lead nitrate is incompatible with combustible materials, metal salts, reducing agents, and acids. Keep nitric acid away from organic materials, plastics, rubber, and some forms of coatings. Nitric acid is incompatible with chlorine and metal ferrocyanide.

See Section IV: "Unusual Fire and Explosion Hazards".

Hazardous Decomposition or Byproducts: Hazardous decomposition of lead nitrate and/or nitric acid can produce various nitrogen oxides, including nitric oxide (NO), nitrogen dioxide (NO₂), nitrous oxide (N₂O), as well as nitric acid mist or vapor.

Hazardous Polymerization: _____ Will Occur X Will Not Occur

SECTION VI. HEALTH HAZARD DATA

Route of Entry: X Inhalation X Skin X Ingestion

Health Hazards (Acute and Chronic): Nitric Acid: Nitric acid may be fatal if inhaled, swallowed, or absorbed through the skin. This material causes burns and is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin. Inhalation may be fatal as a result of spasm, inflammation, and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.

Lead and Lead Nitrate: Inhalation of large amounts of lead may cause a metallic taste, thirst, a burning sensation in the mouth and throat, excessive salivation, abdominal pain with severe colic, vomiting, diarrhea, fatigue, sleep disturbances, irritability, loss of concentration, oliguria, visual failure, paresthesias, muscle pain and weakness, and convulsions. Liver effects may include enlargement with tenderness and jaundice. The fatal dose of absorbed lead is approximately 0.5 grams. Pathological findings include gastrointestinal inflammation and renal tubular degeneration.

Repeated exposure to low levels of lead salts may result in an accumulation in the body tissues and exert an adverse effect on the blood, nervous system, heart, endocrine and immune system, kidneys, and the reproductive system. Early stages of lead poisoning, may be evidenced by anorexia, weight loss, constipation, apathy or irritability, occasional vomiting, fatigue, headache, weakness, metallic taste in the mouth, gingival lead line in persons with poor dental hygiene, and anemia. Loss of recently developed motor skills is generally observed only in children. More advanced stages of poisoning may be characterized by intermittent vomiting, irritability and nervous, myalgia of the arms, legs, joints and abdomen, paralysis of the extensor muscles with wrist and/or foot drop. Irreversible kidney damage has been associated with industrial exposure. Rarely, inorganic nitrates may be converted to nitrites by nitrate-reducing bacteria in the digestive tract, resulting in methemoglobinemia. Symptoms of methemoglobinemia may include cyanosis, headache, weakness, dizziness, lightheadedness, ataxia, shallow respiration, drowsiness, nausea, vomiting, confusion, lethargy, stupor, dyspnea, convulsion, and coma. Reproductive effects have been exhibited in both males and females. Lead crosses the placenta and may affect the fetus causing birth defects, mental retardation, behavioral disorders, and death during the first year of childhood. Animal studies indicate that reproductive effects may be additive if both parents are exposed to lead.

Skin contact may cause irritation; repeated or prolonged contact may cause dermatitis. Eye contact with lead nitrate may cause irritation; repeated or prolonged contact may cause conjunctivitis.

Medical Conditions Generally Aggravated by Exposure: Lead Nitrate: blood system disorders, gastrointestinal disorders, nervous system disorders, and respiratory disorders

Nitric Acid: eye disorders, skin disorders, respiratory disorders, and allergies

Listed as a Carcinogen/Potential Carcinogen (Lead Nitrate):

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens	_____	<u> X </u>
In the International Agency for Research on Cancer (IARC) Monographs	<u> X </u>	_____
By the Occupational Safety and Health Administration (OSHA)	_____	<u> X </u>

NOTE: The IARC classifies lead and inorganic lead compounds as Group 2B, *Possible Carcinogenic to Humans*.

Listed as a Carcinogen/Potential Carcinogen (Nitric Acid):

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens	_____	<u> X </u>
In the International Agency for Research on Cancer (IARC) Monographs	_____	<u> X </u>
By the Occupational Safety and Health Administration (OSHA)	_____	<u> X </u>

EMERGENCY AND FIRST AID PROCEDURES:

Skin Contact: Remove contaminated shoes and clothing. Rinse affected area with large amounts of water followed by washing the area with soap and water. Watch for chemical irritations and treat them accordingly. Obtain medical assistance if necessary.

Eye Contact: Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Obtain medical assistance.

Inhalation: If inhaled, move the victim to fresh air. If breathing is difficult, give oxygen; if the victim is not breathing, give artificial respiration by qualified personnel. Obtain medical assistance if necessary.

Ingestion: If ingestion occurs, wash out mouth with water. **DO NOT** induce vomiting. If the exposed person is responsive, give one or two glasses of milk or water to drink. Obtain medical assistance immediately.

NOTE (Nitric Acid): Wash affected skin areas with 5 % solution of sodium bicarbonate (NaHCO_3). If ingested, the risk versus the benefit of the passage of a naso-gastric tube is debatable. Activated charcoal is of no value. **DO NOT** give the exposed person bicarbonate to neutralize the material.

TARGET ORGAN(S) OF ATTACK: **Lead Nitrate:** nervous system, kidneys; teratogen
Nitric Acid: skin, teeth, eyes, and upper respiratory tract

SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released or Spilled: Notify safety personnel of spills. Surfaces contaminated with spills should be covered with soda ash or sodium bicarbonate to neutralize the acid. Place the neutralized material into containers suitable for eventual disposal, reclamation, or destruction.

Waste Disposal: Follow all federal, state, and local laws governing disposal.

Handling and Storage: Provide general and local explosion proof ventilation systems to maintain airborne concentrations below the TLV. Provide approved respiratory apparatus for non-routine or emergency use. Use an approved filter and vapor respirator when the vapor or mist concentrations are high. Wear gloves and chemical safety glasses where contact with the liquid or high vapor concentrations may occur. An eye wash station and washing facilities should be readily available near handling and use areas.

NOTE: Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the laboratory.

Store this material in its original bottle at room temperature.

SECTION VIII. SOURCE DATA/OTHER COMMENTS

Sources: MDL Information Systems, Inc., MSDS *Nitric Acid*, 18 March 2004.
MDL Information Systems, Inc., MSDS *Lead Nitrate*, 18 March 2004.
MDL Information Systems, Inc., MSDS *Lead*, 18 March 2004.
Certificate 991 *Lead-206 Assay and Isotopic Standard*, National Institute of Standards and Technology, U.S. Department of Commerce: Gaithersburg, MD (2004).

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data on the MSDS. The certified value for this material is given in the NIST Certificate of Analysis.

Safety data for chromium

Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: chromium metal, chrome, alpaste RRA 030

Molecular formula: Cr

CAS No: 7440-47-3

EC No: 231-157-5

Physical data

Appearance: very hard silvery grey metal

Melting point: 1900 C

Boiling point: 2640 C

Vapour density:

Vapour pressure: 1 mm Hg at 1616 C

Specific gravity: 7.14

Flash point:

Explosion limits:

Autoignition temperature:

Stability

Stable. Incompatible with carbonates, strong bases, mineral acids, lithium, sulfur dioxide, strong acids.

Toxicology

In powdered form may act as a human carcinogen. Not expected to pose a risk to health in the massive (lump) form. Typical TLV (dust) 0.5 mg/m³.

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)

R23 R24 R25 R36 R37 R38 R45 (applies to powdered material only).

Transport information

Non-hazardous for air, sea and road freight.

Personal protection

Avoid exposure to dust.

Safety phrases

(The meaning of any safety phrases which appear in this section is given [here](#).)

S26 S28 S36 S37 S39 S45 S53 (applies to powdered material only).

[Return to [Physical & Theoretical Chemistry Lab. Safety home page](#).]

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Material Safety Data Sheet

alvatec

According to EC-directive 91/155/EEC

Date: 23.08.2006

Page: 1 of 5

1. Identification of substance

Product details: **Barium**

Usage: getter material

Manufacturer / Supplier: ALVATEC Production and Sales GesmbH
Friesacher Straße 3
A-9330 Treibach-Althofen, Austria
Tel.: +43/4262/26441321

Emergency information: <http://www.who.int/ipcs/poisons/centre/directory/en/>

2. Composition / Data on components

Chemical characterization: Barium (Ba)
CAS-Number: 7440-39-3
UN-Number: 1400
EINECS-Number: 231-149-1

3. Hazards identification

Hazard designation: Xi Irritant

Information pertaining to particular dangers for man and environment: R 14 reacts violently with water.
R 31 Contact with acids liberates toxic gases.
R 36/R 37/R 38 Irritating to eyes, respiratory system and skin.

4. First aid measures

General information: Instantly remove any clothing soiled by the product.

After inhalation: Supply fresh air. If required, provide artificial respiration. Keep patient warm. Consult doctor if symptoms persist. Seek immediate medical advice.

After skin contact: Instantly wash with water and soap and rinse thoroughly. Seek immediately medical advice.

After eye contact: Rinse opened eyes for several minutes under running water and consult the doctor.

After swallowing: Seek immediate medical advice.

5. Fire fighting measures

Suitable extinguishing agents: Extinguishing powder, dry sand.

Unsuitable agents: Water; water containing agents; Carbon dioxide; Halocarbon extinguishers.

Special hazards: Contact with water releases hydrogen (explosive).

Special protective equipment for extinguishing: Wear self-contained breathing apparatus.

Material Safety Data Sheet

alvatec

According to EC-directive 91/155/EEC

Date: 23.08.2006

Page: 2 of 5

6. Accidental release measures

Personal safety precautions: Avoid contact. Keep ignition sources away. Ensure adequate ventilation. Wear protective clothes. Keep unprotected persons away. Supply fresh air.

Measures for environmental protection: Do not allow the material to be released into the sewerage. Explosion hazard.

Measures of cleaning/collecting: Do not flush with water or aqueous cleaning agents. Collect mechanically. Use return systems. Supply fresh air.

7. Handling and storage

Handling:

Information for safe usage: Handle under dry Argon. Keep container tightly sealed. Ensure adequate ventilation.

Information for fire and explosion protection: Keep away from ignition - No smoking.

Storage:

Information about storage one common storage Facilities:

Do not store together with strong oxidizing agents, water and acids.

Further conditions: Keep container dry and well sealed. Store under dry Argon

8. Exposure control and personal protection

General protective measures: Avoid contact with eyes and skin.

Hygienic measures: Instantly remove any soiled and impregnated garments. Separate storage of protective clothing.

Protection of hands: Gloves from Natural latex, Chloroprene, Nitrile, Viton, or Butyl rubber (Level 6, permeation time* > 480 min)
*) Permeation times may vary from type and conditions of usage!

Eye protection: Safety glasses

Body protection: Protective clothing

Maximum workplace concentration: Barium and soluble compounds as Ba (mg/m³)
UK WEL 0.5

Breathing equipment: Use breathing protection with high concentrations.

Material Safety Data Sheet

alvatec

According to EC-directive 91/155/EEC

Date: 23.08.2006

Page: 3 of 5

9. Physical and chemical properties

General Information:

Form: solid
Colour: silver shining
Smell: odourless
Melting point: 725 °C
Boiling point: 1640 °C (101.3 kPa);
Sublimation point: 367 °C (10⁻⁴ Pa)
Density: not determined
Solubility in water: reacts violently with water

10. Stability and reactivity

Thermal decomposition: No decomposition if used according to specifications.
Condition to be avoided: Moisture.
Materials to be avoided: Oxidizing agents, water, acids, ammonia, halocarbons
Dangerous reactions: Reacts violently with water.
Dangerous products of reactions or decomposition: Hydrogen, metal oxide fume
Further information: Flammable.

11. Toxicological information

Remarks: To our best knowledge the acute and chronic toxicity of this substance is not known completely.
General information: Reacts with humidity of the body.
After respiration: Alkali burns of mucous membrane, airway, lung.
After skin contact: Alkali burns.
After eye contact: Alkali burns, hazard of blindness.
After swallowing: Alkali burns in mouth, fauces, gullet and gastrointestinal tract. (Hazard of perforation)

12. Ecological Information

Ekotoxicological effects: Harmful effects on aquatic organism by shifting of pH-values.
General notes: Do not allow undiluted product or large quantities in sewage systems, water or ground!
Water hazard class: Water hazard class 1 (self-assessment): slightly hazardous

13. Disposal consideration

Precautions: Watch note in chapter 7 before handling.
EWC-Code: 06 03 13

Consult state, local or national regulations for proper disposal. Hand over to disposers of hazardous waste. Must be specially treated under adherence to official regulations.

Material Safety Data Sheet

alvatec

According to EC-directive 91/155/EEC

Date: 23.08.2006

Page: 4 of 5

14. Transport information

Land transport ADR/RID (cross-border/domestic)

ADR/RID class: 4.3, LQ11
Packaging group: II
Kemler number: 423
UN-Number: 1400
Designation of Goods: 1400 Barium

Maritime transport IMDG/GGVSea

UN-Number: 1400
IMDG/GGVSea class: 4.3
Packaging group: II
Correct technical name: Barium

Air transport ICAO/IATA

UN-Number: 1400
ICAO/IATA class: 4.3
Packaging group: II
Correct technical name: Barium

15. Regulatory information

Designation according to EC guidelines

Symbol and Code letter:  Xi Irritant

Risk phrases:

R 14 Reacts violently with water.
R 31 Contact with acids liberates toxic gas.
R 36/R 37/R 38 Irritating to eyes, respiratory system and skin.

Safety phrases:

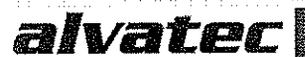
S 16 Keep away from ignition - No smoking.
S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advise.
S 27 Take off immediately all contaminated clothing.
S 36/S 37/S 39 Wear suitable protective clothing, gloves and eye/face protection.
1 (self-assessment): slightly hazardous

Water hazard class:

Information about limitation of use:

For use only by qualified individuals.
Restrictions concerning young persons must be observed

Material Safety Data Sheet



According to EC-directive 91/155/EEC

Date: 23.08.2006

Page: 5 of 5

16. Other information

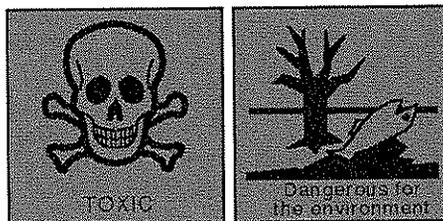
General information:

All information is based upon our best present knowledge.

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

The user is responsible for the adherence to all safety rules.

Safety data for arsenic



Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: arsenic black, arsenicals, arsenic-75, colloidal arsenic, grey arsenic, metallic arsenic

Molecular formula: As

CAS No: 7440-38-2

EINECS No: 231-148-6

Annex I Index No: 033-001-00-X

Physical data

Appearance: grey powder or chunks

Melting point: 817 C

Boiling point:

Vapour density:

Vapour pressure:

Density (g cm⁻³): 5.727

Flash point:

Explosion limits:

Autoignition temperature:

Stability

Stable. Incompatible with acids, oxidizing agents, halogens. Heat and air-sensitive.

Toxicology

Very toxic. May be fatal if inhaled, swallowed or absorbed through the skin. This is a known human carcinogen. May cause reproductive disorders.

Toxicity data

(The meaning of any abbreviations which appear in this section is given [here](#).)

ORL-RAT LD50 763 mg kg⁻¹

IPR-RAT LD50 13 mg kg⁻¹

ORL-MUS LD50 145 mg kg⁻¹

IPR-MUS LD50 46 mg kg⁻¹

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)

R23 R25 R50 R53. (Note that according to Annex I, arsenic is not allocated the Risk Phrase R45 - May Cause Cancer - even though arsenic is known to be carcinogenic in humans. It would be wise to handle this material as a carcinogen, and treat it as though Risk Phrase R45 was specified.)

Environmental information

Harmful in the environment - very toxic to aquatic organisms. May cause long-term damage.

Transport information

(The meaning of any UN hazard codes which appear in this section is given [here](#).)

UN No 1558. Hazard class: 6.1. Packing group: II

Personal protection

Gloves, safety glasses, good ventilation. Handle as a carcinogen.

Safety phrases

(The meaning of any safety phrases which appear in this section is given [here](#).)

S20 S21 S28 S45 S60 S61.

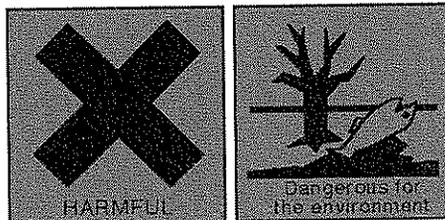
[Return to [Physical & Theoretical Chemistry Lab. Safety home page](#).]

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Safety data for dibenz(a,h)anthracene



Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: 1,2:5,6-benzanthracene, 1,2:5,6-dibenzanthracene, dibenzo(a,h)anthracene, DBA, 1,2,5,6-DBA

Use: a common pollutant in smoke and used oils

Molecular formula: $C_{22}H_{14}$

CAS No: 53-70-3

EINECS No: 200-181-8

Annex I Index. No: 601-041-00-2

Physical data

Appearance: white to light yellow crystalline solid

Melting point: 266 - 267 C

Boiling point: 524 C

Vapour density:

Vapour pressure:

Density ($g\ cm^{-3}$): 1.28

Flash point:

Explosion limits:

Autoignition temperature:

Water solubility:

Stability

Stable. Combustible. Incompatible with strong oxidizing agents.

Toxicology

Harmful if swallowed or inhaled. Experimental carcinogen, tumorigen and neoplastigen. IARC probable human carcinogen.

Toxicity data

(The meaning of any toxicological abbreviations which appear in this section is given [here](#).)

IVN-MUS LDLO 10 mg kg⁻¹

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)

R45 R50 R53.

Environmental information

Harmful in the environment - may cause long-term damage.

Transport information

(The meaning of any UN hazard codes which appear in this section is given [here](#).)

Non-hazardous for air, sea and road freight.

Personal protection

Safety glasses, gloves, good ventilation. Handle as a possible carcinogen.

Safety phrases

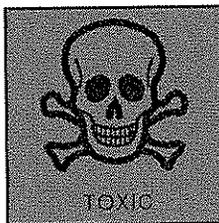
(The meaning of any safety phrases which appear in this section is given [here](#).)

S45 S53 S60 S61.

[Return to [Physical & Theoretical Chemistry Lab. Safety home page](#).]

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Safety data for chrysene



Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: 1,2-benzophenanthrene, benzo(a)phenanthrene, 1,2-benzphenanthrene, coal tar pitch, benz(a)phenanthrene, 1,2,5,6-dibenzonaphthalene

Molecular formula: $C_{18}H_{12}$

CAS No: 218-01-9

EC No: 205-923-4

Physical data

Appearance: crystalline powder

Melting point: 253 C

Boiling point: 448 C

Vapour density:

Vapour pressure:

Density ($g\ cm^{-3}$): 1.27

Flash point:

Explosion limits:

Autoignition temperature:

Water solubility: insoluble

Stability

Stable. Combustible. Incompatible with strong oxidizing agents.

Toxicology

Toxic. Confirmed animal carcinogen, possible human carcinogen. Harmful if swallowed, inhaled or absorbed through the skin.

Toxicity data

(The meaning of any abbreviations which appear in this section is given [here](#).)

IPR-MUS LD50 >320 mg kg⁻¹

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)

R20 R21 R22 R45 R46.

Transport information

(The meaning of any UN hazard codes which appear in this section is given [here](#).)

UN No 2811. Packing group I. Hazard class 6.1. CDG UK Transport category 1. EMS No 6.1-04.

Personal protection

Safety glasses, good ventilation, gloves. Handle as a carcinogen. A COSHH assessment is required.

Safety phrases

(The meaning of any safety phrases which appear in this section is given [here](#).)

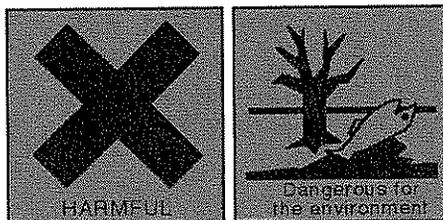
S3 S7 S9 S36 S37 S39 S45.

[Return to [Physical & Theoretical Chemistry Lab. Safety home page](#).]

This information was last updated on April 1, 2005. We have tried to make it as accurate and useful as possible, but can take no responsibility for its use, misuse, or accuracy. We have not verified this information, and cannot guarantee that it is up-to-date.

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Safety data for carbazole



[Glossary of terms on this data sheet.](#)

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: 9-azafluorene, dibenzopyrrole, diphenylenimine, diphenyleneimide, USAF EK-600

Molecular formula: $C_{12}H_9N$

CAS No: 86-74-8

EC No: 201-696-0

Physical data

Appearance: white crystals or light brown powder

Melting point: 245 - 246 C

Boiling point: 335 C

Vapour density:

Vapour pressure: 400 mm Hg at 323 C

Density ($g\ cm^{-3}$): 1.1

Flash point: 220 C (closed cup)

Explosion limits:

Autoignition temperature:

Water solubility: negligible

Stability

Stable. Combustible. Incompatible with strong oxidizing agents, nitrogen oxides, potassium hydroxide.

Toxicology

Harmful by inhalation or ingestion. May be harmful in contact with skin.
Suspected carcinogen.

Toxicity data

(The meaning of any abbreviations which appear in this section is given [here](#).)

ORL-RAT LDLO 500 mg kg⁻¹

IPR-MUS LD50 200 mg kg⁻¹

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)

R20 R22 R40 R50 R53.

Environmental information

Very toxic to aquatic organisms - may cause long-term damage in the environment.

Transport information

(The meaning of any UN hazard codes which appear in this section is given [here](#).)

UN No 2811. Hazard class 6.1. Packing group III.

Personal protection

Safety glasses, gloves, good ventilation.

Safety phrases

(The meaning of any safety phrases which appear in this section is given [here](#).)

S26 S36 S60 S61.

[Return to [Physical & Theoretical Chemistry Lab. Safety home page](#).]

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responsibility for it.

Safety data for dioctyl phthalate

Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: bis(2-ethylhexyl)phthalate, phthalic acid bis(2-ethylhexyl) ester, 1,2-benzenecarboxylic acid dioctyl ester, DEHP, phthalic acid dioctyl ester, diethylhexyl phthalate, eviplast 80, eviplast 81, felximel, flexol DOP, good-rite GP 264, hatcol DOP, hercoflex 260, jayflex DOP, kodaflex DOP, mollan O, nuoplaz DOP, octoil, palatinol AH, reomol D 79P, sicol 150, staflex DOP, further trade names

Use: plasticizer for PVC and other resins. Dielectric fluid. Permitted component in food packaging material

Molecular formula: $C_{24}H_{38}O_4$

Structural formula: $C_6H_4(COOCH_2CH(C_2H_5)C_4H_9)_2$

CAS No: 117-81-7

EC No: 204-211-0

Annex I Index No: 607-317-00-9

Physical data

Appearance: colourless liquid

Melting point: -52 C

Boiling point: 384 C

Vapour density:

Vapour pressure:

Specific gravity: 0.9861

Flash point: 215 C (closed cup)

Explosion limits: 0.3% (lower)

Autoignition temperature: 390 C

Viscosity 0.4 poise

Refractive index 1.4848

Stability

Stable. Incompatible with strong oxidizing agents. Combustible.

Toxicology

May be harmful by inhalation, ingestion or skin absorption. Laboratory evidence suggests that high doses during pregnancy may reduce birth weight of lab animals. May have toxic effects on embryo or fetus. Possible carcinogen. Skin, eye and respiratory irritant. Typical occupational TLV 3mg/m³.

Toxicity data

(The meaning of any abbreviations which appear in this section is given [here](#).)

RAT-ORL LD50 31000 mg kg⁻¹

IPR-RAT LD50 30700 mg kg⁻¹

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)

R36 R37 R38 R60 R61.

Environmental information

Biodegrades in water with a half life of 2-3 weeks.

Personal protection

Safety glasses. Adequate ventilation.

Safety phrases

(The meaning of any safety phrases which appear in this section is given [here](#).)

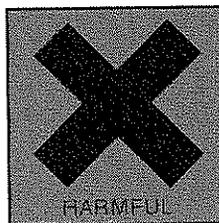
S45 S53.

[Return to [Physical & Theoretical Chemistry Lab. Safety home page](#).]

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Safety data for benzo[k]fluoranthene



Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: 8,9-benzofluorathene, 11,12-benzo[k]fluoranthene, benzo(k) fluoranthene, 2,3,1',8'-binaphthylene, B(K)F, BKF

Use:

Molecular formula: $C_{20}H_{12}$

CAS No: 207-08-9

EC No:

Physical data

Appearance: yellow crystals

Melting point: 215 - 217 C

Boiling point: ca. 480 C

Vapour density:

Vapour pressure:

Density ($g\ cm^{-3}$):

Flash point:

Explosion limits:

Autoignition temperature:

Water solubility: negligible

Stability

Stable. Combustible. Incompatible with strong oxidizing agents.

Toxicology

Anticipated human carcinogen. Harmful if swallowed, inhaled or absorbed through the skin.

Toxicity data

(The meaning of any abbreviations which appear in this section is given [here](#).)

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)

R20 R21 R22 R45.

Transport information

Personal protection

Safety glasses, gloves, good ventilation. Handle as a carcinogen.

Safety phrases

(The meaning of any safety phrases which appear in this section is given [here](#).)

S45 S53.

[Return to [Physical & Theoretical Chemistry Lab. Safety home page](#).]

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Safety data for benzo[ghi]perylene



Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: 1,12-benzoperylene, 1,12-benzperylene, benzo(g,h,i)perylene

Use:

Molecular formula: $C_{22}H_{12}$

CAS No: 191-24-2

EINECS No: 205-883-8

Physical data

Appearance: solid

Melting point: 278 C

Boiling point: 500 C

Vapour density:

Vapour pressure:

Density ($g\ cm^{-3}$):

Flash point:

Explosion limits:

Autoignition temperature:

Water solubility: insoluble

Stability

Stable. Combustible. Incompatible with strong oxidizing agents.

Toxicology

May be harmful or act as an irritant - toxicology not fully investigated.

Toxicity data

(The meaning of any toxicological abbreviations which appear in this section is given [here](#).)

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)
R50 R53.

Environmental information

Very toxic to aquatic organisms - may cause long-term damage in the aquatic environment.

Transport information

(The meaning of any UN hazard codes which appear in this section is given [here](#).)

UN No 3077. Hazard class 9. Packing group III.

Personal protection

Safety glasses.

Safety phrases

(The meaning of any safety phrases which appear in this section is given [here](#).)

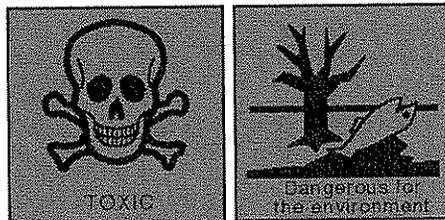
S22 S24 S25 S60 S61.

[Return to [Physical & Theoretical Chemistry Lab. Safety home page](#).]

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Safety data for benzo[b]fluoranthene



Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: 3,4-benzofluoranthene, benz[e]acenaphthanthrylene, 3,4-benz[e]acenaphthanthrylane, 2,3-benzofluoranthene, benzofluoranthrene, benzo[e]fluoranthene

Use:

Molecular formula: $C_{20}H_{12}$

CAS No: 205-99-2

EINECS No: 205-911-9

EC Index No: 601-024-00-4

Physical data

Appearance: off-white to tan powder

Melting point: 163 - 165 C

Boiling point:

Vapour density:

Vapour pressure:

Density ($g\ cm^{-3}$):

Flash point:

Explosion limits:

Autoignition temperature:

Water solubility:

Stability

Stable. Incompatible with strong oxidizing agents.

Toxicology

Toxic. Probable human carcinogen. May act as an irritant.

Toxicity data

(The meaning of any toxicological abbreviations which appear in this section is given [here](#).)

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)
R45 R50 R53.

Environmental information

Very harmful to aquatic organisms - may cause long-term damage to the environment.

Transport information

(The meaning of any UN hazard codes which appear in this section is given [here](#).)

Personal protection

Safety glasses, good ventilation, disposable gloves. Treat as a possible carcinogen.

Safety phrases

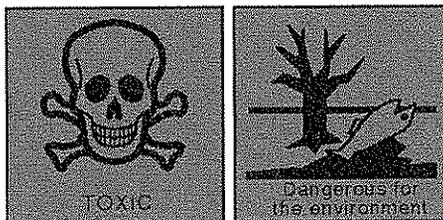
(The meaning of any safety phrases which appear in this section is given [here](#).)
S45 S53 S60 S61.

[Return to [Physical & Theoretical Chemistry Lab. Safety home page](#).]

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Safety data for benzo(a)pyrene



Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: 1,2-benzopyrene, 6,7-benzopyrene, benzo[a]pyrene, B(a)P, BP, 3,4-benzopyrene, benzo[d,e,f]chrysene, 3,4-benzpyrene, benzpyrene, 3,4-benzylpyrene, 3,4-benz[a]pyrene, 3,4-BP, 3,4-benzopyrene

Molecular formula: $C_{20}H_{12}$

CAS No: 50-32-8

EINECS No: 200-028-5

EU Index No: 601-032-00-3

Physical data

Appearance: yellow crystals or powder [found in cigarette smoke, coal tar, fuel exhaust gas and in many other sources]

Melting point: 176 C

Boiling point: 495 C

Vapour density: 8.7 (air = 1)

Vapour pressure:

Density ($g\ cm^{-3}$): 1.351

Flash point:

Explosion limits:

Autoignition temperature:

Water solubility: slight

Stability

Stable. Incompatible with strong oxidizing agents.

Toxicology

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 foetus. May cause reproductive damage. May be transferred to nursing infants through mother's milk. Skin, respiratory and eye irritant. May cause changes to the colour and properties of skin. Exposure to sunlight can increase the skin damage caused by this chemical.

Toxicity data

(The meaning of any abbreviations which appear in this section is given [here](#).)

SCU-RAT LD50 50 mg kg⁻¹

IPR-MUS LDLO 500 mg kg⁻¹

IRN-FRG LDLO 11 mg kg⁻¹

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)

R45 R46 R50 R53 R60 R61.

Transport information

(The meaning of any UN hazard codes which appear in this section is given [here](#).)

Un No 2811. Packing group III. Hazard class 6.1.

Environmental information

Very toxic in the environment - may cause long-term damage.

Personal protection

Restricted material. Only to be used by trained workers. Prepare a full risk assessment before starting work. Safety glasses, gloves, good ventilation. Handle as a carcinogen. Do not dry sweep spills because of the risk of increasing the amount of airborne material.

Safety phrases

(The meaning of any safety phrases which appear in this section is given [here](#).)

S45 S53 S60 S61.

[Return to [Physical & Theoretical Chemistry Lab. Safety home page.](#)]

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Chemical Database

Benz[A]Anthracene

Identifications

- **CAS Number:** 56-55-3
- **RCRA Waste Number:** U018
- **Synonyms/Related:**
 - 1, 2-Benzanthracene
 - 1, 2-Benzoanthracene
 - 1,2-Benz(a) anthracene
 - 1,2-Benzanthracene
 - 1,2-Benzanthrazen
 - 1,2-Benzanthrazen [German]
 - 1,2-Benzanthrene
 - 1,2-Benzoanthracene
 - 1,2-Benz[a]anthracene
 - 2,3-Benzophenanthrene
 - 2,3-Benzphenanthrene
 - BENZ(A) ANTHRACENE
 - Benz(a) anthracene [Polycyclic aromatic compounds]
 - Benz(a) anthracene [Polycyclic aromatic hydrocarbons]
 - Benzanthracene
 - Benzanthrene
 - Benzo(a) anthracene
 - Benzo(b) phenanthrene
 - Benzoanthracene
 - Benzo[a]anthracene
 - Benzo[a]phenanthrene
 - Benzo[b]phenanthrene
 - Benz[A]Anthracene
 - Naphthanthracene
 - Tetraphene

Related Resources

- **USDOT Hazardous Materials Table 49 CFR 172.101**
An online version of the USDOT's listing of hazardous materials from 49CFR 172.101. This table can be sorted by proper shipping name, UN/NA ID and/or by primary hazard class/division.
- **2004 ERG (Emergency Response Guidebook)**
Have you ever wondered what those four digit numbers on the placards on the side of trucks and rail cars mean? Our online 2004ERG will give you your answer. This is an online version of the guidebook produced by the USDOT for first responders during the initial phase of a Dangerous goods/HazMat incident.
- **US DOT Hazardous Materials Transportation Placards**
Hazardous materials placards (DOT placards) are required when shipping hazardous materials in the United States, Canada and Mexico. These pages provide US DOT definitions for each hazmat placard.
- **Guide for Handling Household Chemicals**
Things you can do to make your home safer.
- **Molarity, Molality and Normality**
Introduces stoichiometry and explains the differences between molarity, molality and normality.
- **Molar Mass Calculations and Javascript Calculator**
Molar mass calculations are explained and there is a JavaScript calculator to aid calculations.
- **Periodic Table of Elements**
Provides comprehensive data for each element of the periodic table of elements including up to 40 properties, names in 10 languages and common chemical compounds. Information also provided for 3,600 nuclides and 4,400 nuclide decay modes.

Editor's note: Some chemicals in this database contain more information than others due to the original reason this information was collected and how the compilation was accomplished.

While working with material safety data sheets (MSDS), I found that manufacturers sometimes used obscure names

for constituent chemicals and I didn't always have a good idea of what I was dealing with. To resolve this problem, over the years, I compiled chemical names and identifiers into a personal database, cross referencing regulatory and health safety information when possible. Colleagues and friends eventually started suggesting that I make my data available on this website so that others could benefit from my efforts -- which I finally did in 2004. The more common, regulated and/or hazardous a chemical is, the more information I will have likely collected it.

Further notes are below.**Trademarks**

If you are aware of any synonyms listed above that are registered trademarks, please contact us with relevant information so that trademarks can be appropriately noted.

Notes about mixtures

Some chemicals listed in this database are not pure chemical compounds, rather they are mixtures/solutions of chemicals. It is not uncommon for wide range of molar ratios of a mixture to be lumped together as "synonyms" of the same "chemical". In some instances chemicals that are very similar from a health & safety and/or regulatory standpoint also may have been lumped together.

Reference Sources

Data for this database was compiled from: hundreds of Material Safety Data Sheets (MSDS) of common industrial and household products; the Hazardous Materials Table from the United States "Code of Federal Regulations" title 49 section 172.101; the National Institute for Occupational Safety and Health Pocket Guide to Chemical Hazards; the US DOT 1996, 2000 & 2004 Emergency Response Guidebooks; U.S. National Library of Medicine and many other related resources.

Safety data for indeno[1,2,3-cd]pyrene

Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: 1,10-(1,2-phenylene)pyrene, 1,10-(o-phenylene)pyrene, o-phenylenepyrene, 2,3-phenylenepyrene, 2,3,o-phenylenepyrene, IP

Use:

Molecular formula: $C_{22}H_{12}$

CAS No: 193-39-5

EINECS No: 205-893-2

Physical data

Appearance: solid

Melting point: 161 - 163 C

Boiling point: 536 C

Vapour density:

Vapour pressure:

Density ($g\ cm^{-3}$):

Flash point:

Explosion limits:

Autoignition temperature:

Water solubility:

Stability

Stable. Incompatible with strong oxidizing agents.

Toxicology

Limited evidence that this material may be carcinogenic.

Toxicity data

(The meaning of any toxicological abbreviations which appear in this section is given here.)

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)

R40.

Transport information

(The meaning of any UN hazard codes which appear in this section is given [here](#).)

Non-hazardous for air, sea and road freight.

Personal protection

Treat as potentially hazardous - many multi-ring aromatic compounds are suspected carcinogens.

Safety phrases

(The meaning of any safety phrases which appear in this section is given [here](#).)

S36 S37 S45.

[Return to [Physical & Theoretical Chemistry Lab. Safety home page](#).]

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Safety data for pyrene



Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: beta-pyrene, coal tar pitch volatiles

Molecular formula: $C_{16}H_{10}$

CAS No: 129-00-0

EC No: 204-927-3

Physical data

Appearance: yellow or white crystals and powder

Melting point: 149 - 151 C

Boiling point: 404 C

Vapour density:

Vapour pressure:

Specific gravity:

Flash point:

Explosion limits:

Autoignition temperature:

Stability

Stable. Incompatible with strong oxidizing agents. Flammable.

Toxicology

Harmful if swallowed. May be harmful by inhalation or through skin contact - readily absorbed through skin. Irritant. Toxicology not fully investigated.

Toxicity data

(The meaning of any toxicological abbreviations which appear in this section is given here.)

ORL-RAT LD50 2700 mg kg⁻¹

Risk phrases

(The meaning of any risk phrases which appear in this section is given here.)

R10 R22 R36 R37 R38.

Personal protection

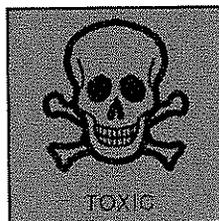
Safety glasses. Adequate ventilation.

[Return to [Physical & Theoretical Chemistry Lab. Safety home page](#).]

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Safety data for naphthalene



Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: albocarbon, mighty 150, mighty rd1, moth flakes, NCI-C52904, white tar, naphthalin, naphthene, camphor tar, tar camphor, moth balls

Molecular formula: $C_{10}H_8$

CAS No: 91-20-3

EC No: 202-049-5

Physical data

Appearance: white crystals

Melting point: 77 C

Boiling point: 218 C

Specific gravity: 1.14

Vapour pressure: 1 mm Hg at 20 C

Vapour density: 4.4 g/l

Flash point: 88 C

Explosion limits: 0.9 - 5.9%

Autoignition temperature:

Stability

Stable. Flammable - avoid sources of ignition. Incompatible with oxidizing agents. Heat-sensitive. Sublimes slowly at room temperature.

Toxicology

May cause irritation. Toxic by inhalation or ingestion. TLV 10 ppm. Sensitizer.
Possible carcinogen.

Toxicity data

(The meaning of any abbreviations which appear in this section is given [here](#).)

ORL-CHD LDLO 100 mg kg⁻¹

UNR-HMN LDLO 29 mg kg⁻¹

ORL-MUS LD50 533 mg kg⁻¹

IVN-MUS LD50 100 mg kg⁻¹

ORL-RBT LD50 3000 mg kg⁻¹

Irritation data

EYE-RBT 100 mg/ml

SKN-RBT 495 mg open mld

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)

R20 R21 R22 R36 R37 R38 R43 R45.

Personal protection

Safety glasses. Use efficient ventilation.

Safety phrases

(The meaning of any safety phrases which appear in this section is given [here](#).)

S16 S26 S36 S37 S39 S45.

[Return to [Physical & Theoretical Chemistry Lab. Safety home page](#).]

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Safety data for anthracene



Click here for data on anthracene in student-friendly format, from the HSci project

Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: anthracin, paranaphthalene, green oil, tetra olive N2G

Molecular formula: $C_{14}H_{10}$

CAS No: 120-12-7

EINECS: 204-371-1

Physical data

Appearance: off-white to pale green crystals

Melting point: 215 - 219 C

Boiling point: 340 C

Specific gravity: 1.25

Vapour pressure:

Flash point: 121 C (closed cup)

Explosion limits: 0.6% (lower)

Autoignition temperature:

Stability

Stable. Substances to be avoided include strong oxidizing agents, hypochlorites, chromic acid, fluorine. Flammable.

Toxicology

Dust may irritate eyes, throat, nose or lungs. May act as a sensitizer. Possible tumor promotor. Typical PEL TWA 0.2 mg/m³.

Toxicity data

(The meaning of any abbreviations which appear in this section is given [here](#).)

ORL-MUS Acute 1470-2440 mg kg⁻¹

IPR-MUS LD50 430 mg kg⁻¹

Irritation data

(The meaning of any abbreviations which appear in this section is given [here](#).)

SKN-MUS 118 mg mld

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)

R36 R37 R38 R50 R53.

Environmental information

Harmful in the environment.

Transport information

(The meaning of any UN hazard codes which appear in this section is given [here](#).)

UN No 3077. Hazard class 9. Packing group III.

Personal protection

Safety glasses. Suitable ventilation.

Safety phrases

(The meaning of any safety phrases which appear in this section is given [here](#).)

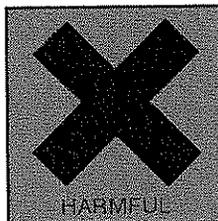
S26 S36.

[Return to [Physical & Theoretical Chemistry Lab. Safety home page](#).]

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Safety data for acenaphthylene



Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: cycopenta(de)naphthalene

Use:

Molecular formula: C₁₂H₈

CAS No: 208-96-8

EINECS No: 205-917-1

Physical data

Appearance: yellow crystalline powder

Melting point: 90 - 92 C

Boiling point: 280 C

Vapour density:

Vapour pressure:

Density (g cm⁻³):

Flash point:

Explosion limits:

Autoignition temperature:

Water solubility:

Stability

Stable. Incompatible with oxidizing agents.

Toxicology

Harmful if swallowed. May be harmful if inhaled or absorbed through the skin. Skin, eye and respiratory irritant. Toxicology not fully investigated.

Toxicity data

(The meaning of any toxicological abbreviations which appear in this section is given [here](#).)

IPR-RAT LD50 1700 mg kg⁻¹

ORL-MUS LD50 1760 mg kg⁻¹

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)

R22 R36 R37 R38.

Transport information

(The meaning of any UN hazard codes which appear in this section is given [here](#).)

Personal protection

Safety glasses, adequate ventilation.

Safety phrases

(The meaning of any safety phrases which appear in this section is given [here](#).)

S26 S36 S37 S39.

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Chemical Database

2-Methylnaphthalene

Identifications

- **CAS Number:** 91-57-6
- **Synonyms/Related:**
 - .beta.-Methylnaphthalene
 - 2-Methylnaphthalene
 - 2-Naphthylmethyl radical
 - beta-methyl naphthalenes
 - beta-Methylnaphthalene
 - c0699
 - C14098
 - NAPHTALENE,2-METHYL MFC11 H10
 - Naphthalene, 2-methyl-
 - Naphthalene, beta-methyl-

Related Resources

- **USDOT Hazardous Materials Table 49 CFR 172.101**
An online version of the USDOT's listing of hazardous materials from 49CFR 172.101. This table can be sorted by proper shipping name, UN/NA ID and/or by primary hazard class/division.
- **2004 ERG (Emergency Response Guidebook)**
Have you ever wondered what those four digit numbers on the placards on the side of trucks and rail cars mean? Our online 2004ERG will give you your answer. This is an online version of the guidebook produced by the USDOT for first responders during the initial phase of a Dangerous goods/HazMat incident.
- **US DOT Hazardous Materials Transportation Placards**
Hazardous materials placards (DOT placards) are required when shipping hazardous materials in the United States, Canada and Mexico. These pages provide US DOT definitions for each hazmat placard.
- **Guide for Handling Household Chemicals**
Things you can do to make your home safer.
- **Molarity, Molality and Normality**
Introduces stoichiometry and explains the differences between molarity, molality and normality.
- **Molar Mass Calculations and Javascript Calculator**
Molar mass calculations are explained and there is a JavaScript calculator to aid calculations.
- **Periodic Table of Elements**
Provides comprehensive data for each element of the periodic table of elements including up to 40 properties, names in 10 languages and common chemical compounds. Information also provided for 3,600 nuclides and 4,400 nuclide decay modes.

Editor's note: Some chemicals in this database contain more information than others due to the original reason this information was collected and how the compilation was accomplished.

While working with material safety data sheets (MSDS), I found that manufacturers sometimes used obscure names for constituent chemicals and I didn't always have a good idea of what I was dealing with. To resolve this problem, over the years, I compiled chemical names and identifiers into a personal database, cross referencing regulatory and health safety information when possible. Colleagues and friends eventually started suggesting that I make my data available on this website so that others could benefit from my efforts -- which I finally did in 2004. The more common, regulated and/or hazardous a chemical is, the more information I will have likely collected it.

Further notes are below.

Trademarks

If you are aware of any synonyms listed above that are registered trademarks, please contact us with relevant information so that trademarks can be appropriately noted.

Notes about mixtures

Some chemicals listed in this database or not pure chemical compounds, rather they are mixtures/solutions of chemicals. It is not uncommon for wide range of molar ratios of a mixture to be lumped together as "synonyms" of the same "chemical". In some instances chemicals that are very similar from a health & safety and/or regulatory standpoint also may have been lumped together.

Reference Sources

Data for this database was compiled from: hundreds of Material Safety Data Sheets (MSDS) of common industrial and household products; the Hazardous Materials Table from the United States "Code of Federal Regulations" title 49 section 172.101; the National Institute for Occupational Safety and Health Pocket Guide to Chemical Hazards; the US DOT 1996, 2000 & 2004 Emergency Response Guidebooks; U.S. National Library of Medicine and many other related resources.

Safety data for 2-butanone



Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: methylacetone, ethyl methyl ketone, methyl ethyl ketone, MEK, butanone, MEETCO

Molecular formula: C_4H_8O

CAS No: 78-93-3

EINECS No: 201-159-0

Physical data

Appearance: colourless liquid

Melting point: -87 C

Boiling point: 80 C

Vapour density: 2.49 (air = 1)

Vapour pressure: 71 mm Hg at 20 C

Density ($g\ cm^{-3}$): 0.805

Flash point: -3 C

Explosion limits: 1.8% - 10.1%

Autoignition temperature: 515 C

Water solubility:

Stability

Stable. Highly flammable. Incompatible with oxidizing agents, bases, strong reducing agents. Protect from moisture.

Toxicology

Severe eye irritant. Can cause CNS depression. Skin irritant. May be harmful by ingestion, inhalation or through skin contact. May cause dermatitis.

Toxicity data

(The meaning of any abbreviations which appear in this section is given [here](#).)

ORL-RAT LD50 2737 mg kg⁻¹
IHL-RAT LC50 23500 mg/m³/8h
IPR-RAT LD50 607 mg kg⁻¹
ORL-MUS LD50 4050 mg kg⁻¹
IHL-MAM LC50 38 g m⁻³
IHL-MUS LC50 32 g/m³/4h

Irritation data

(The meaning of any abbreviations which appear in this section is given [here](#).)

EYE-HMN 350 ppm
SKN-RBT 500 mg/24 mod
SKN-RBT 402 mg/24h mld
SKN-RBT 14 mg/24h open mld

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)

R11 R36 R37.

Transport information

(The meaning of any UN hazard codes which appear in this section is given [here](#).)

Hazard class: 3.0. UN No 1193. Packing group: II.

Personal protection

Safety glasses, adequate ventilation.

Safety phrases

(The meaning of any safety phrases which appear in this section is given [here](#).)

S9 S16 S25 S33.

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Safety data for m-xylene



Glossary of terms on this data sheet.

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General

Synonyms: m-dimethylbenzene, meta-xylene, 1,3-dimethylbenzene, 1,3-xylene

Molecular formula: C_8H_{10}

CAS No: 108-38-3

EC No: 203-576-3

Physical data

Appearance: colourless liquid

Melting point: -48 C

Boiling point: 138 - 139 C

Vapour density: 3.7

Vapour pressure: 16 mm Hg at 37.7 C

Specific gravity: 0.868

Flash point: 25 C

Explosion limits: 1.1 % - 7 %

Autoignition temperature: 527 C

Stability

Stable. Incompatible with oxidizing agents. Flammable.

Toxicology

Harmful by inhalation, ingestion or skin absorption. Narcotic effects. Readily absorbed through skin. May cause dermatitis. High concentrations can cause severe irritation. Reproductive hazard. Typical PEL 100 ppm.

Toxicity data

(The meaning of any abbreviations which appear in this section is given [here](#).)

ORL-RAT LD50 5000 mg kg⁻¹

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)

R10 R20 R21 R22 R36 R37 R38.

Personal protection

Safety glasses. Good ventilation.

Safety phrases

(The meaning of any safety phrases which appear in this section is given [here](#).)

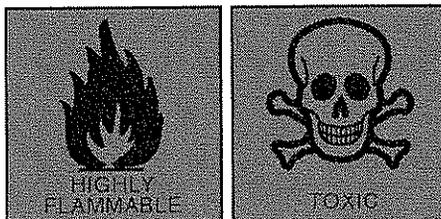
S25.

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Safety data for toluene



Click here for data on toluene in [student-friendly format](#), from the HSci project

[Glossary of terms on this data sheet.](#)

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: methylbenzene, phenylmethane, toluol, antisal 1A, CP 25, methacide, methylbenzol, NCI-C07272, RCRA waste number U220, tolu-sol

Uses: Solvent

Molecular formula: C_7H_8

CAS No: 108-88-3

EC No: 203-625-9

Annex I Index No: 601-021-00-3

Physical data

Appearance: Colourless liquid with a benzene-like odour (odour threshold 0.17 ppm)

Melting point: -93 C

Boiling point: 110.6 C

Specific gravity: 0.865

Vapour pressure: 22 mm Hg at 20 C (vapour density 3.2)

Flash point: 4 C

Explosion limits: 1% - 7%

Autoignition temperature: 536 C

Stability

Stable. Substances to be avoided: oxidizing agents, oxygen, moisture. Highly

flammable. Hygroscopic.

Toxicology

Toxic by inhalation, ingestion or by absorption through skin. Serious irritant.
Experimental teratogen.

Toxicity data

(The meaning of any abbreviations which appear in this section is given [here](#).)

ORL-RAT LD50 636 mg kg⁻¹

IPR-RAT LD50 1332 mg kg⁻¹

ORL-HMN LDLO 50 mg kg⁻¹

IPR-MUS LD50 59 mg kg⁻¹

IHL-MAM LC50 30 g m⁻³

Irritation data

(The meaning of any abbreviations which appear in this section is given [here](#).)

EYE-HMN 300 ppm.

SKN-RBT 435 mg mild.

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)

R11 R23 R24 R25.

Transport information

(The meaning of any UN hazard codes which appear in this section is given [here](#).)

Hazard class 3.0 Packing group II. UN No 1294. IMDG class 3.

Personal protection

Safety glasses. Good ventilation.

Safety phrases

(The meaning of any safety phrases which appear in this section is given [here](#).)

S16 S25 S29 S33.

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Safety data for ethylbenzene

Glossary of terms on this data sheet.

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General

Synonyms: phenylethane, EB, ethylbenzol, ethyl benzene

Molecular formula: C_8H_{10}

CAS No: 100-41-4

EC No: 202-849-4

Physical data

Appearance: colourless liquid

Melting point: -95 C

Boiling point: 136 C

Vapour density: 3.7

Vapour pressure: 10 mm Hg at 20 C

Specific gravity: 0.867

Flash point: 15 C

Explosion limits: 1 % - 6.7 %

Autoignition temperature: 432 C

Stability

Stable. Incompatible with oxidizing agents. Flammable.

Toxicology

May be harmful by inhalation, ingestion or through skin contact. Causes severe eye irritation. Skin and respiratory system irritant. Experimental teratogen. Narcotic in high concentration.

Toxicity data

(The meaning of any abbreviations which appear in this section is given [here](#).)

ORL-RAT LD50 3500 mg kg⁻¹

SKN-RBT LD50 17800 mg kg⁻¹

IHL-GPG LCLO 10000 ppm

Irritation data

(The meaning of any abbreviations which appear in this section is given [here](#).)

SKN-RBT 15 mg/24h open mld.

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)

R10 R36 R37 R38.

Personal protection

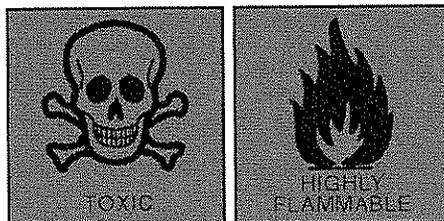
Safety glasses. Good ventilation.

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Safety data for benzene



[Click here for data on benzene in student-friendly format, from the HSci project](#)

[Glossary of terms on this data sheet.](#)

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: (6)annulene, benzin, benzol, benzole, benzolene, phene, phenyl hydride, pyrobenzole, coal naphtha

Molecular formula: C_6H_6

CAS No: 71-43-2

EC No: 200-753-7

Annex I Index No: 601-020-00-8

Physical data

Appearance: colourless liquid

Melting point: 5.5 C

Boiling point: 80 C

Specific gravity: 0.87

Vapour pressure: 74.6 mm Hg at 20 C

Flash point: -11 C

Explosion limits: 1.3 % - 8 %

Autoignition temperature: 561 C

Stability

Stable. Substances to be avoided include strong oxidizing agents, sulfuric acid, nitric acid, halogens. Highly flammable.

Toxicology

This material is a known carcinogen. The risks of using it in the laboratory must be fully assessed before work begins. TLV 10 ppm. Short-term exposure may cause a variety of effects, including nausea, vomiting, dizziness, narcosis, reduction in blood pressure, CNS depression. Skin contact may lead to dermatitis. Long-term exposure may lead to irreversible effects. Severe eye irritant. Skin and respiratory irritant.

Toxicity data

(The meaning of any abbreviations which appear in this section is given [here](#).)

ORL-MAN LDLO 50 mg kg⁻¹

IHL-HMN LCLO 2000 ppm/5h

ORL-RAT LD50 930 mg kg⁻¹

IHL-MUS LC50 9980 ppm

IPR-MUS LD50 340 mg kg⁻¹

ORL-MUS LD50 4700 mg kg⁻¹

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)

R11 R23 R24 R25 R36 R38 R45 R48 R65.

Personal protection

Safety glasses, gloves, good ventilation. Thought should be given to using an alternative, safer product.

Safety phrases

(The meaning of any safety phrases which appear in this section is given [here](#).)

S45 S53.

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Heat Stress Guidelines

Protecting Workers from Heat Stress

Heat Illness

Exposure to heat can cause illness and death. The most serious heat illness is heat stroke. Other heat illnesses, such as heat exhaustion, heat cramps and heat rash, should also be avoided.

There are precautions your employer should take any time temperatures are high and the job involves physical work.

Risk Factors for Heat Illness

- High temperature and humidity, direct sun exposure, no breeze or wind
- Low liquid intake; previous heat illnesses
- Heavy physical labor
- Waterproof clothing
- No recent exposure to hot workplaces

Symptoms of Heat Exhaustion

- Headache, dizziness, or fainting
- Weakness and wet skin
- Irritability or confusion
- Thirst, nausea, or vomiting

Symptoms of Heat Stroke

- May be confused, unable to think clearly, pass out, collapse, or have seizures (fits)
- May stop sweating

To Prevent Heat Illness, Your Employer Should

- Provide training about the hazards leading to heat stress and how to prevent them.
- Provide a lot of cool water to workers close to the work area. At least one pint of water per hour is needed.



For more complete information:

- Schedule frequent rest periods with water breaks in shaded or air-conditioned areas.
- Routinely check workers who are at risk of heat stress due to protective clothing and high temperature.
- Consider protective clothing that provides cooling.



How You Can Protect Yourself and Others

- Know signs/symptoms of heat illnesses; monitor yourself; use a buddy system.
- Block out direct sun and other heat sources.
- Drink plenty of fluids. Drink often and BEFORE you are thirsty.
- Avoid beverages containing alcohol or caffeine.
- Wear lightweight, light colored, loose-fitting clothes.
- Be aware that poor physical condition, some health problems (such as high blood pressure or diabetes), pregnancy, colds and flu, and some medications can increase your personal risk. If you are under treatment, ask your healthcare provider.



What to Do When a Worker is Ill from the Heat

- Call a supervisor for help. If the supervisor is not available, call 911.
- Have someone stay with the worker until help arrives.
- Move the worker to a cooler/shaded area.
- Remove outer clothing.
- Fan and mist the worker with water; apply ice (ice bags or ice towels).
- Provide cool drinking water, if able to drink.

IF THE WORKER IS NOT ALERT or seems confused, this may be a heat stroke. CALL 911 IMMEDIATELY and apply ice as soon as possible.

If you have any questions or concerns, call OSHA at 1-800-321-OSHA.

For more complete information:



U.S. Department of Labor

www.osha.gov (800) 321-OSHA



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OSHA Technical Manual

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Directive Number: TED 01-00-015
 Effective Date: 1/20/1999

SECTION III: CHAPTER 4

HEAT STRESS

Contents:

- I. **[Introduction](#)**
- II. **[Heat Disorders and Health Effects](#)**
- III. **[Investigation Guidelines](#)**
- IV. **[Sampling Methods](#)**
- V. **[Control](#)**
- VI. **[Personal Protective Equipment](#)**
- VII. **[Bibliography](#)**

- [Appendix III:4-1 Heat Stress: General Workplace Review](#)**
- [Appendix III:4-2 Heat Stress-Related Illness/Accident Follow-Up](#)**
- [Appendix III:4-3 Measurement of Wet Bulb Globe Temperature](#)**

For problems with accessibility in using figures and illustrations in this document, please contact the Office of Science and Technology Assessment at (202) 693-2095.

I. INTRODUCTION.

Operations involving high air temperatures, radiant heat sources, high humidity, direct physical contact with hot objects, or strenuous physical activities have a high potential for inducing heat stress in employees engaged in such operations. Such places include: iron and steel foundries, nonferrous foundries, brick-firing and ceramic plants, glass products facilities, rubber products factories, electrical utilities (particularly boiler rooms), bakeries, confectioneries, commercial kitchens, laundries, food canneries, chemical plants, mining sites, smelters, and steam tunnels.

Outdoor operations conducted in hot weather, such as construction, refining, asbestos removal, and hazardous waste site activities, especially those that require workers to wear semipermeable or impermeable protective clothing, are also likely to cause heat stress among exposed workers.

A. CAUSAL FACTORS.

1. Age, weight, degree of physical fitness, degree of acclimatization, metabolism, use of alcohol or drugs, and a variety of medical conditions such as hypertension all affect a person's sensitivity to heat. However, even the type of clothing worn must be considered. Prior heat injury predisposes an individual to additional injury.
2. It is difficult to predict just who will be affected and when, because individual susceptibility varies. In addition, environmental factors include more than the ambient air temperature. Radiant heat, air movement, conduction, and relative humidity all affect an individual's response to heat.

B. DEFINITIONS.

1. The American Conference of Governmental Industrial Hygienists (1992) states that workers should not be permitted to work when their deep body temperature exceeds 38°C (100.4°F).
2. **Heat** is a measure of energy in terms of quantity.

3. A **calorie** is the amount of heat required to raise 1 gram of water 1°C (based on a standard temperature of 16.5 to 17.5°C).
4. **Conduction** is the transfer of heat between materials that contact each other. Heat passes from the warmer material to the cooler material. For example, a worker's skin can transfer heat to a contacting surface if that surface is cooler, and vice versa.
5. **Convection** is the transfer of heat in a moving fluid. Air flowing past the body can cool the body if the air temperature is cool. On the other hand, air that exceeds 35°C (95°F) can increase the heat load on the body.
6. **Evaporative cooling** takes place when sweat evaporates from the skin. High humidity reduces the rate of evaporation and thus reduces the effectiveness of the body's primary cooling mechanism.
7. **Radiation** is the transfer of heat energy through space. A worker whose body temperature is greater than the temperature of the surrounding surfaces radiates heat to these surfaces. Hot surfaces and infrared light sources radiate heat that can increase the body's heat load.
8. **Globe temperature** is the temperature inside a blackened, hollow, thin copper globe.
9. **Metabolic heat** is a by-product of the body's activity.
10. **Natural wet bulb (NWB) temperature** is measured by exposing a wet sensor, such as a wet cotton wick fitted over the bulb of a thermometer, to the effects of evaporation and convection. The term natural refers to the movement of air around the sensor.
11. **Dry bulb (DB) temperature** is measured by a thermal sensor, such as an ordinary mercury-in-glass thermometer, that is shielded from direct radiant energy sources.

