

Draft Remedial Action Work Plan

For

341 Canal Street/11 Greene Street

New York, New York 10013

Block 229, Lot 1

VCP Site Number: TBD

Restrictive Declaration Site Number: 15RHAZ158M

CEQR Number: 07DCP038M

Prepared for:

11 Greene Street LLC

174 Hudson Street, 6th Floor

New York, NY 10013

Prepared by:

AKRF Engineering, P.C.

440 Park Avenue South

New York, NY 10016

212-696-0670

DECEMBER 2014

DRAFT REMEDIAL ACTION PLAN

TABLE OF CONTENTS

LIST OF ACRONYMS	iv
CERTIFICATION.....	vi
EXECUTIVE SUMMARY	1
DRAFT REMEDIAL ACTION WORK PLAN.....	9
1.0 SITE BACKGROUND.....	9
1.1 Site Location and Current Usage	9
1.2 Proposed Redevelopment Plan.....	9
1.3 Description of Surrounding Property	10
1.4 Environmental Investigation Reports.....	10
1.5 Summary of Regulatory Correspondence	11
1.6 Findings of Environmental Investigation	11
2.0 DESCRIPTION OF REMEDIATION.....	14
2.1 Objectives.....	14
2.1.1 Soil	14
2.1.2 Groundwater	14
2.1.3 Soil Vapor	14
2.2 Summary of Remedial Action.....	14
2.3 Soil Cleanup Objectives and Soil/Fill Management	16
2.3.1 Estimated Soil/Fill Removal Quantities.....	17
2.3.2 End-Point Sampling	17
2.3.3 Quality Assurance/Quality Control (QA/QC).....	19
2.3.4 Import and Reuse of Soil	21
2.4 Engineering Controls	22
2.4.1 Composite Cover System.....	22
2.4.2 Vapor Barrier	22
3.0 Remedial Alternatives Analysis	23
3.1 Threshold Criteria	24
3.1.1 Protection of Public Health and the Environment.....	24
3.2 Balancing Criteria	26
3.2.1 Compliance with Standards, Criteria and Guidance (SCGs)	26
3.2.2 Short-Term Effectiveness and Impacts	27
3.2.3 Long-Term Effectiveness and Permanence	28
3.2.4 Reduction of Toxicity, Mobility, or Volume of Contaminated Material	29
3.2.5 Implementability	29
3.2.6 Cost Effectiveness.....	30
3.2.7 Community Acceptance	31
3.2.8 Land Use	31
3.2.9 Sustainability of the Remedial Action	32
4.0 REMEDIAL ACTION MANAGEMENT.....	34
4.1 Project Organization and Oversight	34

4.2	Site Security	34
4.3	Work Hours.....	34
4.4	Construction Health and Safety Plan	34
4.5	Community Air Monitoring Plan	35
4.5.1	VOC Monitoring, Response Levels, and Actions.....	36
4.5.2	Particulate Monitoring, Response Levels, and Actions	37
4.6	Agency Approvals.....	37
4.7	Site Preparation	38
4.7.1	Pre-Construction Meeting	38
4.7.2	Mobilization.....	38
4.7.3	Utility Marker Layouts, Easement Layouts	38
4.7.4	Equipment and Material Staging.....	39
4.7.5	Stabilized Construction Entrance.....	39
4.7.6	Truck Inspection Station	39
4.8	Traffic Control	39
4.9	Demobilization.....	39
4.10	Reporting and Record Keeping	40
4.10.1	Daily Reports	40
4.10.2	Record Keeping and Photo-Documentation.....	41
4.11	Complaint Management	41
4.12	Deviations from the Remedial Action Work Plan.....	41
5.0	REMEDIAL CLOSURE REPORT.....	42
6.0	SCHEDULE.....	44

FIGURES

Figure 1	Site Location Map
Figure 2	Site Plan
Figure 3	Surrounding Land Use
Figure 4	Proposed Excavation Area and Endpoint Sample Location Plan
Figure 5	Extent of Composite Site Cover System
Figure 6	Site Plan with Alphanumeric Grid

APPENDICES

Appendix A	Construction Health and Safety Plan
Appendix B	Proposed Development Plans
Appendix C	Previous Environmental Reports (CD)
Appendix D	Soil/Materials Management Plan
Appendix E	Specifications for Vapor Barrier

LIST OF 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	Register 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
SVOCs	Semi-Volatile 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, Michelle Lapin, am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the 341 Canal Street/ 11 Greene Street Site, VCP Site number TBD.