II. HEAT DISORDERS AND HEALTH EFFECTS.

- A. **HEAT STROKE** occurs when the body's system of temperature regulation fails and body temperature rises to critical levels. This condition is caused by a combination of highly variable factors, and its occurrence is difficult to predict. Heat stroke is a medical emergency. The primary signs and symptoms of heat stroke are confusion; irrational behavior; loss of consciousness; convulsions; a lack of sweating (usually); hot, dry skin; and an abnormally high body temperature, e.g., a rectal temperature of 41°C (105.8°F). If body temperature is too high, it causes death. The elevated metabolic temperatures caused by a combination of work load and environmental heat load, both of which contribute to heat stroke, are also highly variable and difficult to predict.

If a worker shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The worker should be placed in a shady area and the outer clothing should be removed. The worker's skin should be wetted and air movement around the worker should be increased to improve evaporative cooling until professional methods of cooling are initiated and the seriousness of the condition can be assessed. Fluids should be replaced as soon as possible. The medical outcome of an episode of heat stroke depends on the victim's physical fitness and the timing and effectiveness of first aid treatment.

Regardless of the worker's protests, no employee suspected of being ill from heat stroke should be sent home or left unattended unless a physician has specifically approved such an order.

- B. **HEAT EXHAUSTION.** The signs and symptoms of heat exhaustion are headache, nausea, vertigo, weakness, thirst, and giddiness. Fortunately, this condition responds readily to prompt treatment. Heat exhaustion should not be dismissed lightly, however, for several reasons. One is that the fainting associated with heat exhaustion can be dangerous because the victim may be operating machinery or controlling an operation that should not be left unattended; moreover, the victim may be injured when he or she faints. Also, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, a medical emergency.

Workers suffering from heat exhaustion should be removed from the hot environment and given fluid replacement. They should also be encouraged to get adequate rest.

- C. **HEAT CRAMPS** are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. It is important to understand that cramps can be caused by both too much and too little salt. Cramps appear to be caused by the lack of water replenishment. Because sweat is a hypotonic solution ($\pm 0.3\%$ NaCl), excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a guide to the need for water; instead, water must be taken every 15 to 20 minutes in hot environments.

Under extreme conditions, such as working for 6 to 8 hours in heavy protective gear, a loss of sodium may occur. Recent studies have shown that drinking commercially available carbohydrate-electrolyte replacement liquids is effective in minimizing physiological disturbances during recovery.

- D. **HEAT COLLAPSE** ("Fainting"). In heat collapse, the brain does not receive enough oxygen because blood pools in the extremities. As a result, the exposed individual may lose consciousness. This reaction is similar to that of heat exhaustion and does not affect the body's heat balance. However, the onset of heat collapse is rapid and unpredictable. To prevent heat collapse, the worker should gradually become acclimatized to the hot environment.

- E. **HEAT RASHES** are the most common problem in hot work environments. Prickly heat is manifested as red papules and usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to a prickling sensation. Prickly heat occurs in skin that is persistently wetted by unevaporated sweat, and heat rash papules may become infected if they are not treated. In most cases, heat rashes will disappear when the affected individual returns to a cool environment.
- F. **HEAT FATIGUE.** A factor that predisposes an individual to heat fatigue is lack of acclimatization. The use of a program of acclimatization and training for work in hot environments is advisable. The signs and symptoms of heat fatigue include impaired performance of skilled sensorimotor, mental, or vigilance jobs. There is no treatment for heat fatigue except to remove the heat stress before a more serious heat-related condition develops.

III. INVESTIGATION GUIDELINES.

These guidelines for evaluating employee heat stress approximate those found in the 1992-1993 ACGIH publication, *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.*

A. EMPLOYER AND EMPLOYEE INTERVIEWS.

- 1. The inspector will review the OSHA 200 Log and, if possible, the OSHA 101 forms for indications of prior heat stress problems.
- 2. Following are some questions for employer interviews: What type of action, if any, has the employer taken to prevent heat stress problems? What are the potential sources of heat? What employee complaints have been made?
- 3. Following are some questions for employee interviews: What heat stress problems have been experienced? What type of action has the employee taken to minimize heat stress? What is the employer's involvement, i.e., does employee training include information on heat stress? (Appendix III:4-1 lists factors to be evaluated when reviewing a heat stress situation, and Appendix III:4-2 contains a follow-up checklist.)

B. WALKAROUND INSPECTION. During the walkaround inspection, the investigator will: determine building and operation characteristics; determine whether engineering controls are functioning properly; verify information obtained from the employer and employee interviews; and perform temperature measurements and make other determinations to identify potential sources of heat stress. Investigators may wish to discuss any operations that have the potential to cause heat stress with engineers and other knowledgeable personnel. The walkaround inspection should cover all affected areas. Heat sources, such as furnaces, ovens, and boilers, and relative heat load per employee should be noted.

C. WORK-LOAD ASSESSMENT.

- 1. Under conditions of high temperature and heavy workload, the CSHO should determine the work-load category of each job (Table III:4-1 and Figure III:4-1). Work-load category is determined by averaging metabolic rates for the tasks and then ranking them:
 - 1. Light work: up to 200 kcal/hour
 - 2. Medium work: 200-350 kcal/hour
 - 3. Heavy work: 350-500 kcal/hour
- 2. *Cool Rest Area:* Where heat conditions in the rest area are different from those in the work area, the metabolic rate (M) should be calculated using a time-weighted average, as follows:

Equation III: 4-1. Average Metabolic Rate

$$Average_M = \frac{(M_1)(t_1) + (M_2)(t_2) + \dots + (M_n)(t_n)}{(t_1) + (t_2) + \dots + (t_n)}$$

where: M = metabolic rate

t = time in minutes

In some cases, a videotape is helpful in evaluating work practices and metabolic load.

FIGURE III:4-1. ACTIVITY EXAMPLES

- Light hand work: writing, hand knitting
- Heavy hand work: typewriting
- Heavy work with one arm: hammering in nails (shoemaker, upholsterer)
- Light work with two arms: filing metal, planing wood, raking the garden
- Moderate work with the body: cleaning a floor, beating a carpet
- Heavy work with the body: railroad track laying, digging, barking trees

Sample Calculation: Assembly line work using a heavy hand tool

Walking along	2.0 kcal/min
Intermediate value between heavy work with two arms and light work with the body	3.0 kcal/min
Add for basal metabolism	1.0 kcal/min
Total:	6.0 kcal/min

Source: ACGIH 1992.

TABLE III:4-1. ASSESSMENT OF WORK

<i>Body position and movement</i>		<i>kcal/min*</i>	
Sitting		0.3	
Standing		0.6	
Walking		2.0-3.0	
Walking uphill		add 0.8 for every meter (yard) rise	
<i>Type of work</i>		<i>Average kcal/min</i>	<i>Range kcal/min</i>
Hand work			
Light	0.4	0.2-1.2	
Heavy	0.9		
Work: One arm			
Light	1.0	0.7-2.5	
Heavy	1.7		
Work: Both arms			
Light	1.5	1.0-3.5	
Heavy	2.5		
Work: Whole body			
Light	3.5	2.5-15.0	
Moderate	5.0		
Heavy	7.0		
Very heavy	9.0		
* For a "standard" worker of 70 kg body weight (154 lbs) and 1.8m ² body surface (19.4 ft ²).			

Source: ACGIH 1992.

IV. SAMPLING METHODS.

- A. **BODY TEMPERATURE MEASUREMENTS.** Although instruments are available to estimate deep body temperature by measuring the temperature in the ear canal or on the skin, these instruments are not sufficiently reliable to use in compliance evaluations.
- B. **ENVIRONMENTAL MEASUREMENTS.** Environmental heat measurements should be made at, or as close as possible to, the specific work area where the worker is exposed. When a worker is not continuously exposed in a single hot area but moves between two or more areas having different levels of environmental heat, or when the environmental heat varies substantially at a single hot area, environmental heat exposures should be measured for each area and for each level of environmental heat to which employees are exposed.
- C. **WET BULB GLOBE TEMPERATURE INDEX.**

- 1. Wet Bulb Globe Temperature (WBGT) should be calculated using the appropriate formula in [Appendix III:4-2](#). The

WBGT for continuous all-day or several hour exposures should be averaged over a 60-minute period. Intermittent exposures should be averaged over a 120-minute period. These averages should be calculated using the following formula:

Equation III:4-2. Average Web Bulb Globe Temperature (WBGT)

$$Average_{WBGT} = \frac{(WBGT_1)(t_1) + (WBGT_2)(t_2) + \dots + (WBGT_n)(t_n)}{(t_1) + (t_2) + \dots + (t_n)}$$

For indoor and outdoor conditions with no solar load, WBGT is calculated as:

$$WBGT = 0.7NWB + 0.3GT$$

For outdoors with a solar load, WBGT is calculated as

$$WBGT = 0.7NWB + 0.2GT + 0.1DB$$

- where:
- WBGT = Wet Bulb Globe Temperature Index
 - NWB = Nature Wet-Bulb Temperature
 - DB = Dry-Bulb Temperature
 - GT = Globe Temperature

2. The exposure limits in Table III:4-2 are valid for employees wearing light clothing. They must be adjusted for the insulation from clothing that impedes sweat evaporation and other body cooling mechanisms. Use Table III:4-3 to correct Table III:4-2 for various kinds of clothing.
 3. Use of Table III:4-2 requires knowledge of the WBGT and approximate workload. Workload can be estimated using the data in Table III:4-1, and sample calculations are presented in Figure III:4-1.
- D. **MEASUREMENT.** Portable heat stress meters or monitors are used to measure heat conditions. These instruments can calculate both the indoor and outdoor WBGT index according to established ACGIH Threshold Limit Value equations. With this information and information on the type of work being performed, heat stress meters can determine how long a person can safely work or remain in a particular hot environment. See Appendix III:4-2 for an alternate method of calculation.

TABLE III:4-2. PERMISSIBLE HEAT EXPOSURE THRESHOLD LIMIT VALUE

Work/rest regimen	----- Work Load* -----		
	Light	Moderate	Heavy
Continuous work	30.0°C (86°F)	26.7°C (80°F)	25.0°C (77°F)
75% Work, 25% rest, each hour	30.6°C (87°F)	28.0°C (82°F)	25.9°C (78°F)
50% Work, 50% rest, each hour	31.4°C (89°F)	29.4°C (85°F)	27.9°C (82°F)
25% Work, 75% rest, each hour	32.2°C (90°F)	31.1°C (88°F)	30.0°C (86°F)

*Values are in °C and °F, WBGT.

These TLV's are based on the assumption that nearly all acclimatized, fully clothed workers with adequate water and salt intake should be able to function effectively under the given working conditions without exceeding a deep body temperature of 38°C (100.4° F). They are also based on the assumption that the WBGT of the resting place is the same or very close to that of the workplace. Where the WBGT of the work area is different from that of the rest area, a time-weighted average should be used (consult the ACGIH *1992-1993 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* (1992).

These TLV's apply to physically fit and acclimatized individuals wearing light summer clothing. If heavier clothing that impedes sweat or has a higher insulation value is required, the permissible heat exposure TLV's in Table III:4-2 must be reduced by the corrections shown in Table III:4-3.

Source: ACGIH 1992.

E. OTHER THERMAL STRESS INDICES.

1. The Effective Temperature index (ET) combines the temperature, the humidity of the air, and air velocity. This index has been used extensively in the field of comfort ventilation and air-conditioning. ET remains a useful measurement technique in mines and other places where humidity is high and radiant heat is low.
2. The Heat-Stress Index (HSI) was developed by Belding and Hatch in 1965. Although the HSI considers all environmental factors and work rate, it is not completely satisfactory for determining an individual worker's heat stress and is also difficult to use.

TABLE III:4-3. WBGT CORRECTION FACTORS IN °C

Clothing type	Clo* value	WBGT correction
Summer lightweight working clothing	0.6	0
Cotton coveralls	1.0	-2
Winter work clothing	1.4	-4
Water barrier, permeable	1.2	-6

*Clo: Insulation value of clothing. One clo = 5.55 kcal/m²/hr of heat exchange by radiation and convection for each degree °C difference in temperature between the skin and the adjusted dry bulb temperature.

Note: Deleted from the previous version are trade names and "fully encapsulating suit, gloves, boots and hood" including its clo value of 1.2 and WBGT correction of -10.

Source: ACGIH 1992.

V. CONTROL.

Ventilation, air cooling, fans, shielding, and insulation are the five major types of engineering controls used to reduce heat stress in hot work environments. Heat reduction can also be achieved by using power assists and tools that reduce the physical demands placed on a worker.

However, for this approach to be successful, the metabolic effort required for the worker to use or operate these devices must be less than the effort required without them. Another method is to reduce the effort necessary to operate power assists. The worker should be allowed to take frequent rest breaks in a cooler environment.

A. ACCLIMATIZATION.

1. The human body can adapt to heat exposure to some extent. This physiological adaptation is called acclimatization. After a period of acclimatization, the same activity will produce fewer cardiovascular demands. The worker will sweat more efficiently (causing better evaporative cooling), and thus will more easily be able to maintain normal body temperatures.
2. A properly designed and applied acclimatization program decreases the risk of heat-related illnesses. Such a program basically involves exposing employees to work in a hot environment for progressively longer periods. NIOSH (1986) says that, for workers who have had previous experience in jobs where heat levels are high enough to produce heat stress, the regimen should be 50% exposure on day one, 60% on day two, 80% on day three, and 100% on day four. For new workers who will be similarly exposed, the regimen should be 20% on day one, with a 20% increase in exposure each additional day.

B. FLUID REPLACEMENT. Cool (50°-60°F) water or any cool liquid (except alcoholic beverages) should be made available to workers to encourage them to drink small amounts frequently, e.g., one cup every 20 minutes. Ample supplies of liquids should be placed close to the work area. Although some commercial replacement drinks contain salt, this is not necessary for acclimatized individuals because most people add enough salt to their summer diets.

C. ENGINEERING CONTROLS.

1. **General ventilation** is used to dilute hot air with cooler air (generally cooler air that is brought in from the outside). This technique clearly works better in cooler climates than in hot ones. A permanently installed ventilation system usually handles large areas or entire buildings. Portable or local exhaust systems may be more effective or practical in smaller areas.
2. **Air treatment/air cooling** differs from ventilation because it reduces the temperature of the air by removing heat (and sometimes humidity) from the air.
3. **Air conditioning** is a method of air cooling, but it is expensive to install and operate. An alternative to air conditioning is the use of chillers to circulate cool water through heat exchangers over which air from the ventilation system is then passed; chillers are more efficient in cooler climates or in dry climates where

evaporative cooling can be used.

4. **Local air cooling** can be effective in reducing air temperature in specific areas. Two methods have been used successfully in industrial settings. One type, cool rooms, can be used to enclose a specific workplace or to offer a recovery area near hot jobs. The second type is a portable blower with built-in air chiller. The main advantage of a blower, aside from portability, is minimal set-up time.
5. Another way to reduce heat stress is to increase the air flow or **convection** using fans, etc. in the work area (as long as the air temperature is less than the worker's skin temperature). Changes in air speed can help workers stay cooler by increasing both the convective heat exchange (the exchange between the skin surface and the surrounding air) and the rate of evaporation. Because this method does not actually cool the air, any increases in air speed must impact the worker directly to be effective.

If the dry bulb temperature is higher than 35°C (95°F), the hot air passing over the skin can actually make the worker hotter. When the temperature is more than 35°C and the air is dry, evaporative cooling may be improved by air movement, although this improvement will be offset by the convective heat. When the temperature exceeds 35°C and the relative humidity is 100%, air movement will make the worker hotter. Increases in air speed have no effect on the body temperature of workers wearing vapor-barrier clothing.

6. **Heat conduction** methods include insulating the hot surface that generates the heat and changing the surface itself.
7. Simple engineering controls, such as shields, can be used to reduce radiant **heat**, i.e. heat coming from hot surfaces within the worker's line of sight. Surfaces that exceed 35°C (95°F) are sources of infrared radiation that can add to the worker's heat load. Flat black surfaces absorb heat more than smooth, polished ones. Having cooler surfaces surrounding the worker assists in cooling because the worker's body radiates heat toward them.

With some sources of radiation, such as heating pipes, it is possible to use both insulation and surface modifications to achieve a substantial reduction in radiant heat. Instead of reducing radiation from the source, shielding can be used to interrupt the path between the source and the worker. Polished surfaces make the best barriers, although special glass or metal mesh surfaces can be used if visibility is a problem.

Shields should be located so that they do not interfere with air flow, unless they are also being used to reduce convective heating. The reflective surface of the shield should be kept clean to maintain its effectiveness.

D. ADMINISTRATIVE CONTROLS AND WORK PRACTICES.

1. Training is the key to good work practices. Unless all employees understand the reasons for using new, or changing old, work practices, the chances of such a program succeeding are greatly reduced.
2. NIOSH (1986) states that a good heat stress training program should include at least the following components:
 - Knowledge of the hazards of heat stress;
 - Recognition of predisposing factors, danger signs, and symptoms;
 - Awareness of first-aid procedures for, and the potential health effects of, heat stroke;
 - Employee responsibilities in avoiding heat stress;
 - Dangers of using drugs, including therapeutic ones, and alcohol in hot work environments;
 - Use of protective clothing and equipment; and
 - Purpose and coverage of environmental and medical surveillance programs and the advantages of worker participation in such programs.
3. Hot jobs should be scheduled for the cooler part of the day, and routine maintenance and repair work in hot areas should be scheduled for the cooler seasons of the year.

E. WORKER MONITORING PROGRAMS.

1. Every worker who works in extraordinary conditions that increase the risk of heat stress should be personally monitored. These conditions include wearing semipermeable or impermeable clothing when the temperature exceeds 21°C (69.8°F), working at extreme metabolic loads (greater than 500 kcal/hour), etc.
2. Personal monitoring can be done by checking the heart rate, recovery heart rate, oral temperature, or extent of body water loss.
3. To check the heart rate, count the radial pulse for 30 seconds at the beginning of the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work period by one third and maintain the same rest period.
4. The recovery heart rate can be checked by comparing the pulse rate taken at 30 seconds (P_1) with the pulse rate taken at 2.5 minutes (P_2) after the rest break starts. The two pulse rates can be interpreted using Table III:4-4.
5. Oral temperature can be checked with a clinical thermometer after work but before the employee drinks water. If the oral temperature taken under the tongue exceeds 37.6°C, shorten the next work cycle by one third.
6. Body water loss can be measured by weighing the worker on a scale at the beginning and end of each work day.

The worker's weight loss should not exceed 1.5% of total body weight in a work day. If a weight loss exceeding this amount is observed, fluid intake should increase.

F. **OTHER ADMINISTRATIVE CONTROLS.** The following administrative controls can be used to reduce heat stress:

- Reduce the physical demands of work, e.g., excessive lifting or digging with heavy objects;
- Provide recovery areas, e.g., air-conditioned enclosures and rooms;
- Use shifts, e.g., early morning, cool part of the day, or night work;
- Use intermittent rest periods with water breaks;
- Use relief workers;
- Use worker pacing; and
- Assign extra workers and limit worker occupancy, or the number of workers present, especially in confined or enclosed spaces.

TABLE III:4-4. HEART RATE RECOVERY CRITERIA

Heart rate recovery pattern	P ₃	Difference between P ₁ and P ₃
Satisfactory recovery	<90	--
High recovery (Conditions may require further study)	90	10
No recovery (May indicate too much stress)	90	<10

VI. **PERSONAL PROTECTIVE EQUIPMENT.**

A. **REFLECTIVE CLOTHING**, which can vary from aprons and jackets to suits that completely enclose the worker from neck to feet, can stop the skin from absorbing radiant heat. However, since most reflective clothing does not allow air exchange through the garment, the reduction of radiant heat must more than offset the corresponding loss in evaporative cooling. For this reason, reflective clothing should be worn as loosely as possible. In situations where radiant heat is high, auxiliary cooling systems can be used under the reflective clothing.

B. **AUXILIARY BODY COOLING.**

1. Commercially available **ice vests**, though heavy, may accommodate as many as 72 ice packets, which are usually filled with water. Carbon dioxide (dry ice) can also be used as a coolant. The cooling offered by ice packets lasts only 2 to 4 hours at moderate to heavy heat loads, and frequent replacement is necessary. However, ice vests do not encumber the worker and thus permit maximum mobility. Cooling with ice is also relatively inexpensive.
2. **Wetted clothing** is another simple and inexpensive personal cooling technique. It is effective when reflective or other impermeable protective clothing is worn. The clothing may be wetted terry cloth coveralls or wetted two-piece, whole-body cotton suits. This approach to auxiliary cooling can be quite effective under conditions of high temperature and low humidity, where evaporation from the wetted garment is not restricted.
3. **Water-cooled garments** range from a hood, which cools only the head, to vests and "long johns," which offer partial or complete body cooling. Use of this equipment requires a battery-driven circulating pump, liquid-ice coolant, and a container.

Although this system has the advantage of allowing wearer mobility, the weight of the components limits the amount of ice that can be carried and thus reduces the effective use time. The heat transfer rate in liquid cooling systems may limit their use to low-activity jobs; even in such jobs, their service time is only about 20 minutes per pound of cooling ice. To keep outside heat from melting the ice, an outer insulating jacket should be an integral part of these systems.

4. **Circulating air** is the most highly effective, as well as the most complicated, personal cooling system. By directing compressed air around the body from a supplied air system, both evaporative and convective cooling are improved. The greatest advantage occurs when circulating air is used with impermeable garments or double cotton overalls.

One type, used when respiratory protection is also necessary, forces exhaust air from a supplied-air hood ("bubble hood") around the neck and down inside an impermeable suit. The air then escapes through openings in the suit. Air can also be supplied directly to the suit without using a hood in three ways:

- by a single inlet;
- by a distribution tree; or
- by a perforated vest.

In addition, a vortex tube can be used to reduce the temperature of circulating air. The cooled air from this tube can be introduced either under the clothing or into a bubble hood. The use of a vortex tube separates the air stream into a hot and cold stream; these tubes also can be used to supply heat in cold climates. Circulating air, however, is noisy and requires a constant source of compressed air supplied through an attached air hose.

One problem with this system is the limited mobility of workers whose suits are attached to an air hose. Another is that of getting air to the work area itself. These systems should therefore be used in work areas where workers are not required to move around much or to climb. Another concern with these systems is that they can lead to dehydration. The cool, dry air feels comfortable and the worker may not realize that it is important to drink liquids frequently.

- C. **RESPIRATOR USAGE.** The weight of a self-contained breathing apparatus (SCBA) increases stress on a worker, and this stress contributes to overall heat stress. Chemical protective clothing such as totally encapsulating chemical protection suits will also add to the heat stress problem.

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APPENDIX III:4-1. HEAT STRESS: GENERAL WORKPLACE REVIEW.

NOTE: Listed below are sample questions that the Compliance Officer may wish to consider when investigating heat stress in the workplace.

WORKPLACE DESCRIPTION.

- A. Type of business
- B. Heat-producing equipment or processes used
- C. Previous history (if any) of heat-related problems
- D. At "hot" spots:
 - Is the heat steady or intermittent?
 - Number of employees exposed?
 - For how many hours per day?
 - Is potable water available?
 - Are supervisors trained to detect/evaluate heat stress symptoms?

ARE EXPOSURES TYPICAL FOR A WORKPLACE IN THIS INDUSTRY?

- A. Weather at Time of Review
- B. Temperature
- C. Humidity
- D. Air velocity
- E. Is Day Typical of Recent Weather Conditions?
(Get information from the Weather Bureau)
- F. Heat-Reducing Engineering Controls

- G. Ventilation in place?
- H. Ventilation operating?
- I. Air conditioning in place?
- J. Air conditioning operating?
- K. Fans in place?
- L. Fans operating?
- M. Shields or insulation between sources and employees?
- N. Are reflective faces of shields clean?

WORK PRACTICES TO DETECT, EVALUATE, AND PREVENT OR REDUCE HEAT STRESS.

- A. Training program?
- B. Content?
- C. Where given?
- D. For whom?
- E. Liquid replacement program?
- F. Acclimatization program?
- G. Work/rest schedule?
- H. Scheduling of work (during cooler parts of shift, cleaning and maintenance during shut-downs, etc.)
- I. Cool rest areas (including shelter at outdoor work sites)?
- J. Heat monitoring program?
- K. Personal Protective Equipment
- L. Reflective clothing in use?
- M. Ice and/or water-cooled garments in use?
- N. Wetted undergarments (used with reflective or impermeable clothing) in use?
- O. Circulating air systems in use?
- P. First Aid Program
- Q. Trained personnel?
- R. Provision for rapid cool-down?
- S. Procedures for getting medical attention?
- T. Transportation to medical facilities readily available for heat stroke victims?
- U. Medical Screening and Surveillance Program
- V. Content?
- W. Who manages program?
- X. Additional Comments

(Use additional pages as needed.)

APPENDIX III: 4-2. HEAT STRESS-RELATED ILLNESS OR ACCIDENT FOLLOW-UP.

- A. Describe events leading up to the episode.
- B. Evaluation/comments by other workers at the scene.
- C. Work at time of episode (heavy, medium, light)?
- D. How long was affected employee working at site prior to episode?
- E. Medical history of affected worker, if known.
- F. Appropriate engineering controls in place?
- G. Appropriate engineering controls in operation?
- H. Appropriate work practices used by affected employee(s)?
- I. Appropriate personal protective equipment available?
- J. Appropriate personal protective equipment in use?
- K. Medical screening for heat stress and continued surveillance for signs of heat stress given other employees?
- L. Additional comments regarding specific episode(s): (Use additional pages as needed.)

APPENDIX III: 4-3. MEASUREMENT OF WET BULB GLOBE TEMPERATURE.

Measurement is often required of those environmental factors that most nearly correlate with deep body temperature and other physiological responses to heat. At the present time, the Wet Bulb Globe Temperature Index (WBGT) is the most used technique to measure these environmental factors. WBGT values are calculated by the following equations:

Equation III:4-4. Indoor or Outdoor Wet Bulb Globe Temperature Indexes (WBGI) Indoor or outdoors with no solar load

$$WBGT = 0.7NWB + 0.3GT$$

Outdoors with solar load

$$WBGT = 0.7NWB + 0.2GT + 0.1DB$$

where: WBGT = Wet Bulb Globe Temperature Index
 NWB = Natural Wet-Bulb Temperature
 DB = Dry-Bulb (air) Temperature
 GT = Globe Thermometer Temperature

The determination of WBGT requires the use of a black globe thermometer, a natural (static) wet-bulb thermometer, and a dry-bulb thermometer. The measurement of environmental factors shall be performed as follows:

1. The range of the dry and the natural wet-bulb thermometers should be -5°C to $+50^{\circ}\text{C}$, with an accuracy of $\pm 0.5^{\circ}\text{C}$. The dry bulb thermometer must be shielded from the sun and the other radiant surfaces of the environment without restricting the airflow around the bulb. The wick of the natural wet bulb thermometer should be kept wet with distilled water for at least one-half hour before the temperature reading is made. It is not enough to immerse the other end of the wick into a reservoir of distilled water and wait until the whole wick becomes wet by capillarity. The wick must be wetted by direct application of water from a syringe one-half hour before each reading. The wick must cover the bulb of the thermometer and an equal length of additional wick must cover the stem above the bulb. The wick should always be clean, and new wicks should be washed before using.
2. A globe thermometer, consisting of a 15 cm (6-inch) in diameter hollow copper sphere painted on the outside with a matte black finish, or equivalent, must be used. The bulb or sensor of a thermometer (range -5°C to $+100^{\circ}\text{C}$ with an accuracy of $\pm 0.5^{\circ}\text{C}$) must be fixed in the center of the sphere. The globe thermometer should be exposed at least 25 minutes before it is read.
3. A stand should be used to suspend the three thermometers so that they do not restrict free air flow around the bulbs and the wet-bulb and globe thermometer are not shaded.
4. It is permissible to use any other type of temperature sensor that gives a reading similar to that of a mercury thermometer under the same conditions.
5. The thermometers must be placed so that the readings are representative of the employee's work or rest areas, as appropriate.

Once the WBGT has been estimated, employers can estimate workers' metabolic heat load (see Tables III:4-1 and III:4-2) and use the ACGIH method to determine the appropriate work/rest regimen, clothing, and equipment to use to control the heat exposures of workers in their facilities.

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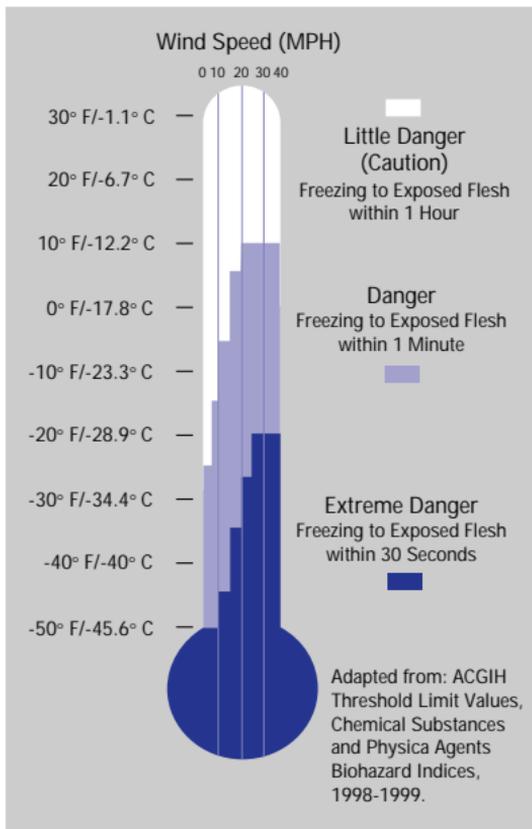
Cold Stress Guidelines

THE COLD STRESS EQUATION

LOW TEMPERATURE + WIND SPEED + WETNESS = INJURIES & ILLNESS

When the body is unable to warm itself, serious cold-related illnesses and injuries may occur, and permanent tissue damage and death may result.

Hypothermia can occur when *land temperatures* are **above** freezing or *water temperatures* are below 98.6°F/37°C. Cold-related illnesses can slowly overcome a person who has been chilled by low temperatures, brisk winds, or wet clothing.



FROST BITE

What Happens to the Body:

FREEZING IN DEEP LAYERS OF SKIN AND TISSUE; PALE, WAXY-WHITE SKIN COLOR; SKIN BECOMES HARD and NUMB; USUALLY AFFECTS THE FINGERS, HANDS, TOES, FEET, EARS, and NOSE.

What Should Be Done: (land temperatures)

- Move the person to a warm dry area. Don't leave the person alone.
- Remove any wet or tight clothing that may cut off blood flow to the affected area.
- **DO NOT** rub the affected area, because rubbing causes damage to the skin and tissue.
- **Gently** place the affected area in a warm (105°F) water bath and monitor the water temperature to **slowly** warm the tissue. Don't pour warm water directly on the affected area because it will warm the tissue too fast causing tissue damage. Warming takes about 25-40 minutes.
- After the affected area has been warmed, it may become puffy and blister. The affected area may have a burning feeling or numbness. When normal feeling, movement, and skin color have returned, the affected area should be dried and wrapped to keep it warm. **NOTE:** If there is a chance the affected area may get cold again, do not warm the skin. If the skin is warmed and then becomes cold again, it will cause severe tissue damage.
- Seek medical attention as soon as possible.

HYPOTHERMIA - (Medical Emergency)

What Happens to the Body:

NORMAL BODY TEMPERATURE (98.6°F/37°C) DROPS TO OR BELOW 95°F (35°C); FATIGUE OR DROWSINESS; UNCONTROLLED SHIVERING; COOL BLUISH SKIN; SLURRED SPEECH; CLUMSY MOVEMENTS; IRRITABLE, IRRATIONAL OR CONFUSED BEHAVIOR.

What Should Be Done: (land temperatures)

- Call for emergency help (i.e., Ambulance or Call 911).
- Move the person to a warm, dry area. Don't leave the person alone. Remove any wet clothing and replace with warm, dry clothing or wrap the person in blankets.
- Have the person drink warm, sweet drinks (sugar water or sports-type drinks) if they are alert. **Avoid drinks with caffeine** (coffee, tea, or hot chocolate) or alcohol.
- Have the person move their arms and legs to create muscle heat. If they are unable to do this, place warm bottles or hot packs in the arm pits, groin, neck, and head areas. **DO NOT** rub the person's body or place them in warm water bath. This may stop their heart.

What Should Be Done: (water temperatures)

- Call for emergency help (Ambulance or Call 911). Body heat is lost up to 25 times faster in water.
- **DO NOT** remove any clothing. Button, buckle, zip, and tighten any collars, cuffs, shoes, and hoods because the layer of trapped water closest to the body provides a layer of insulation that slows the loss of heat. Keep the head out of the water and put on a hat or hood.
- Get out of the water as quickly as possible or climb on anything floating. **DO NOT** attempt to swim unless a floating object or another person can be reached because swimming or other physical activity uses the body's heat and reduces survival time by about 50 percent.
- If getting out of the water is not possible, wait quietly and conserve body heat by folding arms across the chest, keeping thighs together, bending knees, and crossing ankles. If another person is in the water, huddle together with chests held closely.

How to Protect Workers

- Recognize the environmental and workplace conditions that lead to potential cold-induced illnesses and injuries.
- Learn the signs and symptoms of cold-induced illnesses/injuries and what to do to help the worker.
- Train the workforce about cold-induced illnesses and injuries.
- Select proper clothing for cold, wet, and windy conditions. Layer clothing to adjust to changing environmental temperatures. Wear a hat and gloves, in addition to underwear that will keep water away from the skin (polypropylene).
- Take frequent short breaks in warm dry shelters to allow the body to warm up.
- Perform work during the warmest part of the day.
- Avoid exhaustion or fatigue because energy is needed to keep muscles warm.
- Use the buddy system (work in pairs).
- Drink warm, sweet beverages (sugar water, sports-type drinks). Avoid drinks with caffeine (coffee, tea, or hot chocolate) or alcohol.
- Eat warm, high-calorie foods like hot pasta dishes.

Workers Are at Increased Risk When...

- They have predisposing health conditions such as cardiovascular disease, diabetes, and hypertension.
- They take certain medication (check with your doctor, nurse, or pharmacy and ask if any medicines you are taking affect you while working in cold environments).
- They are in poor physical condition, have a poor diet, or are older.

Excavation Check List and Procedures

Daily Excavation Safety Checklist

Company		Date	
Project Name		Approx. Temp.	
Project Location		Approx. Wind Dir.	
Job Number		Safety Rep	
Excavation Depth & Width		Soil Classification	
Protective System Used			
Activities In Excavation			
Competent Person			

Excavation > 4 feet deep? ___ Yes ___ No If **YES**, fill out a Confined Space Permit **PRIOR** to **ANY** person entering the excavation.

NOTE: Trenches over 4 feet in depth are considered excavations. Any items marked **NO** on this form **MUST** be remediated prior to any employees entering the excavation.

YES	NO	N/A	DESCRIPTION
GENERAL			
			Employees protected from cave-ins & loose rock/soil that could roll into the excavation
			Spoils, materials & equipment set back at least 2 feet from the edge of the excavation.
			Engineering designs for sheeting &/or manufacturer's data on trench box capabilities on site
			Adequate signs posted and barricades provided
			Training (toolbox meeting) conducted w/ employees prior to entering excavation

YES	NO	N/A	DESCRIPTION
UTILITIES			
			Utility company contacted & given 24 hours notice &/or utilities already located & marked
			Overhead lines located, noted and reviewed with the operator
			Utility locations reviewed with the operator, & precautions taken to ensure contact does not occur
			Utilities crossing the excavation supported, and protected from falling materials
			Underground installations protected, supported or removed when excavation is open
WET CONDITIONS			
			Precautions taken to protect employees from water accumulation (continuous dewatering)
			Surface water or runoff diverted /controlled to prevent accumulation in the excavation
			Inspection made after every rainstorm or other hazard increasing occurrence
HAZARDOUS ATMOSPHERES			
			Air in the excavation tested for oxygen deficiency, combustibles, other contaminants
			Ventilation used in atmospheres that are oxygen rich/deficient &/or contains hazardous substances
			Ventilation provided to keep LEL below 10 %
			Emergency equipment available where hazardous atmospheres could or do exist
			Safety harness and lifeline used
			Supplied air necessary (if yes, contact safety department)

YES	NO	N/A	DESCRIPTION
ENTRY & EXIT			
			Exit (i.e. ladder, sloped wall) no further than 25 feet from ANY employee
			Ladders secured and extend 3 feet above the edge of the trench
			Wood ramps constructed of uniform material thickness, cleated together @ the bottom
			Employees protected from cave-ins when entering or exiting the excavation

Keep 1 copy of each daily excavation checklist on site for the project duration, and forward the original to the safety director

Medical Surveillance Program

MEDICAL DATA SHEET

This form must be completed by all on-site personnel prior to the commencement of activities, and shall be kept by the Site Health and Safety Officer during site activities. This form must be delivered to any attending physician when medical assistance is needed.

(This form should be typed or printed legibly.)

Site: _____

Name: _____ Home Telephone: _____
(Area Code/Telephone Number)

Address: _____

Date of Birth: _____ Height: _____ Weight: _____

Emergency Contact: _____ Telephone: _____
(Area Code/Telephone Number)

Drug Allergies or Other Allergies: _____

Previous Illnesses or Exposures to Hazardous Substances: _____

Current Medication (Prescription and Non-Prescription): _____

Medical Restrictions: _____

Name, Address and Telephone Number of Person Physician: _____

Example Decontamination Station Layout

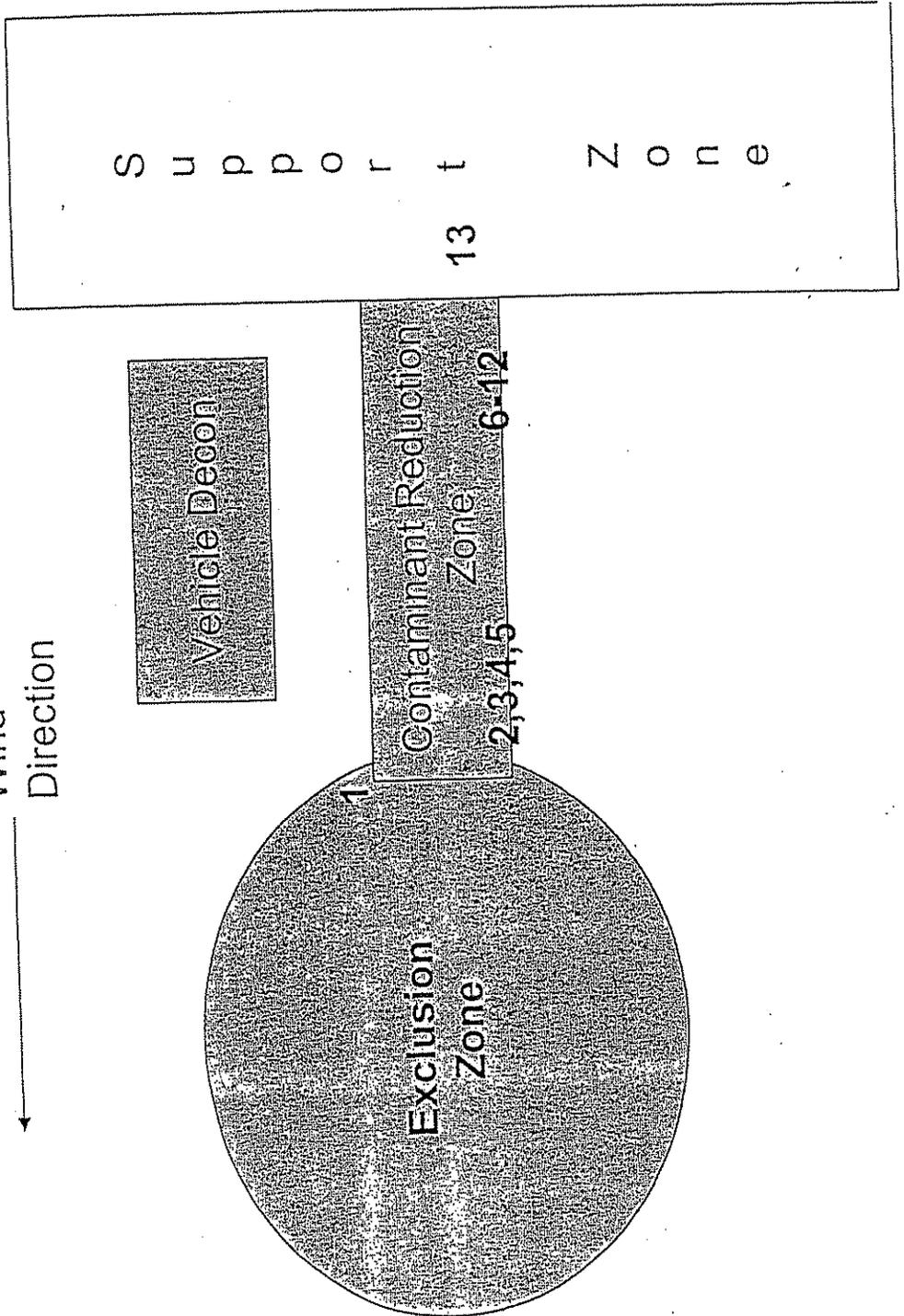
TABLE I

PERSONNEL DECONTAMINATION PLAN

Step 1	Segregated Equipment Drop
Step 2	Cover Boot and Glove Wash
Step 3	Cover Boot and Glove Rinse
Step 4	Cover Boot Removal
Step 5	Cover Glove Removal
	- - - - -HOTLINE- - - - -
Step 6	Suit and Boot Wash - Disposable
Step 7	Suit and Boot Rinse - Disposable
Step 8	Suit Removal
Step 9	Boot Removal
Step 10	Respirator Removal
Step 11	Inner Glove Wash and Rinse
Step 12	Inner Clothing Removal
Step 13	Re-Dress

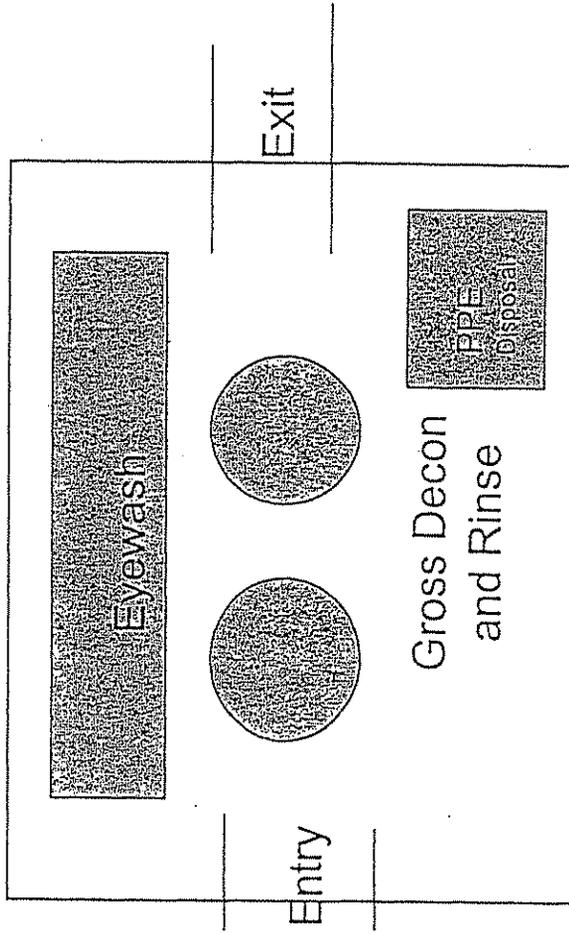
Decontamination Plan

Wind
Direction



Decontamination

Basic Personnel Decontamination Station



Accident Investigation Report

ACCIDENT REPORT

Joe Gentile, Corporate Health and Safety Manager

Cell: (610) 844-6911; Office: (856) 423-8800; Office FAX: (856) 423-3220; Home: (484) 373-0953

PART 1: ADMINISTRATIVE INFORMATION

Project #: _____ Project Name: _____ Project Location (street address/city/state): _____ _____ Client Corporate Name / Contact / Address / Phone #: _____ _____ _____ _____ _____	Immediate Verbal Notifications Given To: Corporate Health & Safety <input type="checkbox"/> Yes <input type="checkbox"/> No Office Health & Safety <input type="checkbox"/> Yes <input type="checkbox"/> No Office Manager <input type="checkbox"/> Yes <input type="checkbox"/> No Project Principal <input type="checkbox"/> Yes <input type="checkbox"/> No Project Manager <input type="checkbox"/> Yes <input type="checkbox"/> No Client Contact <input type="checkbox"/> Yes <input type="checkbox"/> No	REPORT STATUS (time due): <input type="checkbox"/> Initial (24 hr) <input type="checkbox"/> Final (5-10 days) Date: _____ Date: _____ Accident Report Delivered To: Corporate Health & Safety <input type="checkbox"/> Yes <input type="checkbox"/> No Office Health & Safety <input type="checkbox"/> Yes <input type="checkbox"/> No Office Manager <input type="checkbox"/> Yes <input type="checkbox"/> No Project Principal <input type="checkbox"/> Yes <input type="checkbox"/> No Project Manager <input type="checkbox"/> Yes <input type="checkbox"/> No
REPORT TYPE: <input type="checkbox"/> Loss <input type="checkbox"/> Near Loss Estimated Costs: \$ _____		
OSHA CASE # Assigned by Corporate Health & Safety if Applicable: _____		Corporate Health & Safety Confirmed Final Accident Report <input type="checkbox"/> Yes <input type="checkbox"/> No
DATE OF INCIDENT: _____	TIME INCIDENT OCCURRED: _____ <input type="checkbox"/> AM <input type="checkbox"/> PM	INCIDENT LOCATION – City, State, and Country (If outside U.S.A.) _____

INCIDENT TYPES: (Select most appropriate if Loss occurred.)
 From lists below, please select the option that best categories the incident. When selecting an injury or illness, also indicate the severity level.

<input type="checkbox"/> INJURY -----Severity Level----- <input type="checkbox"/> Fatality <input type="checkbox"/> First Aid <input type="checkbox"/> Medical <input type="checkbox"/> Restricted Work <input type="checkbox"/> Lost Time Treatment	<input type="checkbox"/> ILLNESS OTHER INCIDENT TYPES <input type="checkbox"/> Spill / Release <input type="checkbox"/> Misdirected Waste <input type="checkbox"/> Consent Order <input type="checkbox"/> NOV Material involved: _____ Quantity (U.S. Gallons): _____ <input type="checkbox"/> Property Damage <input type="checkbox"/> Exceedance <input type="checkbox"/> Motor Vehicle <input type="checkbox"/> Fine / Penalty
---	---

ACTIVITY TYPE (Check most appropriate one.) <input type="checkbox"/> Decommissioning <input type="checkbox"/> Geoprobe <input type="checkbox"/> Sampling <input type="checkbox"/> Demolition <input type="checkbox"/> Motor Vehicle <input type="checkbox"/> System Start-up <input type="checkbox"/> Dewatering <input type="checkbox"/> Operations/ <input type="checkbox"/> Trenching <input type="checkbox"/> Drilling Maintenance <input type="checkbox"/> AST/UST Removal <input type="checkbox"/> Excavation <input type="checkbox"/> Pump/Pilot Test <input type="checkbox"/> Other _____ <input type="checkbox"/> Gauging <input type="checkbox"/> Rigging/Lifting	INJURY TYPE (Check all applicable.) <input type="checkbox"/> Abrasion <input type="checkbox"/> Occupational Illness <input type="checkbox"/> Amputation <input type="checkbox"/> Puncture <input type="checkbox"/> Burn <input type="checkbox"/> Rash <input type="checkbox"/> Cold/Heat Stress <input type="checkbox"/> Repetitive Motion <input type="checkbox"/> Inflammation <input type="checkbox"/> Sprain/Strain <input type="checkbox"/> Laceration <input type="checkbox"/> Other _____	BODY PART AFFECTED (Check all applicable.) <input type="checkbox"/> Respiratory <input type="checkbox"/> Shoulder <input type="checkbox"/> Face <input type="checkbox"/> Neck <input type="checkbox"/> Arm <input type="checkbox"/> Leg <input type="checkbox"/> Chest <input type="checkbox"/> Wrist <input type="checkbox"/> Knee <input type="checkbox"/> Abdomen <input type="checkbox"/> Hand/Fingers <input type="checkbox"/> Ankle <input type="checkbox"/> Groin <input type="checkbox"/> Eye <input type="checkbox"/> Foot/Toes <input type="checkbox"/> Back <input type="checkbox"/> Head <input type="checkbox"/> Other _____
---	---	--

I. PERSON(S) DIRECTLY / INDIRECTLY INVOLVED IN INCIDENT (Attach additional information as necessary/applicable.)

Name/Phone # of Each Person Directly/Indirectly Involved in Incident:	Designate: Roux/Remedial Employee Roux/Remedial Subcontractor Client Employee Client Contractor Third Party	As applicable, Current Occupation; Yrs in Current Occupation; Current Position; and Yrs in Current Position:	As applicable, Employer Name; Address; and Phone #:	As applicable, Supervisor Name; and Phone #:
1)				
2)				

II. PERSONS INJURED IN INCIDENT (Attach additional information as necessary/applicable.)

Name/Phone # of Each Person Injured in Incident:	Designate: Roux/Remedial Employee Roux/Remedial Subcontractor Client Employee Client Contractor Third Party	As applicable, Current Occupation; Yrs in Current Occupation; Current Position; and Yrs in Current Position:	As applicable, Employer Name; Address; and Phone #:	As applicable, Supervisor Name; and Phone #:	Description of Injury:
1)					
2)					

III. PROPERTY DAMAGED IN INCIDENT (Attach additional information as necessary/applicable.)

Property Damaged:	Property Location:	Owner Name, Address & Phone #:	Description of Damage:	Estimated Cost:
1)				\$

Accident Report – Page 2

2)				\$
----	--	--	--	----

IV. WITNESSES TO INCIDENT (Attach additional information as necessary/applicable.)

Witness Name:	Address:	Phone #:
1)		
2)		

PART 2: WHAT HAPPENED AND INCIDENT DETAILS

PROVIDE FACTUAL DESCRIPTION OF INCIDENT (e.g., describe loss/near loss, injury, response / treatment).

I. AUTHORITIES/GOVERNMENTAL AGENCIES NOTIFIED (Attach additional information as necessary/applicable.)

Authority/Agency Notified:	Name/Phone #/Fax # of Person Notified:	Address of Person Notified:	Date & Time of Notification:	Exact Information Reported/Provided:

II. PUBLIC RESPONSES TO INCIDENT (if applicable)

Response/Inquiry By: (check one)	Entity Name:	Name/Phone # of Respondent/ Inquirer:	Address of Entity/Person:	Date & Time of Response/Inquiry:
<input type="checkbox"/> Newspaper <input type="checkbox"/> Television <input type="checkbox"/> Community Group <input type="checkbox"/> Neighbors <input type="checkbox"/> Other				

Describe Response/Inquiry:

Roux/Remedial Response:

(Check all that apply.) (Attach photos, drawings, etc. to help illustrate the incident.)

ATTACHED INFORMATION: Photo Sketches Vehicle Acord Form Police Report Other

Name(s) of person(s) who prepared Initial and Final Report:	Title(s):	Phone number(s):

PART 3: INVESTIGATION TEAM ANALYSIS

CONCLUSION: WHY IT HAPPENED (LIST CAUSAL FACTORS AND CORRESPONDING ROOT CAUSES)

(Root Causes: Lack of knowledge or skill, Doing the task according to procedures or acceptable practices takes more time or effort, Short-cuts or not following acceptable practices is reinforced or tolerated, Not following procedures or acceptable practices did not result in an accident, Lack of or inadequate procedures, Inadequate communications of expectations regarding procedures or acceptable practices, Inadequate tools or equipment, External Factors)

ROOT CAUSE(S) AND SOLUTION(S): HOW TO PREVENT INCIDENT FROM RECURRING

CAUSAL FACTOR	ROOT CAUSE	SOLUTION(S) [Must Match Root Cause(s)]		PERSON RESPONSIBLE	AGREED DUE DATE	ACTUAL COMPLETION DATE
		#	Solution(s)			
		1				
		2				
		3				

INVESTIGATION TEAM:

PRINT NAME	JOB POSITION	DATE	SIGNATURE

No One Gets Hurt!

Accident/Incident Report
OSHA 3000

OSHA

Forms for Recording Work-Related Injuries and Illnesses

Dear Employer:

This booklet includes the forms needed for maintaining occupational injury and illness records for 2004. These new forms have changed in several important ways from the 2003 recordkeeping forms.

In the December 17, 2002 Federal Register (67 FR 77165-77170), OSHA announced its decision to add an occupational hearing loss column to OSHA's Form 300, Log of Work-Related Injuries and Illnesses. This forms package contains modified Forms 300 and 300A which incorporate the additional column M(5) Hearing Loss. Employers required to complete the injury and illness forms must begin to use these forms on January 1, 2004.

In response to public suggestions, OSHA also has made several changes to the forms package to make the recordkeeping materials clearer and easier to use:

- On Form 300, we've switched the positions of the day count columns. The days "away from work" column now comes before the days "on job transfer or restriction."
- We've clarified the formulas for calculating incidence rates.
- We've added new recording criteria for occupational hearing loss to the "Overview" section.
- On Form 300, we've made the column heading "Classify the Case" more prominent to make it clear that employers should mark only one selection among the four columns offered.

The Occupational Safety and Health Administration shares with you the goal of preventing injuries and illnesses in our nation's workplaces. Accurate injury and illness records will help us achieve that goal.

*Occupational Safety and Health Administration
U.S. Department of Labor*

What's Inside...

In this package, you'll find everything you need to complete OSHA's *Log* and the *Summary of Work-Related Injuries and Illnesses* for the next several years. On the following pages, you'll find:

- ▼ **An Overview: Recording Work-Related Injuries and Illnesses** — General instructions for filling out the forms in this package and definitions of terms you should use when you classify your cases as injuries or illnesses.
- ▼ **How to Fill Out the Log** — An example to guide you in filling out the *Log* properly.
- ▼ **Log of Work-Related Injuries and Illnesses** — Several pages of the *Log* (but you may make as many copies of the *Log* as you need.) Notice that the *Log* is separate from the *Summary*. 
- ▼ **Summary of Work-Related Injuries and Illnesses** — Removable *Summary* pages for easy posting at the end of the year. Note that you post the *Summary* only, not the *Log*. 
- ▼ **Worksheet to Help You Fill Out the Summary** — A worksheet for figuring the average number of employees who worked for your establishment and the total number of hours worked.
- ▼ **OSHA's 301: Injury and Illness Incident Report** — A copy of the OSHA 301 to provide details about the incident. You may make as many copies as you need or use an equivalent form. 

Take a few minutes to review this package. If you have any questions, **visit us online at www.osha.gov OR call your local OSHA office.** We'll be happy to help you.



An Overview: Recording Work-Related Injuries and Illnesses

The Occupational Safety and Health (OSH) Act of 1970 requires certain employers to prepare and maintain records of work-related injuries and illnesses. Use these definitions when you classify cases on the Log. OSHA's recordkeeping regulation (see 29 CFR Part 1904) provides more information about the definitions below.

The *Log of Work-Related Injuries and Illnesses* (Form 300) is used to classify work-related injuries and illnesses and to note the extent and severity of each case. When an incident occurs, use the *Log* to record specific details about what happened and how it happened. The *Summary* — a separate form (Form 300A) — shows the totals for the year in each category. At the end of the year, post the *Summary* in a visible location so that your employees are aware of the injuries and illnesses occurring in their workplace.

Employers must keep a *Log* for each establishment or site. If you have more than one establishment, you must keep a separate *Log* and *Summary* for each physical location that is expected to be in operation for one year or longer.

Note that your employees have the right to review your injury and illness records. For more information, see 29 Code of Federal Regulations Part 1904.35, *Employee Involvement*.

Cases listed on the *Log of Work-Related Injuries and Illnesses* are not necessarily eligible for workers' compensation or other insurance benefits. Listing a case on the *Log* does not mean that the employer or worker was at fault or that an OSHA standard was violated.

When is an injury or illness considered work-related?

An injury or illness is considered work-related if an event or exposure in the work environment caused or contributed to the condition or significantly aggravated a preexisting condition. Work-relatedness is

presumed for injuries and illnesses resulting from events or exposures occurring in the workplace, unless an exception specifically applies. See 29 CFR Part 1904.5(b)(2) for the exceptions. The work environment includes the establishment and other locations where one or more employees are working or are present as a condition of their employment. See 29 CFR Part 1904.5(b)(1).

Which work-related injuries and illnesses should you record?

Record those work-related injuries and illnesses that result in:

- ▼ death,
- ▼ loss of consciousness,
- ▼ days away from work,
- ▼ restricted work activity or job transfer, or
- ▼ medical treatment beyond first aid.

You must also record work-related injuries and illnesses that are significant (as defined below) or meet any of the additional criteria listed below.

You must record any significant work-related injury or illness that is diagnosed by a physician or other licensed health care professional. You must record any work-related case involving cancer, chronic irreversible disease, a fractured or cracked bone, or a punctured eardrum. See 29 CFR 1904.7.

What are the additional criteria?

You must record the following conditions when they are work-related:

- ▼ any needlestick injury or cut from a sharp object that is contaminated with another person's blood or other potentially infectious material;
- ▼ any case requiring an employee to be medically removed under the requirements of an OSHA health standard;
- ▼ tuberculosis infection as evidenced by a positive skin test or diagnosis by a physician or other licensed health care professional after exposure to a known case of active tuberculosis.
- ▼ an employee's hearing test (audiogram) reveals 1) that the employee has experienced a Standard Threshold Shift (STS) in hearing in one or both ears (averaged at 2000, 3000, and 4000 Hz) and 2) the employee's total hearing level is 25 decibels (dB) or more above audiometric zero (also averaged at 2000, 3000, and 4000 Hz) in the same ear(s) as the STS.

What is medical treatment?

Medical treatment includes managing and caring for a patient for the purpose of combating disease or disorder. The following are not considered medical treatments and are NOT recordable:

- ▼ visits to a doctor or health care professional solely for observation or counseling;

What do you need to do?

1. Within 7 calendar days after you receive information about a case, decide if the case is recordable under the OSHA recordkeeping requirements.
2. Determine whether the incident is a new case or a recurrence of an existing one.
3. Establish whether the case was work-related.
4. If the case is recordable, decide which form you will fill out as the injury and illness incident report.

You may use *OSHA's 301: Injury and Illness Incident Report* or an equivalent form. Some state workers compensation, insurance, or other reports may be acceptable substitutes, as long as they provide the same information as the OSHA 301.

How to work with the Log

1. Identify the employee involved unless it is a privacy concern case as described below.
2. Identify when and where the case occurred.
3. Describe the case, as specifically as you can.
4. Classify the seriousness of the case by recording the **most serious outcome** associated with the case, with column G (Death) being the most serious and column J (Other recordable cases) being the least serious.
5. Identify whether the case is an injury or illness. If the case is an injury, check the injury category. If the case is an illness, check the appropriate illness category.



- ▼ diagnostic procedures, including administering prescription medications that are used solely for diagnostic purposes; and
- ▼ any procedure that can be labeled first aid. (See below for more information about first aid.)

What is first aid?

If the incident required only the following types of treatment, consider it first aid. Do NOT record the case if it involves only:

- ▼ using non-prescription medications at non-prescription strength;
- ▼ administering tetanus immunizations;
- ▼ cleaning, flushing, or soaking wounds on the skin surface;
- ▼ using wound coverings, such as bandages, BandAids™, gauze pads, etc., or using SteriStrips™ or butterfly bandages.
- ▼ using hot or cold therapy;
- ▼ using any totally non-rigid means of support, such as elastic bandages, wraps, non-rigid back belts, etc.;
- ▼ using temporary immobilization devices while transporting an accident victim (splints, slings, neck collars, or back boards).
- ▼ drilling a fingernail or toenail to relieve pressure, or draining fluids from blisters;
- ▼ using eye patches;
- ▼ using simple irrigation or a cotton swab to remove foreign bodies not embedded in or adhered to the eye;
- ▼ using irrigation, tweezers, cotton swab or other simple means to remove splinters or foreign material from areas other than the eye;

- ▼ using finger guards;
- ▼ using massages;
- ▼ drinking fluids to relieve heat stress

How do you decide if the case involved restricted work?

Restricted work activity occurs when, as the result of a work-related injury or illness, an employer or health care professional keeps, or recommends keeping, an employee from doing the routine functions of his or her job or from working the full workday that the employee would have been scheduled to work before the injury or illness occurred.

How do you count the number of days of restricted work activity or the number of days away from work?

Count the number of calendar days the employee was on restricted work activity or was away from work as a result of the recordable injury or illness. Do not count the day on which the injury or illness occurred in this number. Begin counting days from the day after the incident occurs. If a single injury or illness involved both days away from work and days of restricted work activity, enter the total number of days for each. You may stop counting days of restricted work activity or days away from work once the total of either or the combination of both reaches 180 days.

Under what circumstances should you NOT enter the employee's name on the OSHA Form 300?

You must consider the following types of injuries or illnesses to be privacy concern cases:

- ▼ an injury or illness to an intimate body part or to the reproductive system,
- ▼ an injury or illness resulting from a sexual assault,
- ▼ a mental illness,
- ▼ a case of HIV infection, hepatitis, or tuberculosis,
- ▼ a needlestick injury or cut from a sharp object that is contaminated with blood or other potentially infectious material (see 29 CFR Part 1904.8 for definition), and
- ▼ other illnesses, if the employee independently and voluntarily requests that his or her name not be entered on the log.

You must not enter the employee's name on the OSHA 300 Log for these cases. Instead, enter "privacy case" in the space normally used for the employee's name. You must keep a separate, confidential list of the case numbers and employee names for the establishment's privacy concern cases so that you can update the cases and provide information to the government if asked to do so.

If you have a reasonable basis to believe that information describing the privacy concern case may be personally identifiable even though the employee's name has been omitted, you may use discretion in describing the injury or illness on both the OSHA 300 and 301 forms. You must enter enough information to identify the cause of the incident and the general severity of

the injury or illness, but you do not need to include details of an intimate or private nature.

What if the outcome changes after you record the case?

If the outcome or extent of an injury or illness changes after you have recorded the case, simply draw a line through the original entry or, if you wish, delete or white-out the original entry. Then write the new entry where it belongs. Remember, you need to record the most serious outcome for each case.

Classifying injuries

An injury is any wound or damage to the body resulting from an event in the work environment.

Examples: Cut, puncture, laceration, abrasion, fracture, bruise, contusion, chipped tooth, amputation, insect bite, electrocution, or a thermal, chemical, electrical, or radiation burn. Sprain and strain injuries to muscles, joints, and connective tissues are classified as injuries when they result from a slip, trip, fall or other similar accidents.

Classifying illnesses

Skin diseases or disorders

Skin diseases or disorders are illnesses involving the worker's skin that are caused by work exposure to chemicals, plants, or other substances.

Examples: Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plants; oil acne; friction blisters, chrome ulcers; inflammation of the skin.

Respiratory conditions

Respiratory conditions are illnesses associated with breathing hazardous biological agents, chemicals, dust, gases, vapors, or fumes at work.

Examples: Silicosis, asbestosis, pneumonitis, pharyngitis, rhinitis or acute congestion; farmer's lung, beryllium disease, tuberculosis, occupational asthma, reactive airways dysfunction syndrome (RADS), chronic obstructive pulmonary disease (COPD), hypersensitivity pneumonitis, toxic inhalation injury, such as metal fume fever, chronic obstructive bronchitis, and other pneumoconioses.

Poisoning

Poisoning includes disorders evidenced by abnormal concentrations of toxic substances in blood, other tissues, other bodily fluids, or the breath that are caused by the ingestion or absorption of toxic substances into the body.

Examples: Poisoning by lead, mercury,

cadmium, arsenic, or other metals; poisoning by carbon monoxide, hydrogen sulfide, or other gases; poisoning by benzene, benzol, carbon tetrachloride, or other organic solvents; poisoning by insecticide sprays, such as parathion or lead arsenate; poisoning by other chemicals, such as formaldehyde.

Hearing Loss

Noise-induced hearing loss is defined for recordkeeping purposes as a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more in either ear at 2000, 3000 and 4000 hertz, and the employee's total hearing level is 25 decibels (dB) or more above audiometric zero (also averaged at 2000, 3000, and 4000 hertz) in the same ear(s).

All other illnesses

All other occupational illnesses.

Examples: Heatstroke, sunstroke, heat exhaustion, heat stress and other effects of environmental heat; freezing, frostbite, and other effects of exposure to low temperatures; decompression sickness; effects of ionizing radiation (isotopes, x-rays, radium); effects of nonionizing radiation (welding flash, ultra-violet rays, lasers); anthrax; bloodborne pathogenic diseases, such as AIDS, HIV, hepatitis B or hepatitis C; brucellosis; malignant or benign tumors; histoplasmosis; coccidioidomycosis.

When must you post the Summary?

You must post the *Summary* only — not the *Log* — by February 1 of the year following the year covered by the form and keep it posted until April 30 of that year.

How long must you keep the Log and Summary on file?

You must keep the *Log* and *Summary* for 5 years following the year to which they pertain.

Do you have to send these forms to OSHA at the end of the year?

No. You do not have to send the completed forms to OSHA unless specifically asked to do so.

How can we help you?

If you have a question about how to fill out the *Log*,

- visit us online at www.osha.gov** or
- call your local OSHA office.**

Optional

Calculating Injury and Illness Incidence Rates

What is an incidence rate?

An incidence rate is the number of recordable injuries and illnesses occurring among a given number of full-time workers (usually 100 full-time workers) over a given period of time (usually one year). To evaluate your firm's injury and illness experience over time or to compare your firm's experience with that of your industry as a whole, you need to compute your incidence rate. Because a specific number of workers and a specific period of time are involved, these rates can help you identify problems in your workplace and/or progress you may have made in preventing work-related injuries and illnesses.

How do you calculate an incidence rate?

You can compute an occupational injury and illness incidence rate for all recordable cases or for cases that involved days away from work for your firm quickly and easily. The formula requires that you follow instructions in paragraph (a) below for the total recordable cases or those in paragraph (b) for cases that involved days away from work, and for both rates the instructions in paragraph (c).

(a) To find out the total number of recordable injuries and illnesses that occurred during the year, count the number of line entries on your OSHA Form 300, or refer to the OSHA Form 300A and sum the entries for columns (G), (H), (I), and (J).

(b) To find out the number of injuries and illnesses that involved days away from work, count the number of line entries on your OSHA Form 300 that received a check mark in column (H), or refer to the entry for column

(H) on the OSHA Form 300A.

(c) The number of hours all employees actually worked during the year. Refer to OSHA Form 300A and optional worksheet to calculate this number.

You can compute the incidence rate for all recordable cases of injuries and illnesses using the following formula:

Total number of injuries and illnesses × 200,000 ÷ Number of hours worked by all employees = Total recordable case rate

(The 200,000 figure in the formula represents the number of hours 100 employees working 40 hours per week, 50 weeks per year would work, and provides the standard base for calculating incidence rates.)

You can compute the incidence rate for recordable cases involving days away from work, days of restricted work activity or job transfer (DART) using the following formula:

(Number of entries in column H + Number of entries in column I) × 200,000 ÷ Number of hours worked by all employees = DART incidence rate

You can use the same formula to calculate incidence rates for other variables such as cases involving restricted work activity (column (I) on Form 300A), cases involving skin disorders (column (M-2) on Form 300A), etc. Just substitute the appropriate total for these cases, from Form 300A, into the formula in place of the total number of injuries and illnesses.

What can I compare my incidence rate to?

The Bureau of Labor Statistics (BLS) conducts a survey of occupational injuries and illnesses each year and publishes incidence rate data by

various classifications (e.g., by industry, by employer size, etc.). You can obtain these published data at www.bls.gov/iif or by calling a BLS Regional Office.

Worksheet

Total number of injuries and illnesses		Number of hours worked by all employees		Total recordable case rate
<input type="text"/>	X 200,000 ÷	<input type="text"/>	=	<input type="text"/>

Number of entries in Column H + Column I		Number of hours worked by all employees		DART incidence rate
<input type="text"/>	X 200,000 ÷	<input type="text"/>	=	<input type="text"/>



How to Fill Out the Log

The *Log of Work-Related Injuries and Illnesses* is used to classify work-related injuries and illnesses and to note the extent and severity of each case. When an incident occurs, use the *Log* to record specific details about what happened and how it happened.

If your company has more than one establishment or site, you must keep separate records for each physical location that is expected to remain in operation for one year or longer.

We have given you several copies of the *Log* in this package. If you need more than we provided, you may photocopy and use as many as you need.

The *Summary* — a separate form — shows the work-related injury and illness totals for the year in each category. At the end of the year, count the number of incidents in each category and transfer the totals from the *Log* to the *Summary*. Then post the *Summary* in a visible location so that your employees are aware of injuries and illnesses occurring in their workplace.

You don't post the Log. You post only the Summary at the end of the year.

OSHA's Form 300 (Rev. 01/2004)

Log of Work-Related Injuries and Illnesses

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Year 20 
U.S. Department of Labor
 Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

You must record information about every work-related death and about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR Part 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an Injury and Illness Incident Report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Establishment name XYZ Company

City Anywhere State MA

Identify the person			Describe the case			Classify the case CHECK ONLY ONE box for each case based on the most serious outcome for that case:				Enter the number of days the injured or ill worker was:		Check the "Injury" column or choose one type of illness:						
(A) Case no.	(B) Employee's name	(C) Job title <small>(e.g. Welder)</small>	(D) Date of injury or onset of illness	(E) Where the event occurred <small>(e.g. Loading dock north end)</small>	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill <small>(e.g. Second degree burns on right forearm from acetylene torch)</small>	Remained at Work				Away from work (K)	On job transfer or restriction (L)	(M)						
						Death (G)	Days away from work (H)	Job transfer or restriction (I)	Other recordable cases (J)			Injury (1)	Skin disorders (2)	Respiratory conditions (3)	Hoarseness (4)	Hearing loss (5)	All other illnesses (6)	
1	Mark Bagin	Welder	5 / 25 <small>month/day</small>	basement	fracture, left arm and left leg, fell from ladder	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	12 days	15 days	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Shana Alexander	Foundry man	7 / 2 <small>month/day</small>	pouring deck	poisoning from lead fumes	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	___ days	30 days	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Sam Sauder	Electrician	8 / 5 <small>month/day</small>	2nd floor storeroom	broken left foot, fell over box	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7 days	30 days	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Ralph Boccella	Laborer	9 / 17 <small>month/day</small>	packaging dept	Back strain lifting boxes	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3 days	___ days	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Jarrod Daniels	Machine opr.	10 / 23 <small>month/day</small>	production floor	dust in eye	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	___ days	___ days	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	___ days	___ days	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Be as specific as possible. You can use two lines if you need more room.

Revise the log if the injury or illness progresses and the outcome is more serious than you originally recorded for the case. Cross out, erase, or white-out the original entry.

Choose ONLY ONE of these categories. Classify the case by recording the most serious outcome of the case, with column G (Death) being the most serious and column J (Other recordable cases) being the least serious.

Note whether the case involves an injury or an illness.



Log of Work-Related Injuries and Illnesses

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Form approved OMB no. 1218-0176

You must record information about every work-related death and about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR Part 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an Injury and Illness Incident Report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Establishment name _____
 City _____ State _____

Identify the person			Describe the case			Classify the case				Enter the number of days the injured or ill worker was:		Check the "Injury" column or choose one type of illness:					
(A) Case no.	(B) Employee's name	(C) Job title <i>(e.g., Welder)</i>	(D) Date of injury or onset of illness	(E) Where the event occurred <i>(e.g., Loading dock north end)</i>	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill <i>(e.g., Second degree burns on right forearm from acetylene torch)</i>	CHECK ONLY ONE box for each case based on the most serious outcome for that case:				Away from work	On job transfer or restriction	(M) Injury					
						Death	Days away from work	Job transfer or restriction	Other recordable cases	(K)	(L)	(1)	(2)	(3)	(4)	(5)	(6)
						(G)	(H)	(I)	(J)	_____ days	_____ days	_____ days	_____ days	_____ days	_____ days	_____ days	_____ days
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_____	_____	_____	_____/_____/_____ month/day	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____ days	_____ days	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	_____	____														

Summary of Work-Related Injuries and Illnesses



All establishments covered by Part 1904 must complete this Summary page, even if no work-related injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete and accurate before completing this summary.

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the Log. If you had no cases, write "0."

Employees, former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR Part 1904.35, in OSHA's recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
_____	_____	_____	_____
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
_____	_____
(K)	(L)

Injury and Illness Types

Total number of . . . (M)	
(1) Injuries _____	(4) Poisonings _____
(2) Skin disorders _____	(5) Hearing loss _____
(3) Respiratory conditions _____	(6) All other illnesses _____

Post this Summary page from February 1 to April 30 of the year following the year covered by the form.

Public reporting burden for this collection of information is estimated to average 58 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

Establishment information

Your establishment name _____

Street _____

City _____ State _____ ZIP _____

Industry description (e.g., *Manufacture of motor truck trailers*)

Standard Industrial Classification (SIC), if known (e.g., 3715)

OR

North American Industrial Classification (NAICS), if known (e.g., 336212)

Employment information (If you don't have these figures, see the Worksheet on the back of this page to estimate.)

Annual average number of employees _____

Total hours worked by all employees last year _____

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

Company executive _____ Title _____

() - / /
Phone Date

Optional

Worksheet to Help You Fill Out the Summary

At the end of the year, OSHA requires you to enter the average number of employees and the total hours worked by your employees on the summary. If you don't have these figures, you can use the information on this page to estimate the numbers you will need to enter on the Summary page at the end of the year.

How to figure the average number of employees who worked for your establishment during the year:

- 1 Add** the total number of employees your establishment paid in all pay periods during the year. Include all employees: full-time, part-time, temporary, seasonal, salaried, and hourly.

The number of employees paid in all pay periods = **1** _____
- 2 Count** the number of pay periods your establishment had during the year. Be sure to include any pay periods when you had no employees.

The number of pay periods during the year = **2** _____
- 3 Divide** the number of employees by the number of pay periods.

$\frac{\mathbf{1}}{\mathbf{2}}$ _____ = **3** _____
- 4 Round the answer** to the next highest whole number. Write the rounded number in the blank marked *Annual average number of employees*.

The number rounded = **4** _____

For example, Acme Construction figured its average employment this way:

For pay period...	Acme paid this number of employees...		
1	10	Number of employees paid =	1 830
2	0		
3	15	Number of pay periods =	2 26
4	30		
5	40	$\frac{830}{26} =$	3 31.92
▼	▼		
24	20	31.92 rounds to	4 32
25	15		
26	+10	32 is the annual average number of employees	
	830		

How to figure the total hours worked by all employees:

Include hours worked by salaried, hourly, part-time and seasonal workers, as well as hours worked by other workers subject to day to day supervision by your establishment (e.g., temporary help services workers).

Do not include vacation, sick leave, holidays, or any other non-work time, even if employees were paid for it. If your establishment keeps records of only the hours paid or if you have employees who are not paid by the hour, please estimate the hours that the employees actually worked.

If this number isn't available, you can use this optional worksheet to estimate it.

Optional Worksheet

- _____ **Find** the number of full-time employees in your establishment for the year.
- X** _____ **Multiply** by the number of work hours for a full-time employee in a year.
- _____ This is the number of full-time hours worked.
- +** _____ **Add** the number of any overtime hours as well as the hours worked by other employees (part-time, temporary, seasonal)
- _____ **Round** the answer to the next highest whole number. Write the rounded number in the blank marked *Total hours worked by all employees last year*.

OSHA's Form 301

Injury and Illness Incident Report

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.



U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

This *Injury and Illness Incident Report* is one of the first forms you must fill out when a recordable work-related injury or illness has occurred. Together with the *Log of Work-Related Injuries and Illnesses* and the accompanying *Summary*, these forms help the employer and OSHA develop a picture of the extent and severity of work-related incidents.

Within 7 calendar days after you receive information that a recordable work-related injury or illness has occurred, you must fill out this form or an equivalent. Some state workers' compensation, insurance, or other reports may be acceptable substitutes. To be considered an equivalent form, any substitute must contain all the information asked for on this form.

According to Public Law 91-596 and 29 CFR 1904, OSHA's recordkeeping rule, you must keep this form on file for 5 years following the year to which it pertains.

If you need additional copies of this form, you may photocopy and use as many as you need.

Completed by _____

Title _____

Phone (____) _____ -- _____ Date ____/____/____

Information about the employee

1) Full name _____

2) Street _____

City _____ State _____ ZIP _____

3) Date of birth ____/____/____

4) Date hired ____/____/____

5) Male

Female

Information about the physician or other health care professional

6) Name of physician or other health care professional _____

7) If treatment was given away from the worksite, where was it given?

Facility _____

Street _____

City _____ State _____ ZIP _____

8) Was employee treated in an emergency room?

Yes

No

9) Was employee hospitalized overnight as an in-patient?

Yes

No

Information about the case

10) Case number from the Log _____ (Transfer the case number from the Log after you record the case.)

11) Date of injury or illness ____/____/____

12) Time employee began work _____ AM / PM

13) Time of event _____ AM / PM Check if time cannot be determined

14) **What was the employee doing just before the incident occurred?** Describe the activity, as well as the tools, equipment, or material the employee was using. Be specific. *Examples:* "climbing a ladder while carrying roofing materials"; "spraying chlorine from hand sprayer"; "daily computer key-entry."

15) **What happened?** Tell us how the injury occurred. *Examples:* "When ladder slipped on wet floor, worker fell 20 feet"; "Worker was sprayed with chlorine when gasket broke during replacement"; "Worker developed soreness in wrist over time."

16) **What was the injury or illness?** Tell us the part of the body that was affected and how it was affected; be more specific than "hurt," "pain," or "sore." *Examples:* "strained back"; "chemical burn, hand"; "carpal tunnel syndrome."

17) **What object or substance directly harmed the employee?** *Examples:* "concrete floor"; "chlorine"; "radial arm saw." *If this question does not apply to the incident, leave it blank.*

18) **If the employee died, when did death occur?** Date of death ____/____/____

If You Need Help...

If you need help deciding whether a case is recordable, or if you have questions about the information in this package, feel free to contact us. We'll gladly answer any questions you have.

▼ Visit us online at www.osha.gov

▼ Call your OSHA Regional office and ask for the recordkeeping coordinator

or

▼ Call your State Plan office

Federal Jurisdiction

Region 1 - 617 / 565-9860
Connecticut; Massachusetts; Maine; New Hampshire; Rhode Island

Region 2 - 212 / 337-2378
New York; New Jersey

Region 3 - 215 / 861-4900
DC; Delaware; Pennsylvania; West Virginia

Region 4 - 404 / 562-2300
Alabama; Florida; Georgia; Mississippi

Region 5 - 312 / 353-2220
Illinois; Ohio; Wisconsin

Region 6 - 214 / 767-4731
Arkansas; Louisiana; Oklahoma; Texas

Region 7 - 816 / 426-5861
Kansas; Missouri; Nebraska

Region 8 - 303 / 844-1600
Colorado; Montana; North Dakota; South Dakota

Region 9 - 415 / 975-4310

Region 10 - 206 / 553-5930
Idaho

State Plan States

Alaska - 907 / 269-4957

Arizona - 602 / 542-5795

California - 415 / 703-5100

*Connecticut - 860 / 566-4380

Hawaii - 808 / 586-9100

Indiana - 317 / 232-2688

Iowa - 515 / 281-3661

Kentucky - 502 / 564-3070

Maryland - 410 / 767-2371

Michigan - 517 / 322-1848

Minnesota - 651 / 284-5050

Nevada - 702 / 486-9020

*New Jersey - 609 / 984-1389

New Mexico - 505 / 827-4230

*New York - 518 / 457-2574

North Carolina - 919 / 807-2875

Oregon - 503 / 378-3272

Puerto Rico - 787 / 754-2172

South Carolina - 803 / 734-9669

Tennessee - 615 / 741-2793

Utah - 801 / 530-6901

Vermont - 802 / 828-2765

Virginia - 804 / 786-6613

Virgin Islands - 340 / 772-1315

Washington - 360 / 902-5601

Wyoming - 307 / 777-7786

*Public Sector only



Have questions?

If you need help in filling out the *Log* or *Summary*, or if you have questions about whether a case is recordable, contact us. We'll be happy to help you. You can:

- ▼ Visit us online at: **www.osha.gov**
- ▼ Call your regional or state plan office. You'll find the phone number listed inside this cover.

Daily Safety Logs

DATE: _____

TAILGATE SAFETY MEETING

Project Manager: _____ Project Name: _____
Site Supervisor: _____ Project Number: _____
Safety Officer: _____ Project Location: _____
Type of Work to be Done: _____

SITE SAFETY INFORMATION:

Weather: _____

Chemical Hazards: _____

Physical Hazards: _____

Protective Clothing/Equipment _____

Exclusion Zone PPE Level(s) _____

Location of Fire Extinguishers _____

Location of First Aid Kit(s) _____

Evacuation Rally Assembly Area: _____

Hospital _____ Phone: _____

Hospital Address _____

* Dial 9-1-1 & Notify supervisor, safety officer & project manager for emergency medical accidents/incidents

ATTENDEES

Name Printed

Signature

Meeting Conducted By: _____
Name Printed

Signature

Air Monitoring Log

Certificates of Occupancy



[CLICK HERE TO SIGN UP FOR BUILDINGS NEWS](#)

NYC Department of Buildings
Property Profile Overview

507 WEST 24 STREET
WEST 24 STREET

505 - 507

MANHATTAN 10011

Health Area : 5500
Census Tract : 99
Community Board : 104
Buildings on Lot : 1

BIN# 1080307

Tax Block : 696
Tax Lot : 28
Condo : NO
Vacant : NO

[View DCP Addresses...](#)

[Browse Block](#)

[View Certificates of Occupancy](#)

Cross Street(s):	10 AVENUE, 11 AVENUE		
DOB Special Place Name:	509-511 W 24 STREET = LOT 26		
DOB Building Remarks:	505-507 W 24 STREET = LOT 28 (9/07)		
Landmark Status:		Special Status:	N/A
Local Law:	NO	Loft Law:	NO
SRO Restricted:	NO	TA Restricted:	NO
UB Restricted:	NO		
Little 'E' Restricted:	HAZMAT/NOISE	Grandfathered Sign:	NO
Legal Adult Use:	NO	City Owned:	NO
Additional BINs for Building:	1080306 1087472		

Special District: WCH - WEST CHELSEA

Department of Finance Building Classification: V1-VACANT LAND

Please Note: The Department of Finance's building classification information shows a building's tax status, which may not be the same as the structure. To determine the legal use of a structure, research the records of the Department of Buildings.

	Total	Open	Elevator Records
Complaints	1	0	Electrical Applications
Violations-DOB	4	1	Permits In-Process / Issued
Violations-ECB	0	0	Illuminated Signs Annual Permits
Jobs/Filings	13		Plumbing Inspections
PRA / ARA Jobs	0		Open Plumbing Jobs / Work Types
Total Jobs	13		Facades
Actions	46		Marquee Annual Permits
			Boiler Records
			DEP Boiler Information

OR Enter Action Type:

OR Select from List:

Select...

AND

If you have any questions please review these [Frequently Asked Questions](#), the [Glossary](#), or call the 311 Citizen Service Center by dialing 311 or (212) NEW YORK outside of New York City.



DEPARTMENT OF BUILDINGS CERTIFICATE OF OCCUPANCY

BOROUGH MANHATTAN

DATE: JUN 09 1999 NO.

117191

This certificate supersedes C.O. NO

ZONING DISTRICT M1-5

THIS CERTIFIES that the ~~XXXX~~-altered-~~XXXX~~kg--building--premises located at
507 WEST 24TH STREET

Block 696 Lot 68

CONFORMS SUBSTANTIALLY TO THE APPROVED PLANS AND SPECIFICATIONS AND TO THE REQUIREMENTS OF ALL APPLICABLE LAWS, RULES, AND REGULATIONS FOR THE USES AND OCCUPANCIES SPECIFIED HEREIN.

PERMISSIBLE USE AND OCCUPANCY

STORY	LIVE LOAD LBS. PER SQ. FT.	MAXIMUM NO. OF PERSONS PERMITTED	ZONING DWELLING OR HOUSING USES	BUILDING CODE HABITABLE ROOMS	ZONING USE GROUP	BUILDING CODE OCCUPANCY GROUP	DESCRIPTION OF USE
1ST FLOOR	OG				16	C	MOTOR VEHICLE SALES LOT (507-511 W. 24 STREET)
1ST FLOOR	OG	2			16	K	TOOL (FRAME) SHED AND AUTO REPAIRING (507-511 W 24 STREET)
1ST FLOOR	OG	11			10	B	OFFICES (505 W 24 STREET)
2ND FLOOR	120	2			16	B-2	STORAGE (505 W 24 STREET)
THIS CERTIFICATE OF OCCUPANCY MUST BE POSTED WITHIN THE BUILDING IN ACCORDANCE WITH THE RULES OF THE DEPARTMENT PROMULGATED MARCH 31ST, 1967.							

OPEN SPACE USES _____

(SPECIFY - PARKING SPACES, LOADING DECKS, OTHER USES, NONIS)

M. G.

NO CHANGES OF USE OR OCCUPANCY SHALL BE MADE UNLESS
A NEW AMENDED CERTIFICATE OF OCCUPANCY IS OBTAINED

THIS CERTIFICATE OF OCCUPANCY IS ISSUED SUBJECT TO FURTHER LIMITATIONS, CONDITIONS AND
SPECIFICATIONS NOTED ON THE REVERSE SIDE.

Randy A. ...
BOROUGH SUPERINTENDENT

Robert ... R.A.
COMMISSIONER

ORIGINAL

OFFICE COPY - DEPARTMENT OF BUILDINGS

COPY

THAT THE ZONING LOT ON WHICH THE PREMISES IS LOCATED IS BOUNDED AS FOLLOWS:

BEGINNING at a point on the NORTH side of WEST 24TH STREET
 distant 70 WEST feet from the corner formed by the intersection of
 WEST 24TH STREET and 10TH AVENUE
 running thence WEST 130 feet; thence NORTH 98.75' feet;
 thence EAST 60 feet; thence NORTH 98.75' feet;
 thence EAST 40 feet; thence SOUTH 118.42' feet;
 to the point or place of beginning, EAST 30 SOUTH 79.08' feet.

102098560
 XXXXX ALT. No. DATE OF COMPLETION 6/4/99 CONSTRUCTION CLASSIFICATION CLASS 3NON-FIREPROOF
 BUILDING OCCUPANCY GROUP CLASSIFICATION COMMERCIAL HEIGHT 2 STORIES, 26' FEET

THE FOLLOWING FIRE DETECTION AND EXTINGUISHING SYSTEMS ARE REQUIRED AND WERE INSTALLED IN COMPLIANCE WITH APPLICABLE LAWS.

	YES	NO		YES	NO
STANDPIPE SYSTEM			AUTOMATIC SPRINKLER SYSTEM		
YARD HYDRANT SYSTEM					
STANDPIPE FIRE TELEPHONE AND SIGNALLING SYSTEM					
SMOKE DETECTOR					
FIRE ALARM AND SIGNAL SYSTEM					

STORM DRAINAGE DISCHARGES INTO:
 A) STORM SEWER B) COMBINED SEWER C) PRIVATE SEWAGE DISPOSAL SYSTEM

SANITARY DRAINAGE DISCHARGES INTO:
 A) SANITARY SEWER B) COMBINED SEWER C) PRIVATE SEWAGE DISPOSAL SYSTEM

LIMITATIONS OR RESTRICTIONS:
 BOARD OF STANDARDS AND APPEALS CAL. NO. _____
 CITY PLANNING COMMISSION CAL. NO. _____
 OTHERS:

DEPARTMENT OF BUILDINGS

BOROUGH OF MANHATTAN

, THE CITY OF NEW YORK

No. 50555

Date May 7, 1959

CERTIFICATE OF OCCUPANCY

(Standard form adopted by the Board of Standards and Appeals and issued pursuant to Section 646 of the New York Charter, and Sections C.26-181.0 to C.26-187.0 inclusive Administrative Code 2.1.3.1. to 2.1.3.7. Building Code.)

This certificate supersedes C. O. No. 48970

To the owner or owners of the building or premises:

THIS CERTIFIES that the ~~new~~ altered ~~existing~~ building premises located at

507-511 West 24th Street

Block 695 Lot 26 & 28

, conforms substantially to the approved plans and specifications, and to the requirements of the building code and all other laws and ordinances, and of the rules and regulations of the Board of Standards and Appeals, applicable to a building of its class and kind at the time the permit was issued; and

CERTIFIES FURTHER that any provisions of Section 646F of the New York Charter have been complied with as certified by a report of the Fire Commissioner to the Borough Superintendent.

~~Alt. No.~~ Alt. No.— 1876-1958

Construction classification—

Occupancy classification— Commercial

Height — — — stories, — — — feet.

Date of completion— April 3, 1959

Located in Unrestricted Use District.

A Area 2

Height Zone at time of issuance of permit

This certificate is issued subject to the limitations hereinafter specified and to the following resolutions of the Board of Standards and Appeals: (Calendar numbers to be inserted here)

PERMISSIBLE USE AND OCCUPANCY

STORY	LIVE LOADS Lbs. per Sq. Ft.	PERSONS ACCOMMODATED			USE
		MALE	FEMALE	TOTAL	
On ground					Parking for more than five (5) motor vehicles. 59509 Gasoline tank installation approved by Fire Department May 4, 1959. Sec. 6.1.2.3 sub-4 Building Code, C.26-273.0 Adm. Code "Prior to the occupancy of any building erected or altered after January 1, 1958, the authorized occupant shall be responsible for the structure as stated in the certificate of occupancy. The occupant shall permanently post under glass and maintained in the main entrance hall of such structure."

Thomas V. ...
Borough Superintendent

**NO CHANGES OF USE OR OCCUPANCY NOT CONSISTENT WITH THIS CERTIFICATE SHALL
BE MADE UNLESS FIRST APPROVED BY THE BOROUGH SUPERINTENDENT**

Unless an approval for the same has been obtained from the Borough Superintendent, no change or rearrangement in the structural parts of the building, or affecting the light and ventilation of any part thereof, or in the exit facilities, shall be made; no enlargement, whether by extending on any side or by increasing in height shall be made; nor shall the building be moved from one location or position to another; nor shall there be any reduction or diminution of the area of the lot or plot on which the building is located.

The building or any part thereof shall not be used for any purpose other than that for which it is certified.

The superimposed, uniformly distributed loads, or concentrated loads producing the same stresses in the construction in any story shall not exceed the live loads specified on reverse side; the number of persons of either sex in any story shall not exceed that specified when sex is indicated, nor shall the aggregate number of persons in any story exceed the specified total; and the use to which any story may be put, shall be restricted to that fixed by this certificate except as specifically stated.

This certificate does not in any way relieve the owner or owners or any other person or persons in possession or control of the building, or any part thereof from obtaining such other permits, licenses or approvals as may be prescribed by law for the uses or purposes for which the building is designed or intended; nor from obtaining the special certificates required for the use and operation of elevators; nor from the installation of fire alarm systems where required by law; nor from complying with any lawful order for additional fire extinguishing appliances under the discretionary powers of the fire commissioner; nor from complying with any lawful order issued with the object of maintaining the building in a safe or lawful condition; nor from complying with any authorized direction to remove encroachments into a public highway or other public place, whether attached to or part of the building or not.

If this certificate is marked "Temporary", it is applicable only to those parts of the building indicated on its face, and certifies to the legal use and occupancy of only such parts of the building; it is subject to all the provisions and conditions applying to a final or permanent certificate; it is not applicable to any building under the jurisdiction of the Housing Division unless it is also approved and endorsed by them, and it must be replaced by a full certificate at the date of expiration.

If this certificate is for an existing building, erected prior to March 14, 1916, it has been duly inspected and it has been found to have been occupied or arranged to be occupied prior to March 14, 1916, as noted on the reverse side, and that on information and belief, since that date there has been no alteration or conversion to a use that changed its classification as defined in the Building Code, or that would necessitate compliance with some special requirement or with the State Labor Law or any other law or ordinance; that there are no notices of violations or orders pending in the Department of Buildings at this time; that Section 646F of the New York City Charter has been complied with as certified by a report of the Fire Commissioner to the Borough Superintendent, and that, so long as the building is not altered, except by permission of the Borough Superintendent, the existing use and occupancy may be continued.

"§ 646 F. No certificate of occupancy shall be issued for any building, structure, enclosure, place or premises wherein containers for combustibles, chemicals, explosives, inflammables and other dangerous substances, articles, compounds or mixtures are stored, or wherein automatic or other fire alarm systems or fire extinguishing equipment are required by law to be or are installed, until the fire commissioner has tested and inspected and has certified his approval in writing of the installation of such containers, systems or equipment to the Borough Superintendent of the borough in which the installation has been made. Such approval shall be recorded on the certificate of occupancy."

Additional copies of this certificate will be furnished to persons having an interest in the building or premises, upon payment of a fee of fifty cents per copy.

DEPARTMENT OF BUILDINGS

BOROUGH OF MANHATTAN, THE CITY OF NEW YORK

No. 48070

Date October 4, 1957

CERTIFICATE OF OCCUPANCY

(Standard form adopted by the Board of Standards and Appeals and issued pursuant to Section 646 of the New York Charter, and Sections C.26-181.0 to C.26-187.0 inclusive Administrative Code 2.1.3.1. to 2.1.3.7. Building Code.)

This certificate supersedes C. O. No.

To the owner or owners of the building or premises:

THIS CERTIFIES that the ~~1001~~ altered ~~existing~~ building premises located at
507-511 West 24th Street

Block 696 Lot 25, 28 & 30

, conforms substantially to the approved plans and specifications, and to the requirements of the building code and all other laws and ordinances, and of the rules and regulations of the Board of Standards and Appeals, applicable to a building of its class and kind at the time the permit was issued; and

CERTIFIES FURTHER that any provisions of Section 646F of the New York Charter have been complied with as certified by a report of the Fire Commissioner to the Borough Superintendent.

NYC or Alt. No. 915-1956

Construction classification

Occupancy classification Commercial

Height stories feet

Date of completion October 3, 1957

Located in Unrestricted Use District

Area 2 Height Zone at time of issuance of permit 1710-1956

This certificate is issued subject to the limitations hereinafter specified and to the following resolutions of the Board of Standards and Appeals: (Calendar numbers to be inserted here)

PERMISSIBLE USE AND OCCUPANCY

STORY	LIVE LOADS Lbs. per Sq. Ft.	PERSONS ACCOMMODATED			USE
		MALE	FEMALE	TOTAL	
On ground					Parking lot for more than five (5) motor vehicles.

SUBSTITUTED
BY C.O. 57555

Sec. 6122 sub-2 Building Code, 204-270 Adm. Code
Prior to the occupancy of a structure on or after January 1, 1933, the building shall be provided with a glass and maintained in the main entrance hall of such structures.

Thomas V. ...

Borough Superintendent

**NO CHANGES OF USE OR OCCUPANCY NOT CONSISTENT WITH THIS CERTIFICATE SHALL
BE MADE UNLESS FIRST APPROVED BY THE BOROUGH SUPERINTENDENT**

Unless an approval for the same has been obtained from the Borough Superintendent, no change or rearrangement in the structural parts of the building, or affecting the light and ventilation of any part thereof, or in the exit facilities, shall be made; no enlargement, whether by extending on any side or by increasing in height shall be made; nor shall the building be moved from one location or position to another; nor shall there be any reduction or diminution of the area of the lot or plot on which the building is located.

The building or any part thereof shall not be used for any purpose other than that for which it is certified.

The superimposed, uniformly distributed loads, or concentrated loads producing the same stresses in the construction in any story shall not exceed the live loads specified on reverse side; the number of persons of either sex in any story shall not exceed that specified when sex is indicated, nor shall the aggregate number of persons in any story exceed the specified total; and the use to which any story may be put shall be restricted to that fixed by this certificate except as specifically stated.

This certificate does not in any way relieve the owner or owners or any other person or persons in possession or control of the building, or any part thereof from obtaining such other permits, licenses or approvals as may be prescribed by law for the uses or purposes for which the building is designed or intended; nor from obtaining the special certificates required for the use and operation of elevators; nor from the installation of fire alarm systems where required by law; nor from complying with any lawful order for additional fire extinguishing appliances under the discretionary powers of the fire commissioner; nor from complying with any lawful order issued with the object of maintaining the building in a safe or lawful condition; nor from complying with any authorized direction to remove encroachments into a public highway or other public place, whether attached to or part of the building or not.

If this certificate is marked "Temporary", it is applicable only to those parts of the building indicated on its face, and certifies to the legal use and occupancy of only such parts of the building; it is subject to all the provisions and conditions applying to a final or permanent certificate; it is not applicable to any building under the jurisdiction of the Housing Division unless it is also approved and endorsed by them, and it must be replaced by a full certificate at the date of expiration.

If this certificate is for an existing building, erected prior to March 14, 1916, it has been duly inspected and it has been found to have been occupied or arranged to be occupied prior to March 14, 1916, as noted on the reverse side, and that on information and belief, since that date there has been no alteration or conversion to a use that changed its classification as defined in the Building Code, or that would necessitate compliance with some special requirement or with the State Labor Law or any other law or ordinance; that there are no notices of violations or orders pending in the Department of Buildings at this time; that Section 646F of the New York City Charter has been complied with as certified by a report of the Fire Commissioner to the Borough Superintendent, and that, so long as the building is not altered, except by permission of the Borough Superintendent, the existing use and occupancy may be continued.

"§ 646 F. No certificate of occupancy shall be issued for any building, structure, enclosure, place or premises wherein containers for combustibles, chemicals, explosives, inflammables and other dangerous substances, articles, compounds or mixtures are stored, or wherein automatic or other fire alarm systems or fire extinguishing equipment are required by law to be or are installed, until the fire commissioner has tested and inspected and has certified his approval in writing of the installation of such containers, systems or equipment to the Borough Superintendent of the borough in which the installation has been made. Such approval shall be recorded on the certificate of occupancy."

Additional copies of this certificate will be furnished to persons having an interest in the building or premises, upon payment of a fee of fifty cents per copy.

ac

DEPARTMENT OF BUILDINGS

BOROUGH OF MANHATTAN, THE CITY OF NEW YORK

Date November 4, 1966

No. 00719

CERTIFICATE OF OCCUPANCY

NO CHANGES OF USE OR OCCUPANCY NOT CONSISTENT WITH THIS CERTIFICATE SHALL BE MADE UNLESS FIRST APPROVED BY THE BOROUGH SUPERINTENDENT

This certificate supersedes C. O. No. 50555, 59509

THIS CERTIFIES that the ~~xxx~~ altered ~~xxxx~~ building—premises located at 505-511 West 24th Street; 504-508 West 25th St. Block 696 Lot 28

That the zoning lot and premises above referred to are situated, bounded and described as follows:
 BEGINNING at a point on the north side of West 24th Street distant 70.0 feet west from the corner formed by the intersection of West 24th Street and 10th Avenue running thence west 130.0, north 98°-9" feet; thence east 60.0, north 98°-9" feet; thence east 40.0 feet; thence south 118'-5" feet; running thence east 30.0 feet; thence south 79'-1" feet;

to the point or place of beginning, conforms substantially to the approved plans and specifications, and to the requirements of the Building Code, the Zoning Resolution and all other laws and ordinances, and of the rules of the Board of Standards and Appeals, applicable to a building of its class and kind at the time the permit was issued; and

CERTIFIES FURTHER that, any provisions of Section 646F of the New York Charter have been complied with as certified by a report of the Fire Commissioner to the Borough Superintendent.

Alt. No.— 1456-1966 Construction classification— Class 3 Nonfireproof
 Occupancy classification— Commercial Building . Height 2 stories, 26'-1 1/2" feet.
 Date of complete November 4, 1966 . Located in M 1-5 Zoning District.
 at time of issuance of permit.

This certificate is issued subject to the limitations hereinafter specified and to the following resolutions of the Board of Standards and Appeals: and The City Planning Commission: (Calendar numbers to be inserted here)

PERMISSIBLE USE AND OCCUPANCY

Off-Street Parking Spaces _____
 Off-Street Loading Berths _____

STORY	LIVE LOADS Lbs. per Sq. Ft.	PERSONS ACCOMMODATED	USE
<u>TWO (2) STORY BUILDING</u>			
1st Story	On Ground	11	Offices.
2nd Story	120	2	Storage.
<u>VACANT PART OF LOT</u>			
On Ground			Parking lot for more than five (5) motor vehicles.
1st Story	On Ground	2	Tool (frame) shed and auto repairing.
		NOTE:	Gasoline Tank Installation approved by Fire Department May 4, 1959.
		NOTE:	Gasoline is for use of owner's motor vehicles.
		Sec. 2412 of the Building Code requires that all structures erected prior to the year 1931, and all structures erected after January 1, 1931, the walls and columns shall be reinforced with steel bars and maintained in good condition. The walls and columns of such structures shall be reinforced with steel bars and maintained in good condition.	

Isador M. Goff
 Borough Superintendent

DEPARTMENT OF BUILDINGS

BOROUGH OF MANHATTAN

, THE CITY OF NEW YORK

No. 50555

Date May 7, 1959

CERTIFICATE OF OCCUPANCY

(Standard form adopted by the Board of Standards and Appeals and issued pursuant to Section 646 of the New York Charter, and Sections C.26-181.0 to C.26-187.0 inclusive Administrative Code 2.1.2.1. to 2.1.3.7. Building Code.)

This certificate supersedes C. O. No. 48070

To the owner or owners of the building or premises:

THIS CERTIFIES that the ~~new~~ ~~altered~~ ~~existing~~ building premises located at

507-511 West 24th Street

Block 695 Lot 26 & 28

, conforms substantially to the approved plans and specifications, and to the requirements of the building code and all other laws and ordinances, and of the rules and regulations of the Board of Standards and Appeals, applicable to a building of its class and kind at the time the permit was issued; and

CERTIFIES FURTHER that any provisions of Section 646F of the New York Charter have been complied with as certified by a report of the Fire Commissioner to the Borough Superintendent.

Alt. No.— 1876-1958

Construction classification—

Occupancy classification— Commercial

Height — — — stories, — — — feet.

Date of completion— April 3, 1959

Located in Unrestricted Use District.

A Area 2

Height Zone at time of issuance of permit

This certificate is issued subject to the limitations hereinafter specified and to the following resolutions of the Board of Standards and Appeals: (Calendar numbers to be inserted here)

PERMISSIBLE USE AND OCCUPANCY

STORY	LIVE LOADS Lbs. per Sq. Ft.	PERSONS ACCOMMODATED			USE
		MALE	FEMALE	TOTAL	
On ground					Parking for more than five (5) motor vehicles. Gasoline tank installation approved by Fire Department May 4, 1959. Sec. 6.1.2.3 sub-4 Building Code, C.26-273.0 Adm. Code "Prior to the occupancy of any building erected or altered after January 1, 1958, the authorized occupant shall be permanently posted under glass and maintained in the main entrance hall of such structures."

Thomas V. ...
Borough Superintendent

**NO CHANGES OF USE OR OCCUPANCY NOT CONSISTENT WITH THIS CERTIFICATE SHALL
BE MADE UNLESS FIRST APPROVED BY THE BOROUGH SUPERINTENDENT**

Unless an approval for the same has been obtained from the Borough Superintendent, no change or rearrangement in the structural parts of the building, or affecting the light and ventilation of any part thereof, or in the exit facilities, shall be made; no enlargement, whether by extending on any side or by increasing in height shall be made; nor shall the building be moved from one location or position to another; nor shall there be any reduction or diminution of the area of the lot or plot on which the building is located.

The building or any part thereof shall not be used for any purpose other than that for which it is certified.

The superimposed, uniformly distributed loads, or concentrated loads producing the same stresses in the construction in any story shall not exceed the live loads specified on reverse side; the number of persons of either sex in any story shall not exceed that specified when sex is indicated, nor shall the aggregate number of persons in any story exceed the specified total; and the use to which any story may be put shall be restricted to that fixed by this certificate except as specifically stated.

This certificate does not in any way relieve the owner or owners or any other person or persons in possession or control of the building, or any part thereof from obtaining such other permits, licenses or approvals as may be prescribed by law for the uses or purposes for which the building is designed or intended; nor from obtaining the special certificates required for the use and operation of elevators; nor from the installation of fire alarm systems where required by law; nor from complying with any lawful order for additional fire extinguishing appliances under the discretionary powers of the fire commissioner; nor from complying with any lawful order issued with the object of maintaining the building in a safe or lawful condition; nor from complying with any authorized direction to remove encroachments into a public highway or other public place, whether attached to or part of the building or not.

If this certificate is marked "Temporary", it is applicable only to those parts of the building indicated on its face, and certifies to the legal use and occupancy of only such parts of the building; it is subject to all the provisions and conditions applying to a final or permanent certificate; it is not applicable to any building under the jurisdiction of the Housing Division unless it is also approved and endorsed by them, and it must be replaced by a full certificate at the date of expiration.

If this certificate is for an existing building, erected prior to March 14, 1916, it has been duly inspected and it has been found to have been occupied or arranged to be occupied prior to March 14, 1916, as noted on the reverse side, and that on information and belief, since that date there has been no alteration or conversion to a use that changed its classification as defined in the Building Code, or that would necessitate compliance with some special requirement or with the State Labor Law or any other law or ordinance; that there are no notices of violations or orders pending in the Department of Buildings at this time; that Section 646F of the New York City Charter has been complied with as certified by a report of the Fire Commissioner to the Borough Superintendent, and that, so long as the building is not altered, except by permission of the Borough Superintendent, the existing use and occupancy may be continued.

"§ 646 F. No certificate of occupancy shall be issued for any building, structure, enclosure, place or premises wherein containers for combustibles, chemicals, explosives, inflammables and other dangerous substances, articles, compounds or mixtures are stored, or wherein automatic or other fire alarm systems or fire extinguishing equipment are required by law to be or are installed, until the fire commissioner has tested and inspected and has certified his approval in writing of the installation of such containers, systems or equipment to the Borough Superintendent of the borough in which the installation has been made. Such approval shall be recorded on the certificate of occupancy."

Additional copies of this certificate will be furnished to persons having an interest in the building or premises, upon payment of a fee of fifty cents per copy.

DEPARTMENT OF BUILDINGS

BOROUGH OF MANHATTAN, THE CITY OF NEW YORK

No. 50555

Date May 7, 1959

CERTIFICATE OF OCCUPANCY

(Standard form adopted by the Board of Standards and Appeals and issued pursuant to Section 646 of the New York Charter, and Sections C.26-181.0 to C.26-187.0 inclusive Administrative Code 2.1.3.1. to 2.1.3.7. Building Code.)

This certificate supersedes C. O. No. 48070

To the owner or owners of the building or premises:

THIS CERTIFIES that the ~~new~~ altered ~~existing~~ building premises located at

507-511 West 24th Street

Block 695 Lot 26 & 28

, conforms substantially to the approved plans and specifications, and to the requirements of the building code and all other laws and ordinances, and of the rules and regulations of the Board of Standards and Appeals, applicable to a building of its class and kind at the time the permit was issued; and

CERTIFIES FURTHER that any provisions of Section 646F of the New York Charter have been complied with as certified by a report of the Fire Commissioner to the Borough Superintendent.

~~NYC~~ Alt. No. 1876-1958

Construction classification

Occupancy classification Commercial

Height stories feet

Date of completion April 3, 1959

Located in Restricted Use District

A Area 2

Height Zone at time of issuance of permit

This certificate is issued subject to the limitations hereinafter specified and to the following resolutions of the Board of Standards and Appeals: (Calendar numbers to be inserted here)

PERMISSIBLE USE AND OCCUPANCY

STORY	LIVE LOADS Lbs. per Sq. Ft.	PERSONS ACCOMMODATED			USE
		MALE	FEMALE	TOTAL	
On ground					Parking for more than five (5) motor vehicles. Gasoline tank installation approved by Fire Department May 4, 1959. Sec. 6.1.2.3 sub-4 Building Code, C.26-273.0 Adm. Code "Prior to the occupancy of any building erected or altered after January 1, 1958, the authorized occupant shall be responsible for the structure as stated in the certificate of occupancy and the same shall be permanently posted under glass and maintained in the main entrance hall of such structures."

Thomas V. ...

Borough Superintendent

CERTIFICATE WILL BE NULL AND VOID IF ALTERED IN ANY MANNER OR ADDITIONS ARE MADE THERETO.

**NO CHANGES OF USE OR OCCUPANCY NOT CONSISTENT WITH THIS CERTIFICATE SHALL
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Unless an approval for the same has been obtained from the Borough Superintendent, no change or rearrangement in the structural parts of the building, or affecting the light and ventilation of any part thereof, or in the exit facilities, shall be made; no enlargement, whether by extending on any side or by increasing in height shall be made; nor shall the building be moved from one location or position to another; nor shall there be any reduction or diminution of the area of the lot or plot on which the building is located.

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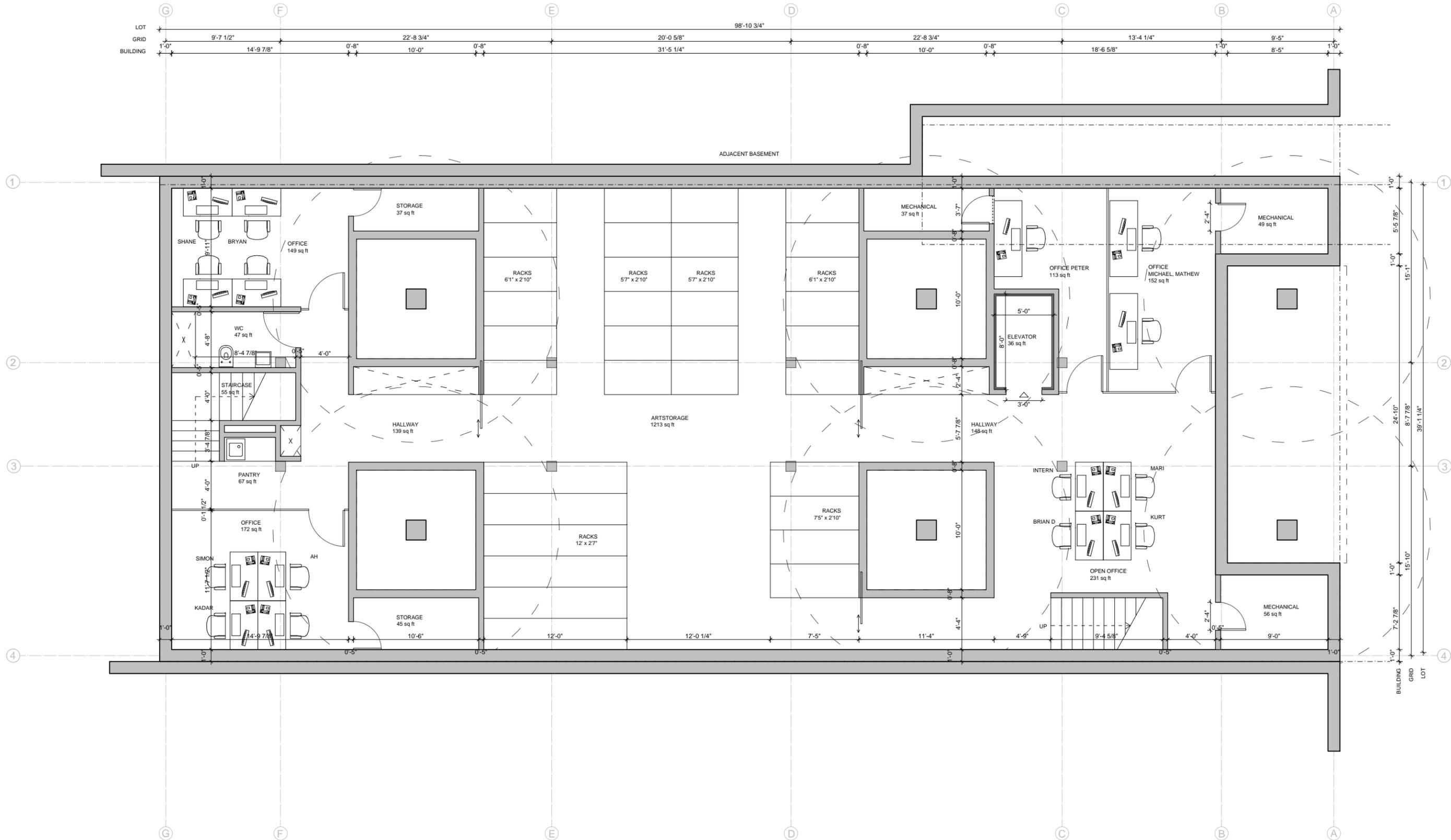
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Additional copies of this certificate will be furnished to persons having an interest in the building or premises, upon payment of a fee of fifty cents per copy.

Proposed Development Plans



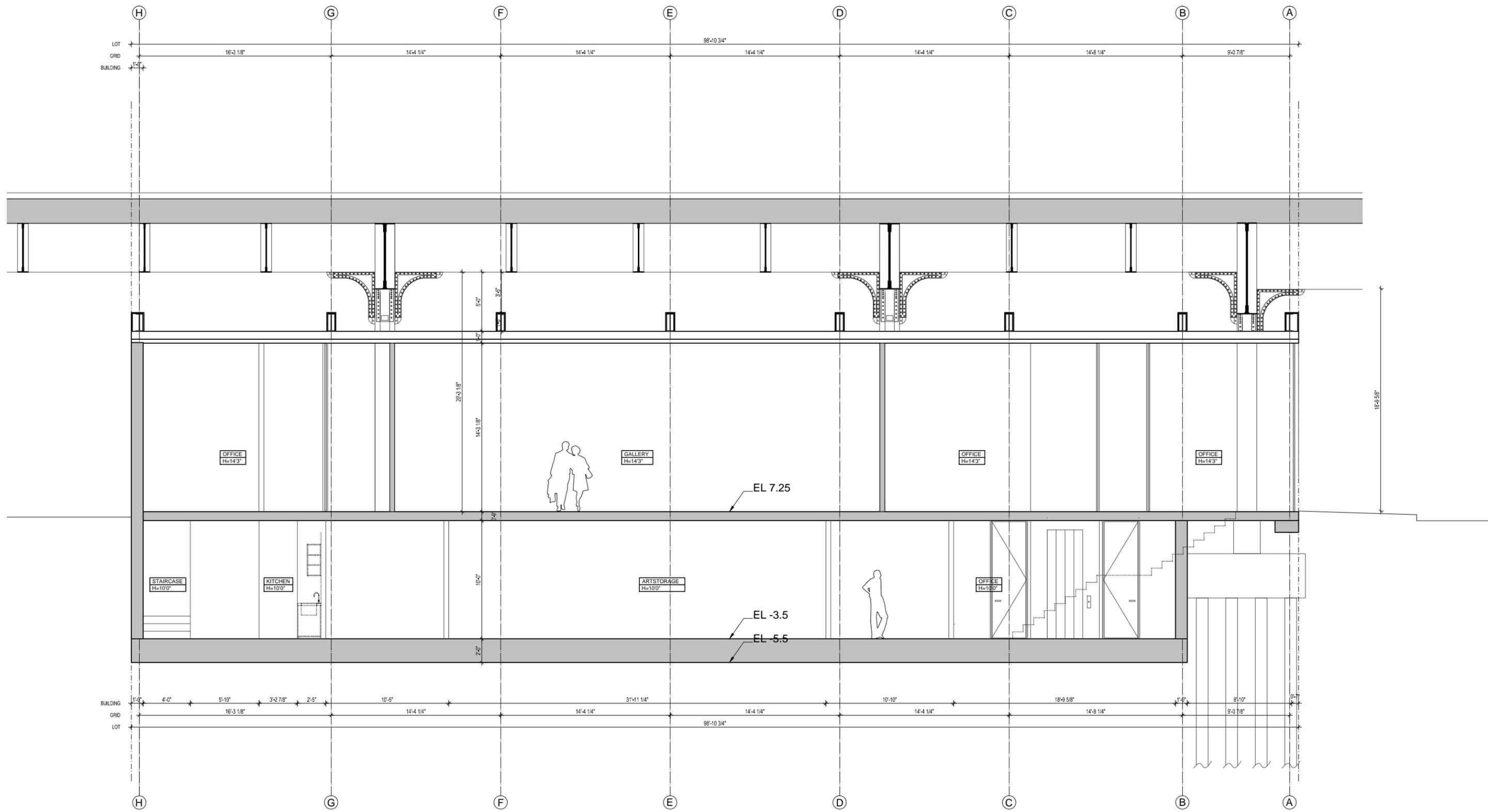
507 W 24th STREET - LAYOUT basement

studioMDA
 102 Franklin Street, 3rd Floor, New York, New York 10013 Phone: 212.343.3330 Fax: 212.343.3350

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SCALE 1/8" = 1'-0"

February 01st, 2012



507 W 24th STREET - SECTION 01

SCALE 1/8" = 1'-0"

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Soil Vapor Sampling Results



ANALYTICAL REPORT
Soil Vapor

West 24

Lot #: H8B150242

William Holubowich

Roux Associates, Inc.
209 Shafter Street
Islandia, NY 11749-5074

TESTAMERICA LABORATORIES, INC.

A handwritten signature in black ink, appearing to read "J. McKinney", is written over the printed name of the project manager.