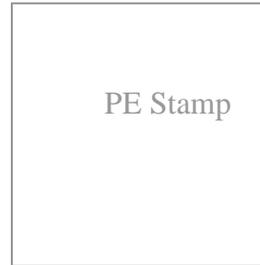
I certify that this Remedial Action Work Plan (RAWP) has a plan for handling, transport and disposal of soil, fill, fluids and other materials removed from the property in accordance with applicable City, State and Federal laws and regulations. Importation of all soil, fill and other material from off-Site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

Name

NYS PE License Number

Signature

Date



EXECUTIVE SUMMARY

11 Greene Street, LLC has enrolled in the New York City Voluntary Cleanup Program to remediate an approximately 13,200-square foot site located at 341 Canal Street/11 Greene Street in Manhattan, New York (the Site). A Remedial Investigation was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP). The remedial action described in this document 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 341 Canal Street/11 Greene Street in the SoHo section of Manhattan, New York and is identified as Block 229, Lot 1 on the New York City Tax Map. The Site is approximately 13,200-square feet and is bounded by commercial and residential spaces to the north, Canal Street to the south, Greene Street to the east, and a parking garage and mixed-use commercial and residential spaces to the west. Currently, the Site is asphalt-paved and is used for public parking. The Site location is shown on Figure 1, and a Site plan depicting the Site boundary is provided as Figure 2.

Summary of Proposed Redevelopment Plan

The proposed development project consists of a seven-story mixed-use commercial and residential building with a partial basement totaling approximately 66,000 gross square feet. The basement and first floors will be used for commercial/retail purposes, with mechanical equipment, storage, and auxiliary space in the basement level. The second through seventh floors will be used for residential purposes, comprising 31 dwelling units. Roof terraces and mechanical equipment will occupy the roof. There will be no on-site parking. The current zoning designation is M1-5B (special mixed-use district for residential and industrial uses in loft buildings). The proposed use is consistent with existing zoning for the Site. The proposed development plans are included as Appendix B.

Summary of the Remedy

The proposed remedial action achieves all of the remedial action goals established for the project. The proposed remedial action is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants and uses standard methods that are well established in the industry. The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP Citizen Participation activities according to an approved Citizen Participation Plan.
2. Performance of a Community Air Monitoring Program for particulates and volatile organic carbon compounds.
3. Establishment of Site Specific (Track 4) Soil Cleanup Objectives (SCOs).
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs, and marking and staking excavation areas.
5. Excavation and removal of soil/fill exceeding Track 4 Site Specific SCOs within the planned excavation area. The eastern portion of the Site where the partial basement will be located will be excavated to a depth of approximately 12 feet below grade. A small area at the northern portion of the Site will be excavated to a greater depth to accommodate the elevator shaft. The western portion of the Site will be graded for the installation of the first floor slab. Additional excavation and removal of soil from two hot spot locations where contaminants exceed the Site-Specific Track 4 SCOs, to 5 feet and 13.5 feet at the northwestern and southeastern hot spot locations, respectively.
6. Collection and analysis of end-point samples to determine performance of the remedy with respect to attainment of Site Specific Track 4 SCOs.
7. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a photoionization detector (PID).
8. Removal of underground storage tanks (if encountered) and closure of petroleum spills (if evidence of a spill/leak is encountered during Site excavation) in compliance with applicable local, State and Federal laws and regulations.
9. Transportation and off-Site disposal of all soil/fill material (including hazardous waste, if any) 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.
10. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations (if any).

-
11. Placement of a demarcation layer above the residual soil/fill.
 12. Installation of a vapor barrier system beneath the building slab as well as behind foundation sidewalls of the new building. The vapor barrier will consist of Grace Preprufe[®] 300R (or equivalent).
 13. Construction and maintenance of an engineered composite cover consisting of concrete building foundations to prevent human exposure to residual soil/fill remaining under the Site.
 14. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
 15. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
 16. Submission of a Remedial Closure Report (RCR) that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP, and describes all Engineering and Institutional Controls to be implemented at the Site.
 17. Submission of an approved Site Management Plan (SMP) in the RCR for long-term management of residual contamination, including plans for operation, monitoring and certification of Engineering and Institutional Controls and reporting at a specified frequency.
 18. The Site will continue to be registered with a Restrictive Declaration (RD) at the NYC Buildings Department. Establishment of Engineering Controls and a requirement that management of these controls must be in compliance with an approved SMP. The SMP includes Institutional Controls that prohibits the following: (1) in-ground vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER-approval.