Jamie A. McKinney
Project Manager

February 26, 2008

CHAIN OF CUSTODY

Air Sampling Field Data Sheet

1788150242
PAGE 1 OF 1

Client / Reporting Information

Company Name: **Roux Associates**
 Address: **209 Shafter St.**
 City: **Islandia** State: **NY** Zip: **11749**
 Project Contact: **Bill Holbowirch** wholebowirch@rouxinc.com
 Phone #: **631.232.2600** Fax #: **631.232.9898**

Weather Parameters

Temperature (Fahrenheit):
 Start: **34** Maximum:
 Stop: **37** Minimum:
 Atmospheric Pressure (Inches of Hg):
 Start: **29.36** Maximum:
 Stop: **29.36** Minimum:
 Other weather comment:

Lab Sample #	Field ID / Point of Collection	Sampling Equipment Info			Start Sampling Information			Stop Sampling Information			Requested Analysis			
		Air Type	Canister Serial #	Canister Size (6L or 1L)	Flow Controller Serial #	Time (24hr clock)	Canister Pressure ("Hg)	Interior Temp (F)	Sampler Init.	Time (24hr clock)		Canister Pressure ("Hg)	Interior Temp (F)	Sampler Init.
SVP-1		ASV	3396	6	3936	9am	30	30	BA1	2/14	11am	0	BA1	X
SVP-2		ASV	3314	6	2937	10am	30	30	BA1	2/14	12pm	10	BA1	X

Standard - 15 Days

Turnaround Time (Business days): **X**

Approved By: _____ Date: _____

Data Deliverable Information

All NJDEP TO-15 is mandatory Full T1

Comm A
 Comm B
 Reduced T2
 Full T1
 Other:

Comments / Remarks

CUSTOMER SEALS INTACT
 RECEIVED AT AMBIENT TEMP
 15AD 2-15-08
 2 NOTES FROM 9:57H 9181 9124-9135
 2 CANS / 2 FUDWS

Relinquished by Laboratory:

1 Date Time: _____ Received By: _____
 3 Date Time: _____ Received By: _____
 5 Date Time: _____ Received By: _____

Relinquished by:

2 Date Time: **2/14/08** Received By: **[Signature]**
 4 Date Time: _____ Received By: _____

Standard TO-15 Reporting List

ANALYTICAL METHODS SUMMARY

H8B150242

<u>PARAMETER</u>	<u>ANALYTICAL METHOD</u>
Volatile Organics by TO15	EPA-2 TO-15

References:

EPA-2 "Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air", EPA-625/R-96/010b, January 1999.

SAMPLE SUMMARY

H8B150242

<u>WO #</u>	<u>SAMPLE#</u>	<u>CLIENT SAMPLE ID</u>	<u>SAMPLED DATE</u>	<u>SAMP TIME</u>
KG6NE	001	SVP-1	02/14/08	09:00
KG6NG	002	SVP-2	02/14/08	10:30

NOTE (S) :

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

PROJECT NARRATIVE

H8B150242

The results reported herein are applicable to the samples submitted for analysis only.

This report shall not be reproduced except in full, without the written approval of the laboratory.

The original chain of custody documentation is included with this report.

Sample Receipt

There were no problems with the condition of the samples received.

Quality Control and Data Interpretation

Unless otherwise noted, all holding times and QC criteria were met and the test results shown in this report meet all applicable NELAC requirements.

TestAmerica Knoxville maintains the following certifications, approvals and accreditations: Arkansas DEQ Cert. #05-043-0, California DHS ELAP Cert. #2423, Colorado DPHE, Connecticut DPH Cert. #PH-0223, Florida DOH Cert. #E87177, Georgia DNR Cert. #906, Hawaii DOH, Illinois EPA Cert. #000687, Indiana DOH Cert. #C-TN-02, Iowa DNR Cert. #375, Kansas DHE Cert. #E-10349, Kentucky DEP Lab ID #90101, Louisiana DEQ Cert. #03079, Louisiana DOHH Cert. #LA030024, Maryland DHMH Cert. #277, Massachusetts DEP Cert. #M-TN009, Michigan DEQ Lab ID #9933, New Jersey DEP Cert. #TN001, New York DOH Lab #10781, North Carolina DPH Lab ID #21705, North Carolina DEHNR Cert. #64, Ohio EPA VAP Cert. #CL0059, Oklahoma DEQ ID #9415, Pennsylvania DEP Cert. #68-00576, South Carolina DHEC Lab ID #84001001, Tennessee DOH Lab ID #02014, Utah DOH Cert. #QUAN3, Virginia DGS Lab ID #00165, Washington DOE Lab #C120, West Virginia DEP Cert. #345, Wisconsin DNR Lab ID #998044300, Naval Facilities Engineering Service Center and USDA Soil Permit #S-46424. This list of approvals is subject to change and does not imply that laboratory certification is available for all parameters reported in this environmental sample data report.

Sample Data Summary

Roux Associates, Inc.
 Client Sample ID: SVP-1
 GC/MS Volatiles

Lot-Sample # H8B150242 - 001

Work Order # KG6NE1AA

Matrix.....: AIR

Date Sampled...: 2/14/08
 Prep Date.....: 2/21/08
 Prep Batch #....: 8053027
 Dilution Factor.: 10

Date Received...: 2/15/08
 Analysis Date... 2/21/08
 Method.....: TO-15

PARAMETER	RESULTS (ppb(v/v))	REPORTING LIMIT (ppb(v/v))	RESULTS (ug/m3)	REPORTING LIMIT (ug/m3)
Dichlorodifluoromethane	ND	2.0	ND	9.9
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	2.0	ND	14
Chloromethane	ND	5.0	ND	10
Vinyl chloride	ND	2.0	ND	5.1
Bromomethane	ND	2.0	ND	7.8
Chloroethane	ND	2.0	ND	5.3
Trichlorofluoromethane	ND	2.0	ND	11
1,1-Dichloroethene	ND	2.0	ND	7.9
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	2.0	ND	15
Methylene chloride	ND	5.0	ND	17
1,1-Dichloroethane	ND	2.0	ND	8.1
cis-1,2-Dichloroethene	ND	2.0	ND	7.9
Chloroform	ND	2.0	ND	9.8
1,1,1-Trichloroethane	ND	2.0	ND	11
Carbon tetrachloride	ND	2.0	ND	13
Benzene	ND	2.0	ND	6.4
1,2-Dichloroethane	ND	2.0	ND	8.1
Trichloroethene	ND	2.0	ND	11
1,2-Dichloropropane	ND	2.0	ND	9.2
cis-1,3-Dichloropropene	ND	2.0	ND	9.1
Toluene	ND	2.0	ND	7.5
trans-1,3-Dichloropropene	ND	2.0	ND	9.1
1,1,2-Trichloroethane	ND	2.0	ND	11
Tetrachloroethene	ND	2.0	ND	14
1,2-Dibromoethane (EDB)	ND	2.0	ND	15
Chlorobenzene	ND	2.0	ND	9.2
Ethylbenzene	ND	2.0	ND	8.7
m-Xylene & p-Xylene	ND	2.0	ND	8.7
o-Xylene	ND	2.0	ND	8.7
Styrene	ND	2.0	ND	8.5
1,1,2,2-Tetrachloroethane	ND	2.0	ND	14
1,3,5-Trimethylbenzene	ND	2.0	ND	9.8
1,2,4-Trimethylbenzene	ND	2.0	ND	9.8
1,3-Dichlorobenzene	ND	2.0	ND	12
1,4-Dichlorobenzene	ND	2.0	ND	12
1,2-Dichlorobenzene	ND	2.0	ND	12
Benzyl chloride	ND	4.0	ND	21
1,2,4-Trichlorobenzene	ND	10	ND	74

Roux Associates, Inc.
 Client Sample ID: SVP-1
 GC/MS Volatiles

Lot-Sample # H8B150242 - 001 Work Order # KG6NE1AA Matrix.....: AIR

PARAMETER	RESULTS (ppb(v/v))	REPORTING LIMIT (ppb(v/v))	RESULTS (ug/m3)	REPORTING LIMIT (ug/m3)
Hexachlorobutadiene	ND	10	ND	110
SURROGATE		PERCENT RECOVERY		LABORATORY CONTROL LIMITS (%)
1,2-Dichloroethane-d4		106		70 - 130
Toluene-d8		105		70 - 130
4-Bromofluorobenzene		97		70 - 130

The 'Result' in ug/m3 is calculated using the following equation: Amount Found(before rounding)*(Molecular Weight/24.45)

The 'Reporting Limit' in ug/m3 is calculated using the following equation: (Reporting Limit(before rounding) * Dilution Factor) * (Molecular Weight/24.45)

Roux Associates, Inc.
Client Sample ID: SVP-2
GC/MS Volatiles

Lot-Sample # H8B150242 - 002

Work Order # KG6NG1AA

Matrix.....: AIR

Date Sampled...: 2/14/08
Prep Date.....: 2/21/08
Prep Batch #.....: 8053027
Dilution Factor.: 10

Date Received..: 2/15/08
Analysis Date... 2/21/08
Method.....: TO-15

PARAMETER	RESULTS (ppb(v/v))	REPORTING LIMIT (ppb(v/v))	RESULTS (ug/m3)	REPORTING LIMIT (ug/m3)
Dichlorodifluoromethane	ND	2.0	ND	9.9
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	2.0	ND	14
Chloromethane	ND	5.0	ND	10
Vinyl chloride	ND	2.0	ND	5.1
Bromomethane	ND	2.0	ND	7.8
Chloroethane	ND	2.0	ND	5.3
Trichlorofluoromethane	ND	2.0	ND	11
1,1-Dichloroethene	ND	2.0	ND	7.9
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	2.0	ND	15
Methylene chloride	ND	5.0	ND	17
1,1-Dichloroethane	ND	2.0	ND	8.1
cis-1,2-Dichloroethene	ND	2.0	ND	7.9
Chloroform	ND	2.0	ND	9.8
1,1,1-Trichloroethane	ND	2.0	ND	11
Carbon tetrachloride	ND	2.0	ND	13
Benzene	3.7	2.0	12	6.4
1,2-Dichloroethane	ND	2.0	ND	8.1
Trichloroethene	7.4	2.0	40	11
1,2-Dichloropropane	ND	2.0	ND	9.2
cis-1,3-Dichloropropene	ND	2.0	ND	9.1
Toluene	18	2.0	66	7.5
trans-1,3-Dichloropropene	ND	2.0	ND	9.1
1,1,2-Trichloroethane	ND	2.0	ND	11
Tetrachloroethene	ND	2.0	ND	14
1,2-Dibromoethane (EDB)	ND	2.0	ND	15
Chlorobenzene	ND	2.0	ND	9.2
Ethylbenzene	ND	2.0	ND	8.7
m-Xylene & p-Xylene	ND	2.0	ND	8.7
o-Xylene	ND	2.0	ND	8.7
Styrene	ND	2.0	ND	8.5
1,1,2,2-Tetrachloroethane	ND	2.0	ND	14
1,3,5-Trimethylbenzene	ND	2.0	ND	9.8
1,2,4-Trimethylbenzene	ND	2.0	ND	9.8
1,3-Dichlorobenzene	ND	2.0	ND	12
1,4-Dichlorobenzene	ND	2.0	ND	12
1,2-Dichlorobenzene	ND	2.0	ND	12
Benzyl chloride	ND	4.0	ND	21
1,2,4-Trichlorobenzene	ND	10	ND	74

Roux Associates, Inc.
 Client Sample ID: SVP-2
 GC/MS Volatiles

Lot-Sample # H8B150242 - 002 Work Order # KG6NG1AA Matrix.....: AIR

PARAMETER	RESULTS (ppb(v/v))	REPORTING LIMIT (ppb(v/v))	RESULTS (ug/m3)	REPORTING LIMIT (ug/m3)
Hexachlorobutadiene	ND	10	ND	110
SURROGATE		PERCENT RECOVERY		LABORATORY CONTROL LIMITS (%)
1,2-Dichloroethane-d4		107		70 - 130
Toluene-d8		106		70 - 130
4-Bromofluorobenzene		95		70 - 130

The 'Result' in ug/m3 is calculated using the following equation: Amount Found(before rounding)*(Molecular Weight/24.45)

The 'Reporting Limit' in ug/m3 is calculated using the following equation: (Reporting Limit(before rounding) * Dilution Factor) * (Molecular Weight/24.45)

Roux Associates, Inc.
 Client Sample ID: INTRA-LAB BLANK
 GC/MS Volatiles

Lot-Sample # H8B220000 - 027B

Work Order # KHGR61AA

Matrix.....: AIR

Prep Date.....: 2/21/08
 Prep Batch #.....: 8053027
 Dilution Factor.: 1

Date Received.: 2/15/08
 Analysis Date... 2/21/08
 Method.....: TO-15

PARAMETER	RESULTS (ppb(v/v))	REPORTING LIMIT (ppb(v/v))	RESULTS (ug/m3)	REPORTING LIMIT (ug/m3)
Dichlorodifluoromethane	ND	0.20	ND	0.99
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	0.20	ND	1.4
Chloromethane	ND	0.50	ND	1.0
Vinyl chloride	ND	0.20	ND	0.51
Bromomethane	ND	0.20	ND	0.78
Chloroethane	ND	0.20	ND	0.53
Trichlorofluoromethane	ND	0.20	ND	1.1
1,1-Dichloroethene	ND	0.20	ND	0.79
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	0.20	ND	1.5
Methylene chloride	ND	0.50	ND	1.7
1,1-Dichloroethane	ND	0.20	ND	0.81
cis-1,2-Dichloroethene	ND	0.20	ND	0.79
Chloroform	ND	0.20	ND	0.98
1,1,1-Trichloroethane	ND	0.20	ND	1.1
Carbon tetrachloride	ND	0.20	ND	1.3
Benzene	ND	0.20	ND	0.64
1,2-Dichloroethane	ND	0.20	ND	0.81
Trichloroethene	ND	0.20	ND	1.1
1,2-Dichloropropane	ND	0.20	ND	0.92
cis-1,3-Dichloropropene	ND	0.20	ND	0.91
Toluene	ND	0.20	ND	0.75
trans-1,3-Dichloropropene	ND	0.20	ND	0.91
1,1,2-Trichloroethane	ND	0.20	ND	1.1
Tetrachloroethene	ND	0.20	ND	1.4
1,2-Dibromoethane (EDB)	ND	0.20	ND	1.5
Chlorobenzene	ND	0.20	ND	0.92
Ethylbenzene	ND	0.20	ND	0.87
m-Xylene & p-Xylene	ND	0.20	ND	0.87
o-Xylene	ND	0.20	ND	0.87
Styrene	ND	0.20	ND	0.85
1,1,2,2-Tetrachloroethane	ND	0.20	ND	1.4
1,3,5-Trimethylbenzene	ND	0.20	ND	0.98
1,2,4-Trimethylbenzene	ND	0.20	ND	0.98
1,3-Dichlorobenzene	ND	0.20	ND	1.2
1,4-Dichlorobenzene	ND	0.20	ND	1.2
1,2-Dichlorobenzene	ND	0.20	ND	1.2
Benzyl chloride	ND	0.40	ND	2.1
1,2,4-Trichlorobenzene	ND	1.0	ND	7.4

Roux Associates, Inc.
 Client Sample ID: INTRA-LAB BLANK
 GC/MS Volatiles

Lot-Sample # H8B220000 - 027B Work Order # KHGR61AA Matrix.....: AIR

PARAMETER	RESULTS (ppb(v/v))	REPORTING LIMIT (ppb(v/v))	RESULTS (ug/m3)	REPORTING LIMIT (ug/m3)
Hexachlorobutadiene	ND	1.0	ND	11

SURROGATE	PERCENT RECOVERY	LABORATORY CONTROL LIMITS (%)
1,2-Dichloroethane-d4	110	70 - 130
Toluene-d8	103	70 - 130
4-Bromofluorobenzene	101	70 - 130

The 'Result' in ug/m3 is calculated using the following equation: Amount Found(before rounding)*(Molecular Weight/24.45)

The 'Reporting Limit' in ug/m3 is calculated using the following equation: (Reporting Limit(before rounding) * Dilution Factor) * (Molecular Weight/24.45)

Groundwater Sampling Results

Connecticut
128 Long Hill Cross Road
Shelton, CT 06484
Tel: 203-929-8140
Fax: 203-929-8142

Chain of
Custody Record

TAL-0015 (1007)

Client: Roux Associates, Inc. City: Yonkers State: NY Zip Code: 10714

Address: 209 Shafter St Telephone Number (Area Code)/Fax Number/e-mail address: 603 232 2600

Project Manager: Bill Holubouch Lab Contact: Bill Dwanick

Site Contact: Bill Dwanick (4 tea may be assessed if samples are retained longer than 1 month)

Project Name and Location (State): Wes 24 W St Contract/Purchase Order/Project No.: 172801V

Field Sample I.D.: (Containers for each sample may be combined on one line)

Field Sample I.D.	Collection Date	Collection Time	Matrix		Containers & Preservatives							Other	Comments	
			Aqueous	Solid	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH				
G-W-1	2/25/08		X											Proxics TA1
G-W-2	2/25/08		X											Filtered by lab
														G-W-1 only anal
														amber bottles w/cs
														collected

Analysis (Attach list if more space is needed):
 VCS 8276
 VCS 8092
 Proxics TA1

Chain of Custody Number: 010857 Page 1 of 1

Turn Around Time Required (business days) Report/ EDD Requirements:
 24 Hours 48 Hours 5 Days 10 Days 15 Days Other

1. Relinquished By: [Signature] Date: 2/25/08 Time: _____
 2. Relinquished By: _____ Date: _____ Time: _____
 3. Received By: _____ Date: _____ Time: _____

State Regulatory QC Requirements

1. Received By: _____ Date: _____ Time: _____
 2. Received By: _____ Date: _____ Time: _____
 Cooler Temps: _____

Passed Rad. Screen (Lab Use Only)
 Yes No

Comments: Lab Filter Media -

GW-1



SUMMARY OF ANALYTICAL RESULTS

TestAmerica Connecticut - 220-4238-1

Sample ID	GW-1
Lab Sample Number	220-4238-1
Sampling Date	2/25/2008 0:00
Matrix	Water
Dilution Factor	1
Units	ug/L
	Low
GC/MS VOA 8260B	
Acetone	10 U
Benzene	5 U
Bromodichloromethane	5 U
Bromoform	5 U
Bromomethane	5 U*
Methyl Ethyl Ketone	10 U
Carbon disulfide	5 U
Carbon tetrachloride	5 U
Chlorobenzene	5 U
Chloroethane	5 U
Chloroform	5 U
Chloromethane	5 U
Dibromochloromethane	5 U
1,1-Dichloroethane	5 U
1,2-Dichloroethane	5 U
1,1-Dichloroethene	5 U
1,2-Dichloropropane	5 U
cis-1,3-Dichloropropene	5 U
trans-1,3-Dichloropropene	5 U
Ethylbenzene	5 U
2-Hexanone	10 U
Methylene Chloride	5 U
methyl isobutyl ketone	10 U

TestAmerica

Styrene	5	U*
1,1,1,2-Tetrachloroethane	5	U
Tetrachloroethene	5	U
Toluene	5	U
1,1,1-Trichloroethane	5	U
1,1,1,2-Trichloroethane	5	U
Trichloroethene	5	U
Vinyl chloride	5	U
Xylenes, Total	5	U
cis-1,2-Dichloroethene	5	U
trans-1,2-Dichloroethene	5	U



SUMMARY OF ANALYTICAL RESULTS
 TestAmerica Connecticut - 220-4238-1

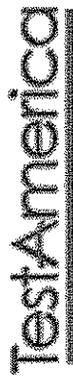
Sample ID	GW-1
Lab Sample Number	220-4238-1
Sampling Date	2/25/2008 0:00
Matrix	Water
Dilution Factor	1
Units	ug/L
	Low
GC/MS Semi VOA- 8270C	
Acenaphthene	11 U
Acenaphthylene	11 U
Anthracene	11 U
Benzo[a]anthracene	11 U
Benzo[a]pyrene	11 U
Benzo[b]fluoranthene	11 U
Benzo[g,h,i]perylene	11 U
Benzo[k]fluoranthene	11 U
Bis(2-chloroethoxy)methane	11 U
Bis(2-chloroethyl)ether	11 U
Bis(2-ethylhexyl) phthalate	11 U
Butyl benzyl phthalate	11 U
Carbazole	11 U
Chrysene	11 U
Di-n-butyl phthalate	11 U
Di-n-octyl phthalate	11 U
4-Bromophenyl phenyl ether	11 U
4-Chloroaniline	11 U
2-Chloronaphthalene	11 U
4-Chlorophenyl phenyl ether	11 U
Dibenz(a,h)anthracene	11 U

TestAmerica

Dibenzofuran	11	U
Diethyl phthalate	11	U
Dimethyl phthalate	11	U
1,2-Dichlorobenzene	11	U
1,3-Dichlorobenzene	11	U
1,4-Dichlorobenzene	11	U
3,3'-Dichlorobenzidine	11	U
2,4-Dinitrotoluene	11	U
2,6-Dinitrotoluene	11	U
Fluoranthene	11	U
Fluorene	11	U
Hexachlorobenzene	11	U
Hexachlorobutadiene	11	U
Hexachlorocyclopentadiene	11	U
Hexachloroethane	11	U
Indeno[1,2,3-cd]pyrene	11	U
Isophorone	11	U
2-Methylnaphthalene	11	U
Naphthalene	11	U
2-Nitroaniline	55	U
3-Nitroaniline	55	U
Nitrobenzene	11	U
N-Nitrosodi-n-propylamine	11	U
N-Nitrosodiphenylamine	11	U
Phenanthrene	11	U
Pyrene	11	U
1,2,4-Trichlorobenzene	11	U
4-Chloro-3-methylphenol	11	U
2-Chlorophenol	11	U
2-Methylphenol	11	U
4-Methylphenol	11	U
2,4-Dichlorophenol	11	U
2,4-Dimethylphenol	11	U
2,4-Dinitrophenol	55	U
4,6-Dinitro-2-methylphenol	55	U

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2-Nitrophenol	11	U
4-Nitrophenol	55	U
Pentachlorophenol	55	U
Phenol	11	U
2,4,5-Trichlorophenol	55	U
2,4,6-Trichlorophenol	11	U
Benzyl alcohol	11	U
4-Nitroaniline	22	U
2,2'-oxybis[1-chloropropane]	11	U



SUMMARY OF ANALYTICAL RESULTS
TestAmerica Connecticut - 220-4238-1

Sample ID	GW-2
Lab Sample Number	220-4238-2
Sampling Date	2/25/2008 0:00
Matrix	Water
Dilution Factor	1
Units	ug/L
	Low
GC Semi VOA - 8082	
PCB-1016	0.5 U
PCB-1221	1 U
PCB-1232	0.5 U
PCB-1242	0.5 U
PCB-1248	0.5 U
PCB-1254	0.5 U
PCB-1260	0.5 U



SUMMARY OF ANALYTICAL RESULTS
 TestAmerica Connecticut - 220-4238-1

Sample ID	GW-1
Lab Sample Number	220-4238-1
Sampling Date	2/25/2008 0:00
Matrix	Water
Dilution Factor	1
Units	ug/L
	Dissolved Low
Metals	
Silver	5 U
Aluminum	500 U
Arsenic	20 U
Barium	87
Beryllium	3 U
Calcium	95900
Cadmium	5 U
Cobalt	10 U
Chromium	10 U
Copper	6 J
Iron	200 U
Potassium	19400
Magnesium	31600
Manganese	1000
Sodium	27400
Nickel	10 U
Lead	10 U
Antimony	20 U
Selenium	30 U
Thallium	30 U
Vanadium	5 U

TestAmerica

Zinc	50	U
Mercury	NR	

GW-2



THE LEADER IN ENVIRONMENTAL TESTING

SUMMARY OF ANALYTICAL RESULTS

TestAmerica Connecticut - 220-4238-1

Sample ID	GW-2
Lab Sample Number	220-4238-2
Sampling Date	2/25/2008 0:00
Matrix	Water
Dilution Factor	1
Units	ug/L
	Low
GC/MS VOA - 8260B	
Acetone	10 U
Benzene	5 U
Bromodichloromethane	5 U
Bromoform	5 U
Bromomethane	5 U*
Methyl Ethyl Ketone	10 U
Carbon disulfide	5 U
Carbon tetrachloride	5 U
Chlorobenzene	5 U
Chloroethane	5 U
Chloroform	5 U
Chloromethane	5 U
Dibromochloromethane	5 U
1,1-Dichloroethane	5 U
1,2-Dichloroethane	5 U
1,1-Dichloroethene	5 U
1,2-Dichloropropane	5 U*
cis-1,3-Dichloropropene	5 U
trans-1,3-Dichloropropene	5 U
Ethylbenzene	5 U
2-Hexanone	10 U
Methylene Chloride	5 U
methyl isobutyl ketone	10 U

TestAmerica

Styrene		5	U
1,1,2,2-Tetrachloroethane		5	U
Tetrachloroethene		5	U
Toluene		0.29	J
1,1,1-Trichloroethane		5	U
1,1,2-Trichloroethane		5	U
Trichloroethene		5	U
Vinyl chloride		5	U
Xylenes, Total		5	U
cis-1,2-Dichloroethene		5	U
trans-1,2-Dichloroethene		5	U



SUMMARY OF ANALYTICAL RESULTS
 TestAmerica Connecticut - 220-4238-1

Sample ID	GW-2
Lab Sample Number	220-4238-2
Sampling Date	2/25/2008 0:00
Matrix	Water
Dilution Factor	1
Units	ug/L
	Low
GC/MS Semi VOA - 8270C	
Acenaphthene	11 U
Acenaphthylene	11 U
Anthracene	0.65 J
Benzo[a]anthracene	1.6 J
Benzo[a]pyrene	1.3 J
Benzo[b]fluoranthene	1.6 J
Benzo[g,h,i]perylene	0.85 J
Benzo[k]fluoranthene	0.51 J
Bis(2-chloroethoxy)methane	11 U
Bis(2-chloroethyl)ether	11 U
Bis(2-ethylhexyl) phthalate	16
Butyl benzyl phthalate	11 U
Carbazole	11 U
Chrysene	1.4 J
Di-n-butyl phthalate	11 U
Di-n-octyl phthalate	11 U
4-Bromophenyl phenyl ether	11 U
4-Chloroaniline	11 U
2-Chloronaphthalene	11 U
4-Chlorophenyl phenyl ether	11 U
Dibenz(a,h)anthracene	11 U

TestAmerica

Dibenzofuran	11	U
Diethyl phthalate	11	U
Dimethyl phthalate	11	U
1,2-Dichlorobenzene	11	U
1,3-Dichlorobenzene	11	U
1,4-Dichlorobenzene	11	U
3,3'-Dichlorobenzidine	11	U
2,4-Dinitrotoluene	11	U
2,6-Dinitrotoluene	11	U
Fluoranthene	2.8	J
Fluorene	11	U
Hexachlorobenzene	11	U
Hexachlorobutadiene	11	U
Hexachlorocyclopentadiene	11	U
Hexachloroethane	11	U
Indeno[1,2,3-cd]pyrene	0.84	J
Isophorone	11	U
2-Methylnaphthalene	11	U
Naphthalene	11	U
2-Nitroaniline	56	U
3-Nitroaniline	56	U
Nitrobenzene	11	U
N-Nitrosodi-n-propylamine	11	U
N-Nitrosodiphenylamine	11	U
Phenanthrene	2.1	J
Pyrene	3.3	J
1,2,4-Trichlorobenzene	11	U
4-Chloro-3-methylphenol	11	U
2-Chlorophenol	11	U
2-Methylphenol	11	U
4-Methylphenol	11	U
2,4-Dichlorophenol	11	U
2,4-Dimethylphenol	11	U
2,4-Dinitrophenol	56	U
4,6-Dinitro-2-methylphenol	56	U

TestAmerica

2-Nitrophenol	11	U
4-Nitrophenol	56	U
Pentachlorophenol	56	U
Phenol	11	U
2,4,5-Trichlorophenol	56	U
2,4,6-Trichlorophenol	11	U
Benzyl alcohol	11	U
4-Nitroaniline	22	U
2,2'-oxybis[1-chloropropane]	11	U



SUMMARY OF ANALYTICAL RESULTS
 TestAmerica Connecticut - 220-4238-1

Sample ID	GW-2
Lab Sample Number	220-4238-2
Sampling Date	2/25/2008 0:00
Matrix	Water
Dilution Factor	1
Units	ug/L
	Dissolved Low
Metals	
Silver	5 U
Aluminum	500 U
Arsenic	20 U
Barium	110
Beryllium	3 U
Calcium	111000
Cadmium	5 U
Cobalt	10 U
Chromium	10 U
Copper	9.6 J
Iron	200 U
Potassium	20900
Magnesium	18400
Manganese	620
Sodium	103000
Nickel	3.1 J
Lead	10 U
Antimony	20 U
Selenium	30 U
Thallium	30 U
Vanadium	5 U

TestAmerica

Zinc	17	J
Mercury	NR	

Previous Environmental Investigations and Reports

Historical soil + gw data

SUBSURFACE ASSESSMENT REPORT

Block 696, Lots 28, 33, & 42
West Chelsea Assemblage
New York, New York

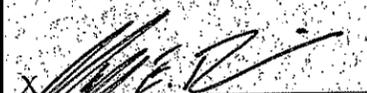
June 4, 2004

Hydro Tech Environmental, Corp. appreciates the opportunity to work for Mr. Timothy Simmons of Alf Naman Real Estate at the property located at West Chelsea Assemblage in New York, New York.

Should you require any additional information or have any comments regarding the contents of this report, please feel free to contact our office at your convenience.

Very Truly Yours,
Hydro Tech Environmental, Corp.

X 
Kathleen De Voe
Project Geologist

X 
Mark E. Robbins, C.P.G., C.E.I.
Senior Geologist

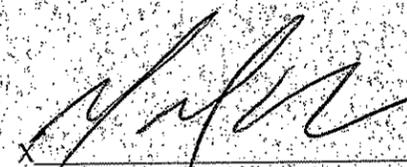
X 
Mostafa El Sehamy, P.G., C.G.W.P.
Operations Director

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1.0 EXECUTIVE SUMMARY

Hydro Tech Environmental, Corp. (HTE) has performed a subsurface assessment at the properties located at 501 - 511 West 24th Street, 510 West 25th Street and 245 Tenth Avenue in New York, New York. The properties are also referred to as the West Chelsea Assemblage. The assessment was performed on behalf of Alf Naman Real Estate.

The purpose of the assessment was to investigate environmental concerns such as underground storage tanks, the use of the properties for auto repairs and a trucking company and the presence of an adjacent gasoline station. The field portion of the assessment consisted of the performance of a Ground-Penetrating Radar (GPR) survey to identify the presence of subsurface anomalies. Next, soil probes and monitoring wells were installed and sampled to characterize the subsurface soil and groundwater quality beneath the Site. The results of soil and groundwater analyticals were compared to applicable New York State Department of Environmental Conservation (NYSDEC) Standards.

The results of the investigation are contained in this report. The subsurface assessment has revealed subsurface anomalies in 5 locations. Elevated levels of semi-volatile organic compounds were identified at concentrations exceeding applicable regulatory standards in shallow soil beneath 507 - 511 West 24th Street. The groundwater flow direction was determined to be toward the northwest. Dissolved constituents indicative of lighter-grade petroleum were identified in groundwater beneath 245 Tenth Avenue.

No effort has been made to perform any investigation beyond what is included in this report. The observations included herein summarize the results of the investigation up to the date of the fieldwork and the date of this report.

The following sections provide the details and specific information pertaining to the various components of the subsurface assessment.

2.0 INTRODUCTION

Hydro Tech Environmental Corp. (HTE) has been retained by Alf Naman Real Estate (the "Client") to perform a subsurface assessment of the properties located at 501 - 511 West 24th Street, 510 West 25th Street and 245 Tenth Avenue in New York, New York. The properties, also commonly referred to as the West Chelsea Assemblage, will hereafter be collectively referred to as the "Site".

The Site is located along the west side of Tenth Avenue, between West 25th Street to the north and West 24th Street to the south, in the southwest portion of New York County, New York. The elevation of the Site is approximately 16 feet above mean sea level. (U.S.G.S. Jamaica, New York Quadrangle, 1969).

Figure 1 provides a Site Location Map.

2.1 Site Description

The Site consists of several current and former auto body shops. The portion of the Site located on Tenth Avenue consists of a 1-story auto body shop that is currently active. The portions of the Site situated to the south of West 25th Street and to the north of West 24th Street both consist of former auto body shops. Several abandoned automobiles are situated along the property located on 24th Street.

Figure 2 provides a Site Plan.

2.2 Environmental Setting

The Site is situated in the southwest portion of New York County. New York County is also commonly referred to as Manhattan, New York.

The vicinity of the site is characterized by metamorphosed sequences of bedrock known as the Manhattan Prong of the Hartland Formation. The Hartland Formation was formed during the late Cambrian to early Ordovician period and consists of undivided pelitic schist with gneiss and amphibolite. The formation is frequently cross cut by transverse and parallel faults. The area is overlain by Pleistocene aged glacial till deposits.

Outcrops of bedrock are commonplace in the borough of Manhattan, as can be seen in Central Park. No bedrock outcroppings were identified at the Site or in the immediate vicinity of the Site.

2.3 Scope of Work

The purpose of the scope of work was to address concerns associated with aboveground and underground storage tanks, the use of the property for auto repairs and a trucking company and the presence of an adjacent gasoline station. The scope of work was developed based upon information and specifications provided by the Client.

All related portions of the field portion of the Phase II Assessment were performed in accordance with acceptable industry standards. These acceptable industry standards include, but are not limited to, the ASTM Standard Guide for Phase II Environmental Site Assessments (E 1903-97) and the New York State Department of Environmental Conservation Bureau of Spill Prevention & Response Sampling Guidelines and Protocols, March 1991 and Draft DER-10 Technical Guidance for Site Investigation and Remediation, December 2002.

3.0 FIELD WORK

3.1 Introduction

The field portion of the investigation was performed on May 12 to 19, 2004 and consisted of the performance of a Ground-Penetrating Radar (GPR) survey, and the installation and sampling of 10 soil probes and 4 monitoring wells. All fieldwork was performed under the direct guidance and oversight of an HTE Geologist and under the supervision of an HTE Project Manager. The scope of work regarding this portion of the project consisted of the following tasks:

- The performance of Ground-Penetrating Radar (GPR) Survey.
- The installation and sampling of 10 soil probes.
- Installation and sampling of 4 monitoring wells.
- The field screening of all soil samples utilizing a Photoionization Detector.

Appendix A provides photographs of the field portion of the Assessment

The following sections provide the details of the field work.

3.2 Ground-Penetrating Radar Survey

The purpose of the GPR survey was to identify the presence of subsurface anomalies, primarily focusing on underground storage tanks (USTs). In addition, the GPR was utilized to clear all sampling locations of potential subsurface obstructions.

3.2.1 Protocol

The GPR Survey was performed on May 13, 2004. The GPR Survey was performed utilizing a GSSI SIR-3000 Control Unit and a 400-megahertz shielded antenna over a grid pattern that was determined immediately prior to the survey. The GPR survey was performed throughout the entire property.

The GPR takes one "scan" per set unit. The number of scans per unit is based upon the estimated sizes of targets. For this investigation the GPR was set to run 50 scans per foot. As each scan is performed, the antenna emits specific radar amplitude into the subsurface. The amplitude of the radar reflected back to the antenna is based upon the differences in the dielectric constants of the

subsurface materials. The difference in amplitude obtained during each scan is graphically displayed at the Control Unit, which are then interpreted by the GPR operator at the time of the survey.

3.2.2 Survey Results

Subsurface anomalies were identified at 5 locations throughout the Site. A breakdown of the details of each anomaly is provided in Table 1. As Table 1 indicates, anomalies indicative of underground tanks were identified at 4 of the 5 locations. These anomalies correspond to the NYFD Affidavits provided by the client, which indicate that two ³/~~2~~ 2,000-gallon and three ²/~~3~~ 550-gallon underground tanks have been abandoned in-place at the Site, and the presence of the known 550-gallon waste oil tank beneath 245 Tenth Avenue. The remaining anomaly is situated in the sidewalk along West 24th Street and was likely a remote fill pipe for the underground tanks located in the southern portion of 507- 511 West 24th Street.

Figure 3 provides the GPR Anomaly Diagram.

Appendix B contains copies of the GPR reports.

Appendix C contains NYFD Affidavits.

3.3 Soil Probes

3.3.1 Protocol and Sampling Locations

The soil probes were installed utilizing HTE's Geoprobe[®] 5410 mounted inside a Ford F350 pickup truck. The Geoprobe[®] installs soil probes utilizing direct-push technology. Soil samples were collected utilizing a four (4)-foot long Macro Core sampler fitted with dedicated acetate liners. The Macro Core sampler allows for the collection of continuous soil samples. Each sampler was installed with 1½-inch diameter drill rods. A total of 10 soil probes were installed during the soil portion of the sampling program. Soil probes SP-1 and SP-2 were installed in the vicinity of GPR anomaly #1. Soil probe SP-3 was installed in the vicinity of GPR anomaly #4. Soil probes SP-4 through SP-8 were installed in the vicinity of GPR anomalies #3 and #5. Soil probes SP-9 and SP-10 were installed in the vicinity of GPR anomaly #2.

Figure 4 provides a Sampling Plan.

Soil samples were obtained in each probe at consecutive 2-foot intervals from the ground surface to the water table, which was encountered at 10 feet below ground surface throughout the Site.

3.3.2 Field Characterization

The HTE geologist characterized each soil sample in the field. The soil characterization consisted of determining the soil classification utilizing the Unified Soil Classification System and screening each sample for organic vapors utilizing a Photoionization Detector (PID).

A PID makes use of the principle of photoionization for the detection and qualitative measurement of organic vapors. A PID does not respond to all compounds similarly; rather, each compound has its own response factor relative to its calibration. For this investigation, the PID was calibrated to the compound isobutylene, which is published by the manufacturer. The PID has a minimum detection limit of 0.1 parts per million (ppm). This meter measures the hydrocarbon concentrations in isolated portions of the secured samples.

Headspace analyses were conducted on each soil sample by partially filling the zip lock bag and sealing it, thereby creating a void. This void is referred to as the sample headspace. To facilitate the detection of any hydrocarbons contained within the headspace, the container was agitated for a period of 30 seconds. The probe of the PID was then placed within the headspace to measure the organic vapors present.

Soil probe logs were then generated based upon the soil characterization, along with the PID field screening. The general soil type identified throughout the Site consists of fill material and brown silty sand. Organic levels exceeding 50 ppm were detected in the soil samples from probe SP-6. Trace levels of organic vapors (<5 ppm) were detected in the soil samples from the remaining probes (SP-1 to SP-5 and SP-7 to SP-10).

Appendix D provides copies of the soil probe logs.

3.4 Monitoring Wells

Monitoring wells will be installed at four locations throughout the Site (see Figure 4). Monitoring well MW-1 was installed at 245 Tenth Avenue, in the vicinity of GPR anomaly #4 and immediately north of a gasoline station situated to the south of the Site. Monitoring well MW-2 was installed in the southern portion of 507 - 511 West 24th Street, in the vicinity of GPR anomaly #3 and to the west of the gasoline station situated to the south of the Site. Monitoring well MW-3 was installed in the northern portion of 507 - 511 West 24th Street, in the vicinity of GPR anomaly #2. Monitoring well MW-4 was installed in the northern portion of 510 West 25th Street, in the vicinity of GPR anomaly #1.

The monitoring wells were constructed of 1-inch diameter PVC and were finished at grade with limited-access manhole covers. Immediately following their completion, each monitoring well was developed. Forty-eight hours following their installation, the monitoring wells were monitored, surveyed, purged and sampled. The wells were monitored and surveyed to the nearest 0.01 foot utilizing our Solinst Oil/Water Interface Probe and a David White LT8-300 Transit, respectively. The wells were purged of 3-well volumes and sampled utilizing applicable USEPA low flow sampling protocols.

3.5 Laboratory Analyticals

Separate aliquots of each soil and groundwater sample were containerized into pre-cleaned sampling containers and appropriately labeled. They were then placed in a cooler filled with ice and maintained at 4 degrees Celsius. All samples were transmitted under proper chain of custody procedures to a State-certified (ELAP) laboratory for confirmatory laboratory analyses.

The soil and groundwater samples were analyzed for Volatile Organic Compounds (VOCs) via EPA Method 8260, Semi-Volatile Organic Compounds (SVOCs) via EPA Method 8270, Pesticides and Polychlorinated Biphenyls via EPA Method 8081/8082 and Target Analyte List (TAL) Metals.

Appendix E provides copies of the laboratory reports.

3.6 Decontamination Procedures

In order to ensure that cross-contamination between sampling locations did not occur, each piece of sampling equipment was decontaminated prior to each use. The following procedure was utilized in the decontamination process:

- Wipe clean and wash with Alconox®
- Potable water rinse.
- Methanol rinse.
- Deionized water rinse.
- Air dry.

All decontamination procedures were performed in an area segregated from any sampling areas. Any rinsate from the decontamination area was contained and removed from the site.

3.7 Quality Assurance/Quality Control

All samples were properly handled and placed into the appropriate labeled containers. The containers were placed in a cooler filled with ice and maintained at a maximum 5 degrees Celsius. All samples were transmitted under proper chain of custody procedures to a State-certified (ELAP) laboratory for confirmatory laboratory analyses. All holding times were met. The laboratory did not report any irregularities with respect to their internal Quality Assurance/Quality Control.

To assure that cross contamination did not occur during the soil and groundwater sampling phases of the project, representative field blanks were prepared. In addition, a trip blank was prepared to verify the integrity of the samples during transmittal to the laboratory. Both the field blanks and trip blank were analyzed for similar parameters to the environmental samples.

4.0 ANALYTICAL RESULTS

4.1 Soil Quality

Table 2 provides the VOC results for each shallow soil sample and Table 3 provides the VOC results for each deep soil sample. Tables 2 and 3 also provide comparisons to each compound's respective Recommended Soil Cleanup Objective (RSCO) from NYSDEC Technical Administrative Guidance Memorandum (TAGM) #4046. The concentrations reported in Tables 2 and 3 are in micrograms per kilogram ($\mu\text{g}/\text{kg}$).

As Table 2 indicates, no VOCs were detected in the shallow soil samples at concentrations exceeding TAGM #4046 Standards. As Table 3 indicates, no VOCs were detected in the deep soil samples at concentrations exceeding TAGM #4046 Standards.

Table 4 provides the SVOC results for each shallow soil sample and Table 5 provides the SVOC results for each deep soil sample. Tables 4 and 5 also provide comparisons to each compound's respective RSCO from NYSDEC TAGM #4046. The concentrations reported in Tables 4 and 5 are in $\mu\text{g}/\text{kg}$.

As Table 4 indicates, no SVOCs were detected in the shallow samples from SP-1 to SP-3 and SP-5 at concentrations exceeding their respective TAGM #4046 Standards. The remaining shallow soil samples (SP-4, SP-6 to SP-10) contain the SVOCs Benzo (a) Anthracene and Chrysene at concentrations exceeding their respective TAGM #4046 Standards. The SVOC Benzo (a) Pyrene was detected in SP-4, SP-6, SP-7 and SP-9 at a concentration exceeding its TAGM #4046 Standard. The total SVOC concentrations in these samples range from a low of 10,969 $\mu\text{g}/\text{kg}$ in SP-7 to a high of 73,690 $\mu\text{g}/\text{kg}$ in SP-4.

As Table 5 indicates, no SVOCs were detected in the deep samples from SP-1 to SP-6 and SP-8 to SP-10 at concentrations exceeding their respective TAGM #4046 Standards. The SVOCs Pyrene, Benzo (a) Anthracene, Chrysene, Benzo (b) Fluoranthene, Benzo (k) Fluoranthene and Benzo (a) Pyrene were detected in the deep sample from SP-7 at concentrations exceeding their respective TAGM #4046 Standards. The total SVOC concentration in this sample is 218,843 $\mu\text{g}/\text{kg}$.

Table 6 provides the TAL Metals results for each shallow soil sample and Table 7 provides the TAL Metals results for each deep soil sample. Tables 6 and 7 also provide comparisons to each analyte's respective RSCO and Eastern USA Background from NYSDEC TAGM #4046. The concentrations reported in Tables 6 and 7 are in $\mu\text{g}/\text{kg}$.

As Table 6 indicates, the Mercury was detected in every shallow soil sample at a concentration exceeding its TAGM #4046 Standard and Eastern USA Background. Other metals, including Barium (2 of 10 samples), Arsenic (1 of 10 samples), Copper (2 of 10 samples), Magnesium (1 of 10 samples), Beryllium (1 of 10 samples) and Nickel (1 of 10 samples) were detected in several samples at concentrations both their respective TAGM #4046 Standard and Eastern USA Background.

As Table 7 indicates, the Mercury was detected in 4 of the 10 deep samples at a concentration exceeding its TAGM #4046 Standard and Eastern USA Background. Barium and Cadmium were each detected in 1 of the 10 deep samples at concentrations exceeding their respective TAGM #4046 Standard and Eastern USA Background.

Table 8 provides the PCB & Pesticides results for each shallow soil sample and Table 9 provides the PCB & Pesticides results for each deep soil sample. Tables 8 and 9 also provide comparisons to each compound's respective RSCO from NYSDEC TAGM #4046. The concentrations reported in Tables 8 and 9 are in $\mu\text{g}/\text{kg}$.

As Table 8 indicates, no PCBs or Pesticides were detected in the shallow soil samples at concentrations exceeding TAGM #4046 Standards. As Table 9 indicates, no PCBs or Pesticides were detected in the deep soil samples at concentrations exceeding TAGM #4046 Standards.

4.2 Groundwater Quality

Table 10 provides the monitoring results for each well. As Table 10 indicates the depth to groundwater beneath the Site ranges from 8.33 feet in MW-2 to 9.69 feet in MW-4. No separate phase product was identified in any monitoring well. The calculated groundwater elevations range from 33.94 in monitoring well MW-4 to 35.42 in monitoring well MW-1.

The groundwater elevations were then imported into a computer-contouring program to determine the site-specific groundwater flow direction. The site-specific groundwater flow direction was determined to be toward the northwest. Figure 5 provides the groundwater flow diagram for May 2004. This flow direction is generally consistent with the regional groundwater flow direction for this area of Manhattan.

Table 11 provides the VOC results for the monitoring wells. Table 11 also provides a comparison of the results to each compound's Groundwater Quality Standard (GQS) from NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 entitled Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. The concentrations reported in Table 11 are in micrograms per liter ($\mu\text{g/L}$).

As Table 11 indicates, Ethylbenzene, Isopropylbenzene, n-Propylbenzene, 1,3,5-Trimethylbenzene, 1,2,4-Trimethylbenzene, sec-Butylbenzene and n-Butylbenzene, 4-Isopropylbenzene, Naphthalene and cis-1,2-Dichloroethene were each detected in the groundwater sample from MW-1 at concentrations exceeding their respective TOGS 1.1.1 Standard. The total VOC concentration detected in MW-1 is 725.6 $\mu\text{g/L}$.

No VOCs were detected in the remaining groundwater samples (MW-2 to MW-4) at concentrations exceeding their respective TOGS 1.1.1 Standard.

Table 12 provides the SVOC results for the monitoring wells. Table 12 also provides a comparison of the results to each compound's GQS from NYSDEC TOGS 1.1.1. The concentrations reported in Table 12 are in $\mu\text{g/L}$.

As Table 12 indicates, no SVOCs were detected in any of the groundwater samples at concentrations exceeding TOGS 1.1.1 Standards.

Table 13 provides the TAL Metals results for the monitoring wells. Table 13 also provides a comparison of the results to each analyte's GQS from NYSDEC TOGS 1.1.1. The concentrations reported in Table 13 are in $\mu\text{g/L}$.

As Table 13 indicates, no individual TAL Metals were detected in any of the groundwater samples at concentrations exceeding their respective TOGS 1.1.1 Standard.

Table 14 provides the PCB & Pesticides results for the monitoring wells. Table 14 also provides a comparison of the results to each compound's GOS from NYSDEC TOGS 1.1.1. The concentrations reported in Table 14 are in µg/L.

As Table 14 indicates, no PCBs or Pesticides were detected in any of the groundwater samples at concentrations exceeding TOGS 1.1.1 Standards.

4.3 Quality Assurance/Quality Control

No detectable levels of VOCs, SVOCs, TAL Metals or PCBs were identified in either of the field blanks or the trip blank. Based upon these results, no evidence of cross contamination was identified during the sampling phase and no contamination was introduced during sample transmittal.

5.0 DISCUSSION OF RESULTS

No shallow or deep soil beneath the Site contains VOCs at levels exceeding TAGM #4046 Standards. No shallow or deep soil beneath the Site contains PCBs or Pesticides at levels exceeding TAGM #4046 Standards.

Shallow (zero to 6 feet) soil beneath the majority of 507-511 West 24th Street contains SVOCs at concentrations exceeding their respective TAGM #4046 Standards. These SVOCs generally consist of Benzo (a) Anthracene and Chrysene, which can be more specifically classified as Polycyclic Aromatic Hydrocarbons, or PAHs. Deeper soil (>6 feet) beneath the southeastern portion of 507-511 West 24th Street also contain similar levels of PAHs. No other soil identified throughout the Site contains levels of SVOCs exceeding TAGM #4046 Standards. These PAHs are ubiquitous in fill material historically utilized throughout the Tri-State Area, specifically in Manhattan.

Concentrations of individual TAL Metals exceeding TAGM #4046 Standards were identified in both shallow and deep soil samples from each boring. These results are consistent with the presence and use of fill material at the Site and also are typically prevalent in soils throughout Manhattan. No individual TAL Metals concentrations are indicative of current or historical releases of metals at the Site.

The groundwater flow direction beneath the Site is toward the northwest. VOCs were detected in groundwater beneath 245 Tenth Avenue at concentrations exceeding TOGS 1.1.1 Standards. These VOCs primarily consist of petroleum constituents, as evidenced by the detectable levels of Ethylbenzene and Trimethylbenzene. Additionally, VOCs indicative of chlorinated solvents were also detected at this location. The groundwater plume does not appear to extend off-site, as evidenced by no detectable levels of VOCs in downgradient monitoring well MW-4.

No other VOCs were identified in groundwater beneath the Site. No SVOCs, TAL Metals, PCBs or Pesticides were detected in groundwater beneath the Site. The lack of TAL Metals in the groundwater beneath the Site indicates that any of the metals detected in the soil have not migrated vertically and impacted the groundwater.

6.0 CONCLUSIONS

Based upon the results of the assessment, the following conclusions have been provided:

- The GPR survey identified anomalies at 5 locations throughout the Site. Anomalies indicative of underground tanks were identified at 4 of the 5 locations and correspond to the presence of two (2) 2,000-gallon, three (3) 550-gallon underground tanks have been abandoned in-place and one (1) 550-gallon underground tank that is currently active. The remaining anomaly is likely a remote fill pipe for the underground tanks.
- The results of the soil sampling portion of the assessment indicate that no shallow or deep soil beneath the Site contains VOCs, PCBs or Pesticides at levels exceeding TAGM #4046 Standards. Shallow (zero to 6 feet) soil beneath the majority of 507-511 West 24th Street contains PAHs at concentrations exceeding their respective TAGM #4046 Standards. Deeper soil (>6 feet) beneath the southeastern portion of 507-511 West 24th Street also contain similar levels of PAHs. These PAHs are ubiquitous in fill material historically utilized throughout the Tri-State Area, specifically in Manhattan. No individual TAL Metals, present in the shallow or deep concentrations, are indicative of current or historical releases of metals at the Site.
- The groundwater flow direction beneath the Site has been determined to be toward the northwest. This is consistent with the regional groundwater flow direction.
- The results of the groundwater sampling portion of the assessment indicate that no SVOCs, TAL Metals, PCBs or Pesticides are present in groundwater beneath the Site at concentrations exceeding TOGS 1.1.1 Standards. Individual VOCs were detected in groundwater beneath 245 Tenth Avenue at concentrations exceeding TOGS 1.1.1 Standards. Additionally, VOCs indicative of chlorinated solvents were also detected at this location.

7.0 RECOMMENDATIONS

Based upon the findings of this investigation, combined with the prior environmental activities conducted, it is recommended that the waste oil tank beneath 245 Tenth Avenue should be removed or abandoned in-place once it is no longer in service and the dissolved petroleum constituents in groundwater be remediated to the satisfaction of the NYSDEC. The removal of the waste oil tank would commence with the excavation of all concrete on top of the tanks utilizing a backhoe fitted with a pneumatic hammer. Next, the tank would be removed and disposed and a detailed SPOTS #14 investigation conducted. If any soil that is excavated contains either visual, olfactory, or field screening evidence of petroleum, the NYSDEC Spill Hotline should be contacted and this soil should be segregated for later disposal.

Once all end point sampling results are obtained, all excavation would be backfilled to grade. Tank Closure Reports would be prepared and submitted to the NYSDEC.

In addition, if any construction activities are conducted in the locations of the previously abandoned underground tanks, the tanks should be properly removed in a similar manner described above.

The dissolved petroleum constituents in groundwater beneath the eastern portion of the Site would likely be addressed through the *in-situ* bioremediation of the plume. First of all, the presence of the plume should be made known to the NYSDEC via the Spill Hotline. Additional monitoring wells would be required to provide additional access points to the plume and to also delineate its extent. Next, a Remedial Action Plan (RAP) would be prepared that would spell out the protocols to be implemented for the remediation. Upon its approval, the RAP would be implemented.

8.0 REFERENCES

1. Standard Practice for Environmental Site Assessments: Phase II Environmental Site Assessment Process, ASTM E 1903-00, American Society for Testing and Materials, West Conshohocken, PA.
2. Principals of Groundwater Engineering, William C. Walton, Lewis Publishers, Inc., 1991.
3. Soil Survey of Nassau County, New York, Soil Conservation Service, United States Department of Agriculture in cooperation with Cornell University Agricultural Experiment Station, February 1987.
4. The Long Island Ground Water Pollution Study, New York State Department of Environmental Conservation, 1972.
5. Geochemical traverse across Cameron's Line, Boro Hall Park, Bronx, New York, Cadmus, D., Hodgson, R., Gatto, L.M., and Puffer, J.H., Geology Department, Rutgers University, Newark, NJ.
6. Drainage History of the New York City Region, Sanders, John E., Geology Department, Hofstra University.
7. Draft DER-10 Technical Guidance for Site Investigation and Remediation, December 2002.

9.0 EXCLUSIONS & DISCLAIMER

The observations described in this report were made under the conditions stated therein. The conclusions presented in the report were based solely upon the services described therein, and not on scientific tasks or procedures beyond the scope of described services or the time and budgetary constraints imposed by the Client.

In preparing this report, Hydro Tech Environmental, Corp. may have relied on certain information provided by state and local officials and other parties referenced therein, and on information contained in the files of state and/or local agencies available to Hydro Tech Environmental, Corp. at the time of the subject property assessment. Although there may have been some degree of overlap in the information provided by these various sources, Hydro Tech Environmental, Corp. did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this subject property assessment.

Observations were made of the subject property and of structures on the subject property as indicated within the report. Where access to portions of the subject property or to structures on the subject property was unavailable or limited, Hydro Tech Environmental, Corp. renders no opinion as to the presence of non-hazardous or hazardous materials, or to the presence of indirect evidence relating to a non-hazardous or hazardous materials, in that portion of the subject property or structure. In addition, Hydro Tech Environmental, Corp. renders no opinion as to the presence of hazardous materials, or the presence of indirect evidence relating to hazardous materials, where direct observation of the interior walls, floors, or ceiling of a structure on a subject property was obstructed by objects or coverings on or over these surfaces.

Hydro Tech Environmental, Corp. did not perform testing or analyses to determine the presence or concentration of asbestos at the subject property or in the environment of the subject property under the scope of the services performed.

The conclusions and recommendations contained in this report are based in part, where noted, upon the data obtained from a limited number of soil samples obtained from widely spaced subsurface explorations. The nature and extent of variations between these explorations may not become evident until further exploration. If variations or other latent conditions then appear evident, it will be necessary to reevaluate the conclusions and recommendations of this report.

Any water level reading made in test pits, borings, and/or observation wells were made at the times and under the conditions stated in the report. However, it must be noted that fluctuations in the level of groundwater may occur due to variations in rainfall and other factors different from those prevailing at the time measurements were made.

Except as noted within the text of the report, no qualitative laboratory testing was performed as part of the subject property assessment. Where such analyses have been conducted by an outside laboratory, Hydro Tech Environmental, Corp. has relied upon the data provided, and has not conducted an independent evaluation of the reliability of the data.

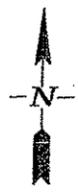
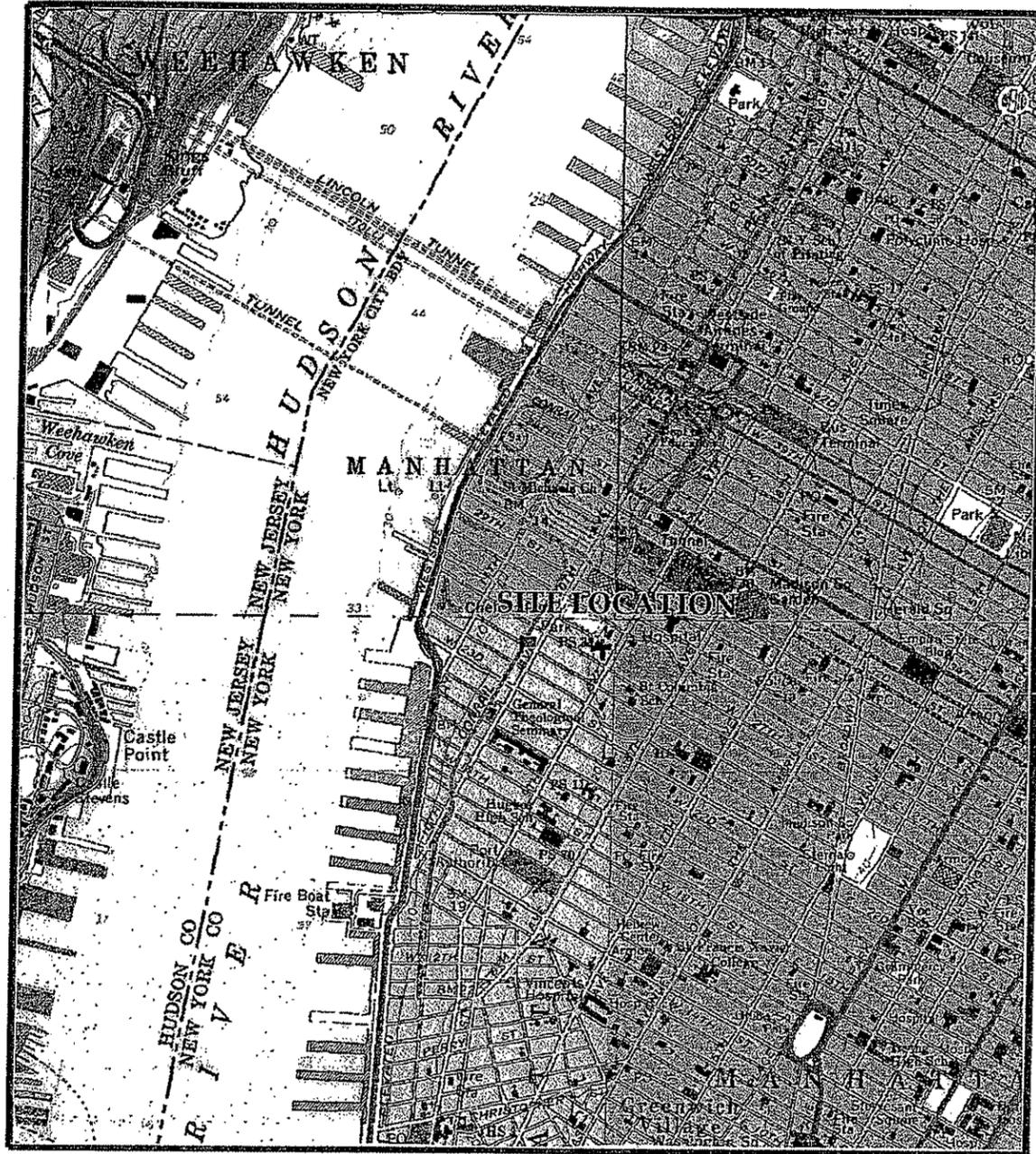
The conclusions and recommendations contained in this report are based in part, where noted, upon various types of chemical data and are contingent upon their validity. The data have been reviewed and interpretations were made in the report. As indicated within the report, some of the

data may be preliminary "screening" level data, and should be confirmed with quantitative analyses if more specific information is necessary. Moreover, it should be noted that variations in the types and concentrations of contaminants and variations in their flow paths may occur due to seasonal water table fluctuations, past disposal practices, the passage of time, and other factors. Should additional chemical data become available in the future, the data should be reviewed, and the conclusions and recommendations presented herein modified accordingly.

Chemical analyses have been performed for specific constituents during the course of this subject property assessment, as described in the text. However, it should be noted that additional chemical constituents not searched for during the current study may be present in soil and/or groundwater at the subject property.

Any GPR survey described above was performed in accordance with good commercial and customary practice and generally accepted protocols within the consulting industry. Hydro Tech Environmental, Corp. does not accept responsibility for survey limitations due to inherent technological limitations or site specific conditions, however, made appropriate effort to identify and notify the client of such limitations and conditions. In particular, please note that the survey described above does not represent a full utility clearance survey, and does not relieve any party of applicable legal obligations to notify a utility one-call service prior to excavating or drilling.

FIGURES

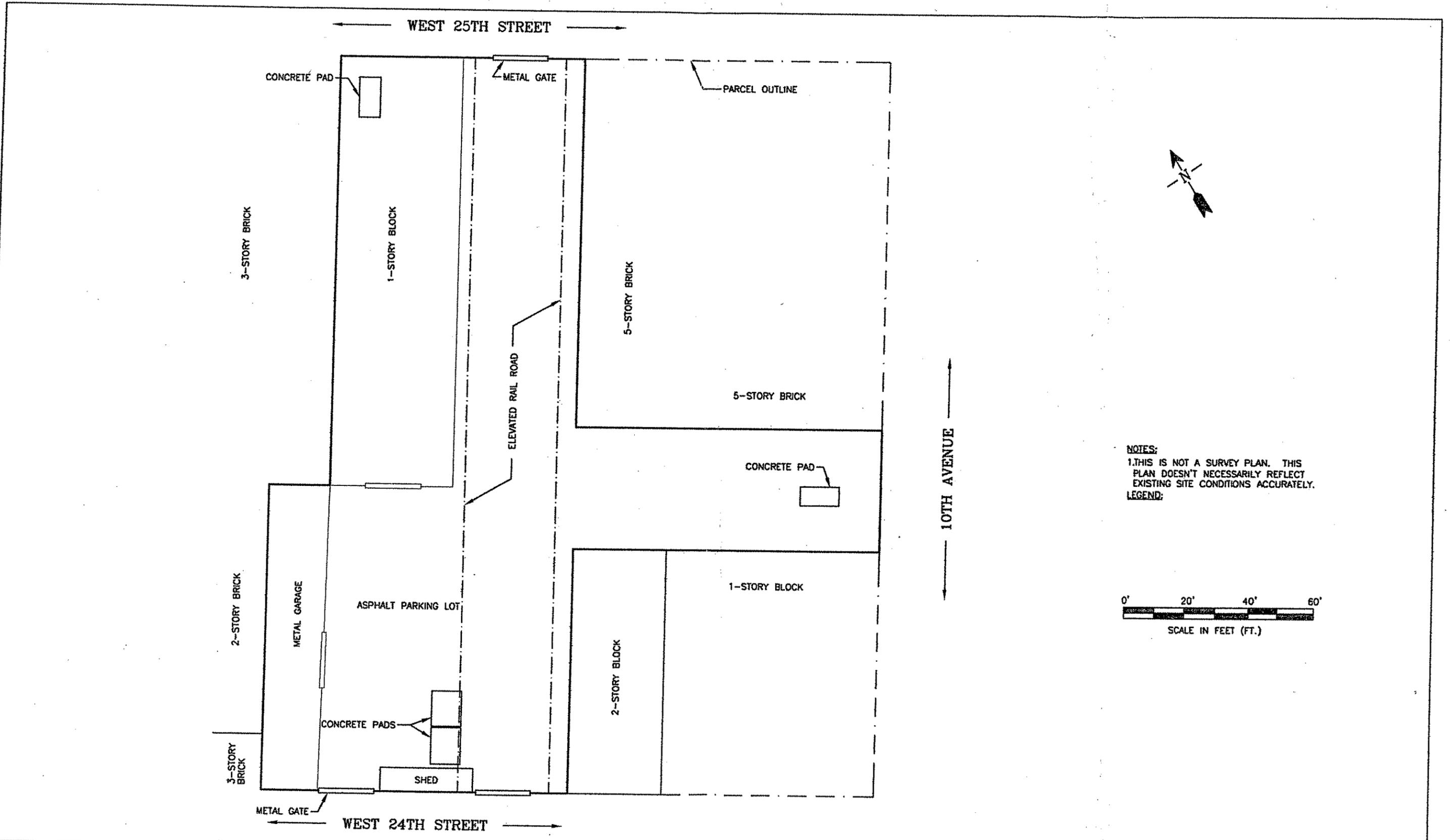


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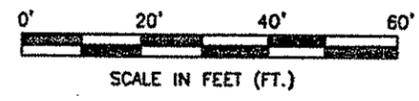
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Figure 1: Site Location Map

West Chelsea Assemblage
 New York, New York



NOTES:
 1. THIS IS NOT A SURVEY PLAN. THIS PLAN DOESN'T NECESSARILY REFLECT EXISTING SITE CONDITIONS ACCURATELY.
LEGEND:



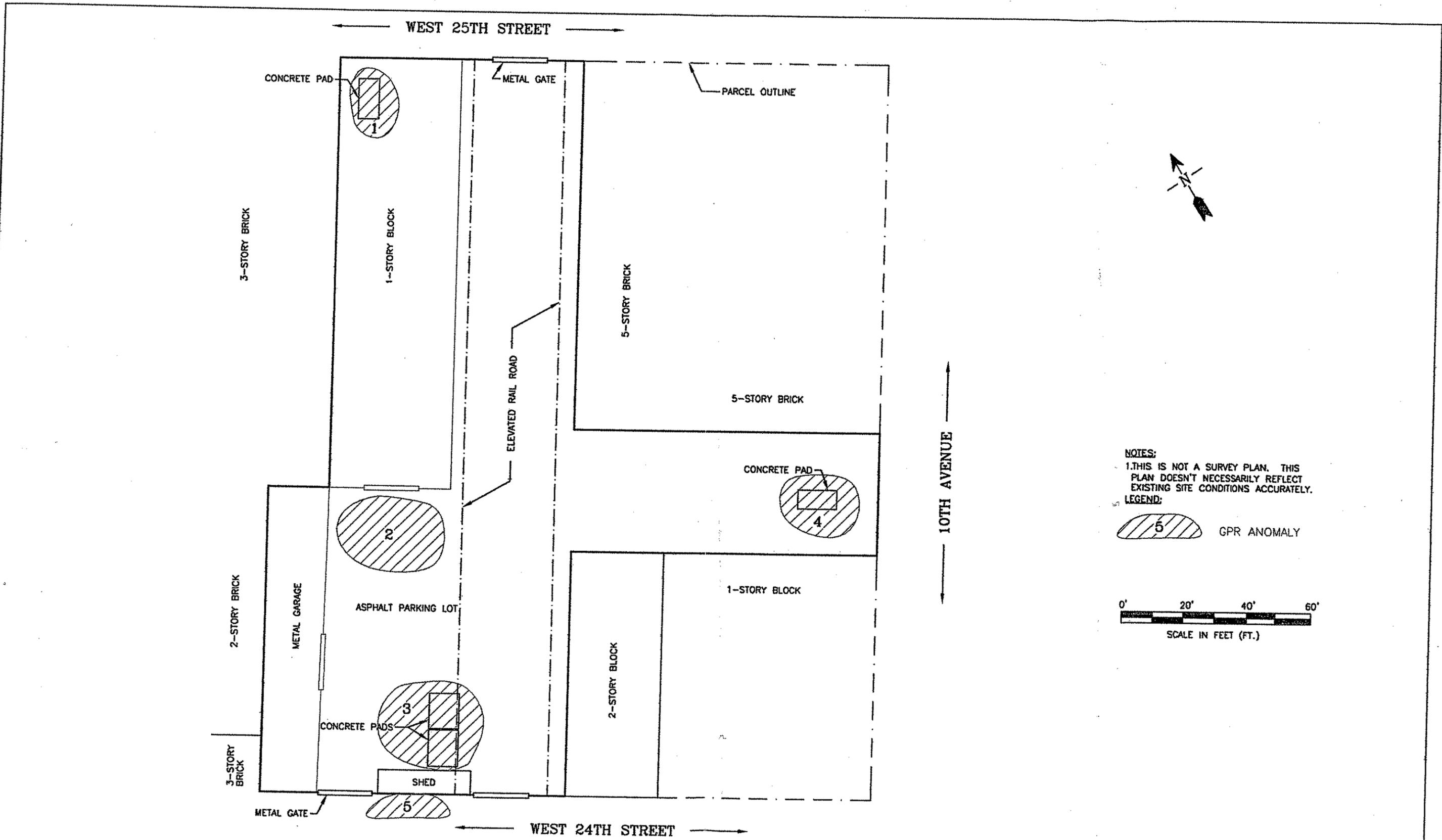
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West Chelsea Assemblage
 New York, New York

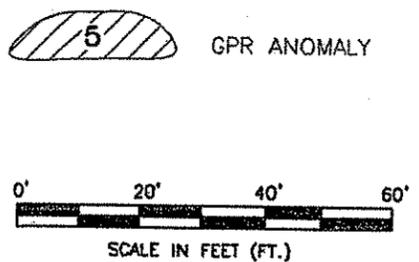
Drawn By: K.P.
 Reviewed By: M.R.
 Approved By: M.S.
 Date: 05-21-04
 Scale: 1"=30'

TITLE:

FIGURE 2: SITE PLAN



NOTES:
 1. THIS IS NOT A SURVEY PLAN. THIS PLAN DOESN'T NECESSARILY REFLECT EXISTING SITE CONDITIONS ACCURATELY.



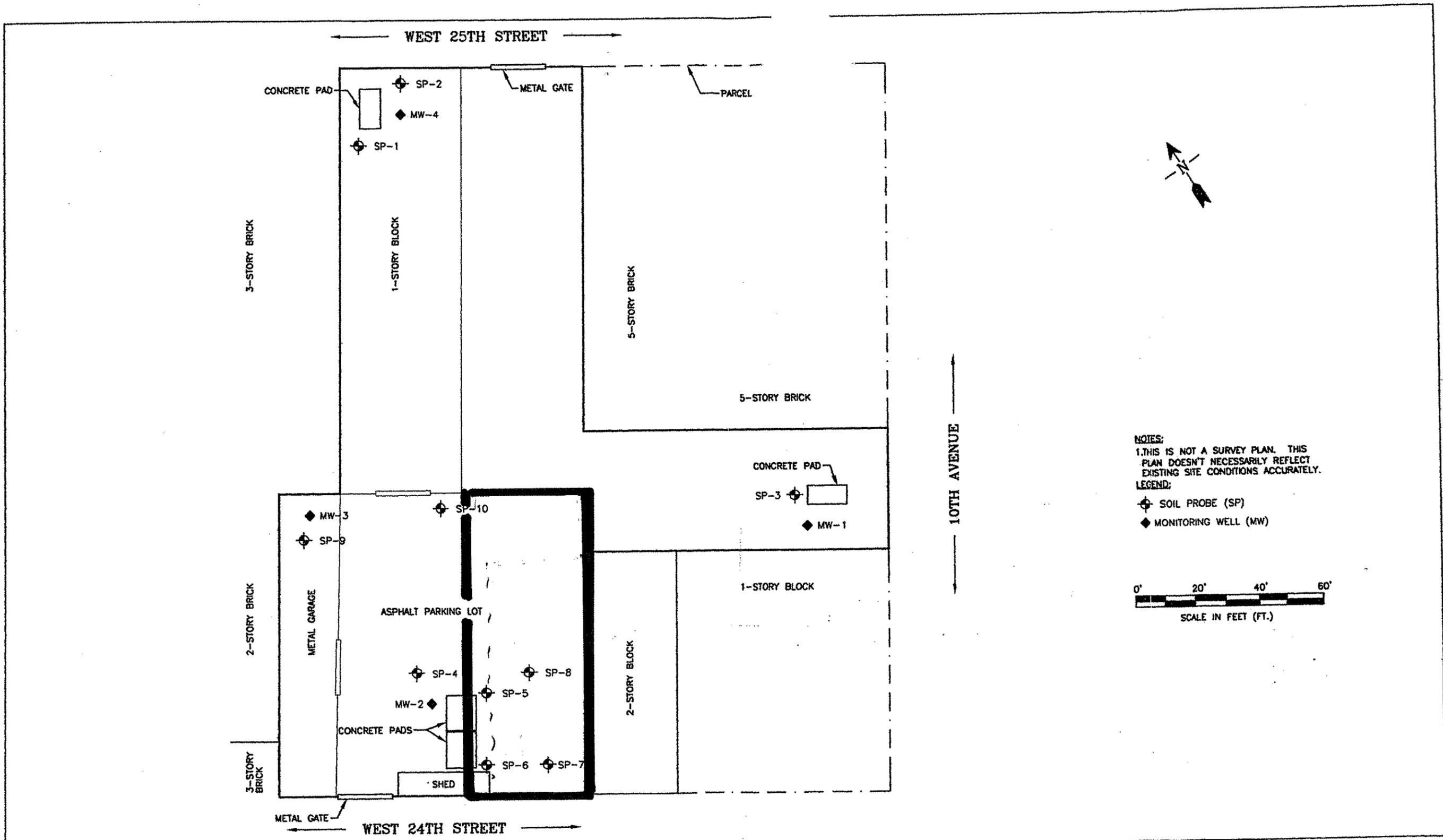
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West Chelsea Assemblage
 New York, New York

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 Reviewed By: M.R.
 Approved By: M.S.
 Date: 05-21-04
 Scale: 1"=30'

TITLE:

FIGURE 3: GPR RESULTS



NOTES:
 1. THIS IS NOT A SURVEY PLAN. THIS PLAN DOESN'T NECESSARILY REFLECT EXISTING SITE CONDITIONS ACCURATELY.

LEGEND:
 ⊕ SOIL PROBE (SP)
 ◆ MONITORING WELL (MW)

0' 20' 40' 60'
 SCALE IN FEET (FT.)



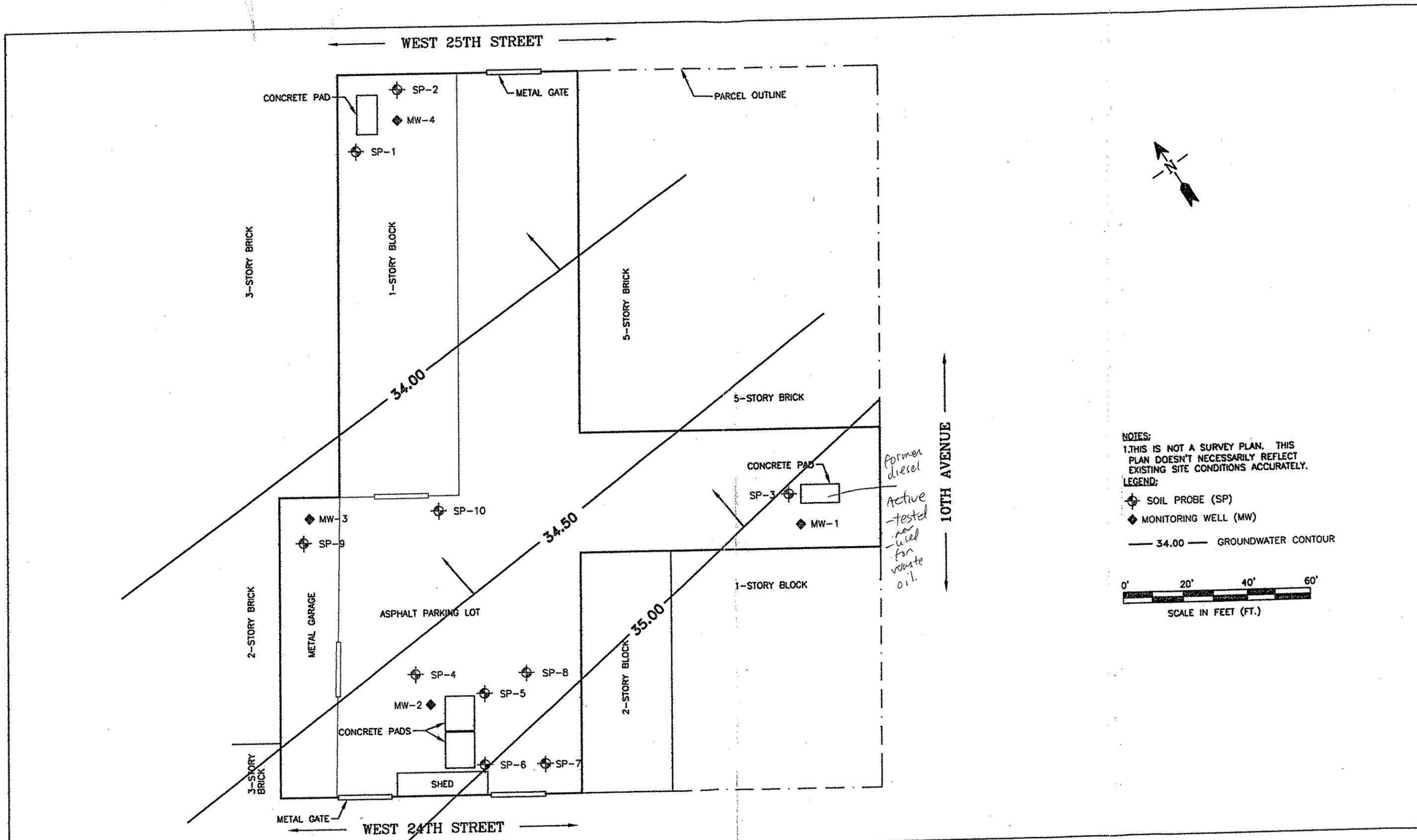
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 Reviewed By: M.R.
 Approved By: M.S.
 Date: 05-21-04
 Scale: 1"=30'

TITLE:

FIGURE 4: SAMPLING PLAN



NOTES:
 1. THIS IS NOT A SURVEY PLAN. THIS PLAN DOESN'T NECESSARILY REFLECT EXISTING SITE CONDITIONS ACCURATELY.

LEGEND:
 ⊕ SOIL PROBE (SP)
 ◆ MONITORING WELL (MW)
 — 34.00 — GROUNDWATER CONTOUR

0' 20' 40' 60'
 SCALE IN FEET (FT.)

*former diesel
 - tested
 - well
 - for
 - waste
 - oil.*

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West Chelsea Assemblage
 New York, New York

Drawn By: K.P.
 Reviewed By: M.R.
 Approved By: M.S.
 Date: 05-21-04
 Scale: 1"=30'

TITLE:

**FIGURE 5: GROUNDWATER FLOW
 DIAGRAM—MAY 2004**

TABLES

Table 2
 Volatile Organic Compounds Soil Results SP-1 through SP-10 - Shallow (µg/kg)
 West Chelsea Assemblage, New York, NY

Compound	SP-01 0'-2'	SP-02 0'-2'	SP-03 0'-2'	SP-04 0'-2'	SP-05 0'-2'	SP-06 2'-4'	SP-07 2'-4'	SP-08 4'-6'	SP-09 0'-2'	SP-10 0'-2'	RSCO	Compound	SP-01 0'-2'	SP-02 0'-2'	SP-03 0'-2'	SP-04 0'-2'	SP-05 0'-2'	SP-06 2'-4'	SP-07 2'-4'	SP-08 4'-6'	SP-09 0'-2'	SP-10 0'-2'	RSCO
Dichlorodifluoromethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	1,2-Dibromoethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS
Chloromethane	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	NS	Chlorobenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1,700
Vinyl chloride	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	200.0	1,1,1,2-Tetrachloroethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS
Bromomethane	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	NS	Ethylbenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	10.9	5,500
Chloroethane	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	1,900	o-Xylene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	10.9	1,200
Trichlorofluoromethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	m + p-Xylene	<1.00	<1.00	<1.00	<1.00	2.68	<1.00	<1.00	<1.00	<1.00	28.2	1,200
1,1-Dichloroethene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	400.0	Styrene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS
Methylene chloride	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	100.0	Bromoform	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS
trans-1,2-Dichloroethene	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	NS	Isopropylbenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	2,300
1,1-Dichloroethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	200.0	Bromobenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS
2,2-Dichloropropane	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	NS	1,1,2,2-Tetrachloroethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	500.0
cis-1,2-Dichloroethene	<5.00	<5.00	5.19	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	NS	1,2,3-Trichloropropane	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	100.0
Bromochloromethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	n-Propylbenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1,700
Chloroform	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	300.0	2-Chlorotoluene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS
1,1,1-Trichloroethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	800.0	4-Chlorotoluene	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	NS
Carbon tetrachloride	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	600.0	1,3,5-Trimethylbenzene	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	26.1	1,300
1,1-Dichloropropene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	tert-Butylbenzene	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	10,000
Benzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.39	<1.00	60	1,2,4-Trimethylbenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	10,000
1,2-Dichloroethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	100.0	sec-Butylbenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	10,000
Trichloroethene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	700.0	1,3-Dichlorobenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1,600
1,2-Dichloropropane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	4-Isopropyltoluene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	10,000
Dibromomethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	1,4-Dichlorobenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1,500
Bromodichloromethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	1,2-Dichlorobenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1,900
cis-1,3-Dichloropropene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	n-Butylbenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	10,000
Toluene	1.34	<1.00	<1.00	<1.00	3.88	2.21	<1.00	<1.00	2.47	82.6	1,500	1,2-Dibromo-3-chloropropane	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	NS
trans-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	1,2,4-Trichlorobenzene	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	NS
1,1,2-Trichloroethane	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	NS	Hexachlorobutadiene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS
Tetrachloroethene	5.86	<1.00	15.8	<1.00	<1.00	<1.00	2.74	<1.00	<1.00	<1.00	1,400	Naphthalene	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	11	<5.00	10,000
1,3-Dichloropropane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	300.0	1,2,3-Trichlorobenzene	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	10,000
Dibromochloromethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NA	Methyl-Tert-Butyl-Ether (MTBE)	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1,200
												Total VOCs	7.20	<5.00	20.99	<5.00	6.56	2.21	2.74	<5.00	14.86	176.9	10,000

NS ... No Standard

µg/kg...micrograms/kilogram

NA ... Not Available

RSCO...recommended soil cleanup objective

* ... NYSDEC TAGM #4046, 1/24/94.

Table 3
 Volatile Organic Compounds Soil Results SP-1 through SP-10 - Deep (µg/kg)
 West Chelsea Assemblage, New York, NY

Compound	SP-01 8'-10'	SP-02 8'-10'	SP-03 8'-10'	SP-04 8'-10'	SP-05 8'-10'	SP-06 8'-10'	SP-07 8'-10'	SP-08 8'-10'	SP-09 8'-10'	SP-10 8'-10'	RSCO	Compound	SP-01 8'-10'	SP-02 8'-10'	SP-03 8'-10'	SP-04 8'-10'	SP-05 8'-10'	SP-06 8'-10'	SP-07 8'-10'	SP-08 8'-10'	SP-09 8'-10'	SP-10 8'-10'	RSCO		
Dichlorodifluoromethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	1,2-Dibromoethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	
Chloromethane	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	NS	Chlorobenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	
Vinyl chloride	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	200.0	1,1,1,2-Tetrachloroethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	5,500	
Bromomethane	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	NS	Ethylbenzene	<1.00	<1.00	1.84	<1.00	<1.00	<1.00	5.07	<1.00	<1.00	<1.00	<1.00	1,200	
Chloroethane	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	1,900	o-Xylene	<1.00	<1.00	1.64	<1.00	<1.00	<1.00	1.84	<1.00	<1.00	<1.00	<1.00	1,200	
Trichlorofluoromethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	m + p-Xylene	<1.00	<1.00	1.39	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	
1,1-Dichloroethene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	400.0	Styrene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	
Methylene chloride	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	100.0	Bromoform	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	2,300	
trans-1,2-Dichloroethene	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	NS	Isopropylbenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	
1,1-Dichloroethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	200.0	Bromobenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	600.0	
2,2-Dichloropropane	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	NS	1,1,2,2-Tetrachloroethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	400.0	
cis-1,2-Dichloroethene	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	NS	1,2,3-Trichloropropane	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	3,700	
Bromochloromethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	n-Propylbenzene	<1.00	1.61	<1.00	<1.00	<1.00	1.33	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS
Chloroform	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	300.0	2-Chlorotoluene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	
1,1,1-Trichloroethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	800.0	4-Chlorotoluene	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	NS	
Carbon tetrachloride	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	600.0	1,3,5-Trimethylbenzene	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	3,300	
1,1-Dichloropropene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	tert-Butylbenzene	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	10,000	
Benzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	60	1,2,4-Trimethylbenzene	<1.00	38.4	<1.00	<1.00	<1.00	2.39	3.38	<1.00	<1.00	<1.00	<1.00	10,000	
1,2-Dichloroethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	100.0	sec-Butylbenzene	<1.00	<1.00	<1.00	<1.00	<1.00	1.45	<1.00	<1.00	<1.00	<1.00	<1.00	10,000	
Trichloroethene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	700.0	1,3-Dichlorobenzene	<1.00	<1.00	<1.00	<1.00	<1.00	1.97	<1.00	<1.00	<1.00	<1.00	<1.00	10,000	
1,2-Dichloropropane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	4-Isopropyltoluene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	8,500	
Dibromomethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	1,4-Dichlorobenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	7,900	
Bromodichloromethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	1,2-Dichlorobenzene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	10,000	
cis-1,3-Dichloropropene	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	n-Butylbenzene	<1.00	1.10	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NS	
Toluene	<1.00	<1.00	4.50	<1.00	<1.00	<1.00	1.71	<1.00	1.40	<1.00	1,500	1,2-Dibromo-3-chloropropane	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	NS	
trans-1,3-Dichloropropene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NS	1,2,4-Trichlorobenzene	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	NS	
1,1,2-Trichloroethane	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	NS	Hexachlorobutadiene	<1.00	<1.00	<1.00	<1.00	<5.00	6.33	153	12.3	<5.00	<5.00	<5.00	13,000	
Tetrachloroethene	<1.00	<1.00	4.8	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1,400	Naphthalene	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	10,000	
1,3-Dichloropropane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	300.0	1,2,3-Trichlorobenzene	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	1,200	
Dibromochloromethane	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	NA	Methyl-Tert-Butyl-Ether	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<5.00	10,000	
												Total VOCs	<5.00	41.11	14.17	<5.00	<5.00	13.47	165	12.3	1.40	<5.00	<5.00		

NS . . . No Standard
 NA . . . Not Available

µg/kg...micrograms/kilogram
 RSCO...recommended soil cleanup objective

Table 4
Semi-Volatile Organic Compounds Soil Results SP-1 through SP-10 - Shallow (µg/kg)
West Chelsea Assemblage, New York, NY

Compound	SP-01 0'-2'	SP-02 0'-2'	SP-03 0'-2'	SP-04 0'-2'	SP-05 0'-2'	SP-06 2'-4'	SP-07 2'-4'	SP-08 4'-6'	SP-09 0'-2'	SP-10 0'-2'	RSCO*	Compound	SP-01 0'-2'	SP-02 0'-2'	SP-03 0'-2'	SP-04 0'-2'	SP-05 0'-2'	SP-06 2'-4'	SP-07 2'-4'	SP-08 4'-6'	SP-09 0'-2'	SP-10 0'-2'	RSCO*
Phenol	<33.3	<33.3	<33.3	<267	<33.3	<33.3	<33.3	<200	<33.3	<33.3	30 or MDL	Dibenzofuran	<33.3	<33.3	<33.3	<267	<33.3	<33.3	<33.3	<200	250	<33.3	6,200
bis(2-Chloroethyl)ether	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	NS	2,4-Dinitrotoluene	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	NS
2-Chlorophenol	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	800	Diethyl phthalate	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	NS
2-Methylphenol	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	100 or MDL	4-Chlorophenol phenyl ether	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	50,000
bis(2-Chloroisopropyl)ether	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	NS	Fluorene	<66.6	<66.6	<66.6	1,290	<66.6	198	115	<400	555	<66.6	50,000
3,4-Methylphenol	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	900	4-Nitroaniline	<66.6	<66.6	<66.6	<533	<33.3	<33.3	<33.3	<400	<66.6	<33.3	NS
N-Nitrosodi-n-propylamine	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	NS	2-Methyl-4,6-dinitrophenol	<167	<167	<167	<1340	<66.6	<66.6	<66.6	<1,000	<167	<66.6	NS
Hexachloroethane	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	NS	N-Nitrosodiphenylamine	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	NS
Nitrobenzene	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	200 or MDL	4-Bromophenyl phenyl ether	<33.3	<33.3	<33.3	<267	<66.6	<66.6	<66.6	<200	<33.3	<66.6	NS
Isophorone	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	4,400	Hexachlorobenzene	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	410
2-Nitrophenol	<167	<167	<167	<1340	<167	<167	<167	<1,000	<167	<167	330 or MDL	Pentachlorophenol	<167	<167	<167	<1340	<167	<167	<167	<1,000	<167	<167	1,000 or MDL
2,4-Dimethylphenol	<333	<333	<333	<2660	<333	<333	<333	<2,000	<333	<333	NS	Phenanthrene	<66.6	153	74.3	16,800	173	2,490	1,460	2,010	4,000	455	50,000
bis(2-Chloroethoxy) methane	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	NS	Anthracene	<66.6	<66.6	<66.6	3,170	<66.6	460	302	508	782	89.9	50,000
2,4-Dichlorophenol	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	400	Di-n-butylphthalate	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	8,100
4-Chloroaniline	<167	<167	<167	<1340	<167	<167	<167	<1,000	<167	<167	220 or MDL	Fluoranthene	<33.3	162	136	1,990	332	1,690	1,180	1,650	2,040	335	50,000
4-Chloro-3-methylphenol	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	240 or MDL	Pyrene	<66.6	170	149	28,900	501	9,060	4,710	8,990	11,100	1,440	50,000
2-Methylnaphthalene	<33.3	<33.3	<33.3	<267	<33.3	<33.3	<33.3	<200	221	<33.3	36,400	Butyl benzyl phthalate	<167	<167	<167	<1340	<167	<167	<167	<1,000	<167	<167	50,000
Hexachlorocyclopentadiene	<167	<167	<167	<1340	<167	<167	<167	<1,000	<167	<167	NS	3,3'-Dichlorobenzidene	<167	<167	<167	<1340	<167	<167	<167	<1,000	<167	<167	NA
2,4,6-Trichlorophenol	<33.3	<33.3	<33.3	<267	<33.3	<33.3	<33.3	<2300	<33.3	<33.3	100	Benzo(a)anthracene	<33.3	78.6	87.2	6,610	186	1,110	633	840	1,430	313	224 or MDL
2,4,5-Trichlorophenol	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	NS	Chrysene	<66.6	94.6	93.9	6,570	206	1,350	763	1,180	1,900	426	400
2-Chloronaphthalene	<33.3	<33.3	<33.3	<267	<33.3	<33.3	<33.3	<200	<33.3	<33.3	NS	bis(2-Ethylhexyl)phthalate	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	50,000
2-Nitroaniline	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	430 or MDL	Di-n-octylphthalate	<167	<167	<167	<1340	<167	<167	<167	<1,000	<167	<167	50,000
Dimethyl phthalate	<33.3	<33.3	<33.3	<267	<33.3	48.3	<33.3	<200	<33.3	<33.3	NS	Benzo(b)fluoranthene	<167	<167	<167	<1340	<167	673	<167	<1,000	815	<167	1,100
Acenaphthylene	<33.3	<33.3	<33.3	<267	<33.3	<33.3	<33.3	<200	92.9	58.6	41,000	Benzo(k)fluoranthene	<66.6	<66.6	<66.6	<533	<66.6	592	<66.6	<400	898	<66.6	1,100
2,6-Dinitrotoluene	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	1,000	Benzo(a)pyrene	<33.3	<33.3	<33.3	6,860	<33.3	1,060	652	<200	1,450	396	610 or MDL
3-Nitroaniline	<167	<167	<167	<1340	<167	<167	<167	<1,000	<167	<167	500 or MDL	Indeno(1,2,3-cd)pyrene	<66.6	<66.6	<66.6	<533	<66.6	910	467	<400	1,090	<66.6	3,200
Acenaphthene	<33.3	<33.3	<33.3	1500	<33.3	196	122	<200	333	<33.3	50,000	Dibenzo(a,h)anthracene	<66.6	<66.6	<66.6	<533	<66.6	<66.6	<66.6	<400	<66.6	<66.6	140 or MDL
2,4-Dinitrophenol	<167	<167	<167	<1340	<167	<167	<167	<1,000	<167	<167	200 or MDL	Benzo(g,h,i)perylene	<33.3	<33.3	<33.3	<267	<33.3	1,140	565	<200	1,240	<33.3	50,000
4-Nitrophenol	<167	<167	<167	<1340	<167	<167	<167	<1,000	<167	<167	100 or MDL	Total SVOCs	<167	658.2	540.4	73,690	1,398	20,977	10,969	15,178	28,196.9	3513.5	500,000

NS ... No Standard

NA ... Not Available

* ... NYSDEC TAGM #4046, 1/24/94.

shaded values represent concentrations greater than RSCO

RSCO...recommended soil cleanup objective

Table 5
Semi-Volatile Organic Compounds Soil Results SP-1 through SP-10 - Deep(µg/kg)
West Chelsea Assemblage, New York, NY

Compound	SP-01 8'-10'	SP-02 8'-10'	SP-03 8'-10'	SP-04 8'-10'	SP-05 8'-10'	SP-06 8'-10'	SP-07 8'-10'	SP-08 8'-10'	SP-09 8'-10'	SP-10 8'-10'	RSCO*	Compound	SP-01 8'-10'	SP-02 8'-10'	SP-03 8'-10'	SP-04 8'-10'	SP-05 8'-10'	SP-06 8'-10'	SP-07 8'-10'	SP-08 8'-10'	SP-09 8'-10'	SP-10 8'-10'	RSCO*
Phenol	<33.3	<33.3	<33.3	<33.3	<33.3	<33.3	<200	<33.3	<33.3	<33.3	30 or MDL	Dibenzofuran	<33.3	<33.3	<33.3	<33.3	<33.3	<33.3	<200	<33.3	<33.3	<33.3	6,200
bis(2-Chloroethyl)ether	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	NS	2,4-Dinitrotoluene	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	NS
2-Chlorophenol	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	800	Diethyl phthalate	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	NS
2-Methylphenol	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<200	<66.6	<66.6	<66.6	100 or MDL	4-Chlorophenol phenyl ether	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	50,000
bis(2-Chloroisopropyl)ether	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	NS	Fluorene	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	100	<66.6	<66.6	50,000
3,4-Methylphenol	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	900	4-Nitroaniline	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	NS
N-Nitrosodi-n-propylamine	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	NS	2-Methyl-4,6-dinitrophenol	<167	<167	<167	<167	<167	<167	<1,000	<167	<167	<167	NS
Hexachloroethane	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	NS	N-Nitrosodiphenylamine	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	NS
Nitrobenzene	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	200 or MDL	4-Bromophenyl phenyl ether	<33.3	<33.3	<33.3	<33.3	<33.3	<33.3	<200	<33.3	<33.3	<33.3	NS
Isophorone	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	4,400	Hexachlorobenzene	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	410
2-Nitrophenol	<167	<167	<167	<167	<167	<167	<1,000	<167	<167	<167	30 or MDL	Pentachlorophenol	<167	<167	<167	<167	<167	<167	<1,000	<167	<167	<167	1,000 or MDL
2,4-Dimethylphenol	<333	<333	<333	<333	<333	<333	<2,000	<333	<333	<333	NS	Phenanthrene	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	36,000	600	233	<66.6	50,000
bis(2-Chloroethoxy) methane	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	NS	Anthracene	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	1,630	162	<66.6	<66.6	50,000
2,4-Dichlorophenol	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	400	Di-n-butylphthalate	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	8,100
4-Chloroaniline	<167	<167	<167	<167	<167	<167	<1,000	<167	<167	<167	20 or MDL	Fluoranthene	<33.3	<33.3	<33.3	<33.3	<33.3	<33.3	5,290	366	173	<33.3	50,000
4-Chloro-3-methylphenol	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	240 or MDL	Pyrene	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	157,000	2,170	1,250	<66.6	50,000
2-Methylnaphthalene	<33.3	<33.3	<33.3	<33.3	<33.3	<33.3	207	<33.3	<33.3	<33.3	36,400	Butyl benzyl phthalate	<167	<167	796	<167	<167	<167	<1,000	<167	<167	<167	50,000
Hexachlorocyclopentadiene	<167	<167	<167	<167	<167	<167	<1,000	<167	<167	<167	NS	3,3'-Dichlorobenzidene	<167	<167	<167	<167	<167	<167	<1,000	<167	<167	<167	NA
2,4,6-Trichlorophenol	<33.3	<33.3	<33.3	<33.3	<33.3	<33.3	<200	<33.3	<33.3	<33.3	100	Benzo(a)anthracene	<33.3	<33.3	<33.3	<33.3	<33.3	<33.3	3,380	191	<33.3	<33.3	24 or MDL
2,4,5-Trichlorophenol	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	NS	Chrysene	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	3,320	262	<66.6	<66.6	400
2-Chloronaphthalene	<33.3	<33.3	<33.3	<33.3	<33.3	<33.3	<200	<33.3	<33.3	<33.3	NS	bis(2-Ethylhexyl)phthalate	<66.6	<66.6	291	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	50,000
2-Nitroaniline	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	430 or MDL	Di-n-octylphthalate	<167	<167	<167	<167	<167	<167	<1,000	<167	<167	<167	50,000
Dimethyl phthalate	<33.3	<33.3	<33.3	<33.3	<33.3	<33.3	<200	<33.3	<33.3	<33.3	NS	Benzo(b)fluoranthene	<167	<167	<167	<167	<167	<167	1,420	<167	<167	<167	1,100
Acenaphthylene	<33.3	<33.3	<33.3	<33.3	<33.3	<33.3	368	<33.3	<33.3	<33.3	41,000	Benzo(k)fluoranthene	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	1,900	<66.6	<66.6	<66.6	1,100
2,6-Dinitrotoluene	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	1,000	Benzo(a)pyrene	<33.3	<33.3	<33.3	<33.3	<33.3	<33.3	2,370	<33.3	<33.3	<33.3	10 or MDL
3-Nitroaniline	<167	<167	<167	<167	<167	<167	<1,000	<167	<167	<167	500 or MDL	Indeno(1,2,3-cd)pyrene	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	2,650	<66.6	<66.6	<66.6	3,200
Acenaphthene	<33.3	<33.3	<33.3	<33.3	<33.3	<33.3	508	74.9	<33.3	<33.3	50,000	Dibenzo(a,h)anthracene	<66.6	<66.6	<66.6	<66.6	<66.6	<66.6	<400	<66.6	<66.6	<66.6	40 or MDL
2,4-Dinitrophenol	<167	<167	<167	<167	<167	<167	<1,000	<167	<167	<167	200 or MDL	Benzo(g,h,i)perylene	<33.3	<33.3	<33.3	<33.3	<33.3	<33.3	2,800	<33.3	<33.3	<33.3	50,000
4-Nitrophenol	<167	<167	<167	<167	<167	<167	<1,000	<167	<167	<167	100 or MDL	Total SVOCs	<167	<167	1,087	<167	<167	218,843	3,925.9	1,656	<167	500,000	

NS ... No Standard
NA ... Not Available
* ... NYSDEC TAGM #4046, 1/24/94.

µg/kg...micrograms/kilogram
shaded values represent concentrations greater than RSCO
RSCO...recommended soil cleanup objective

Table 6
Target Analyte List Metals Soil Results SP-01 through SP-10 - Shallow (mg/kg)

West Chelsea Assemblage, New York, NY

Analyte	SP-1 0'-2'	SP-02 0'-2'	SP-03 0'-2'	SP-04 0'-2'	SP-05 0'-2'	SP-06 2'-4'	SP-07 2'-4'	SP-08 4'-6'	SP-09 0'-2'	SP-10 0'-2'	RSCO	Eastern USA Background
Aluminum	5,680	7,120	6,550	7,330	9,180	5,040	5,250	4,640	7,690	4,790	SB	33,000
Antimony	0.318	<.192	<.250	0.208	<0.227	4.85	0.458	0.850	<0.227	0.781	SB	N/A
Arsenic	3.50	1.04	1.75	5.71	12.8	5.08	5.42	1.80	1.58	3.27	7.5	3 to 12
Barium	287	77.3	680	147	1,533	119	39.6	125	1.08	131	300 or SB	15 to 600
Beryllium	0.272	0.231	0.150	0.292	0.500	0.154	0.167	0.150	1.86	0.169	0.16 (HEAST) or SB	0 to 1.75
Cadmium	5.32	3.38	3.10	4.08	4.32	14.5	3.12	2.25	2.87	8.35	0.1 to 1	1 or SB
Calcium	5,730	4,920	6,500	4,790	3,750	4,350	5,120	6,300	2,930	3,620	30 to 35,000	SB
Chromium	18.1	14.3	16.9	16.2	16.0	12.2	17.0	10.4	12.6	10.1	1 to 40**	10 or SB
Cobalt	5.22	4.88	4.40	5.38	6.50	3.27	3.54	3.10	4.78	4.64	30 or SB	2.5 to 60
Copper	81.8	50.8	41.2	16.2	3,060	473	90.0	21.6	27.0	974	25 or SB	1 to 50
Iron	14,300	9,770	9,000	10,800	10,700	10,800	8,540	7,150	9,040	12,200	2,000 or SB	2,000 to 550,000
Lead	454	32.6	1,180	525	434	823	942	352	153	738	SB	200 to 500 ppm
Magnesium	2,320	3,740	2,850	3,590	3,250	2,020	2,620	2,610	2,780	2,370	SB	100 to 5,000
Manganese	1,710	274	236	245	253	205	225	198	202	155	SB	50 to 50,000
Mercury	1.90	3.32	0.959	18.3	8.74	2.76	12.3	25.7	0.544	0.995	0.1	0.001 to 0.2
Nickel	10.5	12.7	21.9	18.2	21.1	13.6	17.0	9.60	13.5	26.0	13 or SB	0.5 to 25
Potassium	198	175	240	170	144	188	123	250	241	161	SB	8,500 to 43,000
Selenium	0.136	<0.115	<0.150	<0.125	<0.136	<0.115	<0.125	<0.150	<0.136	<0.115	2 or SB	0.1 to 3.9
Silver	2.00	0.385	0.250	0.375	0.591	0.231	<0.083	<0.100	<0.091	0.100	SB	N/A
Sodium	50.0	67.7	128	24.2	41.8	66.5	33.0	104	19.2	51.8	SB	6,000 to 8,000
Thallium	<0.091	<0.077	<0.100	<0.083	<0.091	<0.077	<0.083	<0.100	<0.091	<0.077	SB	N/A
Vanadium	14.8	15.9	19.9	29.2	21.1	16.2	30.1	17.5	15.2	19.1	150 or SB	1 to 300
Zinc	217	129	630	567	1,440	431	283	135	81.5	2,080	20 or SB	9 to 50

SB...site background

*.....NYSDEC TAGM #4046, 1/24/94

mg/kg...milligrams per kilogram

RSCO...recommended soil cleanup objective

shaded values are greater than RSCO and Eastern USA Site Background

Table 7
Target Analyte List Metals Soil Results SP-01 through SP-10 - Deep (mg/kg)

Analyte	West Chelsea Assemblage, New York, NY										RSCO	Eastern USA Background
	SP-1 8'-10'	SP-2 8'-10'	SP-3 8'-10'	SP-4 8'-10'	SP-5 8'-10'	SP-6 8'-10'	SP-7 8'-10'	SP-8 8'-10'	SP-9 8'-10'	SP-10 8'-10'		
Aluminum	11,900	8,580	8,850	7,270	4,650	5,920	2,650	7,830	7,320	8,620	SB	33,000
Antimony	<0.227	<0.208	<0.250	1.18	<0.250	0.083	2.04	<0.208	<.227	<0.250	SB	N/A
Arsenic	4.55	<0.125	1.40	23.5	8.15	<0.125	1.09	1.08	<.140	0.170	7.5	3 to 12
Barium	1,140	71.2	354	55.0	63.0	26.7	62.3	111	42.4	46.9	300 or SB	15 to 600
Beryllium	1.00	0.292	0.300	0.182	0.050	0.125	0.136	0.208	0.259	0.280	0.16 (HEAST) or SB	0 to 1.75
Cadmium	29.4	2.62	7.65	345	9.8	2.42	3.04	33.29	3.22	3.84	0.1 to 1	1 or SB
Calcium	4,420	1,650	6,250	1,340	1,090	662	3,500	3,630	1,130	2,390	30 to 35,000	SB
Chromium	23.6	12.2	17.9	31.4	17.8	8.58	11.9	13.9	14.6	17.5	1 to 40**	10 or SB
Cobalt	28.5	4.46	8.15	5.68	3.00	3.50	3.64	4.96	5.72	6.22	30 or SB	2.5 to 60
Copper	19.2	41.7	21.1	800	47.4	299	298	39.9	15.9	78.4	25 or SB	1 to 50
Iron	30,600	9,000	19,500	10,500	22,300	8,210	8,910	5,280	10,200	11,200	2,000 or SB	2,000 to 550,000
Lead	94.5	18.6	186	103	16.0	10.5	189	235	17.6	77.7	SB	200 to 500 ppm
Magnesium	2,670	1,620	3,340	2,800	1,720	1,970	2,650	2,150	2,330	2,810	SB	100 to 5,000
Manganese	6,090	442	1,750	217	58.5	95.0	173	271	346	382	SB	50 to 50,000
Mercury	0.123	0.023	0.221	10.6	0.037	0.028	6.29	7.18	0.016	0.117	0.1	0.001 to 0.2
Nickel	16.5	10.2	17.5	31.5	8.50	14.0	13.5	14.7	13.4	16.5	13 or SB	0.5 to 25
Potassium	138	189	245	273	700	194	234	185	346	190	SB	8,500 to 43,000
Selenium	<0.136	<0.125	<0.150	<0.036	<0.150	<0.125	<0.136	<0.125	<0.136	<0.150	2 or SB	0.1 to 3.9
Silver	1.95	0.083	0.150	0.773	<0.100	<0.083	<0.091	<0.083	<0.136	<0.100	SB	N/A
Sodium	28.6	53.3	51.5	30.8	416	12.4	22.3	36.0	16.5	12.8	SB	6,000 to 8,000
Thallium	<0.091	<0.083	<0.100	<0.091	<0.100	<0.083	<0.091	<0.083	<0.091	<0.100	SB	N/A
Vanadium	39.5	15.3	23.2	23.6	27.6	12.2	15.4	20.1	18.2	21.3	150 or SB	1 to 300
Zinc	342	26.2	256	375	34.2	91.7	240	126	33.8	334	20 or SB	9 to 50

SB....site background

*.....NYSDEC TAGM #4046, 1/24/94

mg/kg...milligrams per kilogram

RSCO...recommended soil cleanup objective

shaded values are greater than RSCO and Eastern USA Site Background

Table 8
 Pesticides and Polychlorinated Biphenyls Soil Results - SP-1 to SP-10 - Shallow (ug/kg)
 West Chelsea Assembly, New York, NY

Parameter	SP-01 0'-2'	SP-02 0'-2'	SP-03 0'-2'	SP-04 0'-2'	SP-05 0'-2'	SP-06 2'-4'	SP-07 2'-4'	SP-08 4'-6'	SP-09 0'-2'	SP-10 0'-2'	RSCO*
Pesticides											
a BHC	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	110
d BHC	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	300
Heptachlor	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	100
Endosulfan I	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	900
Dieldrin	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	44
Endrin	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	100
p,p-DDD	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	2900
p,p-DDT	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	2,100
Methoxychlor	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	**
b BHC	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	200
g-BHC	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	60
Aldrin	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	41
Heptachlor Epoxide	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	20
p,p-DDE	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	2,100
Endosulfan II	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	900
Endrin aldehyde	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	NA
Endosulfan Sulfate	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	1,000
Endrin Ketone	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	NA
Toxaphene	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	NA
Chlordane	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	540
PCBs											
Aroclor 1016	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	1,000
Aroclor 1221	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	1,000
Aroclor 1232	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	1,000
Aroclor 1242	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	1,000
Aroclor 1248	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	1,000
Aroclor 1254	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	1,000
Aroclor 1260	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	1,000

*...NYSDEC TAGM #4046

NS...No Standard

ug/kg...micrograms per kilogram

Note: RSCO for PCBs represents Surface Standard.

PCBs...Polychlorinated Biphenyls

...ns per TAGM #4046, Total VOCs <10,000 ppb

Table 9
Pesticides and Polychlorinated Biphenyls Soil Results - SP-1 to SP-10 - Deep (ug/kg)

West Chelsea Assemblage, New York, NY											
Parameter	SP-1 8'-10'	SP-02 8'-10'	SP-03 8'-10'	SP-04 8'-10'	SP-05 8'-10'	SP-06 8'-10'	SP-07 8'-10'	SP-08 8'-10'	SP-09 8'-10'	SP-10 8'-10'	RSCO*
Pesticides											
a BHC	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	110
d BHC	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	300
Heptachlor	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	100
Endosulfan I	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	900
Dieldrin	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	44
Endrin	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	100
p,p-DDD	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	2900
p,p-DDT	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	2,100
Methoxychlor	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	**
b BHC	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	200
g-BHC	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	60
Aldrin	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	41
Heptachlor Epoxide	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	20
p,p-DDE	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	2,100
Endosulfan II	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	900
Endrin aldehyde	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	NA
Endosulfan Sulfate	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	1,000
Endrin Ketone	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	<1.67	NA
Toxaphene	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	NA
Chlordane	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	540
PCBs											
Aroclor 1016	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	1,000
Aroclor 1221	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	1,000
Aroclor 1232	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	1,000
Aroclor 1242	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	1,000
Aroclor 1248	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	1,000
Aroclor 1254	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	1,000
Aroclor 1260	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	<3.33	1,000

*...NYSDEC TAGM #4046

NS...No Standard

ug/kg...micrograms per kilogram

Note: RSCO for PCBs represents Surface Standard.