COMMUNITY PROTECTION STATEMENT

The Office of Environmental Remediation created the New York City Voluntary Cleanup Program (NYC VCP) to provide governmental oversight for the cleanup of contaminated property in NYC. This Draft Remedial Action Work Plan (“cleanup plan”) describes the findings of prior environmental studies that show the location of contamination at the site, and describes the plans to clean up the site to protect public health and the environment.

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

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

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

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

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

Site Safety Coordinator. This project has a designated Site safety coordinator to implement the Health and Safety Plan. The safety coordinator maintains an emergency contact sheet and protocol for management of emergencies. The Site safety coordinator is Mark Jepsen and can be reached at 646-388-9567.

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

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

Odor, Dust and Noise Control. This cleanup plan includes actions for odor and dust control. These actions are designed to prevent off-Site odor and dust nuisances and includes steps to be taken if nuisances are detected. Generally, dust is managed by application of physical covers and by water sprays. Odors are controlled by limiting the area of open excavations, physical covers, spray foams and by a series of other actions (called operational measures). The project is also required to comply with NYC noise control standards. If you observe problems in these areas, please contact the Project Manager Deborah Shapiro at 646-388-9544 or NYC Office of Environmental Remediation Project Manager Horace Zhang at 212-341-2034.

Quality Assurance. This cleanup plan requires that evidence be provided to illustrate that all cleanup work required under the plan has been completed properly. This evidence will be

summarized in the final report, called the Remedial Action Report. This report will be submitted to the NYC Office of Environmental Remediation and will be thoroughly reviewed.

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

Hours of Operation. The hours for operation of cleanup will comply with the NYC Department of Buildings construction code requirements or according to specific variances issued by that agency.

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

Complaint Management. The contractor performing this cleanup is required to address all complaints. If you have any complaints, you can call the Project Manager Deborah Shapiro at 646-388-9544 or NYC Office of Environmental Remediation Project Manager Horace Zhang at 212-341-2034, or call 311 and mention the Site is in the NYC Voluntary Cleanup Program.

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

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

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

Stockpile Management. Soil stockpiles will be kept covered with tarps to prevent dust, odors and erosion. Stockpiles will be frequently inspected. Damaged tarp covers will be promptly replaced. Stockpiles will be protected with silt fences. Hay bales will be used, as needed to protect storm water catch basins and other discharge points.

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

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

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

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

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

Final Report. The results of all cleanup work will be fully documented in a final report (called a Remedial Action Report) that will be available for you to review in the public document

repositories located at The New York Public Library: Mulberry Street Library Branch, 10 Jersey Street, New York, New York.

Long-Term Site Management. To provide long-term protection after the cleanup is complete, the property owner will be required to comply with an ongoing Site Management Plan that calls for continued inspection of protective controls, such as Site covers. The Site Management Plan is evaluated and approved by the NYC Office of Environmental Remediation. Requirements that the property owner must comply with are defined in the property's deed. A certification of continued protectiveness of the cleanup will be required from time to time to show that the approved cleanup is still effective.

DRAFT REMEDIAL ACTION WORK PLAN

1.0 SITE BACKGROUND

This Draft Remedial Action Work Plan (RAWP) and site-specific Construction Health and Safety Plan (CHASP) have been developed for the Site located at 341 Canal Street/11 Greene Street in the SoHo section of Manhattan, New York (the Site). 11 Greene Street LLC has enrolled in the New York City Voluntary Cleanup Program to remediate the Site. This RAWP describes the remediation and/or mitigation activities to be implemented at the Site in coordination with the Office of Environmental Remediation (OER) for the purposes of satisfying the requirements of the Restrictive Declaration and obtaining a Notice To Proceed.

The site-specific CHASP (Appendix A) 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 an approximately 13,200-square foot parcel located in the SoHo neighborhood of Manhattan and is identified as Block 229, Lot 1. The surrounding area primarily includes mixed-use commercial and residential, commercial, residential, governmental, and light industrial uses. The Site is abutted to the north by mixed-use commercial and residential spaces, to the east by Greene Street, to the South by Canal Street, and to the west by a parking garage and residential and commercial spaces. The Site location is shown on Figure 1. A Site Plan depicting the Site boundary is provided as Figure 2.