PCBs...Polychlorinated Biphenyls

Table 10
Groundwater Monitoring Results - May 2004
West Chelsea Assemblage, New York, NY

Monitoring Well	Total Depth (ft)	Depth to Water (ft)	Depth to Product (ft)	Product Thickness (ft)	Casing Elevation (ft)	Groundwater Elevation (ft)
MW-1	20	9.19	ND	ND	44.61	35.42
MW-2	20	8.33	ND	ND	42.64	34.51
MW-3	20	9.27	ND	ND	43.38	34.11
MW-4	20	9.69	ND	ND	43.63	33.94

ft...feet

ND...None detected

Table 11
Volatile Organic Compounds Groundwater Results MW-1 to MW-4
West Chelsea Assemblage, New York, New York

Compound	MW-1	MW-2	MW-3	MW-4	GQS*	Compound	MW-1	MW-2	MW-3	MW-4	GQS*
Dichlorodifluoromethane	<5.00	<1.00	<1.00	<1.00	5	1,2-Dibromoethane	<5.00	<1.00	<1.00	<1.00	5
Chloromethane	<25.0	<5.00	<5.00	<5.00	NS	Chlorobenzene	<5.00	<1.00	<1.00	<1.00	5
Vinyl chloride	<25.0	<5.00	<5.00	<5.00	2	1,1,1,2-Tetrachloroethane	<5.00	<1.00	<1.00	<1.00	5
Bromomethane	<25.0	<5.00	<5.00	<5.00	5	Ethylbenzene	115	<1.00	<1.00	<1.00	5
Chloroethane	<25.0	<5.00	<5.00	<5.00	5	o-Xylene	<5.00	<1.00	<1.00	<1.00	5
Trichlorofluoromethane	<5.00	<1.00	<1.00	<1.00	5	m,p-Xylene	<5.00	<1.00	<1.00	<1.00	5
1,1-Dichloroethene	<5.00	<1.00	<1.00	<1.00	5	Styrene	<5.00	<1.00	<1.00	<1.00	5
Methylene chloride	<5.00	<1.00	<1.00	<1.00	5	Bromoform	<5.00	<1.00	<1.00	<1.00	NS
trans-1,2-Dichloroethene	<25.0	<5.00	<5.00	<5.00	5	Isopropylbenzene	59.8	<1.00	<1.00	<1.00	5
1,1-Dichloroethane	<5.00	<1.00	<1.00	<1.00	5	Bromobenzene	<5.00	<1.00	<1.00	<1.00	5
2,2-Dichloropropane	<25.0	<5.00	<5.00	<5.00	5	1,1,2,2-Tetrachloroethane	<5.00	<1.00	<1.00	<1.00	5
cis-1,2-Dichloroethene	51.7	<5.00	<5.00	<5.00	5	1,2,3-Trichloropropane	<25.0	<5.00	<5.00	<5.00	0.04
Bromochloromethane	<5.00	<1.00	<1.00	<1.00	5	n-Propylbenzene	206	<1.00	<1.00	<1.00	5
Chloroform	<5.00	<1.00	<1.00	<1.00	7	2-Chlorotoluene	<5.00	<1.00	<1.00	<1.00	5
1,1,1-Trichloroethane	<5.00	<1.00	<1.00	<1.00	5	4-Chlorotoluene	<25.0	<5.00	<5.00	<5.00	5
Carbon tetrachloride	<25.0	<5.00	<5.00	<5.00	5	1,3,5-Trimethylbenzene	49.9	<5.00	<5.00	<5.00	5
1,1-Dichloropropene	<5.00	<1.00	<1.00	<1.00	5	tert-Butylbenzene	<25.0	<5.00	<5.00	<5.00	5
Benzene	<5.00	<1.00	<1.00	<1.00	1	1,2,4-Trimethylbenzene	15.0	3.83	<1.00	<1.00	5
1,2-Dichloroethane	<5.00	<1.00	<1.00	<1.00	5	sec-Butylbenzene	33.8	<1.00	<1.00	<1.00	5
Trichloroethene	<5.00	<1.00	1.11	<1.00	5	1,3-Dichlorobenzene	<5.00	<1.00	<1.00	<1.00	3
1,2-Dichloropropane	<5.00	<1.00	<1.00	<1.00	1	4-Isopropyltoluene	14.7	<1.00	<1.00	<1.00	5
Dibromomethane	<5.00	<1.00	<1.00	<1.00	5	1,4-Dichlorobenzene	<5.00	<1.00	<1.00	<1.00	3
Bromodichloromethane	<5.00	<1.00	<1.00	<1.00	NS	1,2-Dichlorobenzene	<5.00	<1.00	<1.00	<1.00	3
cis-1,3-Dichloropropene	<5.00	<1.00	<1.00	<1.00	0.4	n-Butylbenzene	113	<1.00	<1.00	<1.00	5
Toluene	<5.00	<1.00	<1.00	<1.00	5	1,2-Dibromo-3-chloropropane	<25.0	<5.00	<5.00	<5.00	5
trans-1,3-Dichloropropene	<5.00	<1.00	<1.00	<1.00	0	1,2,4-Trichlorobenzene	<25.0	<5.00	<5.00	<5.00	5
1,1,2-Trichloroethane	<25.0	<5.00	<5.00	<5.00	5	Hexachlorobutadiene	<5.00	<1.00	<1.00	<1.00	5
Tetrachloroethene	<5.00	<1.00	<1.00	<1.00	5	Naphthalene	66.7	<5.00	<5.00	<5.00	10
1,3-Dichloropropane	<5.00	<1.00	<1.00	<1.00	5	1,2,3-Trichlorobenzene	<25.0	<5.00	<5.00	<5.00	5
Dibromochloromethane	<5.00	<1.00	<1.00	<1.00	NS	Methyl-t-butyl ether	<5.00	<1.00	<1.00	<1.00	5

*...NYSDEC TOGS 1.1.1

GQS...groundwater quality standard

NS...No Standard

ug/L...micrograms per liter

Table 12
Semi-Volatile Organic Compounds Groundwater Results MW-1 to MW-4
West Chelsea Assemblage, New York, New York

Compound	MW-1	MW-2	MW-3	MW-4	GQS	Compound	MW-1	MW-2	MW-3	MW-4	GQS
Phenol	<1.00	<1.00	<1.00	<1.00	1	4-Nitrophenol	<5.00	<5.00	<5.00	<5.00	NS
bis(2-Chloroethyl)ether	<2.00	<2.00	<2.00	<2.00	1	Dibenzofuran	<1.00	<1.00	<1.00	<1.00	NS
2-Chlorophenol	<2.00	<2.00	<2.00	<2.00	NS	2,4-Dinitrotoluene	<2.00	<2.00	<2.00	<2.00	5
2-Methylphenol	<2.00	<2.00	<2.00	<2.00	NS	Diethyl phthalate	<2.00	<2.00	<2.00	<2.00	NS
bis(2-Chloroisopropyl)ether	<2.00	<2.00	<2.00	<2.00	NS	4-Chlorophenol phenyl ether	<2.00	<2.00	<2.00	<2.00	NS
3,4-Methylphenol	<2.00	<2.00	<2.00	<2.00	NS	Fluorene	<2.00	10.4	<2.00	<2.00	50
N-Nitrosodi-n-propylamine	<2.00	<2.00	<2.00	<2.00	NS	4-Nitroaniline	<2.00	<2.00	<2.00	<2.00	5
Hexachloroethane	<2.00	<2.00	<2.00	<2.00	5	2-Methyl-4,6-dinitrophenol	<5.00	<5.00	<5.00	<5.00	NS
Nitrobenzene	<2.00	<2.00	<2.00	<2.00	0	N-Nitrosodiphenylamine	<2.00	<2.00	<2.00	<2.00	50
Isophorone	<2.00	<2.00	<2.00	<2.00	50	4-Bromophenyl phenyl ether	<1.00	<1.00	<1.00	<1.00	NS
2-Nitrophenol	<5.00	<5.00	<5.00	<5.00	NS	Hexachlorobenzene	<2.00	<2.00	<2.00	<2.00	0
2,4-Dimethylphenol	<10.0	<10.0	<10.0	<10.0	50	Pentachlorophenol	<5.00	<5.00	<5.00	<5.00	1
bis(2-Chloroethoxy)methane	<2.00	<2.00	<2.00	<2.00	NS	Phenanthrene	<2.00	601	<2.00	<2.00	50
2,4-Dichlorophenol	<2.00	<2.00	<2.00	<2.00	NS	Anthracene	<2.00	<2.00	<2.00	<2.00	50
4-Chloroaniline	<5.00	<5.00	<5.00	<5.00	5	Di-n-butylphthalate	<2.00	<2.00	<2.00	<2.00	50
4-Chloro-3-methylphenol	<2.00	<2.00	<2.00	<2.00	NS	Fluoranthene	<1.00	<1.00	<1.00	<1.00	50
2-Methylnaphthalene	42.2	<1.00	<2.00	<2.00	NS	Pyrene	<2.00	4.89	<2.00	<2.00	50
Hexachlorocyclopentadiene	<5.00	<5.00	<5.00	<1.00	5	Butyl benzyl phthalate	<5.00	<5.00	<5.00	<5.00	50
2,4,6-Trichlorophenol	<1.00	<1.00	<1.00	<1.00	NS	3,3'-Dichlorobenzidene	<5.00	<5.00	<5.00	<5.00	5
2,4,5-Trichlorophenol	<2.00	<2.00	<2.00	<2.00	NS	Benzo(a)anthracene	<1.00	<1.00	<1.00	<1.00	NS
2-Chloronaphthalene	<1.00	<1.00	<1.00	<1.00	10	Chrysene	<2.00	<2.00	<2.00	<2.00	0.002
2-Nitroaniline	<2.00	<2.00	<2.00	<2.00	5	bis(2-Ethylhexyl)phthalate	<2.00	<2.00	<2.00	<2.00	5
Dimethyl phthalate	<1.00	<1.00	<1.00	<1.00	NS	Di-n-octylphthalate	<5.00	<5.00	<5.00	<5.00	NS
Acenaphthylene	<1.00	<1.00	<1.00	<1.00	NS	Benzo(b)fluoranthene	<5.00	<5.00	<5.00	<5.00	0.002
2,6-Dinitrotoluene	<2.00	<2.00	<2.00	<2.00	5	Benzo(k)fluoranthene	<2.00	<2.00	<2.00	<2.00	0.002
3-Nitroaniline	<5.00	<5.00	<5.00	<5.00	5	Benzo(a)pyrene	<1.00	<1.00	<1.00	<1.00	NS
Acenaphthene	<1.00	<1.00	<1.00	<1.00	20	Indeno(1,2,3-cd)pyrene	<2.00	<2.00	<2.00	<2.00	0.002
2,4-Dinitrophenol	<5.00	<5.00	<5.00	<5.00	10	Dibenzo(a,h)anthracene	<2.00	<2.00	<2.00	<2.00	NS
						Benzo(g,h,i)perylene	<1.00	<1.00	<1.00	<1.00	NS

*...NYSDEC TOGS 1.1.1

NS...No Standard

ug/L...micrograms per liter

GQS...groundwater quality standard

Table 13
Target Analyte List Metals Groundwater- MW-1 to MW-4 (mg/L)
West Chelsea Assemblage, New York, New York

Parameter	MW-1	MW-2	MW-3	MW-4	GQS
Aluminum	256	525	188	158	2,000
Antimony	<0.005	<0.005	<0.005	<0.005	5 0.003
Arsenic	0.024	0.849	<0.003	<0.003	50 0.025
Barium	1.89	1.55	1.18	1.41	2,000 1
Beryllium	0.013	0.025	0.010	0.009	5 0.003
Cadmium	0.035	0.102	0.022	0.02	10 0.005
Calcium	60.8	40.4	42.4	63.0	NS
Chromium	0.463	1.30	0.301	0.287	100 0.050
Cobalt	0.131	0.203	0.104	0.110	NS
Copper	0.803	53.6	0.286	0.312	NS
Iron	223	1,140	177	146	600
Lead	3.32	1.05	0.247	0.238	35,000 0.025
Magnesium	60.7	129	57.4	55.5	35,000 35
Manganese	6.76	5.91	7.61	11.2	NS
Mercury	<0.001	<0.001	<0.001	<0.001	14 0.007
Nickel	0.350	0.715	0.261	0.264	200 0.1
Potassium	5.45	5.32	13.6	11.2	NS
Selenium	<0.003	<0.003	<0.003	<0.003	20
Silver	<0.002	<0.002	<0.002	<0.002	100
Sodium	3.74	1.12	29.9	207	SB
Thallium	<0.002	<0.002	<0.002	<0.002	0.5
Vanadium	0.448	1.36	0.353	0.264	NS
Zinc	2.41	14.0	0.489	0.478	5,000 2

*...NYSDEC TOGS 1.1.1

mg/L...milligrams per liter

NS...No Standard

Shaded value represents concentration exceeding GQS

GQS...groundwater quality standard

Table 14

Pesticides and Polychlorinated Biphenyls Groundwater Results - MW-1 to MW-4 (ug/L)
West Chelsea Assemblage, New York, New York

Parameter	MW-1	MW-2	MW-3	MW-4	GQS
a BHC	<0.01	<0.01	<0.01	<0.01	NS
Lindane	<0.01	<0.01	<0.01	<0.01	NS
Heptachlor	<0.01	<0.01	<0.01	<0.01	0.04
Endosulfan I	<0.01	<0.01	<0.01	<0.01	NS
Dieldrin	<0.05	<0.05	<0.05	<0.05	0.004
Endrin	<0.05	<0.05	<0.05	<0.05	NS
4,4- DDD	<0.05	<0.05	<0.05	<0.05	0.3
p,p-DDT	<0.05	<0.05	<0.05	<0.05	0.2
Methoxychlor	<0.10	<0.10	<0.10	<0.10	0.3
b BHC	<0.01	<0.01	<0.01	<0.01	NS
d BHC	<0.01	<0.01	<0.01	<0.01	NS
Aldrin	<0.01	<0.01	<0.01	<0.01	NS
Heptachlor Epoxide	<0.01	<0.01	<0.01	<0.01	0.03
p,p-DDE	<0.05	<0.05	<0.05	<0.05	0.2
Endosulfan II	<0.05	<0.05	<0.05	<0.05	NA
Endrin aldehyde	<0.05	<0.05	<0.05	<0.05	5
Endosulfan Sulfate	<0.05	<0.05	<0.05	<0.05	NS
Edrin Ketone	<0.05	<0.05	<0.05	<0.05	5
Toxaphene	<0.10	<0.10	<0.10	<0.10	0.06
Chlordane	<0.10	<0.10	<0.10	<0.10	0.05
PCBs					
Aroclor 1016	<0.10	<0.10	<0.10	<0.10	0.09
Aroclor 1221	<0.10	<0.10	<0.10	<0.10	0.09
Aroclor 1232	<0.10	<0.10	<0.10	<0.10	0.09
Aroclor 1242	<0.10	<0.10	<0.10	<0.10	0.09
Aroclor 1248	<0.10	<0.10	<0.10	<0.10	0.09
Aroclor 1254	<0.10	<0.10	<0.10	<0.10	0.09
Aroclor 1260	<0.10	<0.10	<0.10	<0.10	0.09

*...NYSDEC TOGS 1.1.1

NS...No Standard

NA... Not Available

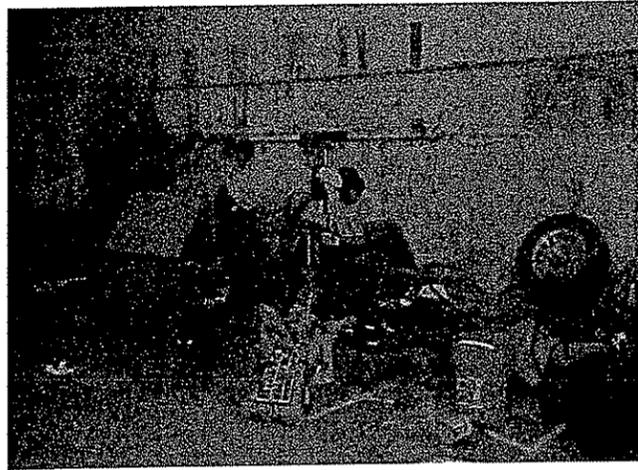
ug/L...micrograms per Liter

PCBs... Pesticides and Polychlorinated Biphenyls

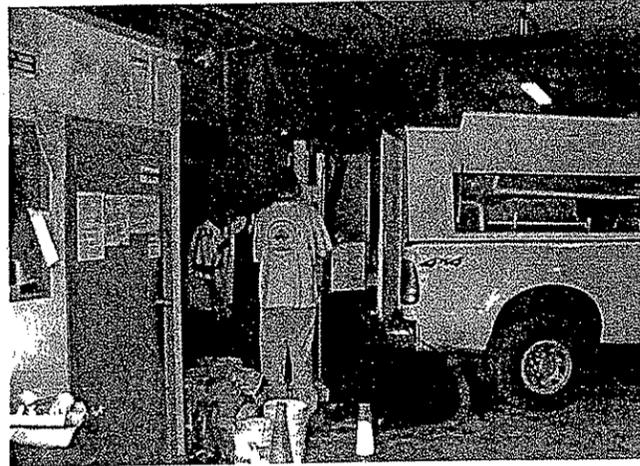
GQS...groundwater quality standard

APPENDICES

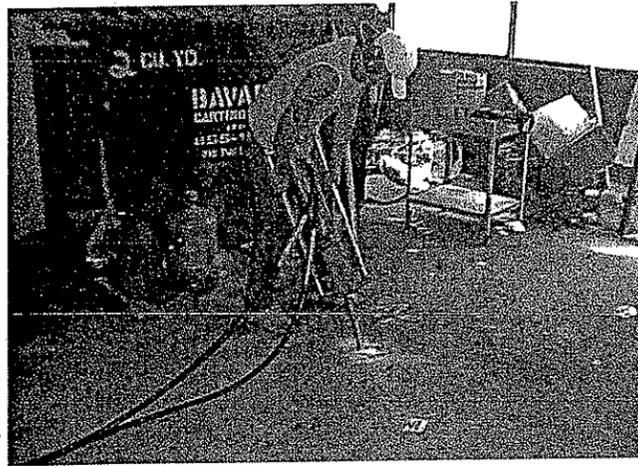
APPENDIX A
PHOTOGRAPHS



Installation of Soil Probe



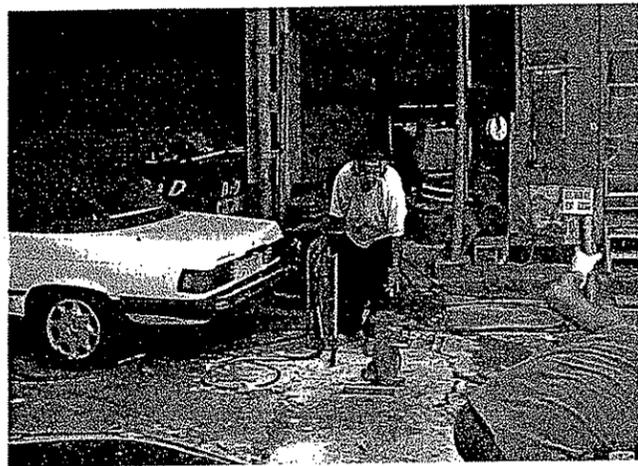
Installation of Soil Probe



Installation of Soil Probe



Installation of Soil Probe



Installation of Soil Probe



Removing Macro Core



Installation of Groundwater Probe

APPENDIX B
GPR REPORTS

Created 00:00:00 Modified 00:00:00
Channel(s) 1 Samples/Scan 1024
Scans/Second 64 Scans/Meter 98.4252
Piel Constant 8 Bits/Sample 16
Meters/Mark 1.2192

CHANNEL 1 400MHz
Position 0 nS Range 50 nS
Position Correction -0.65 nS
Vert IIR LP N =1 F =800 MHz
Vert IIR HP N =1 F =100 MHz
Range Gain (dB) -8.0 -8.0 37.0
41.0 44.0

GEOTECHNICAL ENGINEERING REPORT

507 W 24th Street
New York, NY

Prepared For:

**Alf Naman Real Estate
460 Park Avenue, Fl 22
New York, NY 10022**

Prepared By:

**Langan Engineering and Environmental Services, P.C.
360 West 31st Street, 8th Floor
New York, NY 10001-2727**



04 April 2008
005821101

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Raha Nasser
Staff Engineer



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Senior Associate



04 April 2008
005821101

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- Drawing 8 Permanent Lateral Earth Pressures
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APPENDIX A

Boring and Well Construction Logs

APPENDIX B

Laboratory Test Results

INTRODUCTION

This report presents the results of our geotechnical engineering study for the proposed development at 507 W 24th Street in Manhattan, New York. All services were performed in accordance with the Langan Engineering & Environmental Services, P.C. (Langan) proposal to Alf Naman Real Estate dated 4 December 2007.

Our geotechnical engineering study included a field investigation, an evaluation of the subsurface conditions, and development of recommendations for foundation support and other geotechnical related issues. An overview of the project, the results of our investigation, and a summary of our geotechnical recommendations are presented herein.

Architectural information was provided by Studio MDA Architects. Survey information is obtained from a topographic survey completed by Langan Engineering & Environmental Service, dated 2 February 2008. Hi-line information is obtained from the original construction drawings dated 15 October 1930. Adjacent building information is obtained from original foundation drawings and our communication with the architect.

All elevations presented herein are referenced to the Borough President of Manhattan Datum (BPMD), which is 2.75 ft above the U.S. Geological Survey National Geodetic Vertical Datum (Mean Sea Level at Sandy Hook, New Jersey, NGVD 1929).

SITE DESCRIPTION

The referenced site is in the Chelsea section of Manhattan, in a city block bordered by West 24th Street to the south, West 25th Street to the north, Tenth Avenue to the east and Eleventh Avenue to the west. A site location plan is presented in Drawing No. 1. The site has about a 40-ft frontage along West 24th Street. The footprint area of the site is about 3,950 square feet.

The site is currently occupied by construction equipment for the on-going development to the east (245-247 Tenth Avenue). Surface grades range from about el 7.3 along 24th Street to about el 10.6 along the northern property line. The project site is within the 500-year flood zone of the Hudson River and the sidewalk fronting the site is within the 100-year flood zone. The 100-year flood level is el 7.25. The Flood Insurance Map is provided as Drawing No. 2.

Historic maps indicate that the site is located outboard of the 17th century Manhattan shoreline. This portion of Manhattan was filled in during a period of land reclamation in the first half of the 1800's.

The entire site is beneath the Hi-Line structure; the 1.5-mile-long elevated structure extends from 34th Street to Gansevoort Street on the west side of Manhattan. The Hi-Line was built in the 1930s for freight lines, but has not been used since 1980. Six columns (three rows) of the Hi-line structure are within the subject property limits. The columns are supported on 18-in diameter concrete-filled open-end steel pipe piles bearing on the bedrock. The dimension of the pile caps in plan view are about 24 ft by 10 ft for the southernmost row of the columns and about 10 ft by 10 ft for the remaining columns; the thickness of the columns are about 3.5 ft.

The site is bordered to the east by an active construction site; the on-going development is a 10-story mixed-use building with one cellar level supported on a mat foundation. The bottom of the mat foundation is at about el -7.03 for the southern 20-ft portion of the building and at about el -5.5 for the remaining of the building, based on foundation drawings and our communication with the architect. The southern 45 ft of this building has a 5-ft setback from the east property line. The site is bordered to the west by a 2 to 3-story brick and aluminum gallery building with no cellar level. The building is supported on steel H-piles; elevations of top of pile caps vary from el 5.5 to 6.2 based on the foundation drawings. The north side of the property is bordered by a vacant lot.

SITE GEOLOGY

The "Geologic Map of New York City and Adjacent Part of New Jersey" by U.S. Geological Survey indicates the bedrock underlying the site is part of the Hartland Formation. The Hartland Formation, is comprised of a dark gray, medium to coarse-grained muscovite-biotite-garnet (mica) schist and gray fine-grained quartz-feldspar granulite with biotite and garnet, with localized concentrations of granite and intrusions of coarse-grained granitic pegmatite. Granulite and schist are metamorphic rocks formed under the effects of heat and pressure during deep burial within the earth's crust.

The predominant feature of the Hartland Formation is the parallel alignment of the mineral grains, referred to as schistosity or foliation. The foliation in the Hartland Formation generally dips steeply to the west or the east depending on local conditions of folding, although foliation dipping to other directions or nearly horizontal foliation has been observed. The quality of the mica schist and granulite is generally good to fair, and tends to improve with depth. However, localized shear zones and zones of decomposed rock are known to exist, sometimes to significant depths.

PROPOSED CONSTRUCTION

The proposed construction consists of a single-story gallery space with a single cellar level. The first floor finished level will be about el 7.3 and the cellar finished level is at about el -3.5.

SUBSURFACE INVESTIGATION

The subsurface investigation program consisted of two borings; one of the borings was converted to a monitoring well upon completion. All work was performed by Aquifer Drilling and Testing Inc., under the full-time controlled inspection of Langan.

Borings and Observation Well

Two borings, identified as B-1(OW) and B-2, were drilled with a track-mounted rig. Steel casing and mud rotary drilling techniques were used for soil support. Borings were drilled to the depths of 34 and 48 ft, respectively, where the bedrock was encountered. A boring location plan is presented in Drawing No. 3.

Soil samples were obtained typically continuously in the upper 12 ft of the borehole and at 5-ft intervals thereafter, using a standard two-inch outside diameter split spoon sampler driven by a safety or donut 140-lbs-hammer in accordance with ASTM-1586 (Standard Penetration Test, SPT¹).

Recovered soil samples were visually examined and classified in the field and assigned classification numbers in accordance with the New York City Building Code (Building Code). Soil classification, standard penetration resistances and other field observations were recorded on field logs. Copies of the field boring logs are presented in Appendix A.

An observation well was installed in the completed boring LB-1, to a depth of about 20 ft below existing grade. The groundwater observation well consisted of a 10-ft section of 2-inch diameter PVC screen and a solid PVC riser pipe. The annulus around the screen was backfilled with filter sand; bentonite pellets were used at about 2 ft below grade to limit surface water runoff. Observation well location is shown on Drawing No. 3; a copy of well installation log is presented in Appendix A.

¹ The Standard Penetration Test (SPT) is a measure of soil density and consistency. The SPT N-value is defined as the number of blows required to drive one foot of 2-inch-diameter split-barrel sampler after an initial penetration of 6 inches, using a 140 lbs hammer falling freely from 30 inches.

Laboratory Testing

Geotechnical laboratory testing was conducted on two of the soil samples obtained from the borings. Laboratory testing of selected soil samples included natural water content determinations [ASTM D2216], liquid and plastic (Atterberg) limits determination [ASTM D4318] and organic content [ASTM D2974]. Laboratory test results are presented in Appendix B.

SUBSURFACE CONDITIONS

Subsurface soil consisted generally of fill overlaying a layer of fine sand, followed by a thin layer of clay and clayey silt with trace organics. The clay and clayey silt was in turn followed by a layer of sand overlaying silty sand followed by the bedrock. A detailed description of each layer is given below in order of increasing depth. A subsurface profile is presented in Drawing No. 4. The location of the section is provided in Drawing No. 3.

Fill

Below the 6-in-thick asphalt pavement, a layer of fill, generally consisting of brown sand with varying amounts of gravel, brick and concrete was encountered. The thickness of the fill was about 12 to 13 ft; the bottom of the fill ranged from about el -3 to -4. Standard penetration resistance N-values ranged from 3 blows per ft (bpf) to refusal (over 100 bpf) and averaged about 12 bpf. The higher N-values are likely the result of obstructions in the fill that impeded the advance of the split spoon. The fill layer is classified as Building Code Class 11-65.

Fine Sand

A 3-ft layer of brown sand with trace silt was encountered below the fill in boring B-1. The depth to the top of the sand layer was at about el -4. The single N-value recorded was 27 bpf. The sand layer is designated as SP in accordance with the Unified Soil Classification System (USCS) and is classified as Building Code Class 8-65.

Clay and Clayey Silt

A layer of grey clay and clayey silt with trace organics was encountered in both borings. The depth to top of the clayey silt layer ranged from about 13 to 15 ft below the ground surface and the corresponding elevation of top of the layer was at about el -3. The N-values in this layer ranged from about 8 to 11 bpf and averaged about 10 bpf.

Atterberg Limits test performed on two samples from this layer resulted in a liquid limit of 27 and 36 and a plasticity index of 1 and 14. The natural water content determined for two samples were 24% and 35%. The organic content of the samples were 1.5% and 2%.

The clay and clayey silt are designated as CL and ML in accordance with the USCS and is classified as Building Code Class 9-65 and 10-65, respectively.

Sand

Brown coarse to fine sand with some silt and gravel was encountered below the clay and clayey silt. The thickness of the layer was about 10 ft; the depth to the top of layer was about 18 ft below the surface grade corresponding to el -8 to -10. The N-values in this layer ranged from about 17 to 41 bpf and averaged about 27 bpf. The layer is designated as SP in accordance with USCS and is classified as Building Code Class 7-65.

Silty Sand

Brown medium to fine silty sand with trace clay was encountered below the sand layer. The depth to the top of layer was about 28 ft below the surface grade, corresponding to el -18 to -20. The silty sand layer extended to the terminating depths of borings, where bed rock was encountered. The N-values in this layer ranged from about 10 to 29 bpf and averaged about 16 bpf. The layer is designated as SM in accordance with USCS and is classified as Building Code Class 8-65.

Groundwater

Groundwater level was measure at the observation well B-1. The stabilized water level was measured at about 11 ft below the ground surface. The corresponding elevation is el -3.

RECOMMENDATIONS

The following sections provide our recommendations for foundation system and other geotechnical-related issues including seismic evaluation, below grade walls, groundwater control, backfill and compaction, excavation considerations and monitoring of the adjacent buildings and structures.

Foundation System

The building loads can be supported on a shallow foundation system bearing on clay and clayey silt of Building Code Class 9-65 and 10-6, encountered at the proposed foundation level. We recommend a mat foundation system to prevent differential settlement. The recommended total allowable bearing pressure is 2 tons per square ft for the design of the mat foundation. The recommended modulus of subgrade reaction is 35 psi per inch. Trace organic is presented at the clay and silt layer encountered at the site. In case, silt and clay with high organic content are encountered at the foundation level, an evaluation will be done by the geotechnical engineer at the site.

Footings bearing surfaces should be level and clear of debris, standing or frozen water and other deleterious material. Machine excavation should not be allowed within 6 inches of the final bearing elevation to avoid disturbance. In accordance with the Building Code requirements for controlled inspection, a professional geotechnical engineer should inspect and approve the foundation subgrade to assure that the subgrade material is adequate to provide the recommended allowable bearing pressure.

We anticipate that total settlement at columns will be less than 1 inch and differential settlement between adjacent columns will be less than $\frac{3}{4}$ inches.

Proofrolling

All slab subgrades should be proofrolled, which consists of compacting the existing soil material in place. The purpose is to identify any potential loose or soft zones. The proofrolling should be performed using a smooth drum vibratory roller having a static drum weight of at least 2 tons. At least six overlapping passes should be made with the roller. Soft or loose zones that are identified should be excavated and replaced with controlled compacted fill.

Tension Anchors

The uplift forces can be resisted by vertical rock anchor tie-downs. We recommend the rock anchors consist of 1-3/8 inch diameter double corrosion protected thread bars having a yield strength of 150 kips per square inch. The bars should be secured into 4-inch nominal diameter drill holes using neat cement grout having a 28-day compressive strength of at least 4,000 pound per square inch. Anchor bars should be placed a minimum of 3 ft on center. The recommended maximum design capacity is 125 kips. The anchor bond length should be proportioned using a unit peripheral shear resistance between the rock and the grout of 100 psi. The free stressing length of the bar should be proportioned such that the dead weight of the engaged rock mass is greater than the anchor loads. Each rock anchor should be field tested to confirm the design capacity.

Seismic Evaluation

Site Coefficient

New York is located in Seismic Zone Z, with a seismic zone factor of 0.15g in accordance with the Building Code. Seismic site coefficients (S-factors) are based on the type and thickness of subsurface materials below the level of footings or pile caps. S-factors range from S_0 for buildings whose footings are supported directly on hard rock to S_4 for buildings underlain by thick deposits of unsuitable or soft bearing strata. The soil profile beneath the foundation level consists of a thin layer of clay and clayey silt followed by sand and silty sand over bedrock

encountered at the depth of 34 to 48 ft. Therefore, we have determined that the site soil profile below the foundation level is type S_1 and the corresponding site coefficient factor is 1.0.

Liquefaction Potential

The Building Code requires an evaluation of the liquefaction potential of sand, silt and non-cohesive unsuitable bearing materials below the groundwater table and to a depth of 50 ft below the ground surface. The uncorrected N-values versus depth are shown in Drawing No. 6. Two of the twelve average N-values (16%) fall within the Building Code Category A, "probable liquefaction"; three of the twelve average N-values (25%) fall within the Building Code Category B, "possible liquefaction". The remaining N-values (59%) fall within Building Code Category C, "liquefaction unlikely."

Site-Specific Analysis

We evaluated the potential for soil liquefaction using a site-specific procedure, the "simplified procedure" (Youd et al 2001). Our design parameters included a magnitude 5.75 earthquake event resulting in magnitude scaling factor of 2.0, peak ground acceleration of 0.15g and 15% of fine content for the soil. Drawing No. 7 presents the plot of the depth versus corrected N-values, $(N_1)_{60}$. The $(N_1)_{60}$ is the SPT blow count normalized to an overburden pressure of approximately one ton per square foot and a hammer energy ratio or hammer efficiency of 60% (Youd et al 2001). The critical $(N_1)_{60}$ is the minimum $(N_1)_{60}$ corresponding to "no liquefaction" at a given depth.

Based on the results of the empirical site-specific analysis, all N-values fall in the non-liquefiable zone. The factor of safety against soil liquefaction, defined as the average N-value divided by the critical N-value, ranged from 1. to 3.6 and averaged at 3 for all depths. Therefore the effect of soil liquefaction need not be considered in the foundation design.

Below-Grade Walls

Below grade walls should be designed to resist static and dynamic earth pressures and lateral pressures from surcharge loadings. Two loading conditions should be considered: 1) static pressures and, 2) dynamic pressures. The recommended soil pressures are described below.

Static Earth Pressures

We recommend the walls be designed using an earth pressure distribution increasing with the ratio of 55 psf per ft of depth above the design groundwater level at el 7.25 and 24 psf per ft of depth below the design groundwater level within the fill material and with a ratio of 30 psf per ft of depth within the sand layer. Lateral pressures from sidewalk and any other surcharge loads should be added as a uniform soil pressure equal to 40% the vertical pressure applied

over the full height of the wall. Our recommended lateral earth pressure diagram is presented in Drawing No. 8a.

Dynamic Earth Pressures

The dynamic lateral earth pressure component is an inverted triangle having a maximum pressure at the ground surface of $11 H$ psf where H is the wall height in feet. The pressure reduces to zero at the bottom of the wall. The dynamic component is added to the static earth pressure. Lateral earth pressures resulting from the surcharge loads need not be considered for the dynamic loading condition. Our recommended lateral earth pressure diagram is presented in Drawing No. 8b.

Permanent Groundwater Control

Design Groundwater Level

The stabilized water level was measured at about 11 ft below the ground surface, or at about el -3. The 100-year flood level is el 7.25, above the measured stabilized water level; therefore the recommended design water level is el 7.25. We recommend that the first floor slab be 1 ft above this level at el 8.25 to prevent flooding during the 100-year flood event. The below grade slab should be a structural pressure slab integrated with the foundation system. The slab should be designed to withstand downward dead plus live loads. Additionally, the pressure slab must be designed to resist hydrostatic uplift pressures resulting from the design groundwater level of el 7.25.

Waterproofing

We recommend that the foundation mat and below grade walls be fully waterproofed to ground surface. We recommend a membrane type waterproofing be used, such as the Prepruf and Bituthene products by Grace. The use of bentonite waterproofing or negative side crystalline waterproofing is not recommended. The foundation subgrade should be prepared with a 2-inch-thick concrete working surface or smooth compacted subgrade. The vertical waterproofing should be protected with a rigid barrier to prevent damage during backfilling operations.

Backfill and Compaction

The fill material should consist of well-graded sand and/or gravel having less than 12% by dry weight passing the No. 200 sieve, be free of organics and other deleterious materials and have a maximum particle size no greater than 4 inches. On-site or imported material satisfying this criterion may be used.

The fill should be placed in uniform lifts and compacted to at least 95% of its maximum dry density as determined by Modified Proctor Test (ASTM D1557). No fill should be placed on

areas where free water is standing, on frozen subsoil areas, or on surfaces which have not been approved by the project engineer. Care should be taken to protect the foundations, walls and waterproofing during placement and compaction of fill.

Backfill should not be placed against below grade walls until the wall concrete has reached its 28-day strength. In addition, backfilling should be performed after either the first floor slab has been completed or temporary lateral bracing has been provided to prevent rotation of the wall, or as allowed by the structural engineer.

Excavation Considerations

The proposed construction requires a general excavation to about 12 ft below the surface grades. Site excavation can be performed using conventional earth moving equipment (e.g. backhoes, excavators, etc.). All excavations should be conducted in accordance with Occupational Safety and Health Administration (OSHA) requirements including, but not limited to temporary shoring, trench boxes and/or proper benching.

Temporary Excavation Support

During excavation, lateral support of excavation sides will be required. On north, south and southern 35 ft of the east property line, we recommend an excavation support system consisting of soldier piles and timber lagging, supplemented with lateral bracing. A similar excavation support system can be used around the Hi-Line pile caps for the lateral support of the soil around the piles. The lateral bracing can consist of external tiebacks or interior raker braces and corner braces. The recommended earth pressure diagram is as shown in Drawing No. 9. Lateral pressures from transient vertical surcharge loads should be added as one-half the vertical pressure at the top of the wall and reducing linearly to zero at the bottom of the wall. Large concentrated loads, such as crane loading, should be analyzed individually on a case-by-case basis.

A detailed design of the entire lateral support system should be provided by the contractor. The design should be signed and sealed by a Professional Engineer registered in the State of New York.

Underpinning

Undermining of the adjacent buildings and structures must be avoided. The mat foundation for the adjacent building to the east is at about the same elevation of the proposed foundation and therefore underpinning is not anticipated.

The adjacent building to the west is supported on piles and therefore, underpinning is not anticipated. However, lateral support of the soil is required. We recommend use of concrete

piers, extending from the bottom of the adjacent floor slab to the bottom of excavation, with timber lagging between individual piers.

Temporary Dewatering

Excavation to reach to the level of the bottom of the mat foundation will require temporary dewatering. We recommend that the groundwater level be maintained at least 3 ft below the mat subgrade level throughout the excavation and casting of the mat. The corresponding elevation is about el -9 or a lowering of the groundwater level of about 6 ft. A system of shallow well points or deep wells operating around-the-clock will be required to control the groundwater.

The temporary dewatering system can be discontinued once the cellar floor is cast, the perimeter walls have been constructed to the first floor level, and the building dead weight plus uplift capacity is sufficient to resist hydrostatic pressures resulting from a measured groundwater level at el 3.0. We recommend that all well points, header pipe, and pump remain in-place and operable until the building has sufficient dead weight to resist hydrostatic pressures resulting from a 100-year flood level of el 7.25. In the unlikely event that the groundwater rises above el 3.0 during the first few weeks of superstructure construction, the dewatering system could be reactivated to control the hydrostatic pressures. We recommend that the groundwater level both inside and outside the excavation be monitored from the start of pumping until the dewatering system is dismantled.

Monitoring of Adjacent Buildings and Structures

During active excavation operations, a precise optical survey program will be implemented by a third party to monitor for vertical and horizontal movements of surrounding structures. Survey control points will be established to monitor lateral movement of the excavation bracing system through minimum of six points on each of the two adjacent buildings and the Hi-line structure. The survey will be performed at least twice weekly during excavation, with measurements taken to the nearest 0.005 ft. The survey will be performed by a licensed surveyor. Excavation and foundation work should be temporarily stopped if the total movement (vertical or horizontal) exceed about ¼ inches. Depending on the findings of the preconstruction conditions survey, crack gauges may be required to monitor for crack changes inside and/or outside the adjacent structures during work. Seismographs, capable of measuring to the nearest 0.02 inches per second, will be used to monitor construction induced vibrations at the foundation level of the adjacent structures.

CONSTRUCTION DOCUMENTS AND QUALITY CONTROL

Technical specifications and design drawings should incorporate our recommendations to ensure that subsurface conditions and other geotechnical issues at the site are adequately addressed in the construction documents. Langan should assist the design team in preparing specification sections related to geotechnical issues such as earthwork, and excavation support. Langan should also review foundation drawings and details, and all contractor submittals and construction procedures related to geotechnical work.

A professional engineer familiar with the site subsurface conditions and design intent should perform the engineering inspection and testing of geotechnical-related work during construction. We recommend that Langan perform this work to verify proper implementation of our recommendations and to maintain continuity of our responsibility for this project. Construction activities that require quality-control inspections include, but are not limited to subgrade preparation.

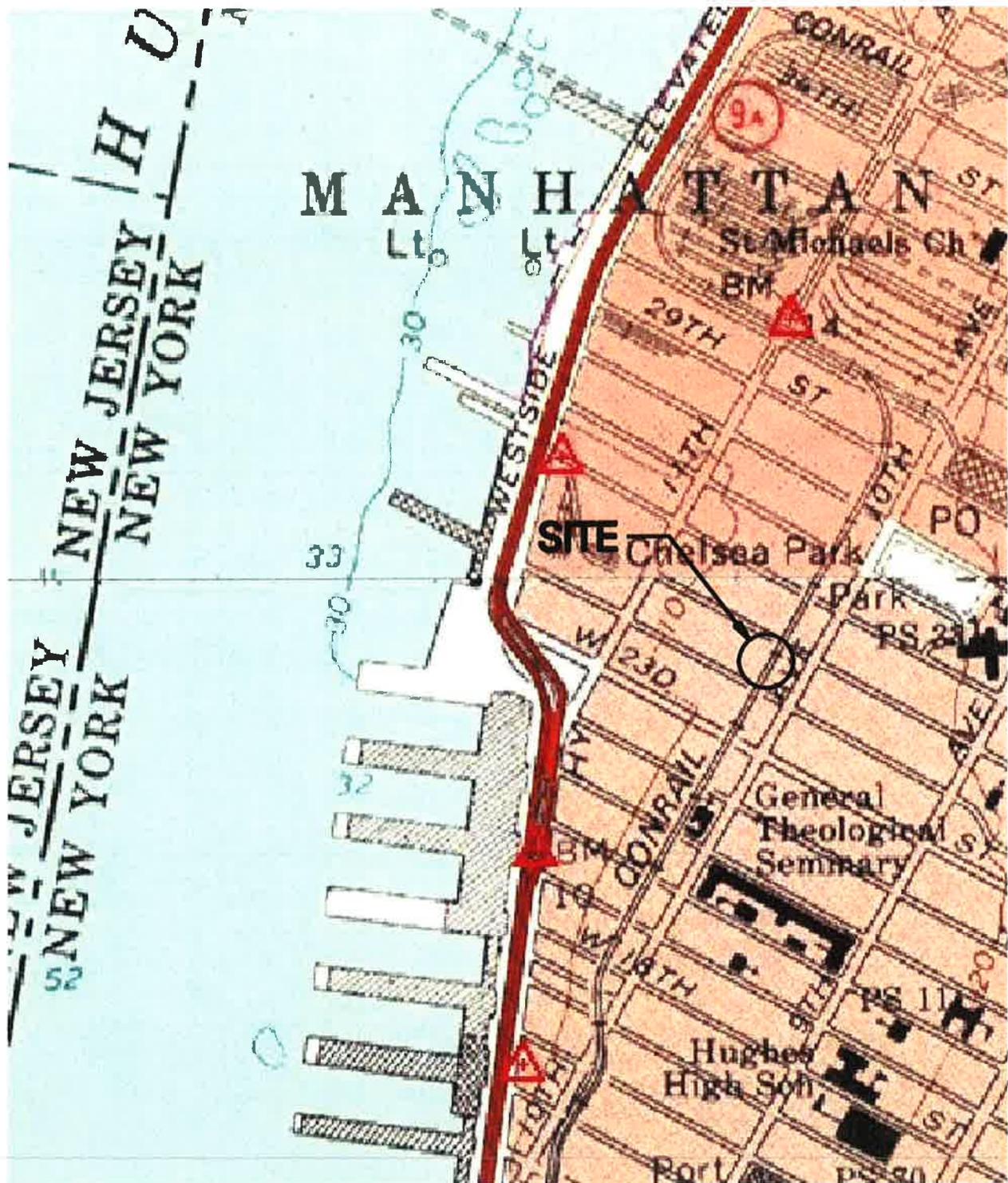
LIMITATIONS

The conclusions and recommendations provided in this report are based on subsurface conditions inferred from a limited number of borings and test pits, as well as architectural and structural information provided by Studio MDA Architects. Recommendations provided are contingent upon one another and no recommendation should be followed independent of the others.

This report has been prepared to assist the owner, architect and structural engineer in the design process and is only applicable to the envisioned project discussed herein. Any proposed changes in structures or their locations should be brought to our attention so that we can determine whether such changes affect our recommendations. Langan cannot assume responsibility for use of this report for any areas beyond the limits of this study or for any projects not specifically discussed herein.

Information on subsurface strata and groundwater levels shown on the logs represents conditions encountered only at the locations indicated and at the time of investigation. If different conditions are encountered during construction, they should immediately be brought to our attention for evaluation as they may affect our recommendations.

Environmental issues (such as potentially contaminated soil and groundwater) are outside the scope of this study and should be addressed in a separate study.



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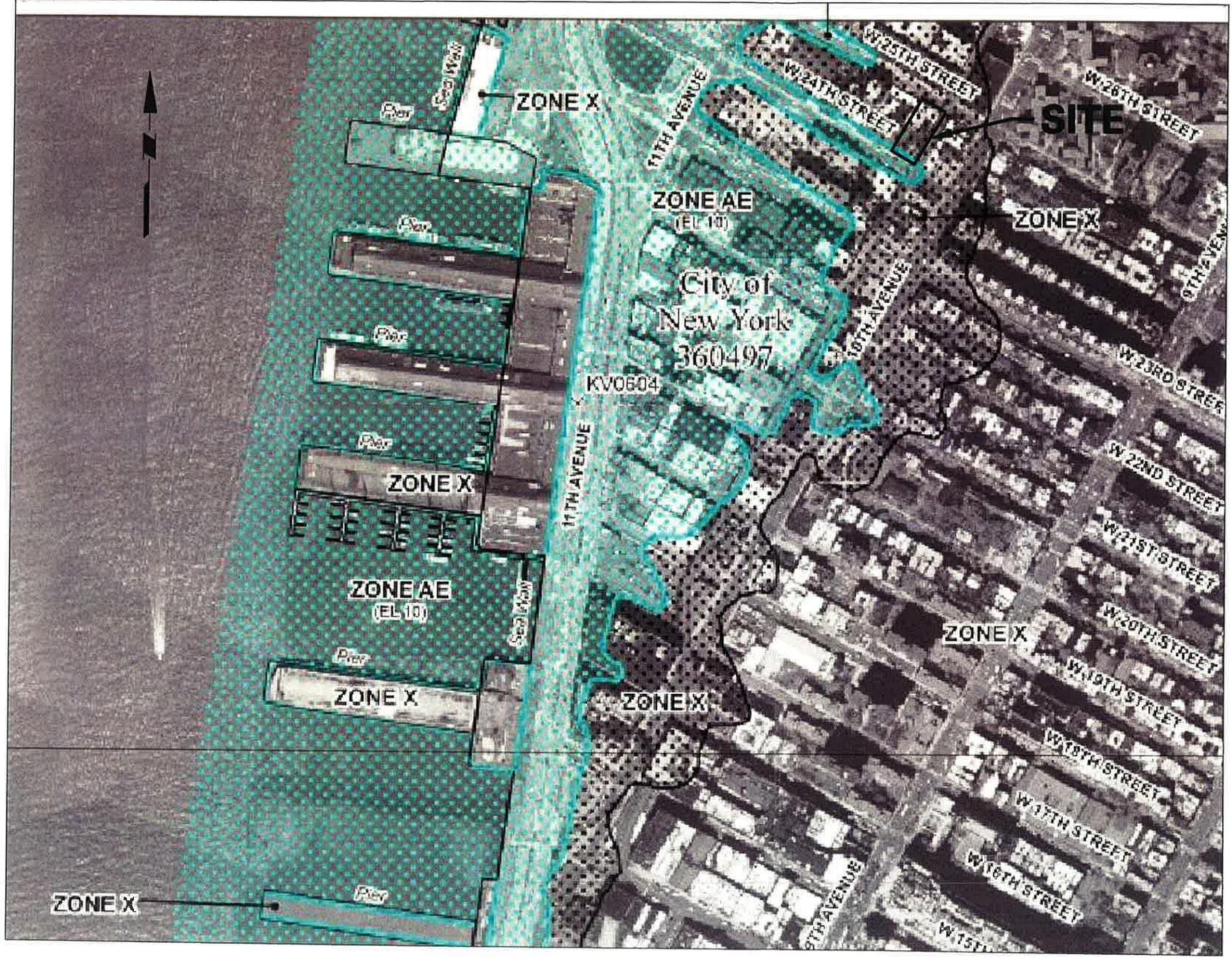
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507 W 24TH STREET

SITE LOCATION PLAN

NEW YORK	NEW YORK
Project No. 5821101	Dwg. No. 1
Date 2/26/08	Scale NTS



SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Areas subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard are: Zone A, AE, AH, AO, AR, AV, and VE. The Base Flood Elevation is the water elevation of the 1% annual chance flood.

- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on debris); total depths determined. For areas of alluvial fan flooding, not determined.
- ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual flood by a flood control system that has subsequently deteriorated; indicates that the former flood control system is being restored; protection from the 1% annual chance or greater flood.
- ZONE AV** Area to be protected from 1% annual chance flood by a levee protection system under construction; no Base Flood determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); no Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain area that must be so developed so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance average depths of less than 1 foot; or with drainage areas of 1 square mile; and areas protected by levees from 1% annual flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplains.

Zone D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) ARE

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are generally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area 1
- Boundary dividing Special Flood Hazard Areas of 1%

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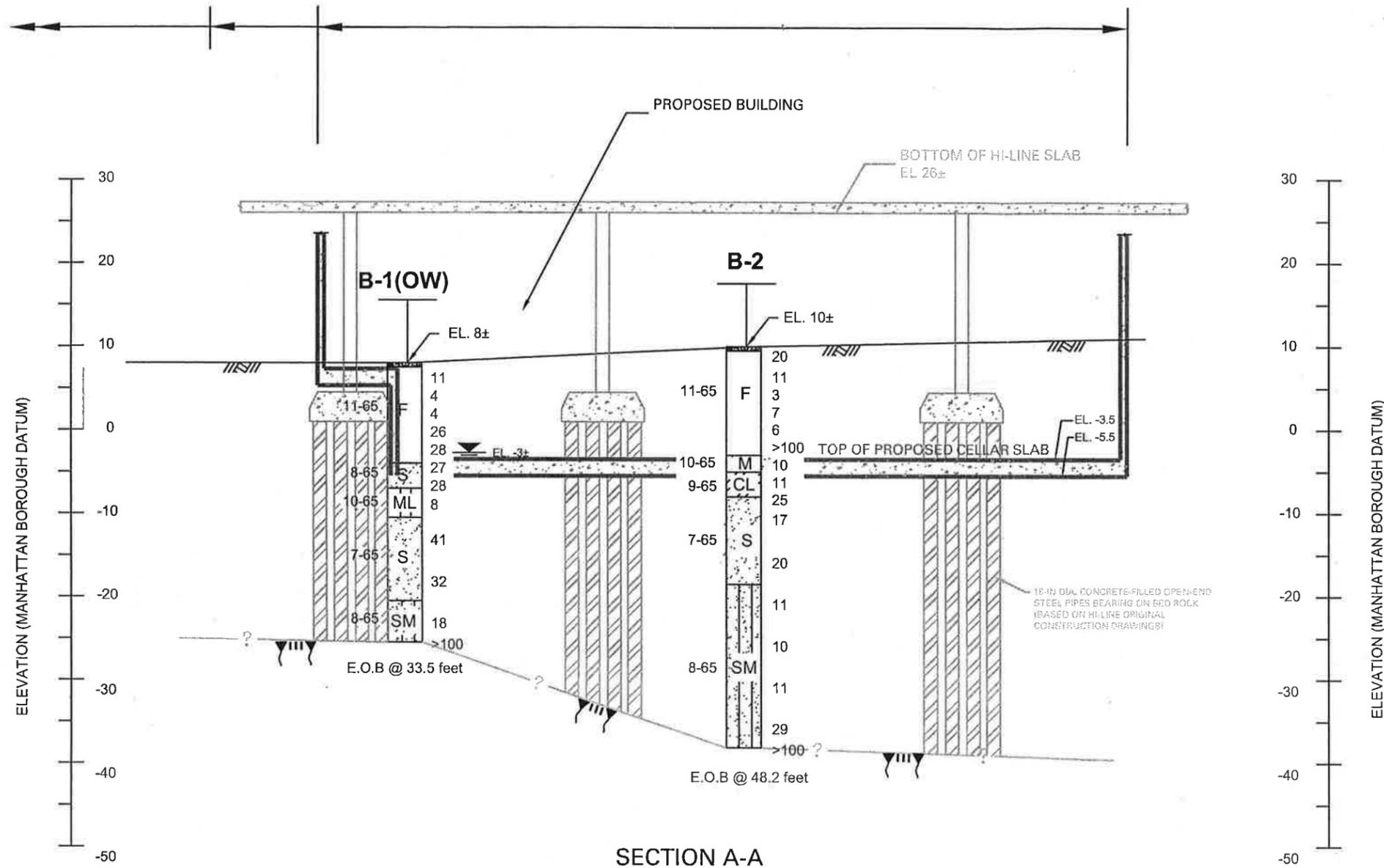
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507 W 24TH STREET
FLOOD INSURANCE MAP

NEW YORK	NEW YORK
Project No. 5821101	Date 2/28/08
Scale NTS	Dwg. No. 2

24TH STREET SIDE WALK PROPERTY LIMITS/PROPOSED BUILDING



SECTION A-A

NOTES

- ELEVATIONS ARE REFERRED TO BOROUGH PRESIDENT OF MANHATTAN DATUM (BPMD), WHICH IS 2.75 FT ABOVE MEAN SEA LEVEL MEASURED AT SANDY HOOK, NEW JERSEY, 1929 (NGVG).
- SURFACE ELEVATIONS ARE TAKEN FROM A SURVEY DRAWING PREPARED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES P.C., DATED 22 FEBRUARY 2008.
- HI-LINE FOUNDATION INFORMATION IS OBTAINED FROM THE ORIGINAL CONSTRUCTION DRAWINGS, DATED 15 OCTOBER 1930.
- ADJACENT BUILDINGS INFORMATION ARE TAKEN FROM ORIGINAL FOUNDATION DRAWINGS AND COMMUNICATIONS WITH THE ARCHITECT.
- REFER TO FIGURE 3 FOR BORING AND SECTION LOCATIONS.

LEGEND

- UNCONTROLLED FILL
- SAND
- SILT
- CLAY
-

- B BORING IDENTIFICATION
- EL GROUND SURFACE ELEVATION AT THE TIME OF DRILLING
- N STANDARDS PENETRATION RESISTANCE
- X-65 NEW YORK CITY BUILDING CODE CLASSIFICATION
- (OW) GROUND WATER OBSERVATION WELL
-
- REC (LENGTH OF ROCK RETRIVED/ LENGTH OF ROCK CORED)*100%
- RQD ROCK QUALITY DESIGNATION (LENGTH OF ROCK PIECES 4 IN AND GREATER/ LENGTH CORED)*100%

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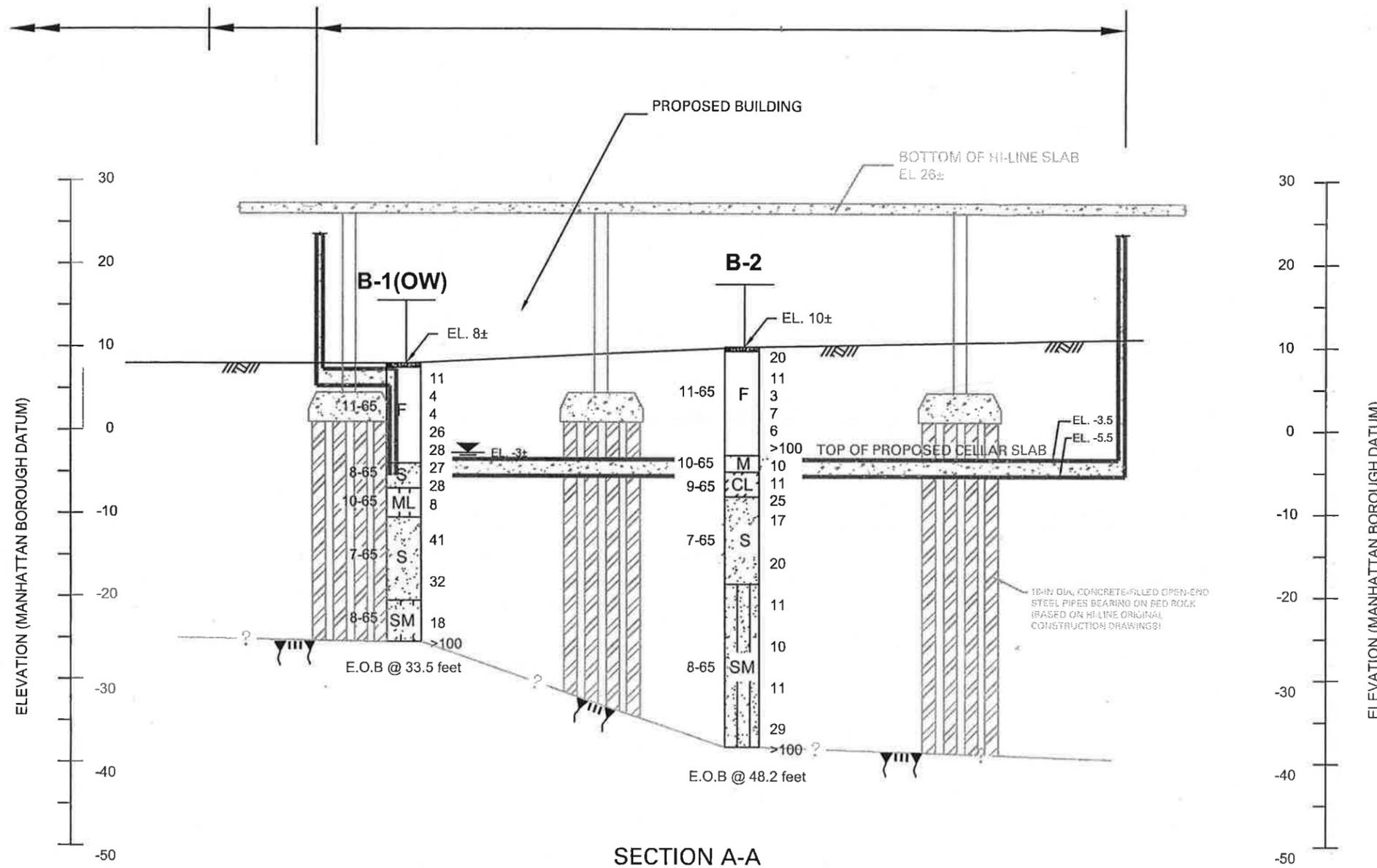
507 W 24TH STREET
SUBSURFACE PROFILE
SECTION A-A

NEW YORK NEW YORK

Project No. 5821101	Date 4/02/08	Scale 1"=16'	Dwg. No. 4
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24TH STREET SIDE WALK PROPERTY LIMITS/PROPOSED BUILDING



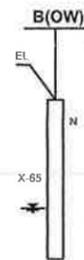
SECTION A-A

NOTES

- ELEVATIONS ARE REFERRED TO BOROUGH PRESIDENT OF MANHATTAN DATUM (BPM D), WHICH IS 2.75 FT ABOVE MEAN SEA LEVEL MEASURED AT SANDY HOOK, NEW JERSEY, 1929 (NGVG).
- SURFACE ELEVATIONS ARE TAKEN FROM A SURVEY DRAWING PREPARED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES P.C., DATED 22 FEBRUARY 2008.
- HI-LINE FOUNDATION INFORMATION IS OBTAINED FROM THE ORIGINAL CONSTRUCTION DRAWINGS, DATED 15 OCTOBER 1930.
- ADJACENT BUILDINGS INFORMATION ARE TAKEN FROM ORIGINAL FOUNDATION DRAWINGS AND COMMUNICATIONS WITH THE ARCHITECT.
- REFER TO FIGURE 3 FOR BORING AND SECTION LOCATIONS.

LEGEND

- UNCONTROLLED FILL
- SAND
- SILT
- CLAY
- GROUND SURFACE



- B BORING IDENTIFICATION
- EL GROUND SURFACE ELEVATION AT THE TIME OF DRILLING
- N STANDARS PENETRATION RESISTANCE
- X-65 NEW YORK CITY BUILDING CODE CLASSIFICATION
- (OW) GROUND WATER OBSERVATION WELL
- MEASURED GROUND WATER LEVEL
- REC (LENGTH OF ROCK RETRIVED/ LENGTH OF ROCK CORED)*100%
- RQD ROCK QUALITY DESIGNATION (LENGTH OF ROCK PIECES 4 IN AND GREATER/ LENGTH CORED)*100%



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507 W 24TH STREET
SUBSURFACE PROFILE
SECTION A-A

NEW YORK NEW YORK

Project No.	Date	Scale	Dwg. No.
5821101	4/02/08	1"=16'	4

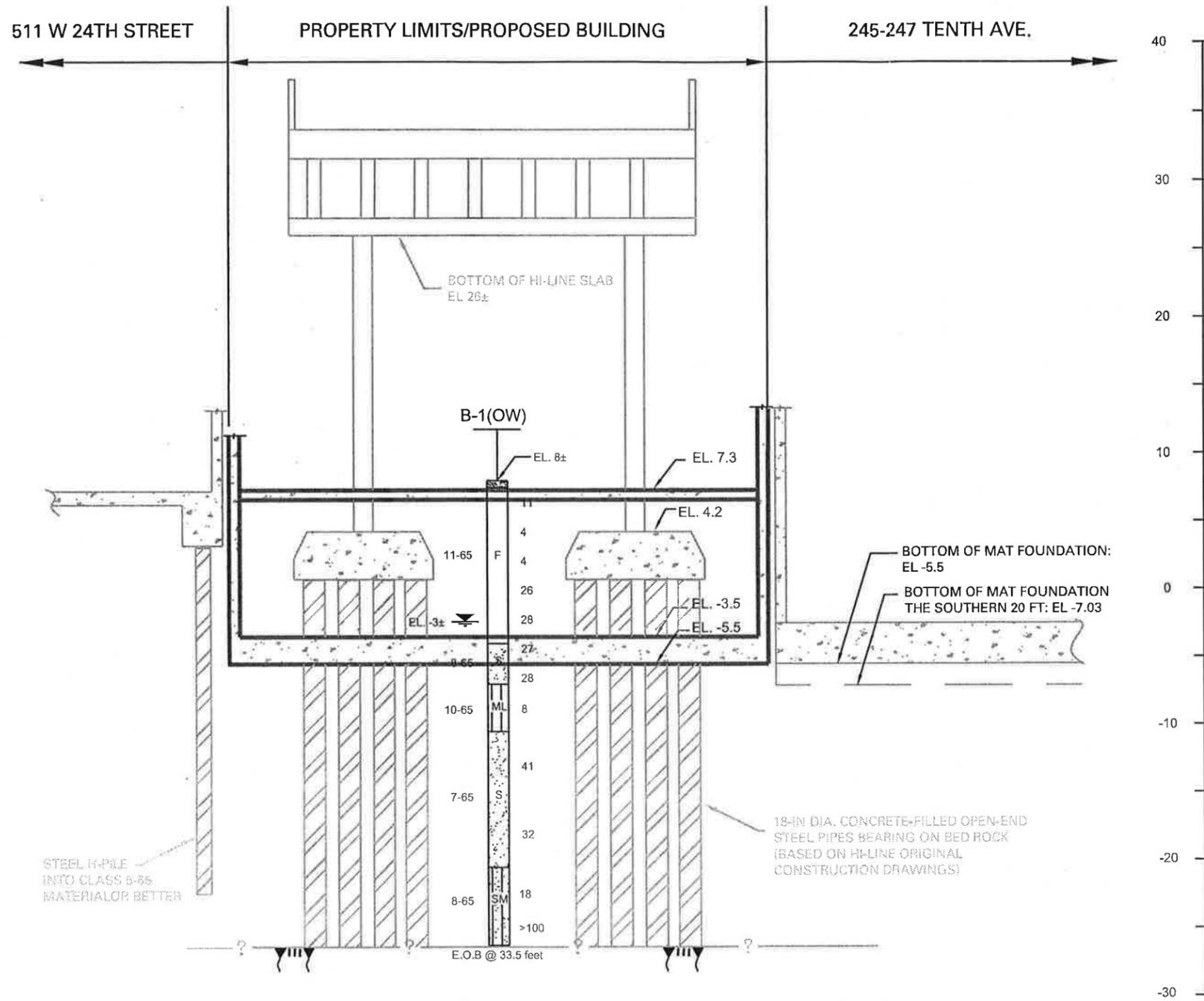
ELEVATION (MANHATTAN BOROUGH DATUM)



511 W 24TH STREET

PROPERTY LIMITS/PROPOSED BUILDING

245-247 TENTH AVE.



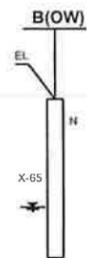
ELEVATION (MANHATTAN BOROUGH DATUM)

NOTES

1. ELEVATIONS ARE REFERRED TO BOROUGH PRESIDENT OF MANHATTAN DATUM (BPMD), WHICH IS 2.75 FT ABOVE MEAN SEA LEVEL MEASURED AT SANDY HOOK, NEW JERSEY, 1929 (NGVG).
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4. ADJACENT BUILDINGS INFORMATION ARE TAKEN FROM ORIGINAL FOUNDATION DRAWINGS AND COMMUNICATIONS WITH THE ARCHITECT.
5. REFER TO FIGURE 3 FOR BORING AND SECTION LOCATIONS.

LEGEND

- UNCONTROLLED FILL
- SAND
- SILT
- ORGANIC SILT



- B BORING IDENTIFICATION
- EL GROUND SURFACE ELEVATION AT THE TIME OF DRILLING
- N STANDARS PENETRATION RESISTANCE
- X-65 NEW YORK CITY BUILDING CODE CLASSIFICATION
- (OW) GROUND WATER OBSERVATION WELL
- MEASURED GROUND WATER LEVEL
- REC (LENGTH OF ROCK RETRIVED/ LENGTH OF ROCK CORED)*100%
- RQD ROCK QUALITY DESIGNATION (LENGTH OF ROCK PIECES 4 IN AND GREATER/ LENGTH CORED)*100%

GROUND SURFACE



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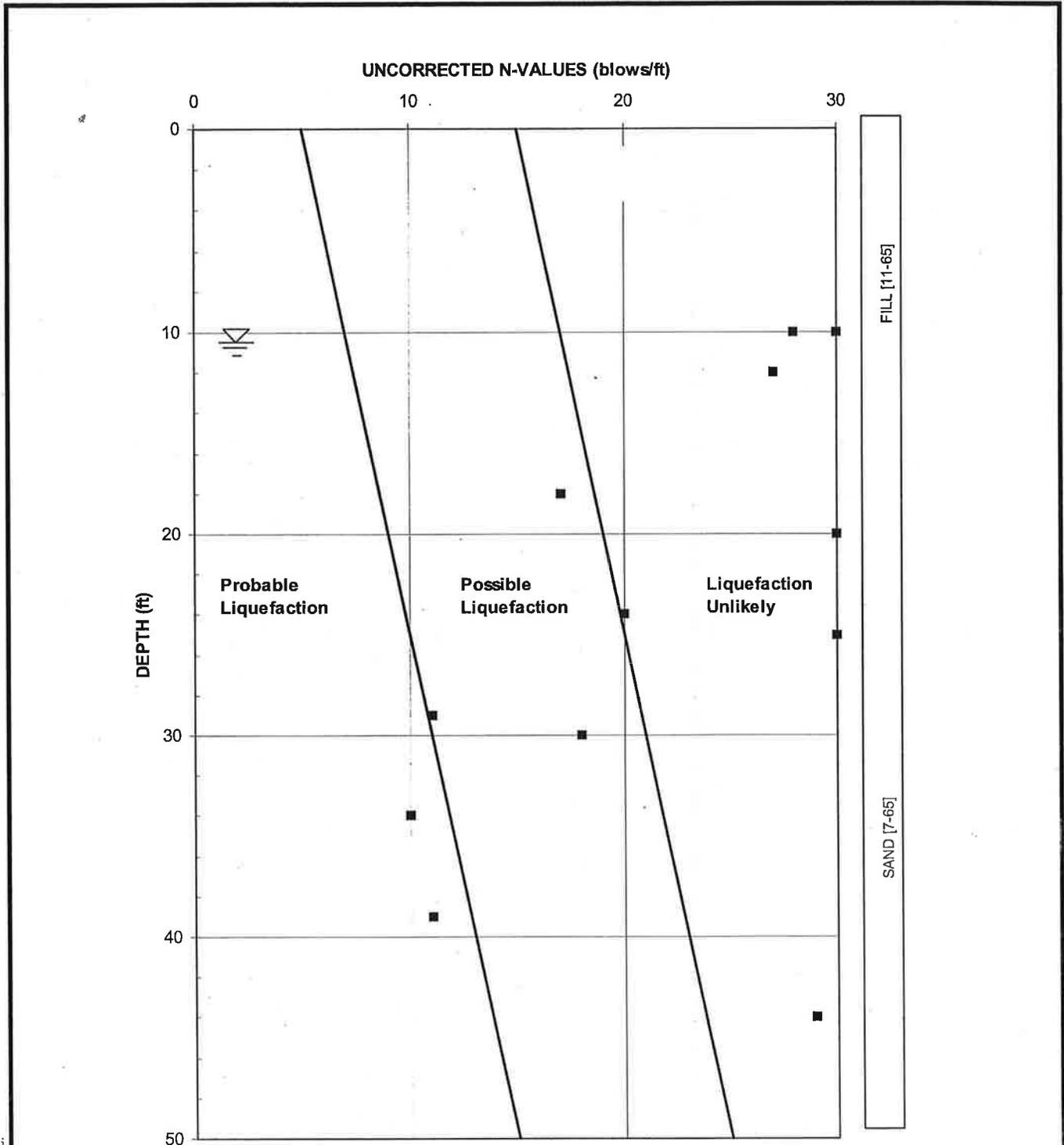
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NJ Certificate of Authorization No: 24GA27996400

507 W 24TH STREET
SUBSURFACE PROFILE
SECTION B-B

NEW YORK NEW YORK

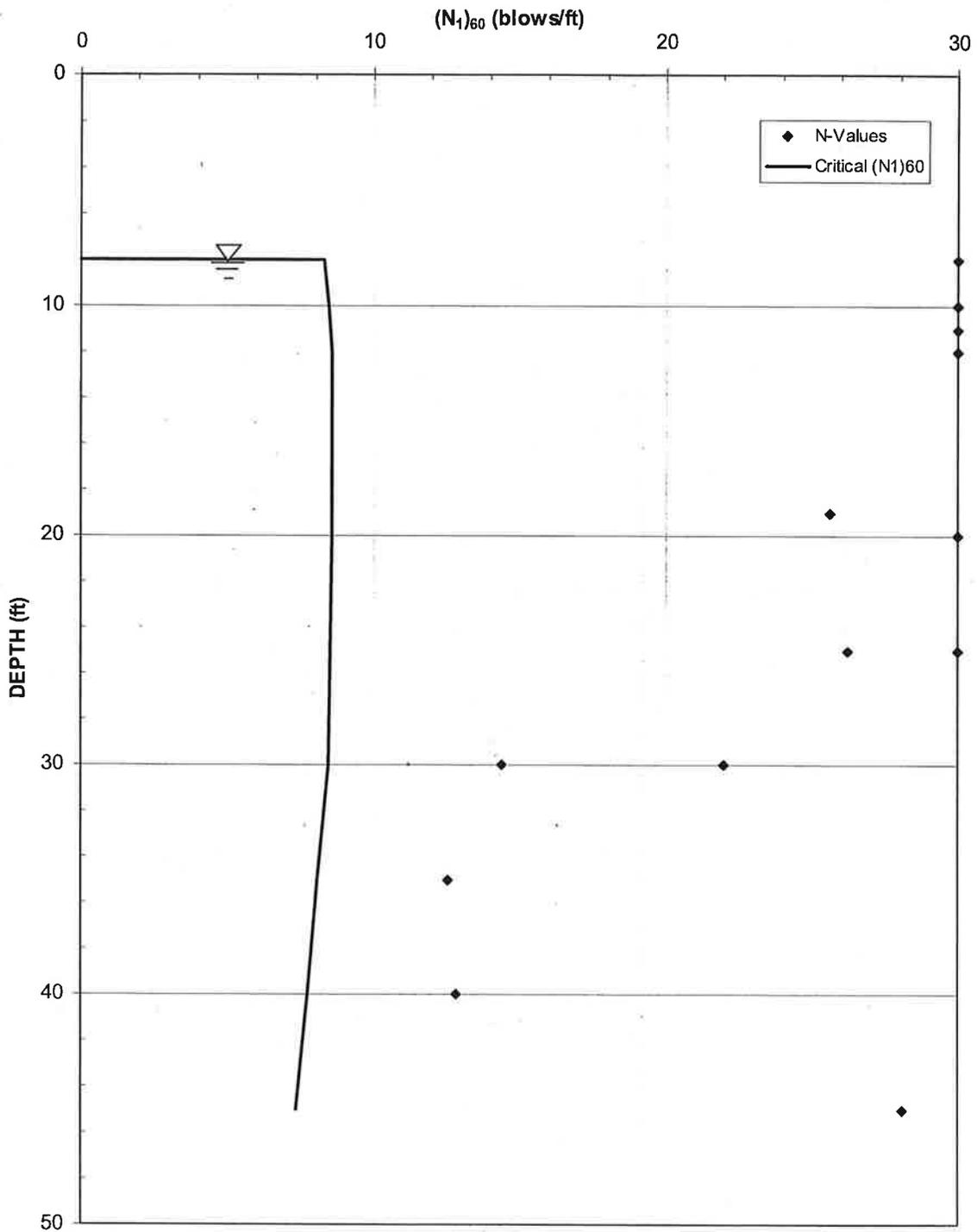
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		507 W 24TH STREET LIQUEFACTION EVALUATION (NYC BUILDING CODE)	
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NEW JERSEY PENNSYLVANIA NEW YORK CONNECTICUT FLORIDA NEVADA NJ Certificate of Authorization No: 24GA27996400		Project No. 5821101	Date 2/ 28/08
		Scale NTS	Dwg. No. 6

Seed & Idriss Liquefaction Analysis



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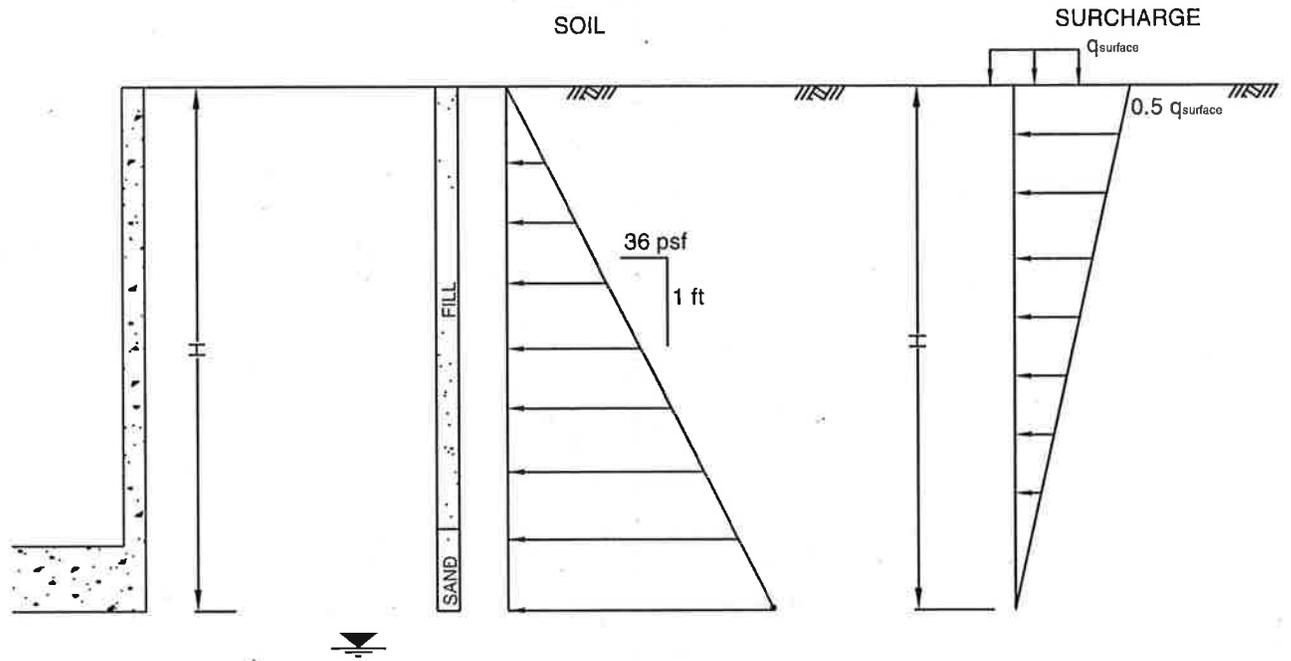


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NEW JERSEY PENNSYLVANIA NEW YORK CONNECTICUT FLORIDA NEVADA
 NJ Certificate of Authorization No: 24GA27996400

507 W 24TH STREET
**SITE SPECIFIC LIQUEFACTION
 EVALUATION**

NEW YORK		NEW YORK	
Project No.	Date	Scale	Dwg. No.
5821101	2/ 28/08	NTS	7



ACTIVE LATERAL EARTH PRESSURE

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NEW JERSEY PENNSYLVANIA NEW YORK CONNECTICUT FLORIDA NEVADA

NJ Certificate of Authorization No: 24GA27996400

507 W 24TH STREET
**TEMPORARY LATERAL EARTH
 PRESSURE**

NEW YORK

NEW YORK

Project No. 5821101	Date 3/10/08	Scale NTS	Dwg. No. 9
------------------------	-----------------	--------------	---------------

PROJECT 507 West 24th St			PROJECT NO. 58 21101		
LOCATION Manhattan NY			ELEVATION AND DATUM + 8 ±		
DRILLING AGENCY ADT			DATE STARTED 12/12/07		DATE FINISHED 12/13/07
DRILLING EQUIPMENT Davey Drill DK 5/5			COMPLETION DEPTH 33.5		ROCK DEPTH 33.5
SIZE AND TYPE OF BIT Tricore Roller			NO. SAMPLES	DIST. 10	UNDIST. -
CASING 4" Flush joint steel			WATER LEVEL	FIRST	COMPL. 24 HR.
CASING HAMMER WEIGHT 140'		DROP 30"	FOREMAN Prem - HAVIER		
SAMPLER 2" O D S S			INSPECTOR JC		
SAMPLER HAMMER WEIGHT 140'		DROP 30"			

Material	NYC BC	SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
				NO. LOC.	TYPE	RECOV. FT.	PENETR. RESIST. BL/6 IN.	
		6" concrete						
VOID		void below concrete to 2' begin ss @ 2'	1					
		medium to fine grained Brown sand mixed with brick concrete Asphalt (Fill)	2				1	
			3	SS 1	SS	6"	3	
			4				8	
			5				3	
		medium to fine grained Brown sand mixed with brick concrete Asphalt stone concrete filler (Fill)	6	SS 2	SS	6"	2	
			7				2	
		medium to fine grained Brown sand mixed with brick wood Rock (Fill)	8	SS 3	SS	6"	2	
			9				2	
		medium to fine grained Brown sand (Trace of grey) mixed with concrete Asphalt wood (all fine grained wood)	10	SS 4	SS	10"	11	
			11				12	
		medium to fine grained Brown sand mixed with crushed brick concrete (Fill)	12	SS 5	SS	30"	13	
		medium to fine grained Brown sand mixed with crushed brick concrete (Fill)	13	SS 6	SS	10"	14	
		Transits	14				10	

← organics @ h served @ Approx 12 - 12.5

FILL 11-65

SAND 8-65

JOB NO. 582101

LOG OF BORING NO. B-1

DATE 12/13/07

SHEET 2 OF 3

Material	NYC DC	SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)				
				NO. LOC.	TYPE	RECOV. FT.	PENETR. RESIST. BL/6 IN.					
Organic SILT	11-65	no sample Roller Bit to 14'	14					Push 4" casing + 14' roller bit 74 wood coming up in cuttings stuck in casing will Roller bit to 15'				
		Sandy Silt grey Dark grey with trace organic, Black stains.	15				4					
			16	SS-7	SS	24"	5		3			
			17				9					
				? ?	18							
					19							
				Fine to medium grained Reddish Brown Sand	20					Used revert to keep hole open for remainder of boring		
					21	SS-8	SS		15"		20	21
					22						25	
					23							
			24									
SAND	7-65		25									
			26									
			27									
			28									
			29									
			30									
			31	Fine to medium Reddish Brown Sand trace silt	26	SS-9	SS	15"	19	13		
			32		27				14			
Silty SAND	8-65		30									
		Fine to medium Reddish Brown Silty Sand	31	SS-10	SS	16"	8	10				

JOB NO. 58 21101

LOG OF BORING NO. B-1

DATE 12/13/07

SHEET 3 OF 3

Material	NYC BC	SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
				NO. LOC.	TYPE	RECOV. FT.	PENETR. RESIST. BL/G IN.	
	P-65		32					
			33	S-11	SS	0"	100/0	
		End of Boring 33.5'						While casing Biting hit Refusal @ 33.5'. Placed SS in hole & Draped Hammer 100 times no movement SS empty.
		Water level. 11 ft on 2/25/08						Install observation well

PROJECT 507 W 24 th Street		PROJECT NO. 5821101	
LOCATION 507 W 24 th Street, NY, NY		ELEVATION AND DATUM +10 ±	
DRILLING AGENCY ADT		DATE STARTED 2/22/08	DATE FINISHED 2/22/08
DRILLING EQUIPMENT CME LC 55 track-mounted rig		COMPLETION DEPTH 48.2'	ROCK DEPTH 4 ft ?
SIZE AND TYPE OF BIT 3 7/8" - 2 7/8" tricone roller		NO. SAMPLES	DIST. — UNDIST. — CORE —
CASING 4" ID steel pipe		WATER LEVEL	FIRST — COMPL. — 24 HR. —
CASING HAMMER Auto	WEIGHT 140 lbs	DROP 30"	
SAMPLER 2" ID Split spoon		FOREMAN Prim	
CASING HAMMER Auto	WEIGHT 170 lbs	DROP 30"	
		INSPECTOR R. Nasseri	

Material	NYC BC	SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
				NO. LOG.	TYPE	RECOV. FT.	PENETR. RESIST. BLU 6 IN.	
///	///	Concrete Pavement	///	///	///	///	///	<p>Location</p> <p>Adjacent Bldg</p> <p>W 24 Street</p> <p>Start 2/22/08 - 11:20 AM</p> <p>Drill through pavement</p> <p>Take S-1 Rollerbit to 3^{ft}</p> <p>Obstruction (boulder?) from 2.5 - 3.1 ft.</p> <p>Take S-2 Rollerbit to 5^{ft}</p> <p>Take S-3 Rollerbit to 7^{ft}</p> <p>Take S-4 Rollerbit to 9^{ft}</p> <p>Take S-5 Rollerbit to 11^{ft}</p> <p>Take S-6 Rollerbit to 13^{ft}</p> <p>Take S-7 Rollerbit to 15^{ft}</p>
		Dark Brown/Black cf SAND, some Silt, tr-so. of Gravel, or Mica, or Brick [FILL] (11-65)	1	S-1	S.S.	9"	15	
		Red BRICK, some of Brown Sand, some of Gravel [FILL] (11-65)	2	S-2	S.S.	8"	9	
		Red BRICK [FILL] (11-65)	3	S-3	S.S.	1"	11	
		Red BRICK [FILL] (11-65)	4	S-4	S.S.	4"	12	
		Red BRICK [FILL] (11-65)	5	S-5	S.S.	12"	4	
		Brown/Grey cf SAND, some of Gravel, or Brick, or Silt (decomposed concrete?)	6	S-6	S.S.	8"	5	
		[FILL] (11-65)	7	S-7	S.S.	3"	6	
			8				7	
			9				7 3/4	
			10				7	
			11				7 1/4	
			12				7 1/4	
			13				7 1/4	
			14				7 1/4	

FILL 11-65

SILT 10-65

JOB NO. 5821101

LOG OF BORING NO. B-2

DATE _____

SHEET 2 OF 3

Material NYC DC.	SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES			REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
			NO. LOC.	TYPE	RECOV. FT. PENETR. RESIST. BL/6 in.	
SILT 11-65	Brown Clayey SILT, some mf Sand, (tr Organic Clayey SILT @ 2 in of spoon tip). [ML] (10-65)	15	S-7	S.S.	4	- Take S-8. Rollerbit to 17 ^{ft}
		16	S-8	S.S.	5	
Organic SILT 11-65	Grey Organic Clayey SILT, tr mf Sand, tr Sea shells [OM] (10-65) No Recovery	17	S-8	S.S.	4	- Take S-9. Rollerbit to 19 ^{ft}
		18	S-9	S.S.	7	
SAND 7-65	Brown ct SAND, some Silt, tr mf Gravel [SM] (7-65)	19	S-9	N/R	8	- Take S-10. Rollerbit to 25 ^{ft}
		20	S-10	S.S.	5	
		21	S-10	S.S.	13	
SAND 7-65	Brown ct SAND, some Silt, tr f Gravel [SM] (7-65)	22			12	- Take S-11. Rollerbit to 30 ^{ft}
		23			6	
		24			7	
SAND 7-65	Brown ct SAND, some Silt, tr f Gravel [SM] (7-65)	25	S-11	S.S.	10	- Take S-12. Rollerbit to 35 ^{ft}
		26	S-11	S.S.	10	
		27	S-11	S.S.	8	
Silty SAND 8-65	Brown Silty ct SAND, tr Clay, tr Mica powder [SM]	28			11	
		29			10	
		30			10	
Silty SAND 8-65	Brown Silty ct SAND, tr Clay, tr Mica powder [SM]	31	S-12	S.S.	5	
		32	S-12	S.S.	5	

JOB NO. 5821101
DATE 2/22/08

LOG OF BORING NO. B-2

SHEET 3 OF 3

Material NYC B.C.	SAMPLE DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
			NO. LOC.	TYPE	RECOV. FT.	PENETR. RESIST BL/6 IN.	
Silty SAND 8-65	Brown Silty F SAND, w/ Clay [SM] (8-65)	33					
		34					
		35					- Take S-13
		36	S-13	S.S.	18"	4 5 5 4	
		37					- Rollerbit to 40ft
		38					
		39					
		40					- Take S-14
		41	S-14	S.S.	18"	4 5 6	
		42					- Rollerbit to 45ft.
No Recovery		43					
		44					
		45					- Take S-15
		46	S-15	S.S.	0"	12 17	
		47					- Rollerbit to 48ft Hard drilling 47-48ft.
"???" E.O.B @ 48ft		48	S-16	SS	0	100/0*	- Take S-16. Refusal
		49					- Stop 2/22/08 - 4:30 PM
		50					

Langan #5821101

LABORATORY TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS						REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	ORGANIC CONTENT (burnoff) (%)	
B-1	S-7	15-17	23.5	27	26	1	ML	1.9	
B-2	S-8	15-17	34.5	36	22	14	CL	1.5	

Note: (1) USCS symbol based on visual observation and Atterberg limits reported.



March 9, 2005

Mr. Steven Sangesland
Environmental Engineer I
NYSDEC Region 2 Office
Hunters Point Plaza
47-40 21st Street
Long Island City, New York 11101

Re: Tank Removal and Post-Excavation Soil Sampling
507-511 West 24th Street
New York, New York
Spill No. 0412228

Dear Mr. Sangesland:

On behalf of High Line Partners LLC (High Line), Roux Associates, Inc. (Roux Associates) is providing this summary of analytical results from soil samples collected at the above-referenced site. On February 16, 2005, a spill was reported to the New York State Department of Environmental Conservation (NYSDEC) for the site, in response to observations of potentially impacted soil (i.e., staining and petroleum odors) during the removal of several underground storage tanks (USTs). The potentially impacted soil was stockpiled adjacent to the excavation and covered with plastic sheeting. A total of five USTs (one 2,000-gallon tank and four 550-gallon tanks) were removed from the excavation and staged onsite.

Following removal of the tanks and excavation of the potentially impacted soil, the NYSDEC was notified of the observations made at the site and Spill Number 04-12228 was issued. NYSDEC requested that post-excavation soil samples be collected. On February 18, 2005, Roux Associates mobilized to the site and collected six post-excavation soil samples. A site map showing the sample locations is provided as Figure 1. A total of six post-excavation samples were collected. One soil sample was collected from each of the four sidewalls of the excavation (Samples PX-1 through PX-4) and two samples were collected from the bottom of the excavation (Samples PX-5 and PX-6). Three additional quality assurance/quality control (QA/QC) samples were submitted for analysis: field blank sample (FB-1), duplicate sample (PX-2DUP), and a trip blank.

The samples were stored on ice at 4°C in a cooler and transported under chain of custody procedures to Severn Trent Laboratories in Monroe, Connecticut. The samples were analyzed for volatile organic compounds (VOCs) using the United States Environmental Protection Agency (USEPA) Method 8260 and semi-volatile organic compounds (SVOCs) using USEPA Method 8270. Additionally, one sample was collected from the stockpiled soil (WC-1) and analyzed for waste disposal parameters.

Soil analytical results were compared to the NYSDEC Recommended Soil Cleanup Objectives (RSCOs). The laboratory results for the VOC and SVOC analyses are summarized in Table 1.

VOCs

Low concentrations of VOCs were detected in all of the post-excavation samples collected. The VOCs detected included acetone, benzene, toluene, ethylbenzene, and xylenes. None of the samples contained concentrations of VOCs exceeding the NYSDEC RSCOs.

SVOCs

Low concentrations of SVOCs were detected in all of the post-excavation samples collected, except for sample PX-3. Samples PX-1, PX-2 (and duplicate), PX-4, PX-5, and PX-6 contained several polycyclic aromatic hydrocarbons (PAHs) at concentrations above their respective NYSDEC RSCOs. The PAHs detected at concentrations exceeding the NYSDEC RSCOs included benzo[a]anthracene, fluoranthene, phenanthrene, pyrene, and benzo[a]pyrene. These concentrations of SVOCs have been observed consistently in fill at other sites in the surrounding area and are attributable to the historical nature of the fill in an urban area.

Waste Characterization

The concentrations of VOCs and SVOCs in the waste characterization samples were significantly higher than the VOC and SVOC concentrations in the post-excavation samples. This indicates that the areas of impacted soil have been removed. Waste characterization results are provided in Table 2.

Conclusions

Based on the analytical results (a comparison between the post-excavation and waste characterization analyses and field observations), Roux Associates concludes that impacted soil associated with the excavation of the USTs has been removed from the excavation and no further investigation is warranted. The concentrations of SVOCs remaining at the site are consistent with regional background concentrations and attributable to historic fill. Additionally, site reconnaissance has identified no buildings immediately adjacent to the site that have basements or other subsurface structures that could potentially be impacted by the low concentrations of PAHs remaining. Roux Associates thereby requests permission from the NYSDEC to conclude investigation and remediation activities at the site.

Mr. Steven Sangesland

March 9, 2005

Page 3

If you have any questions or require additional information, please do not hesitate to call.

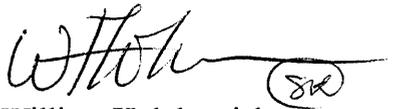
Sincerely,

ROUX ASSOCIATES, INC.



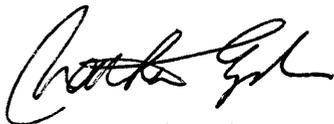
Christopher Battista

Project Scientist



William Holubowich

Senior Scientist



Nathan Epler, Ph.D.

Principal Hydrogeologist

cc: Timothy Simmons, High Line Partners, LLC.

Alf Naman, High Line Partners, LLC.

Table 1. Summary of Post-Excavation Soil Samples, 507-511 West 24th Street, New York, New York

Parameter	NYSDEC	Sample Designation:									
	RSCOs (µg/kg)	PX-1 Sample Date: 02/18/05	PX-2 02/18/05	PX-2 DUP 02/18/05	PX-3 02/18/05	PX-4 02/18/05	PX-5 02/18/05	PX-6 02/18/05	TRIP BLANK 02/18/05	FB-1 02/18/05	(Units in µg/L)
Semivolatile Organic Compounds (µg/kg)											
1,2,4-Trichlorobenzene	3400	390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U	
1,2-Dichlorobenzene	7900	390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U	
1,3-Dichlorobenzene	1600	390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U	
1,4-Dichlorobenzene	8500	390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U	
2,2'-oxybis (1-chloropropane)	--	390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U	
2,4,5-Trichlorophenol	100	1900 U	1700 U	1800 U	1700 U	1700 U	1800 U	2000 U	NA	50 U	
2,4,6-Trichlorophenol	--	390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U	
2,4-Dichlorophenol	400	390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U	
2,4-Dimethylphenol	--	390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U	
2,4-Dinitrophenol	200	1900 U	1700 U	1800 U	1700 U	1700 U	1800 U	2000 U	NA	50 U	
2,4-Dinitrotoluene	--	390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U	
2,6-Dinitrotoluene	100	390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U	
2-Chloronaphthalene	--	390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U	
2-Chlorophenol	800	390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U	
2-Methylnaphthalene	36400	390 U	58 J	370 U	350 U	350 U	92 J	410 U	NA	10 U	
2-Methylphenol	100	390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U	
2-Nitroaniline	430	1900 U	1700 U	1800 U	1700 U	1700 U	1800 U	2000 U	NA	50 U	
2-Nitrophenol	330	390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U	
3,3'-Dichlorobenzidine	--	770 U	710 U	740 U	710 U	710 U	720 U	820 U	NA	20 U	
3-Nitroaniline	500	1900 U	1700 U	1800 U	1700 U	1700 U	1800 U	2000 U	NA	50 U	
4,6-Dinitro-2-methylphenol	--	1900 U	1700 U	1800 U	1700 U	1700 U	1800 U	2000 U	NA	50 U	
4-Bromophenyl phenyl ether	--	390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U	
4-Chloro-3-methylphenol	240	390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U	
4-Chloroaniline	220	390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U	
4-Chlorophenyl phenyl ether	--	390 U*	360 U*	370 U*	350 U*	350 U*	360 U*	410 U*	NA	10 U	
4-Methylphenol	900	390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U	
4-Nitroaniline	--	770 U*	710 U*	740 U*	710 U*	710 U*	720 U*	820 U*	NA	20 U	
4-Nitrophenol	100	1900 U	1700 U	1800 U	1700 U	1700 U	1800 U	2000 U	NA	50 U	
Acenaphthene	50000	390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U	
Acenaphthylene	50000	390 U	360 U	370 U	350 U	350 U	360 U	66 J	NA	10 U	
Anthracene	50000	390 U	110 J	100 J	350 U	350 U	360 U	170 J	NA	10 U	
Benzo[a]anthracene	224	110 J	590	590	350 U	200 J	190 J	670	NA	10 U	
Benzo[a]pyrene	61	110 J	430	530	350 U	160 J	190 J	680	NA	10 U	
Benzo[b]fluoranthene	220	390 U	770	500	350 U	190 JM	160 J	540	NA	10 U	
Benzo[g,h,i]perylene	50000	66 J	260 J	180 J	350 U	100 J	75 JM	230 J	NA	10 U	
Benzo[k]fluoranthene	220	86 JM	360 U	540	350 U	210 J	190 J	630	NA	10 U	
Benzyl Alcohol	--	390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U	

Table 1. Summary of Post-Excavation Soil Samples, 507-511 West 24th Street, New York, New York

Parameter	NYSDEC	Sample Designation:		PX-1	PX-2	PX-2 DUP	PX-3	PX-4	PX-5	PX-6	TRIP BLANK	FB-1
	RSCOs (µg/kg)	Sample Date:		02/18/05	02/18/05	02/18/05	02/18/05	02/18/05	02/18/05	02/18/05	02/18/05	02/18/05
Semivolatile Organic Compounds (µg/kg)												
Bis(2-chloroethoxy)methane	--			390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U
Bis(2-chloroethyl) ether	--			390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U
Bis(2-ethylhexyl) phthalate	50000			90 J	54 J	370 U	350 U	350 U	360 U	410 U	NA	10 U
Butylbenzyl phthalate	50000			390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U
Carbazole	--			390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U
Chrysene	400			110 J	580	640	350 U	240 J	230 J	750	NA	10 U
Dibenzo[a,h]anthracene	14.3			390 U	100 J	73 JM	350 U	350 U	360 U	89 JM	NA	10 U
Dibenzofuran	6200			390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U
Diethyl phthalate	7100			390 U*	360 U*	370 U*	350 U*	350 U*	360 U*	410 U*	NA	10 U
Dimethyl phthalate	2000			390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U
Di-n-butyl phthalate	8100			390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U
Di-n-octyl phthalate	50000			390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U
Fluoranthene	50000			170 J	1100	1300	350 U	260 J	400	1400	NA	10 U
Fluorene	50000			390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U
Hexachlorobenzene	41			390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U
Hexachlorobutadiene	--			390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U
Hexachlorocyclopentadiene	--			390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U
Hexachloroethane	--			390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U
Indeno[1,2,3-cd]pyrene	3200			60 J	230 J	170 J	350 U	99 J	70 J	220 J	NA	10 U
Isophorone	4400			390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U
Naphthalene	13000			390 U	360 U	370 U	350 U	350 U	88 J	73 J	NA	10 U
Nitrobenzene	200			390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U
n-Nitrosodi-n-propylamine	--			390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U
n-Nitrosodiphenylamine	--			390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U
Pentachlorophenol	1000			1900 U	1700 U	1800 U	1700 U	1700 U	1800 U	2000 U	NA	50 U
Phenanthrene	50000			83 J	540	380	350 U	150 J	190 J	730	NA	10 U
Phenol	30			390 U	360 U	370 U	350 U	350 U	360 U	410 U	NA	10 U
Pyrene	50000			220 J	1300	1100	350 U	330 J	390	1300	NA	10 U
Volatile Organic Compounds (µg/kg)												
1,1,1-Trichloroethane	800			6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
1,1,2,2-Tetrachloroethane	600			6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
1,1,2-Trichloroethane	--			6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
1,1-Dichloroethane	200			6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
1,1-Dichloroethene	400			6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
1,2-Dichloroethane	100			6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
1,2-Dichloropropane	--			6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
2-Butanone	300			12 U	11 U	11 U	11 U	11 U	5.4 J	13 U	10 U	10 U
2-Hexanone	--			12 U	11 U	11 U	11 U	11 U	11 U	13 U	10 U	10 U

Table 1. Summary of Post-Excavation Soil Samples, 507-511 West 24th Street, New York, New York

Parameter	NYSDEC	Sample Designation:	PX-1	PX-2	PX-2 DUP	PX-3	PX-4	PX-5	PX-6	TRIP BLANK	FB-1
	RSCOs (µg/kg)	Sample Date:	02/18/05	02/18/05	02/18/05	02/18/05	02/18/05	02/18/05	02/18/05	02/18/05	02/18/05
<u>Volatile Organic Compounds (µg/kg)</u>											
4-Methyl-2-pentanone	1000		12 U	11 U	13 U	10 U	10 U				
Acetone	200		2.6 J	7.9 J	17	2.4 J	3.2 J	19 B	30	4.9 J	4 J
Benzene	60		6 U	5.7 U	2.5 J	5.6 U	5.6 U	5.7 U	18	5 U	5 U
Bromodichloromethane	--		6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
Bromoform	--		6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
Bromomethane	--		6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
Carbon disulfide	2700		6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
Carbon tetrachloride	600		6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
Chlorobenzene	1700		6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
Chloroethane	1900		6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
Chloroform	300		6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
Chloromethane	--		6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
cis-1,2-Dichloroethene	--		6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
cis-1,3-Dichloropropene	--		6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
Dibromochloromethane	--		6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
Ethylbenzene	5500		6 U	15	23	5.6 U	5.6 U	2.7 J	110	5 U	5 U
Methylene chloride	100		12 U	11 UB	13 U	2.2 JB	5 UB				
Styrene	--		6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
Tetrachloroethene	1400		6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
Toluene	1500		6 U	23	37	5.6 U	5.6 U	3.6 J	190	5 U	5 U
trans-1,2-Dichloroethene	300		6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
trans-1,3-Dichloropropene	--		6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
Trichloroethene	700		6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
Vinyl chloride	200		6 U	5.7 U	5.7 U	5.6 U	5.6 U	5.7 U	6.4 U	5 U	5 U
Xylenes (total)	1200		6 U	130	200	5.6 U	5.6 U	29	740	5 U	5 U

Notes:

µg/kg - Micrograms per kilogram

µg/L - Micrograms per liter

* - Batch QC exceeds the upper or lower control limits

B - Detected in lab blank

J - Estimated value

M - Manually integrated compound

U - Not detected

NYSDEC - New York State Department of Environmental Conservation

RSCOs - Recommended Soil Cleanup Objectives

-- No NYSDEC RSCO available

Note:

Bold data indicates that parameter was detected above the

NYSDEC RSCOs

Table 2. Summary of Waste Characterization Samples, 507-511 West 24th Street, New York, New York

Parameter	Sample Designation: Sample Date:	WC-1 02/18/05	WC-1 DL 02/18/05
<u>TCLP Metals (mg/L)</u>			
Arsenic		0.2 U	NA
Barium		0.634	NA
Cadmium		0.0155 B	NA
Chromium		0.05 U	NA
Copper		3.72	NA
Lead		0.505	NA
Mercury		0.01 U	NA
Nickel		0.0269 B	NA
Selenium		0.15 U	NA
Silver		0.03 U	NA
Zinc		4.44	NA
Reactive Cyanide (µg/Kg)		500 U	NA
Reactive Sulfide (mg/Kg)		20 U	NA
<u>Polychlorinated Biphenyl Compounds (µg/Kg)</u>			
Aroclor-1016		19 U	NA
Aroclor-1221		37 U	NA
Aroclor-1232		19 U	NA
Aroclor-1242		19 U	NA
Aroclor-1248		19 U	NA
Aroclor-1254		19 U	NA
Aroclor-1260		16 JM	NA
<u>Semivolatile Organic Compounds (µg/kg)</u>			
Acenaphthene		190 J	190 JH
Acenaphthylene		62 J	720 U
Anthracene		520	510 J
Benzo[a]anthracene		1400	1500
Benzo[a]pyrene		1300	1200
Benzo[b]fluoranthene		1000	920
Benzo[g,h,i]perylene		350 J	650 J
Benzo[k]fluoranthene		1300	1100
Chrysene		1600	1700
Dibenzo[a,h]anthracene		120 J	210 J
Fluoranthene		3400 A	3500 H
Fluorene		200 J	720 U
Indeno[1,2,3-cd]pyrene		350 J	570 J
Naphthalene		120 J	720 U
Phenanthrene		2700	3000
Pyrene		3100 A	3300
<u>Volatile Organic Compounds (µg/kg)</u>			
1,1,1,2-Tetrachloroethane		5.8 U	12 U
1,1,1-Trichloroethane		5.8 U	12 U
1,1,2,2-Tetrachloroethane		5.8 U	12 U
1,1,2-Trichloroethane		5.8 U	12 U
1,1-Dichloroethane		5.8 U	12 U
1,1-Dichloroethene		5.8 U	12 U
1,1-Dichloropropene		5.8 U	12 U
1,2,3-Trichlorobenzene		5.8 U	12 U
1,2,3-Trichloropropane		5.8 U	12 U
1,2,4-Trichlorobenzene		5.8 U	12 U

Table 2. Summary of Waste Characterization Samples, 507-511 West 24th Street, New York, New York

Volatile Organic Compounds (µg/kg)

1,2,4-Trimethylbenzene	310 A	55
1,2-Dibromo-3-chloropropane	5.8 U	12 U
1,2-Dibromoethane	5.8 U	12 U
1,2-Dichlorobenzene	5.8 U	12 U
1,2-Dichloroethane	5.8 U	12 U
1,2-Dichloropropane	5.8 U	12 U
1,3,5-Trimethylbenzene	80	21
1,3-Dichlorobenzene	5.8 U	12 U
1,3-Dichloropropane	5.8 U	12 U
1,4-Dichlorobenzene	5.8 U	12 U
2,2-Dichloropropane	5.8 U	12 U
2-Butanone	12 U	23 U
2-Chlorotoluene	5.8 U	12 U
2-Hexanone	12 U	23 U
4-Chlorotoluene	5.8 U	12 U
Acetone	13	24 B
Benzene	3.5 J	12 U
Bromobenzene	5.8 U	12 U
Bromochloromethane	5.8 U	12 U
Bromodichloromethane	5.8 U	12 U
Bromoform	5.8 U	12 U
Bromomethane	5.8 U	12 U
Carbon disulfide	5.8 U	12 U
Carbon tetrachloride	5.8 U	12 U
Chlorobenzene	5.8 U	12 U
Chloroethane	5.8 U	12 U
Chloroform	5.8 U	12 U
Chloromethane	5.8 U	12 U
cis-1,2-Dichloroethene	5.8 U	12 U
Dibromochloromethane	5.8 U	12 U
Dibromomethane	5.8 U	12 U
Dichlorodifluoromethane	5.8 U	12 U
Ethylbenzene	24	12 U
Hexachlorobutadiene	5.8 U	12 U
Isopropylbenzene	6.2	12 U
m+p-Xylene	110	12 U
Methylene chloride	12 U	11 JB
MTBE	97	4.4 J
Naphthalene	65	33
n-Butylbenzene	26	3.6 J
n-Propylbenzene	30	5.2 J
o-Xylene	55	8.1 J
p-Isopropyltoluene	5.2 J	12 U
sec-Butylbenzene	6.5	12 U
Styrene	5.8 U	12 U
tert-Butylbenzene	5.8 U	6.6 J
Tetrachloroethene	5.8 U	12 U
Toluene	50	12 U
trans-1,2-Dichloroethene	5.8 U	12 U
Trichloroethene	5.8 U	12 U
Trichlorotrifluoroethane	5.8 U	12 U
Vinyl acetate	5.8 U	12 U
Vinyl chloride	5.8 U	12 U

Total Petroleum Hydrocarbons (µg/Kg)

Diesel Range Organics	220000	NA
Gasoline Range Organics	7000	NA

Table 2. Summary of Waste Characterization Samples, 507-511 West 24th Street, New York, New York

Wet Chemistry

Corrosivity (yes/no)	no	NA
Ignitability (Pos/Neg)	neg	NA
pH (pH Units)	10.02	NA

Notes:

µg/kg - Micrograms per kilogram

µg/L - Micrograms per liter

A - Concentration exceeds the instrument calibration range or below the reporting limit.

B (inorganics) - Result is less than the CRDL/RL, but greater than or equal to the IDL/MDL

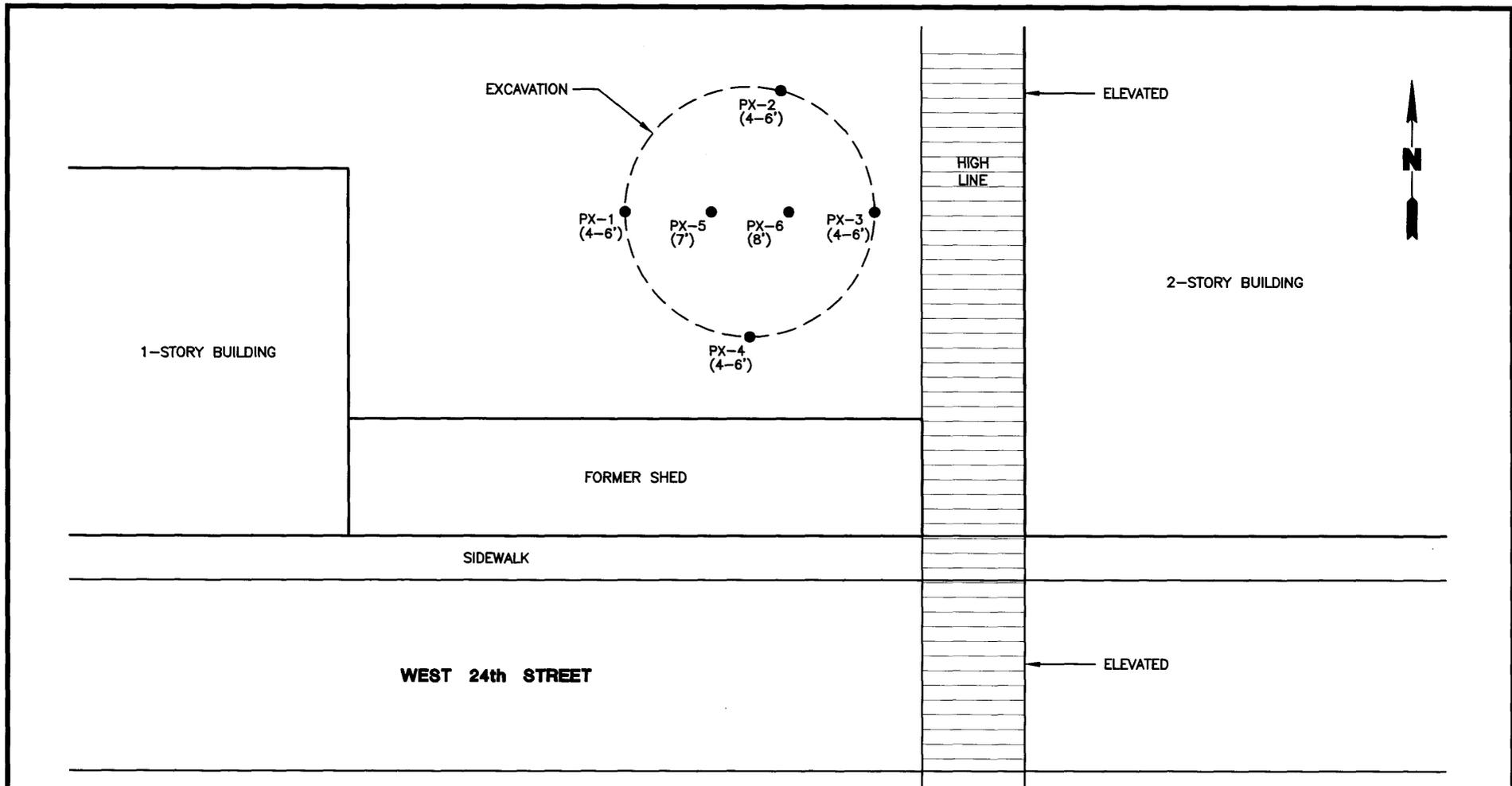
B (organics) - Detected in lab blank

H - Alternate peak selection upon analytical review

J - Estimated value

M - Manually integrated compound

U - Not detected



LEGEND

PX-1 ● SOIL BORING/SAMPLE LOCATION AND DESIGNATION
 (4-6') SAMPLE DEPTH IN FEET

Title:

SOIL SAMPLE LOCATION MAP

507 WEST 24th STREET
 NEW YORK, NEW YORK

Prepared For:

 ROUX ASSOCIATES, INC. <i>Environmental Consulting & Management</i>	Compiled by: W.H.	Date: 01MAR05	FIGURE
	Prepared by: G.M.	Scale: NTS	
	Project Mgr: W.H.	Office: NY	
	File No: ALF04-10201	Project: 126204Y	

1



Spill Incidents Database Search Details

Spill Record

Administrative Information

DEC Region: 2

Spill Number: 0412228

Spill Date/Time

Spill Date: 02/16/2005 **Spill Time:** 11:02:00 AM

Call Received Date: 02/16/2005 **Call Received Time:** 11:02:00 AM

Location

Spill Name: VACANT LOT

Address: 511 WEST 24TH STREET

City: MANHATTAN **County:** NEW_YORK

Spill Description

Material Spilled	Amount Spilled	Resource Affected
UNKNOWN PETROLEUM	UNKNOWN	Groundwater

Cause: Tank Failure

Source: Institutional, Educational, Gov., Other

Waterbody:

Record Close

Date Spill Closed: 03/16/2005

"Date Spill Closed" means the date the spill case was closed by the case manager in the Department of Environmental Conservation (the Department). The spill case was closed because either; a) the records and data submitted indicate that the necessary cleanup and removal actions have been completed and no further remedial activities are necessary, or b) the case was closed for administrative reasons (e.g., multiple reports of a single spill consolidated into a single spill number). The Department however reserves the right to require additional remedial work in relation to the spill, if in the future it determines that further action is necessary.

If you have questions about this reported incident, please contact the [Regional Office](#) where the incident occurred.

[Refine Current Search](#)

Previous Regulatory Correspondence



DEPARTMENT OF ENVIRONMENTAL PROTECTION

59-17 Junction Boulevard
Flushing, New York 11373

**Emily Lloyd
Commissioner**

Tel. (718) 595-6565
Fax (718) 595-3525
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**Angela Licata
Deputy Commissioner**

**Bureau of Environmental
Planning & Analysis**

Tel. (718) 595-4398
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alicata@dep.nyc.gov



www.nyc.gov/dep

311 Government Information
and Services for NYC

July 1, 2008

William Holubowich
Senior Scientist
Roux Associates Inc.
209 Shafter Street
Islandia, NY 11749-5074

**Re: 507 W 24th St – Hazardous Materials & Noise “E”-Designation
E-142: Block 696, Lot 28
West Chelsea Zoning Resolution – CEQR #03DCP069M
Manhattan, New York, CD 4**

Dear Mr. Holubowich:

The New York City Department of Environmental Protection Bureau of Environmental Planning and Analysis (DEP) has received the following documents for the above referenced site.

- | | |
|---|--|
| <input type="checkbox"/> EAS/EIS | <input checked="" type="checkbox"/> incomplete Phase I |
| <input checked="" type="checkbox"/> uncertified Architectural Plans | <input type="checkbox"/> Phase II Workplan |
| <input type="checkbox"/> Investigative HASP | <input checked="" type="checkbox"/> limited Phase II |
| <input checked="" type="checkbox"/> incomplete Remedial Action Plan | <input checked="" type="checkbox"/> incomplete Draft Construction HASP |
| <input type="checkbox"/> Restrictive Declaration | <input type="checkbox"/> Clean Fill Results |
| <input type="checkbox"/> Closure Certification | <input checked="" type="checkbox"/> Other Project Description |

The submission is deemed _____ Sufficient X Not Sufficient.

If sufficient, your project tracking number is _____

Please use this number on all future correspondence for this project.

If not sufficient, the reason is: **incomplete Phase I ESA (DEP requires that regulatory database search results be included with the Phase I ESA.), incomplete site characterization data, no certified architectural drawings for the proposed construction project, no certified engineering/architectural drawings for the proposed vapor barrier, incomplete "Draft" CHASP.**

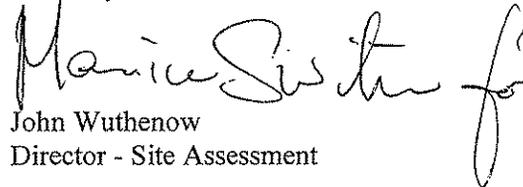
- Regulatory database results were not included in Phase I submission received by DEP.
- The June 2008 Roux Phase II limited Environmental Site Investigation relies heavily on the June 2004 Hydro Tech Environmental Corp. Phase II Sub-surface Investigation to draw conclusions regarding worker safety and protection of human health and the environment. Therefore, DEP must also review the original Hydro Tech Phase II report. Please submit the June 2004 Hydro Tech Phase II report.
- Any clean fill/top soil that will be imported must be segregated at the source/facility, have qualified environmental personnel collect representative samples at a frequency

of one (1) sample for every 250 cubic yards, analyze the samples for Target Compound List (TCL) VOCs, SVOCs, Pesticides/PCBs and Target Analyte List (TAL) Metals by a NYSDOH ELAP-certified laboratory, compare to TAGM 4046 RSCOs, and receive DEP written approval to use the clean fill/top soil. Upon receipt of DEPs written approval, the clean fill/top soil may be transported to the site for grading. The clean fill/top soil should not be comprised of any C&D debris.

- A Notice to Proceed can only be issued by DEP after certified architectural plans have been received and reviewed by DEP.
- The description of the vapor barrier is incomplete. DEP requires a sample of the vapor barrier material, as well as a description of the thickness of the vapor barrier, and the resistance specifications for identified on-site contaminants. DEP also requires certified architectural/engineering drawings of the proposed sub-slab vapor barrier, including detailed drawings that indicate how the vapor barrier will be fit to the building footings and the sub-grade walls.
- The CHASP submitted to DEP was submitted in "DRAFT" form. DEP reviews the final versions of documents for proposed projects.
- The CHASP should include names of key personnel as well as their alternates. The CHASP currently only lists personnel as TBD. This information should be submitted in a revised CHASP.
- The CHASP refers to Figure 1. Map to Hospital, however, no map is included. This information should be submitted in a revised CHASP.
- The CHASP refers to Appendices A – K, which were not submitted to DEP.
- Section 4.2 of the CHASP refers to MSDS for the chemicals potentially present at the subject site, however, this information was not included in the submission. This information should be submitted in a revised CHASP.
- It should be noted that this site also has a Noise "E" requirement. A Notice to Proceed can only be issued by DEP after all "E" requirements have been met. For information regarding Hazardous Materials "E" requirements contact Zach Schreiber at (718) 595-6443 and for information regarding Noise "E" requirements contact Wei Yu at (718) 595-4358.

If you have any questions, please feel free to contact Zach Schreiber at Zschreiber@dep.nyc.gov.

Sincerely,


John Wuthenow
Director - Site Assessment

cc: G. Heath; J. Wuthenow; M. Winter; Z. Schreiber; S. Vafadari; W. Yu; File

Nathan Epler

From: Schreiber, Zachariah [ZSchreiber@cityhall.nyc.gov]
Sent: Thursday, June 25, 2009 2:53 PM
To: Nathan Epler
Cc: Cole, Daniel; Bertini, Maurizio
Subject: 507 West 24th St. (OER # 09EH-N109M)

Follow Up Flag: Follow up
Flag Status: Completed

June 25, 2009

Nathan Epler
Roux Associates Inc.
209 Shafter Street
Islandia, NY 11749-5074

**Re: 507 W 24th St – Hazardous Materials & Noise “E”-Designation
E-142: Block 696, Lot 28
Manhattan, New York, CD 4
West Chelsea Zoning Resolution – CEQR #03DCP069M
OER # 09EH-N109M**

Dear Mr. Epler:

The New York City Office of Environmental Remediation (OER) has reviewed the August 2004 ASTM E-1527-05 compliant Phase I Environmental Assessment (Phase I) report prepared by AKRF, Inc (AKRF), the June 2004 Phase II Subsurface Assessment Report (Phase II) prepared by Hydro Tech Environmental, Corp (HTE) on behalf of Alf Naman Real Estate, and the April 2009 Phase II Environmental Assessment (Phase II) report, Remedial Action Plan (RAP), and April 2008 site-specific Construction Health and Safety Plan (CHASP) prepared by Roux Associates, Inc. (Roux) on behalf of Highline Partners, LLC, and the July 2008 certified Architectural Plans prepared by studioMDA and certified by Kevin B. Byrne R.A. for the above referenced parcels. The applicant is proposing the development of a single two (2)-story commercial building. One floor will be a sub-grade basement. There will be no landscaped areas at the site. The building will be as an art gallery for exhibition, office and storage space. The structure will be built directly beneath the above ground railroad known as the High Line. The iron supports of the railway will penetrate the building through the roof and slab of the structure. The site will be excavated to an approximate depth of fifteen and one-half (15.5) feet below grade (ftbg). Lot 28 has been designated with a Hazardous Materials "E"-designation as part of the June 23, 2005 West Chelsea Rezoning (CEQR # 03DCP069M).

The August 2008 Phase I prepared by AKRF identified potential recognized environmental conditions (RECs) at the subject property due to potential USTs on and adjacent to the site; and historical auto parking and service related activities on and adjacent to the site. The June 2004 and April 2009 Phase II reports prepared by HTE and Roux, respectively, describe four (4) soil borings, two (2) temporary groundwater monitoring wells, and two (2) soil vapor sampling points completed at the site. The geophysical survey conducted by HTE did not identify any anomalies at the site. All samples were analyzed for volatile organic compounds (VOCs) by USEPA method 8260, semivolatile organic compounds (SVOCs) by USEPA method 8270, polychlorinated biphenyls (PCBs) by USEPA method 8082, pesticides by USEPA method 8081, and target analyte list (TAL) metals. Site soil samples were indicative of urban fill. Soil samples indicated exceedances of New York State Department of Environmental Conservation (NYSDEC) Technical and Administrative Guidance Memorandum

#4046 (TAGM) Recommended Soil Clean-up Objectives (RCSOs) for SVOCs, primarily polycyclic aromatic hydrocarbons (PAHS). TAGM and Eastern US Background exceedances were also observed for metals in soils (including lead at 823 and 942 mg/kg and mercury ranging 2.76 from 25.7 mg/kg). Ground water at the site was identified between 8 – 10 ftbg. Groundwater exceedances of New York State Technical & Operational Guidance Series 1.1.1 (TOGS) Groundwater Effluent Limitations (Class GA) for VOCs (including ethylbenzene and cis-1,2-dichloroethene) and TAL metals were observed at the site. The soil vapor samples collected at the site indicated concentrations of benzene, toluene, and trichloroethene. The presence of VOCs in ground water and soil vapor present a potential vapor intrusion concern.

The April 2009 RAP prepared by Roux proposes a Soil Management Plan under which contaminated soil would be excavated, transported and disposed of in accordance with NYSDEC regulations, as well as backfilling as needed with certified clean sub-base. The RAP discusses management plans for found USTs and associated equipment, dust control, and appropriately obtaining DEP sewer discharge permits. The HASP discusses air monitoring at the site. In order to address the VOCs identified in ground water and sub-slab soil gas, the RAP proposes the installation of a water proofing and vapor intrusion mitigation sub-slab and sub-grade wall vapor barrier. Roux proposes the installation of either a 32-mil Grace PrePrufe 160R or 46-mil Grace PrePrufe 300R vapor barrier. Penetrations of the foundation slab would be sealed with appropriate sealant. After the remedial action is complete at the site, a P.E. certified Closure Report would be prepared.

Based upon our review of the submitted documentation, OER has the following comments/recommendations:

- The June 2004 HTE Phase II report did not include laboratory reports for the analytical work conducted.
- The current plans for the proposed structure on the subject property do not currently include landscaped/grass covered areas. If the plans should change to include landscaped/grass covered areas, the proposed areas will be capped with two (2) feet of certified clean fill/top soil, a visible demarcation barrier (e.g. orange construction fence material) will be placed between underlying native material and imported clean fill/top soil. Two (2) feet of certified clean fill/top soil must be imported from an approved facility/source and graded across all landscaped/grass covered areas of the site not capped with concrete/asphalt. The certified clean fill/top soil must be segregated at the source/facility, have qualified environmental personnel collect representative samples at a frequency of one (1) sample for every 250 cubic yards, analyze the samples for Target Compound List (TCL) VOCs, SVOCs, Pesticides/ PCBs and TAL Metals by a New York State Department of Health (NYSDOH) ELAP-certified laboratory, and receive DEP written approval of the proposed clean fill/top soil. Upon receipt of OER's written approval, the certified clean fill/top soil may be transported to the site for grading. The certified clean fill/top soil should not be comprised of any C&D debris.
- The Roux Phase II report description of the soil gas sampling indicates that the sampling was not conducted in compliance with the 2006 NYSDOH Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York. The methodology and sampling protocol for the soil vapor sampling points were not completed in accordance with the guidelines according to proper sampling point construction, sampling depth, purge volumes, and equilibration interval. Additionally, sampling point installation and sample logs were not included in the Roux Phase II report.
- Section 5.2 of the Roux RAP discusses the HVAC system that will be installed in the building. Since the structure will be built into the ground water, and it is therefore not possible to install a sub-slab depressurization system (SSDS). The RAP should indicate how it is planned to operate the HVAC system, and whether it will be operated under positive pressure in the structure to additionally prevent the collection and intrusion of vapors into the structure.

- The Roux cover letter for the submitted RAP and the cover letter for the studioMDA proposed architectural plans were not P.E. and R.A. certified, respectively. Additionally, a hard copy of the studioMDA cover letter and project description was not submitted with the submission. In order to facilitate OER's transition to digital documentation for project submittals, applicants shall include digital images of R.A. and P.E. stamps and signatures as appropriate. The hard copy cover letter accompanying a digital submission shall include an original of these stamps and signatures, and the text of the cover letter shall indicate that the digital stamps and signatures in the digital materials represents the original and all corresponding requirements.
- Section S.01 references "in-wall drainage." The means of mitigating vapor intrusion with this wall structure and the "in-wall drainage" construction is not detailed in SK-7. The plans detailing the proposed vapor barrier installation and the proposed building plans must be consistent and the proposed mitigation methods for the structure should be indicated.
- Drawing SK-7 detailing vapor barrier installation was not P.E. certified. The RAP and plans do not indicate the final vapor barrier thickness. OER requires certified architectural/engineering drawings of the proposed sub-slab vapor barrier, including detailed drawings that indicate how the vapor barrier will be fit to the building footings and the sub-grade walls. OER requires a description of the thickness of the vapor barrier, the resistance specifications for identified on-site contaminants, and a justification for the selected vapor barrier thickness.
- The P.E. certified Closure Report will document that all OER remedial requirements have been properly implemented (i.e., proper transportation/disposal manifests and certificates from impacted soils/fill removed from the site in accordance with all applicable NYSDEC regulations, photographic documentation and final engineering/architectural drawings of the installed (SSDS) and vapor barrier, OER approved clean fill/top soil manifests if necessary, documentation of any found tanks that have been removed and closed, documentation of sampling of dewatering discharge and copies of all correspondence with NYSDEC, etc.).
- The vapor intrusion mitigation system (vapor barrier) would be inspected by a P.E., and the inspection documentation would be submitted with the Closure Report.
- Section 1.2.4 of the CHASP refers to Figure 1. Map to Hospital, however, no map is included. This information should be submitted in a revised CHASP.
- The noise "E" designation covers both residential and commercial development; therefore, the requirements for the proposed gallery do not need further determination.
- The letter from Studio MDA states that laminated glass, 3/8" – 0.030 - 1/4" thick, will be installed at the site. Please, submit the manufacturer and the OITC rating for this glass. Also, specify if the proposed structure has skylights. If yes, the skylights will have to be fitted with glass rated with an OITC of 35 dBA.