1.2 Proposed Redevelopment Plan

The proposed development project consists of a seven-story mixed-use commercial and residential building with a partial basement totaling approximately 66,000 gross square feet. The basement and first floors will be used for commercial/retail purposes, with mechanical equipment, storage, and auxiliary space in the basement level. The second through seventh floors will be used for residential purposes, comprising 31 dwelling units. Roof terraces and mechanical equipment will occupy the roof. There will be no on-site parking. The current zoning designation is M1-5B (special mixed-use district for residential and industrial uses in

loft buildings). The proposed use is consistent with existing zoning for the Site.

The redevelopment plan includes excavation on the eastern portion of the Site to a depth of approximately 12 feet below street grade to accommodate a partial cellar for the new building's storage, fitness room, and mechanical spaces. One hotspot location on the northwestern portion of the Site will be excavated to approximately 5 feet below grade, and a second hot spot location on the southeastern portion of the Site will be excavated to approximately 13.5 feet below grade. No excavation other than what is required for Site grading and hot spot removal is planned for the western portion of the Site. The construction plan includes a full build-out of the Site. Based on the Remedial Investigation conducted at the Site in October 2014, the water table is expected at approximately 12.5 to 13.5 feet below current grade.

The Site is currently free of structures and the current surface grade and lies at sidewalk level. It is estimated that up to 12 feet of soil on the eastern portion of the Site, totaling approximately 4,000 tons, will require excavation and off-site disposal to facilitate installation of the proposed new building foundation. Foundation plans and architectural drawings of the proposed building are included in Appendix B.

1.3 Description of Surrounding Property

The surrounding area primarily included mixed-use commercial and residential, commercial, residential, governmental, and light industrial uses. The Site is abutted to the north by mixed-use commercial and residential spaces, to the east by Greene Street, to the South by Canal Street, and to the west by a parking garage and residential and commercial spaces. Figure 3 shows the surrounding land use.

1.4 Environmental Investigation Reports

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

- *Environmental Assessment Statement*, 11 Greene Street, New York, NY, April 2007, by Ethan C. Eldon Associates.
- *Phase I Environmental Site Assessment*, 11 Greene Street, New York, NY, April 2007 by Ethan C. Eldon Associates.
- *Subsurface Soil Quality Characterization*, May 2007, by Galdun Frankel Environmental.

- *Phase II Work Plan*, 11 Greene Street, New York, NY, October 2014, by AKRF, Inc.
- *Remedial Investigation Report*, 341 Canal Street/ 11 Greene Street, New York, NY, November 2014, AKRF, Inc.

Digital (PDF) copies of the above referenced environmental documents are included as Appendix C.

The following work was conducted at the Site as part of the 2014 Remedial Investigation:

1. Conducted a Site inspection to identify the AOC (i.e., historic fill) and physical obstructions (i.e., structures, buildings, etc.);
2. Geophysical survey to identify potential unknown tanks or obstructions;
3. Installed six soil borings across the entire Site, and collected twelve soil samples for chemical analysis from the soil borings to evaluate soil quality;
4. Installed one temporary groundwater monitoring well at the Site and collected one groundwater sample from the temporary groundwater monitoring well and one groundwater sample from a previously installed permanent geotechnical groundwater monitoring well for chemical analysis to evaluate groundwater quality;
5. Installed four soil gas probes and collected four soil gas samples and one outdoor ambient air sample for chemical analysis.

1.5 Summary of Regulatory Correspondence

AKRF prepared a Phase II (Subsurface Investigation) Work Plan dated October 6, 2014, which was submitted to OER and approved in an email dated October 15, 2014.

1.6 Findings of Environmental Investigation

A summary of the 2014 Remedial Investigation findings is present below:

1. The sidewalk elevation of the Site is approximately 20 feet above the National Geodetic Vertical Datum (NGVD) of 1929 (an approximation of mean sea level).
2. Groundwater beneath the Site was encountered at approximately 12.5 to 13.5 feet below current grade.
3. Regional groundwater flow is generally from northeast to southwest beneath the Site.
4. Bedrock was not encountered during the October 2014 Remedial Investigation.
5. Stratigraphy at the Site is roughly 12 to 15 feet of historic fill characterized by brown sand and silt with gravel, asphalt, and concrete. Below the historic fill is a red-brown sand and silt stratum with trace clay and gravel to the termination of each boring. Wood was encountered at the bottom of soil boring SB-2. Bedrock was not encountered during this investigation. Suspect contamination (e.g., PID readings, staining, and odors) was observed in soil boring SB-6 between 11 and 20 feet below