A revised RAP and CHASP should be submitted to OER in digital format. The revisions should be underlined in the revised documents to expedite review. All future correspondence regarding this project should include the OER reference number: **09EH-N109M**. Soil disturbance on site should not occur without OER's written approval. If you have any questions regarding Hazardous Materials "E" requirements contact Zach Schreiber at (212) 788-3056 and for information regarding Noise "E" requirements contact Maurizio Bertini at (212) 788-3922.

cc: D. Cole

M. Bertini
File

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Soil/Materials Management Plan

Appendix I

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 Remedial Closure Report (RCR). Soil screening will be performed during invasive work performed during the remedy and development phases prior to issuance of the Notice of Satisfaction.

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 RAP;
- 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 in Section 3.8 of the RAP. 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 Applicant 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 under a governmental remediation program. The letter will provide the project identity and the name and phone number of the PE/QEP or Applicant. 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 RCR.

The RCR 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 RCR.

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 RCR. A manifest system for off-Site transportation of exported materials will be employed. Manifest information will be reported in the RCR. 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 established in this plan may be reused on-Site. The soil cleanup objectives for on-Site reuse are listed in the RAP. “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 comparable soil/fill material, and addressed pursuant to Engineering 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 RAP are followed. The expected location for placement of reused material is shown in the RAP.

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 RCR; 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 RCR. This demarcation will constitute the top of the site management horizon.

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. The backfill and cover soil quality objectives are listed in the RAP.

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 RAP. The RCR 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.

Source Screening and 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 RCR. 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 Storm-water Pollution Prevention

Applicable laws and regulations pertaining to storm-water pollution prevention will be addressed during the remedial program. Erosion and sediment control measures identified in this RAP (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 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

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 Full List volatiles and semi-volatiles, pesticides/PCBs, and TAL metals, 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 the RCR.

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 the Remedial Closure Report.

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.

1.14 Import of Clean Cover

Approximately **number** tons (**number** cubic yards) of soil is anticipated to be imported to the Site for use as clean cover. All imported soil will be uncontaminated, clean soil that meets the lesser of the appropriate NYSDEC 6 NYCRR Part 375-6.8(a) Unrestricted Use SCOs and the NYSDEC 6 NYCRR Part 375-6.8 groundwater protection SCOs.

The imported uncontaminated, clean soil cover will be from an approved source/facility and will be evaluated by the PE/QEP to ensure:

- 1) That a segregated stockpile for **number** tons (**number** cubic yards) is properly maintained at the source and will not be comingled with any other material prior to importing and grading the clean soil material at the Site;
- 2) That the material does not include any solid waste, including construction and demolition material, as it's prohibited;
- 3) That screening for evidence of contamination by visual, olfactory and PID soil screening practices prior to testing at the source as well as upon importing to the Site for grading is completed; and
- 4) That a maximum five-part composite sample will be collected from the segregated stockpile at the source at a minimum frequency of one sample per 250 cubic yards and analyzed for the following Full List parameters:

- VOCs by EPA Method 8260C (rev. 2006)
- SVOCs by EPA Method 8270D (rev. 2007)
- Pesticides by EPA Method 8081B (rev. 2000)
- PCBs by EPA Method 8082A (rev. 2000)
- TAL Metals by EPA Method 6010C (rev. 2007)

Upon receipt of the segregated stockpile analytical results collected at the source, a Clean Soil Sampling Report will be submitted to OER for review/approval prior to importing. The report will include the following:

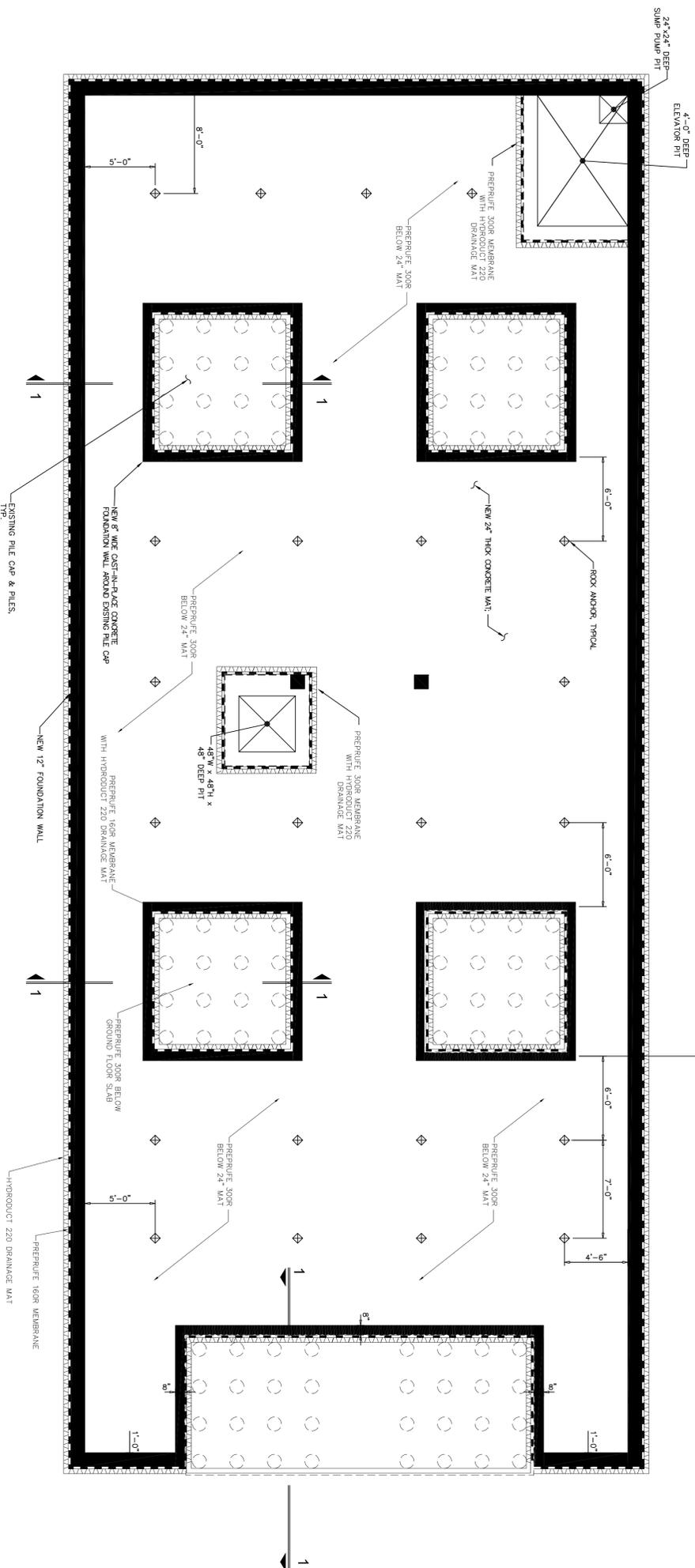
- 1) Summary of number of samples collected and analyzed, tabulated data and comparison to the selected Site Use SCOs;
- 2) Analytical data sheets and chain of custody documentation;
- 3) Summary of **number** tons (**number** cubic yards);
- 4) Photographs from the segregated stockpile at the source with sample point locations identified;
- 5) An affidavit from the source/facility on company letterhead stating that the segregated stockpile for **number** tons (**number** cubic yards) has been properly maintained at the source and complies with the requirements listed above; and
- 6) A copy of source/facility NYSDEC permit;

A highly visible demarcation barrier (i.e. orange geo-synthetic material or equivalent) will be installed beneath the clean soil/fill surface cover. Upon importing and grading the OER approved clean soil cover for **number** tons (**number** cubic yards) on top of a highly visible demarcation barrier, the following documentation will be presented in the Final Remedial Closure Report:

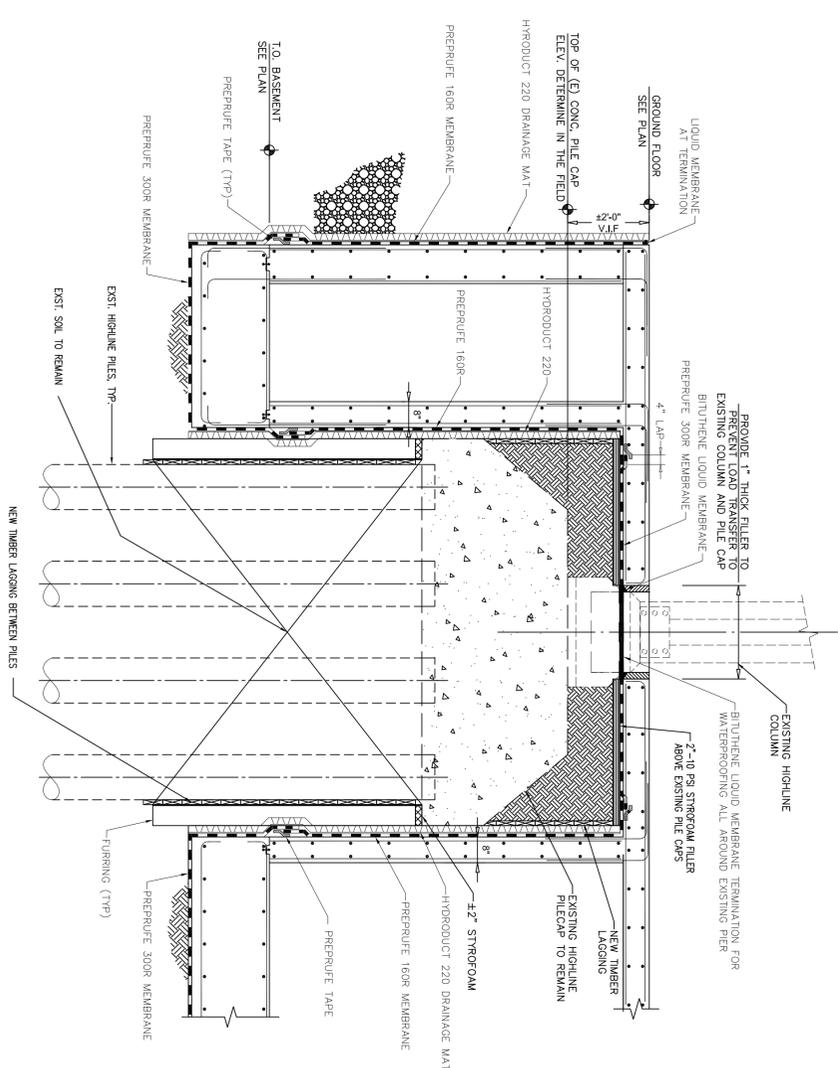
1. Copies of purchase invoices;
2. Truck transportation slips from the source to the Site;
3. Confirmation of **number** tons (**number** cubic yards) of OER approved clean soil cover material imported and graded at the site on top of highly visible demarcation barrier;

4. Site plan depicting all areas where the OER approved clean soil cover has been placed;
and
5. Photographs documenting the importing and grading of the OER approved clean soil cover across the site with the underlying highly visible demarcation barrier (i.e. orange geo-synthetic material or equivalent).

**Design Diagrams and Specifications for
Vapor Barrier/Waterproofing Membrane**



NORTH
FOUNDATION PLAN
 SCALE: 1/4" = 1'-0"



SECTION 1-1

CONTRACTOR

URBAN
 FOUNDATION/
 ENGINEERING, LLC.
 3523 11TH STREET, SUITE 200
 PHOENIX, AZ 85018
 Phone: 714-478-5021 Fax: 714-897-1917

REV. NO.	DATE	DESCRIPTION

PROJECT
24 TH STREET GALLERY

DOCUMENT
WATERPROOFING
 PLAN AND DETAILS

DATE	3-16-12
PROJECT NO.	
DRAWING BY:	WM
CHECKED BY:	DWL
DWG. NO.	WP-1
	1 OF 1

FLORPRUFE® 120

Integrally bonded vapor protection for slabs on grade

Description

Florprufe® 120 is a high performance vapor barrier with Grace's Advanced Bond Technology™ that forms a unique seal to the underside of concrete floor slabs.

Comprising a highly durable polyolefin sheet and a specially developed, non-tacky adhesive coating, Florprufe 120 seals to liquid concrete to provide integrally bonded vapor protection.

Florprufe exceeds ASTM E1745 Class A rating.

Advantages

- Forms a powerful integral seal to the underside of concrete slabs
- Protects valuable floor finishes such as wood, tiles, carpet and resilient flooring from damage by vapor transmission
- Direct contact with the slab complies with the latest industry recommendations
- Remains sealed to the slab even in cases of ground settlement
- Ultra low vapor permeability
- Durable, chemical resistant polyolefin sheet
- Lightweight, easy to apply, kick out rolls
- Simple lap forming with mechanical fixings or tape

Use

Florprufe 120 is engineered for use below slabs on grade with moisture-impermeable or moisture-sensitive floor finishes that require the highest level of vapor protection.

¹ ACI 302.1R-96

Florprufe complies with the latest recommendations of ACI Committees 302 and 360, i.e. for slabs with vapor sensitive coverings, the location of the vapor barrier should always be in direct contact with the slab¹.

The membrane is loose laid onto the prepared subbase, forming overlaps that can be either mechanically secured or taped. The unique bond of Florprufe to concrete provides continuity of vapor protection at laps. Alternatively, if a taped system is preferred, self-adhered Preprufe® Tape can be used to overband the laps.

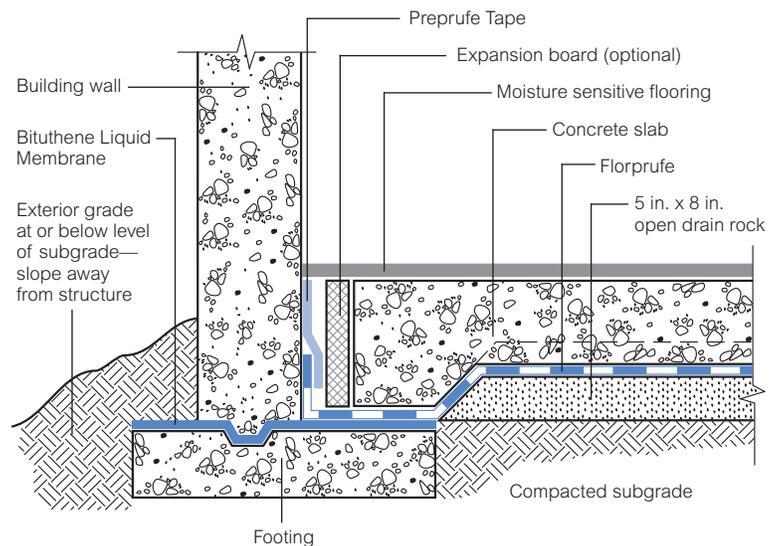
Slab reinforcement and concrete can be placed immediately. Once the concrete is poured, an integral bond develops between the concrete and membrane.

Installation

Health & Safety

Refer to relevant Material Safety Data Sheet. Complete rolls should be handled by 2 persons.

Florprufe 120 can be applied at temperatures of 25°F (-4°C) or above. Membrane installation is unaffected by wet weather. Installation and detailing of Florprufe 120 are generally in accordance with ASTM E1643-98.



Typical Assembly

Drawings are for illustration purposes only. Please refer to www.graceconstruction.com for specific application details.

Product Advantages

- Forms a powerful integral seal
- Protects valuable floor finishes
- Ultra low vapor permeability
- Durable, chemical resistant
- Lightweight and easy to apply

Supply

Florprufe 120		
Supplied in rolls	4 ft x 115 ft (1.2 m x 35 m)	
Roll area	460 ft ² (42 m ²)	
Roll weight	70 lbs (32 kg) approx.	
Ancillary Products		
Preprufe Tape is packaged in cartons containing 4 rolls that are 4 in. x 49 ft (100 mm x 15 m).		
Bituthene Liquid Membrane is supplied in 1.5 gal (5.7 L) pails.		

Physical Properties: Exceeds ASTM E1745 Class A rating

Property	Typical Value	Test Method
Color	White	
Thickness (nominal)	0.021 in. (0.5 mm)	ASTM D3767—method A
Water vapor permeance	0.03 perms	ASTM E96—method B1
Tensile strength	65 lbs/in.	ASTM E1541
Elongation	300%	ASTM D412
Puncture resistance	3300 gms	ASTM D17091
Peel adhesion to concrete	>4 lbs/in.	ASTM D903

1. Test methods that comprise ASTM E1745 standard for vapor retarders

Prepare substrate in accordance with ACI 302.1R Section 4.1. Install Florprufe 120 over the leveled and compacted base. Place the membrane with the smooth side down and the plastic release liner side up facing towards the concrete slab. Remove and discard plastic release liner. End laps should be staggered to avoid a build up of layers. Succeeding sheets should be accurately positioned to overlap the previous sheet 2 in. (50 mm) along the marked lap line.

Laps

1. Mechanical fastening method—

To prevent the membrane from moving and gaps opening, the laps should be fastened together at 39 in. (1.0 m) maximum centers. Fix through the center of the lap area using 0.5 in. (12 mm) long washer-head, self-tapping, galvanized screws (or similar) and allowing the head of the screw to bed into the adhesive compound to self-seal. It is not necessary to fix the membrane to the substrate, only to itself. Ensure the membrane lays flat and no openings occur. (See Figure 1.) Additional fastening may be required at corners, details, etc. Continuity is achieved once the slab is poured and the bond to concrete develops.

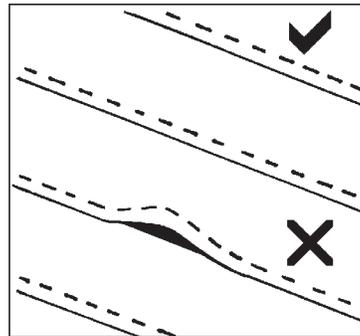


Figure 1

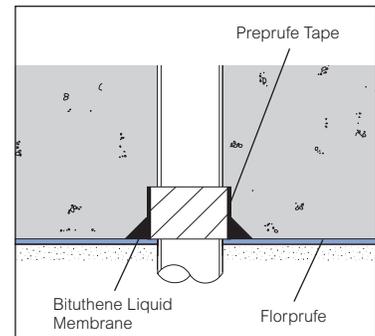


Figure 2

OR

2. Taped lap method—

For additional security use Grace Preprufe Tape to secure and seal the overlaps. Overband the lap with the 4 in. (100 mm) wide Preprufe Tape, using the lap line for alignment. Remove plastic release liner to ensure bond to concrete.

Penetrations

Mix and apply Bituthene Liquid Membrane detailing compound to seal around penetrations such as drainage pipes, etc. (See Figure 2 and refer to the Bituthene Liquid Membrane data sheet, BIT-230.)

Concrete Placement

Place concrete within 30 days. Inspect membrane and repair any damage with patches of Preprufe Tape. Ensure all liner is removed from membrane and tape before concreting.

www.graceconstruction.com

For technical assistance call toll free at 866-333-3SBM (3726)

Florprufe and Preprufe are registered trademarks of W. R. Grace & Co.—Conn.

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.
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FA/LI/1M

GRACE

BITUTHENE® SYSTEM 4000

Self-adhesive HDPE waterproofing membrane with super tacky compound for use with patented, water-based System 4000 Surface Conditioner

Description

Bituthene® System 4000 is a 1.5 mm (1/16 in.) flexible, pre-formed waterproof membrane which combines a high performance, cross laminated, HDPE carrier film with a unique, super tacky, self-adhesive rubberized asphalt compound.

System 4000 Surface Conditioner is a unique, water-based, latex surface treatment which imparts an aggressive, high tack finish to the treated substrate. It is specifically formulated to bind site dust and concrete efflorescence, thereby providing a suitable surface for the Bituthene System 4000 Waterproofing Membrane.

Conveniently packaged in each roll of membrane, System 4000 Surface Conditioner promotes good initial adhesion and, more importantly, excellent permanent adhesion of the Bituthene System 4000 Waterproofing Membrane. The VOC (Volatile Organic Compound) content of this product is 100 g/L.

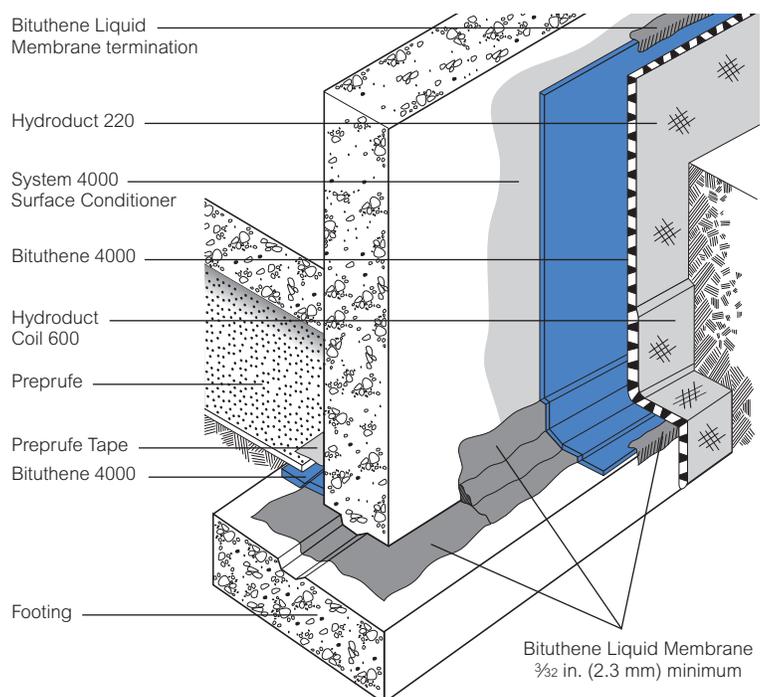
Product Advantages

- Excellent adhesion
- Cold applied
- Reduced inventory and handling costs
- Wide application temperature range
- Overlap security
- Cross laminated, high density polyethylene carrier film
- Flexible
- Ripcord

Architectural and Industrial Maintenance Regulations limit the VOC content in products classified as Architectural Coatings. Refer to Technical Letters at graceconstruction.com for most current list of allowable limits.

Advantages

- **Excellent adhesion**—special adhesive compound engineered to work with high tack System 4000 Surface Conditioner
- **Cold applied**—simple application to substrates, especially at low temperatures
- **Reduced inventory and handling costs**—System 4000 Surface Conditioner is included with each roll of membrane
- **Wide application temperature range**—excellent bond to self and substrate from 25°F (-4°C) and above



Drawings are for illustration purposes only. Please refer to graceconstruction.com for specific application details.

- **Overlap security**—minimizes margin for error under site conditions
- **Cross laminated, high density polyethylene carrier film**—provides high tear strength, puncture and impact resistance
- **Flexible**—accommodates minor structural movements and will bridge shrinkage cracks
- **Ripcord**[®]—this split release on demand feature allows the splitting of the release paper into two (2) pieces for ease of installation in detailed areas

Use

Bituthene is ideal for waterproofing concrete, masonry and wood surfaces where in-service temperatures will not exceed 135°F (57°C). It can be applied to foundation walls, tunnels, earth sheltered structures and split slab construction, both above and below grade. (For above grade applications, see *Above Grade Waterproofing Bituthene System 4000*.)

Bituthene is 1/16 in. (1.5 mm) thick, 3 ft (0.9 m) wide and 66.7 ft (20 m) long and is supplied in rolls. It is unrolled sticky side down onto concrete slabs or applied onto vertical concrete faces primed with System 4000 Surface Conditioner. Continuity is achieved by overlapping a minimum 2 in. (50 mm) and firmly rolling the joint.

Bituthene is extremely flexible. It is capable of bridging shrinkage cracks in the concrete and will accommodate minor differential movement throughout the service life of the structure.

Application Procedures

Safety, Storage and Handling Information

Bituthene products must be handled properly. Vapors from solvent-based primers and mastic are harmful and flammable. For these products, the best available information on safe handling, storage, personal protection, health and environmental considerations has been gathered. Material Safety Data Sheets (MSDS) are available at graceconstruction.com and users should acquaint themselves with this information. Carefully read detailed precaution statements on product labels and the MSDS before use.

Surface Preparation

Surfaces should be structurally sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Concrete must be properly dried (minimum 7 days for normal structural concrete and 14 days for lightweight structural concrete).

If time is critical, Bituthene Primer B2 or Bituthene Primer B2 LVC may be used to allow priming and installation of membrane on damp surfaces or green concrete. Priming may begin in this case as soon as the concrete will maintain structural integrity. Use form release agents which will not transfer to the concrete. Remove forms as soon as possible from below horizontal slabs to prevent entrapment of excess moisture. Excess moisture may lead to blistering of the membrane. Cure concrete with clear, resin-based curing compounds which do not contain oil, wax or pigment. Except with Bituthene Primer B2 or Bituthene Primer B2 LVC, allow concrete to thoroughly dry following rain. Do not apply any products to frozen concrete.

Repair defects such as spalled or poorly consolidated areas. Remove sharp protrusions and form match lines. On masonry surfaces, apply a parge coat to rough concrete block and brick walls or trowel cut mortar joints flush to the face of the concrete blocks.

Temperature

- Apply Bituthene System 4000 Membrane and Conditioner only in dry weather and when air and surface temperatures are 25°F (-4°C) or above.
- Apply Bituthene Primer B2 or Bituthene Primer B2 LVC in dry weather above 25°F (-4°C). (See separate product information sheet.)

Conditioning

Bituthene System 4000 Surface Conditioner is ready to use and can be applied by spray or roller. For best results, use a pump-type air sprayer with fan tip nozzle, like the Bituthene System 4000 Surface Conditioner Sprayer, to apply the surface conditioner.

Apply Bituthene System 4000 Surface Conditioner to clean, dry, frost-free surfaces at a coverage rate of 300 ft²/gal (7.4 m²/L). Coverage should be uniform. Surface conditioner should not be applied so heavily that it puddles or runs. **Do not apply conditioner to Bituthene membrane.**

Allow Bituthene System 4000 Surface Conditioner to dry one hour or until substrate returns to its original color. At low temperatures or in high humidity conditions, dry time may be longer.

Bituthene System 4000 Surface Conditioner is clear when dry and may be slightly tacky. In general, conditioning should be limited to what can be covered within 24 hours. In situations where long dry times may prevail, substrates may be conditioned in advance. Substrates should be reconditioned if significant dirt or dust accumulates.

Before surface conditioner dries, tools should be cleaned with water. After surface conditioner dries, tools should be cleaned with mineral spirits. Mineral spirits is a combustible liquid which should be used only in accordance with manufacturer's recommendations. **Do not use solvents to clean hands or skin.**

Corner Details

The treatment of corners varies depending on the location of the corner. For detailed information on Bituthene Liquid Membrane, see separate product information sheet.

- At wall to footing inside corners—
Option 1: Apply membrane to within 1 in. (25 mm) of base of wall. Treat the inside corner by installing a ¾ in. (20 mm) fillet of Bituthene Liquid Membrane. Extend Bituthene Liquid Membrane at least 2½ in. (65 mm) onto footing, and 2½ in. (65 mm) onto wall membrane.
Option 2: Treat the inside corner by installing a ¾ in. (20 mm) fillet of Bituthene Liquid Membrane. Apply 12 in. (300 mm) wide strip of sheet membrane centered over fillet. Apply wall membrane over inside corner and extend 6 in. (150 mm) onto footing. Apply 1 in. (25 mm) wide troweling of Bituthene Liquid Membrane over all terminations and seams within 12 in. (300 mm) of corner.

- At footings where the elevation of the floor slab is 6 in. (150 mm) or more above the footing, treat the inside corner either by the above two methods or terminate the membrane at the base of the wall. Seal the termination with Bituthene Liquid Membrane.

Joints

Properly seal all joints with waterstop, joint filler and sealant as required. Bituthene membranes are not intended to function as the primary joint seal. Allow sealants to fully cure. Pre-strip all slab and wall cracks over ¼ in. (1.5 mm) wide and all construction and control joints with 9 in. (230 mm) wide sheet membrane strip.

Application on Horizontal Surfaces

(Note: Preprufe® pre-applied membranes are strongly recommended for below slab or for any application where the membrane is applied before concreting. See Preprufe product information sheets.)

Apply membrane from the low point to the high point so that laps shed water. Overlap all seams at least 2 in. (50 mm). Stagger all end laps. Roll the entire membrane firmly and completely as soon as possible. Use a linoleum roller or standard water-filled garden roller less than 30 in. (760 mm) wide, weighing a minimum of 75 lbs (34 kg) when filled. Cover the face of the roller with a resilient material such as a ½ in. (13 mm) plastic foam or two wraps of indoor-outdoor carpet to allow the membrane to fully contact the primed substrate. Seal all T-joints and membrane terminations with Bituthene Liquid Membrane at the end of the day.

Protrusions and Drains

Apply membrane to within 1 in. (25 mm) of the base of the protrusion. Apply Bituthene Liquid Membrane 0.1 in. (2.5 mm) thick around protrusion. Bituthene Liquid Membrane should extend over the membrane a minimum of 2½ in. (65 mm) and up the penetration to just below the finished height of the wearing course.

Vertical Surfaces

Apply membrane in lengths up to 8 ft (2.5 m). Overlap all seams at least 2 in. (50 mm). On higher walls apply membrane in two or more sections with the upper overlapping the lower by at least 2 in. (50 mm). Roll all membrane with a hand roller.

Terminate the membrane at grade level. Press the membrane firmly to the wall with the butt end of a hardwood tool such as a hammer handle or secure into a reglet. Failure to use heavy pressure at terminations can result in a poor seal. A termination bar may be used to ensure a tight seal. Terminate the membrane at the base of the wall if the bottom of the interior floor slab is at least 6 in. (150 mm) above the footing. Otherwise, use appropriate inside corner detail where the wall and footing meet.

Membrane Repairs

Patch tears and inadequately lapped seams with membrane. Clean membrane with a damp cloth and dry. Slit fishmouths and repair with a patch extending 6 in. (150 mm) in all directions from the slit and seal edges of the patch with Bituthene Liquid Membrane. Inspect the membrane thoroughly before covering and make any repairs.

Drainage

Hydroduct® drainage composites are recommended for both active drainage and protection of the membrane. See Hydroduct product information sheets.

Protection of Membrane

Protect Bituthene membranes to avoid damage from other trades, construction materials or backfill. Place protection immediately in temperatures above 77°F (25°C) to avoid potential for blisters.

- On vertical applications, use Hydroduct 220 Drainage Composite. Adhere Hydroduct 220 Drainage Composite to membrane with Hydroduct Tape. Alternative methods of protection are to use 1 in. (25 mm) expanded polystyrene or ¼ in. (6 mm) extruded polystyrene that has a minimum compressive strength of 8 lbs/in.² (55 kN/m²). Such alternatives do not provide positive drainage to

System 4000 Surface Conditioner Sprayer

The Bituthene System 4000 Surface Conditioner Sprayer is a professional grade, polyethylene, pump-type, compressed air sprayer with a brass fan tip nozzle. It has a 2 gal (7.6 L) capacity. The nozzle orifice and spray pattern have been specifically engineered for the optimum application of Bituthene System 4000 Surface Conditioner.

Hold nozzle 18 in. (450 mm) from substrate and squeeze handle to spray. Spray in a sweeping motion until substrate is uniformly covered.

Sprayer should be repressurized by pumping as needed. For best results, sprayer should be maintained at high pressure during spraying.

To release pressure, invert the sprayer and spray until all compressed air is released.



Maintenance

The Bituthene System 4000 Surface Conditioner Sprayer should perform without trouble for an extended period if maintained properly.

Sprayer should not be used to store Bituthene System 4000 Surface Conditioner. The sprayer should be flushed with clean water immediately after spraying. For breaks in the spray operation of one hour or less, invert the sprayer and squeeze the spray handle until only air comes from the nozzle. This will avoid clogging.

Should the sprayer need repairs or parts, call the maintenance telephone number on the sprayer tank (800-323-0620).

the system. If ¼ in. (6 mm) extruded polystyrene protection board is used, backfill should not contain sharp rock or aggregate over 2 in. (50 mm) in diameter. Adhere polystyrene protection board with Hydroduct Tape.

- In mud slab waterproofing, or other applications where positive drainage is not desired and where reinforced concrete slabs are placed over the membrane, the use of ¼ in. (6 mm) hardboard or 2 layers of ⅛ in. (3 mm) hardboard is recommended.

Insulation

Always apply Bituthene membrane directly to primed or conditioned structural substrates. Insulation, if used, must be applied over the membrane. Do not apply Bituthene membranes over lightweight insulating concrete.

Backfill

Place backfill as soon as possible. Use care during backfill operation to avoid damage to the waterproofing system. Follow generally accepted practices for backfilling and compaction. Backfill should be added and compacted in 6 in. (150 mm) to 12 in. (300 mm) lifts.

For areas which cannot be fully compacted, a termination bar is recommended across the top termination of the membrane.

Placing Steel

When placing steel over properly protected membrane, use concrete bar supports (dobies) or chairs with plastic tips or rolled feet to prevent damage from sharp edges. Use special care when using wire mesh, especially if the mesh is curled.

Approvals

- City of Los Angeles Research Report RR 24386
- Miami-Dade County Code Report NOA 04-0114.03
- U.S. Department of Housing and Urban Development (HUD) HUD Materials Release 628E
- Bituthene 4000 Membranes carry a Underwriters' Laboratory Class A Fire Rating (Building Materials Directory, File #R7910) when used in either of the following constructions:
 - Limited to noncombustible decks at inclines not exceeding ¼ in. (6 mm) to the horizontal 1 ft (0.3 m). One layer of Bituthene waterproofing membrane, followed by one layer of ⅛ in. (3 mm) protection board, encased in 2 in. (50 mm) minimum concrete monolithic pour.
 - Limited to noncombustible decks at inclines not exceeding ¼ in. (6 mm) to the horizontal 1 ft (0.3 m). One layer of Bituthene waterproofing membrane, followed by one layer of DOW Styrofoam PD Insulation Board [2 in. (50 mm) thick]. This is covered with one layer of 2 ft x 2 ft x 2 in. (0.6 m x 0.6 m x 50 mm) of concrete paver topping.

Warranty

Five year material warranties covering Bituthene and Hydroduct products are available upon request. Contact your Grace sales representative for details.

Technical Services

Support is provided by full time, technically trained Grace representatives and technical service personnel, backed by a central research and development staff.

Supply

Bituthene System 4000	3 ft x 66.7 ft roll (200 ft ²) [0.9 m x 20 m (18.6 m ²)]
Roll weight	83 lbs (38 kg) gross
Palletization	25 rolls per pallet
Storage	Store upright in dry conditions below 95°F (+35°C).
System 4000 Surface Conditioner	1 x 0.625 gal (2.3 L) bottle in each roll of System 4000 Membrane
Ancillary Products	
Surface Conditioner Sprayer	2 gal (7.6 L) capacity professional grade sprayer with specially engineered nozzle
Bituthene Liquid Membrane	1.5 gal (5.7 L) pail/125 pails per pallet or 4 gal (15.1 L) pail/48 pails per pallet
Hydroduct Tape	1 in. x 200 ft (2.5 cm x 61.0 m) roll/6 rolls per carton
Bituthene Mastic	Twelve 30 oz (0.9 L) tubes/carton or 5 gal (18.9 L) pail/36 pails per pallet
Complementary Material	
Hydroduct	See separate data sheets

Equipment by others: Soft broom, utility knife, brush or roller for priming

Physical Properties for Bituthene 4000 Membrane

Property	Typical Value	Test Method
Color	Dark gray-black	
Thickness	1/16 in. (1.5 mm) nominal	ASTM D3767—method A
Flexibility, 180° bend over 1 in. (25 mm) mandrel at -25°F (-32°C)	Unaffected	ASTM D1970
Tensile strength, membrane, die C	325 lbs/in. ² (2240 kPa) minimum	ASTM D412 modified ¹
Tensile strength, film	5,000 lbs/in. ² (34.5 MPa) minimum	ASTM D882 modified ¹
Elongation, ultimate failure of rubberized asphalt	300% minimum	ASTM D412 modified ¹
Crack cycling at -25°F (-32°C), 100 cycles	Unaffected	ASTM C836
Lap adhesion at minimum application temperature	5 lbs/in. (880 N/m)	ASTM D1876 modified ²
Peel strength	9 lbs/in. (1576 N/m)	ASTM D903 modified ³
Puncture resistance, membrane	50 lbs (222 N) minimum	ASTM E154
Resistance to hydrostatic head	210 ft (70 m) of water	ASTM D5385
Permeance	0.05 perms (2.9 ng/m ² sPa) maximum	ASTM E96, section 12—water method
Water absorption	0.1% maximum	ASTM D570

Footnotes:

1. The test is run at a rate of 2 in. (50 mm) per minute.
2. The test is conducted 15 minutes after the lap is formed and run at a rate of 2 in. (50 mm) per minute at 40°F (5°C).
3. The 180° peel strength is run at a rate of 12 in. (300 mm) per minute.

Physical Properties for System 4000 Surface Conditioner

Property	Typical Value
Solvent type	Water
Flash point	>140°F (>60°C)
VOC* content	91 g/L
Application temperature	25°F (-4°C) and above
Freeze thaw stability	5 cycles (minimum)
Freezing point (as packaged)	14°F (-10°C)
Dry time (hours)	1 hour**

* Volatile Organic Compound

** Dry time will vary with weather conditions

www.graceconstruction.com

For technical assistance call toll free at 866-333-3SBM (3726)

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GRACE

BITUTHENE® 3000 AND BITUTHENE LOW TEMPERATURE

Self-adhesive, rubberized asphalt/polyethylene waterproofing membranes for basements and sub-structures

Description

Bituthene® 3000 and Bituthene Low Temperature are self-adhesive, rubberized asphalt/polyethylene waterproofing membranes used in basements and sub-structures.

Advantages

- **Waterproof**—high hydrostatic head resistance
- **Cross laminated film**—provides dimensional stability, high tear strength, puncture and impact resistance
- **Cold applied**—no flame hazard; self-adhesive overlaps ensure continuity
- **Chemically resistant**—provides effective external protection against aggressive soils and ground water
- **Flexible**—accommodates minor settlement and shrinkage movement
- **Controlled thickness**—factory made sheet ensures constant, non-variable site application
- **Wide application window**—
 - **Bituthene Low Temperature** surface and ambient temperatures between 25°F (-4°C) and 60°F (16°C)
 - **Bituthene 3000** surface and ambient temperatures at 40°F (5°C) or above

- **Ripcord® split release on demand**—faster application in the straight-aways, ease of membrane positioning in detailed areas

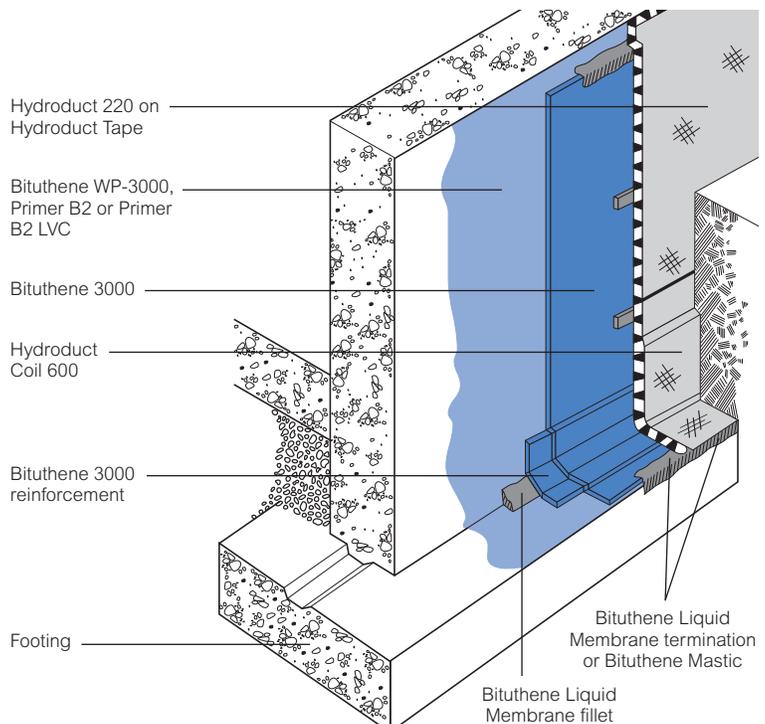
Use

Bituthene is ideal for waterproofing concrete, masonry and wood surfaces where in-service temperatures will not exceed 130°F (54°C). It can be applied to foundation walls, tunnels, earth sheltered structures and split slab construction, both above and below grade. (For above grade applications, see *Above Grade Waterproofing Bituthene 3000 and Bituthene Low Temperature.*)

Bituthene is 1/16 in. (1.5 mm) thick, 3 ft (0.9 m) wide and 66.7 ft (20 m) long and is supplied in rolls. It is unrolled sticky side down onto concrete slabs or applied onto vertical concrete faces primed with Bituthene Primer WP-3000, Primer B2 or Primer B2 LVC. Continuity is achieved by overlapping a minimum 2 in. (50 mm) and firmly rolling the joint.

Product Advantages

- Waterproof
- Cross laminated film
- Cold applied
- Chemically resistant
- Flexible
- Controlled thickness
- Wide application window
- Ripcord split release on demand



Drawings are for illustration purposes only. Please refer to graceconstruction.com for specific application details.

Bituthene is extremely flexible. It is capable of bridging shrinkage cracks in the concrete and will accommodate minor differential movement throughout the service life of the structure.

Application Procedures

Safety, Storage and Handling Information

Bituthene products must be handled properly. Vapors from solvent-based primers and mastic are harmful and flammable. For these products, the best available information on safe handling, storage, personal protection, health and environmental considerations has been gathered. Material Safety Data Sheets (MSDS) are available at graceconstruction.com and users should acquaint themselves with this information. Carefully read detailed precaution statements on product labels and the MSDS before use.

Surface Preparation

Surfaces should be structurally sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Concrete must be properly dried (minimum 7 days for normal structural concrete and 14 days for lightweight structural concrete).

If time is critical, Bituthene Primer B2 or Bituthene Primer B2 LVC may be used to allow priming and installation of membrane on damp surfaces or green concrete. Priming may begin in this case as soon as the concrete will maintain structural integrity. Use form release agents which will not transfer to the concrete. Remove forms as soon as possible from below horizontal slabs to prevent entrapment of excess moisture. Excess moisture may lead to blistering of the membrane. Cure concrete with clear, resin-based curing compounds which do not contain oil, wax or pigment. Except with Primer B2 or Primer B2 LVC, allow concrete to thoroughly dry following rain. Do not apply any products to frozen concrete.

Repair defects such as spalled or poorly consolidated areas. Remove sharp protrusions and form match lines. On masonry surfaces, apply a parge coat to rough concrete block and brick walls or trowel cut mortar joints flush to the face of the concrete blocks.

Temperature

- Apply Bituthene 3000 Membrane only in dry weather and at air and surface temperatures of 40°F (5°C) and above.
- Apply Bituthene Low Temperature Membrane only in dry weather and when air and surface temperatures are between 25°F (-4°C) and 60°F (16°C).
- Apply Bituthene Primer WP-3000 in dry weather above 40°F (5°C).

- Apply Bituthene Primer B2 in dry weather above 25°F (-4°C). (See separate product information sheet.)

Priming

- Apply Bituthene Primer WP-3000 by spray or roller at a coverage rate of 500–600 ft²/gal (12–15 m²/L). Allow to dry one hour or until concrete returns to original color.
- Apply Bituthene Primer B2 by a lamb's wool roller at a coverage rate of 250–350 ft²/gal (6–8 m²/L). Allow primer to dry one hour or until tack-free.
- Apply Bituthene Primer B2 LVC by a lamb's wool roller at a coverage rate of 325–425 ft²/gal (7.5–10 m²/L). Allow primer to dry one hour or until tack free.
- Dry time may be longer in cold temperatures. Reprime areas if contaminated by dust. If the work area is dusty, apply membrane as soon as the primer is dry.
- **Do not apply any primer to Bituthene membrane.**

Corner Details

The treatment of corners varies depending on the location of the corner. For detailed information on Bituthene Liquid Membrane, see separate product information sheet.

- At wall to footing inside corners—
 - Option 1:** Apply membrane to within 1 in. (25 mm) of base of wall. Treat the inside corner by installing a ¾ in. (20 mm) fillet of Bituthene Liquid Membrane. Extend Bituthene Liquid Membrane at least 2½ in. (65 mm) onto footing, and 2½ in. (65 mm) onto wall membrane.
 - Option 2:** Treat the inside corner by installing a ¾ in. (20 mm) fillet of Bituthene Liquid Membrane. Apply 12 in. (300 mm) wide strip of sheet membrane centered over fillet. Apply wall membrane over inside corner and extend 6 in. (150 mm) onto footing. Apply 1 in. (25 mm) wide troweling of Bituthene Liquid Membrane over all terminations and seams within 12 in. (300 mm) of corner.
- At footings where the elevation of the floor slab is 6 in. (150 mm) or more above the footing, treat the inside corner either by the above two methods or terminate the membrane at the base of the wall. Seal the termination with Bituthene Liquid Membrane.

Joints

Properly seal all joints with waterstop, joint filler and sealant as required. Bituthene membranes are not intended to function as the primary joint seal. Allow sealants to fully cure. Pre-strip all slab and wall cracks over ¼ in. (1.5 mm) wide and all construction and control joints with 9 in. (230 mm) wide sheet membrane strip.

Application on Horizontal Surfaces

(Note: Preprufe® pre-applied membranes are strongly recommended for below slab or for any application where the membrane is applied before concreting. See Preprufe product information sheets.)

Apply membrane from the low point to the high point so that laps shed water. Overlap all seams at least 2 in. (50 mm). Stagger all end laps. Roll the entire membrane firmly and completely as soon as possible. Use a linoleum roller or standard water-filled garden roller less than 30 in. (760 mm) wide, weighing a minimum of 75 lbs (34 kg) when filled. Cover the face of the roller with a resilient material such as a ½ in. (13 mm) plastic foam or two wraps of indoor-outdoor carpet to allow the membrane to fully contact the primed substrate. Seal all T-joints and membrane terminations with Bituthene Liquid Membrane at the end of the day.

Protrusions and Drains

Apply membrane to within 1 in. (25 mm) of the base of the protrusion. Apply Bituthene Liquid Membrane 0.1 in. (2.5 mm) thick around protrusion. Bituthene Liquid Membrane should extend over the membrane a minimum of 2½ in. (65 mm) and up the penetration to just below the finished height of the wearing course.

Vertical Surfaces

Apply membrane in lengths up to 8 ft (2.5 m). Overlap all seams at least 2 in. (50 mm). On higher walls apply membrane in two or more sections with the upper overlapping the lower by at least 2 in. (50 mm). Roll all membrane with a hand roller.

Terminate the membrane at grade level. Press the membrane firmly to the wall with the butt end of a hardwood tool such as a hammer handle or secure into a reglet. Failure to use heavy pressure at terminations can result in a poor seal. A termination bar may be used to ensure a tight seal.

Terminate the membrane at the base of the wall if the bottom of the interior floor slab is at least 6 in. (150 mm) above the footing. Otherwise, use appropriate inside corner detail where the wall and footing meet.

Membrane Repairs

Patch tears and inadequately lapped seams with membrane. Clean membrane with a damp cloth and dry. Slit fishmouths and repair with a patch extending 6 in. (150 mm) in all directions from the slit and seal edges of the patch with Bituthene Liquid Membrane. Inspect the membrane thoroughly before covering and make any repairs.

Drainage

Hydroduct® drainage composites are recommended for both active drainage and protection of the membrane. See Hydroduct product information sheets.

Protection of Membrane

Protect Bituthene membranes to avoid damage from other trades, construction materials or backfill. Place protection immediately in temperatures above 77°F (25°C) to avoid potential for blisters.

- On vertical applications, use Hydroduct 220 Drainage Composite. Adhere Hydroduct 220 Drainage Composite to membrane with Hydroduct Tape. Alternative methods of protection are to use ¼ in. (6 mm) asphalt impregnated board or 1 in. (25 mm) extruded polystyrene. Such alternatives do not provide positive drainage to the system. Adhere protection board with an adhesive or Hydroduct Tape.
- In mud slab waterproofing, or other applications where positive drainage is not desired and where reinforced concrete slabs are placed over the membrane, the use of ¼ in. (6 mm) hardboard or 2 layers of ⅛ in. (3 mm) hardboard is recommended.

Insulation

Always apply Bituthene membrane directly to primed or conditioned structural substrates. Insulation, if used, must be applied over the membrane. Do not apply Bituthene membranes over lightweight insulating concrete.

Backfill

Place backfill as soon as possible. Use care during backfill operation to avoid damage to the waterproofing system. Follow generally accepted practices for backfilling and compaction. Backfill should be added and compacted in 6 in. (150 mm) to 12 in. (300 mm) lifts.

For areas which cannot be fully compacted, a termination bar is recommended across the top termination of the membrane.

Placing Steel

When placing steel over properly protected membrane, use concrete bar supports (dobies) or chairs with plastic tips or rolled feet to prevent damage from sharp edges. Use special care when using wire mesh, especially if the mesh is curled.

Approvals

- City of Los Angeles Research Report RR 24386
- U.S. Department of Housing and Urban Development (HUD) HUD Materials Release 628E

Warranty

Five year material warranties covering Bituthene and Hydroduct products are available upon request. Contact your Grace sales representative for details.

Technical Services

Support is provided by full time, technically trained Grace representatives and technical service personnel, backed by a central research and development staff.

Supply

Bituthene 3000 or Bituthene Low Temperature	3 ft x 66.7 ft roll (200 ft ²) [0.9 m x 20 m (18.6 m ²)]
Roll weight	83 lbs (38 kg) gross
Palletization	25 rolls per pallet
Storage	Store upright in dry conditions below 95°F (+35°C).
Ancillary Products	
Bituthene WP-3000	5 gal (18.9 L) pail/24 pails per pallet
Bituthene Primer B2	5 gal (18.9 L) pail/48 pails per pallet
Bituthene Primer B2 LVC	5 gal (18.9 L) pail/48 pails per pallet
Bituthene Liquid Membrane	1.5 gal (5.7 L) pail/100 pails per pallet or 4 gal (15.1 L) pail/24 pails per pallet
Hydroduct Tape	1 in. x 200 ft (2.5 cm x 61.0 m) roll/6 rolls per carton
Bituthene Mastic	Twelve 30 oz (0.9 L) tubes/carton or 5 gal (18.9 L) pail/36 pails per pallet

Equipment by others: Soft broom, utility knife, brush or roller for priming

Physical Properties for Bituthene Membrane

Property	Typical Value	Test Method
Color	Dark gray-black	
Thickness	1/16 in. (1.5 mm) nominal	ASTM D3767—method A
Flexibility, 180° bend over 1 in. (25 mm) mandrel at -25°F (-32°C)	Unaffected	ASTM D1970
Tensile strength, membrane, die C	325 lbs/in. ² (2240 kPa) minimum	ASTM D412 modified ¹
Tensile strength, film	5,000 lbs/in. ² (34.5 MPa) minimum	ASTM D882 modified ¹
Elongation, ultimate failure of rubberized asphalt	300% minimum	ASTM D412 modified ¹
Crack cycling at -25°F (-32°C), 100 cycles	Unaffected	ASTM C836
Lap adhesion at minimum application temperature	3000: 4 lbs/in. (700 N/m) Low Temp: 5 lbs/in. (880 N/m)	ASTM D1876 modified ²
Peel strength	9 lbs/in. (1576 N/m)	ASTM D903 modified ³
Puncture resistance, membrane	50 lbs (222 N) minimum	ASTM E154
Resistance to hydrostatic head	200 ft (60 m) of water	ASTM D5385
Permeance	0.05 perms (2.9 ng/m ² sPa) maximum	ASTM E96, section 12—water method
Water absorption	0.1% maximum	ASTM D570

Footnotes:

1. The test is run at a rate of 2 in. (50 mm) per minute.
2. The test is conducted 15 minutes after the lap is formed and run at a rate of 2 in. (50 mm) per minute at 40°F (5°C).
3. The 180° peel strength is run at a rate of 12 in. (300 mm) per minute.

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For technical assistance call toll free at 866-333-3SBM (3726)

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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:

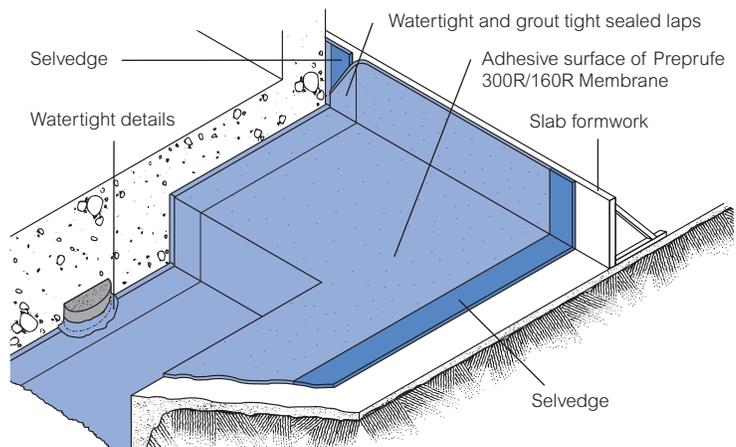
- **Preprufe 300R**—heavy-duty grade for use below slabs and on rafts (i.e. mud slabs). Designed to accept the placing of heavy reinforcement using conventional concrete spacers.
- **Preprufe 160R**—thinner grade for blindside, zero property line applications against soil retention systems.
- **Preprufe 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 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

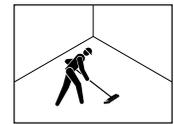


Figure 2

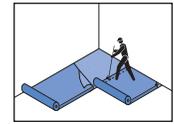
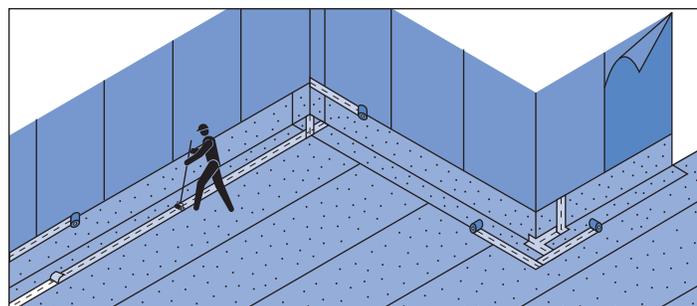
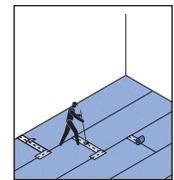


Figure 3

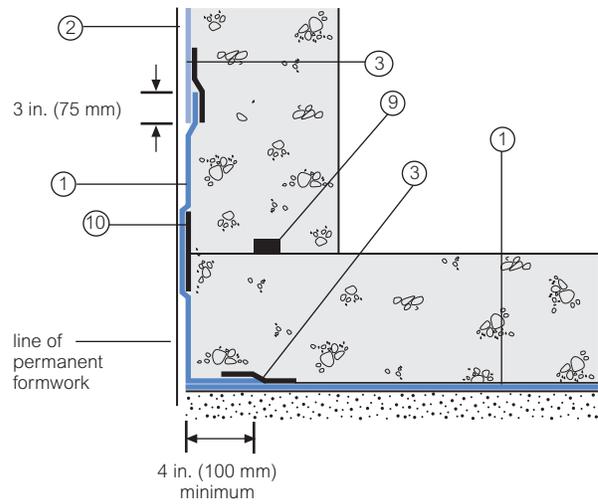


Detail Drawings

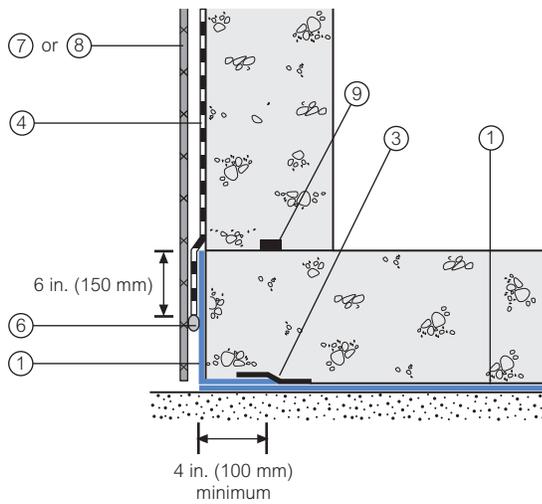
Details shown are typical illustrations and not working details. For a list of the most current details, visit us at graceconstruction.com.

For technical assistance with detailing and problem solving please call toll free at 866-333-3SBM (3726).

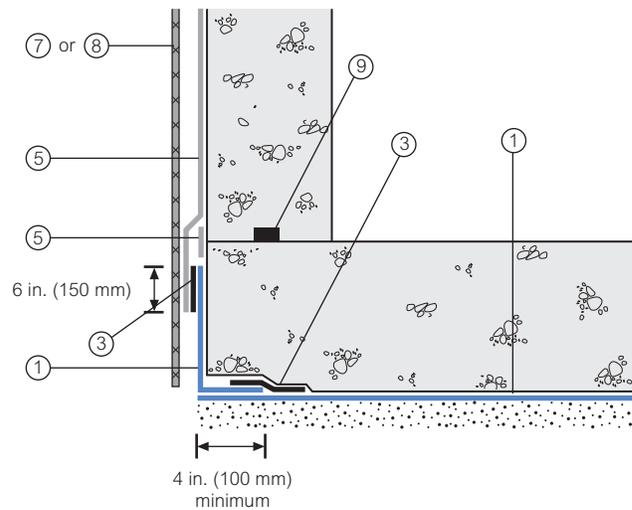
Wall base detail against permanent shutter



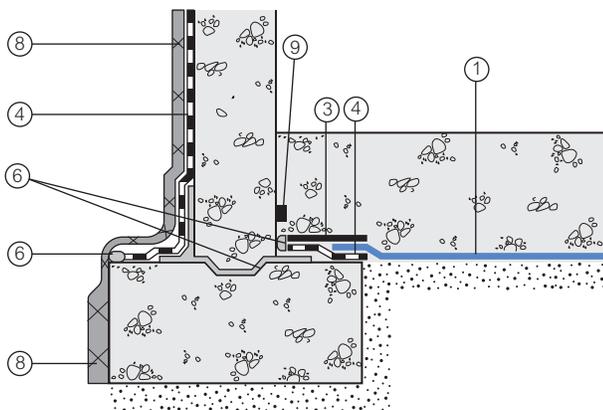
Bituthene wall base detail (Option 1)



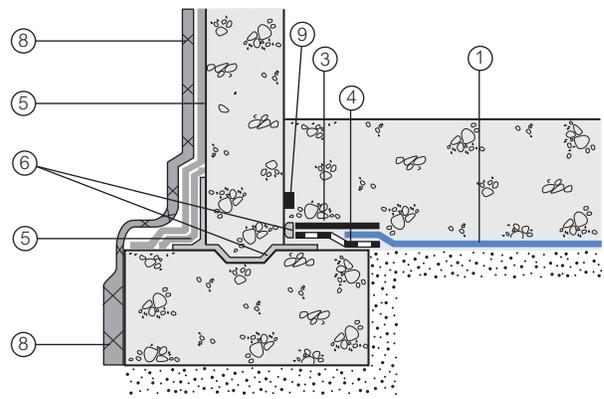
Procor wall base detail (Option 1)



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	660%	580%	ASTM D412, modified ³
Tensile strength	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)

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