- ground surface. Although some influence from past on-site historical use cannot be ruled out, these detections may be attributable to historic fill material in the soil borings and to apparent creosote-covered lumber observed in the soil boring SB-2 at a depth of approximately 15 feet below grade.
6. Soil/fill samples collected during the RI were compared to the Part 375 Unrestricted Use Soil Cleanup Objectives (USCOs) and Part 375 Restricted Residential Soil Cleanup Objectives (RRSCOs). A review of the soil/fill analytical results showed that the VOC acetone was detected in soil samples SB-3 (0-2) and SB-4 (13-15) at concentrations of 0.17 and 0.16 parts per million (ppm), respectively, above its USCO, but below its RRSCO. Benzene, m-xylene and p-xylene, o-xylene, and toluene were detected in soil sample SB-6 (13-15) at concentrations of 0.87 ppm, 4.3 ppm, 1.7 ppm, and 2.8 ppm, respectively, above their respective USCOs, but below their respective RRSCOs. The SVOCs 4-methylphenol, acenaphthene, fluorene, and phenol were detected above their respective USCOs in soil sample SB-6 (13-15) and chrysene was detected above its USCO in soil sample SB-4 (13-15), but below its RRSCO. Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene were detected in soil sample SB-6 (13-15), above their respective RRSCOs at concentrations ranging from 7.8 ppm to 180 ppm. Indeno(1,2,3-cd)pyrene was also detected in soil sample SB-4 (13-15) above its RRSCO at a concentration of 0.67 ppm. The metals barium (maximum of 509 ppm), lead (maximum of 1,970 ppm), mercury (maximum of 0.47 ppm), nickel (maximum of 46.4 ppm), and/ or zinc (maximum of 425 ppm) were detected above their respective USCOs and/or RRSCOs in soil samples SB-1 (3-5), SB-2 (0-2), SB-3 (10.5-12.5), SB-4 (0-2), SB-4 (13-15), SB-5 (3-5), SB-6 (0-2), and SB-6 (13-15). The PCB Aroclor 1248 was detected in soil sample SB-3 (10.5-12.5) at a concentration of 0.18 ppm, above the total PCB USCO of 0.1 ppm, but below the RRSCO of 1.0 ppm. No pesticides were detected above respective USCOs or RRSCOs in the soil samples. Soil samples SB-2 (13-15), SB-3 (10.5-12.5), SB-4 (0-2), and SB-6 (13-15) were not analyzed for pesticides.
 7. Groundwater samples collected during the RI were compared to the NYSDEC Class GA Ambient Standards. A review of the groundwater analytical results showed that the VOCs 1,2-dichloropropane, benzene, and chloroform were detected in at least one of the groundwater samples above their respective Class GA standard. No SVOCs were detected in the groundwater samples above their respective Class GA standard. Four total metals (iron, magnesium, manganese, and sodium) and three dissolved metals (magnesium, manganese, and sodium) were detected above the Class GA standards in groundwater sample TW-3. No PCBs or pesticides were detected in the groundwater samples above Class GA standards. Groundwater sample TW-3 was not analyzed for pesticides.
 8. Soil gas samples collected during the RI were compared to the NYSDOH Soil Vapor Intrusion Air Guidance Values (AGVs). A review of the soil gas analytical results identified the presence of 16 VOCs in the soil gas samples. VOCs associated with petroleum [including benzene, toluene, ethylbenzene, xylenes (collectively referred to

as BTEX), 1,2,4- and 1,3-dichlorobenzene, and 2,2,4-trimethylpentane, n-butane, n-heptane, and n-hexane] were detected at concentrations up to 67 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). Solvent-related VOCs [including isopropyl alcohol, tetrachloroethene (PCE), and methyl ethyl ketone (MEK)] were detected at concentrations up to 720 $\mu\text{g}/\text{m}^3$. PCE was detected in SG-3 and SG-4 at concentrations of 37 $\mu\text{g}/\text{m}^3$ and 32 $\mu\text{g}/\text{m}^3$, respectively, above its AGV of 30 $\mu\text{g}/\text{m}^3$. Low-level concentrations of these VOCs were also detected in the ambient air sample AA-1. The PCE concentrations are in the “no further action” and take reasonable and practical actions to identify source(s) and reduce exposures category established within the New York State Department of Health (NYSDOH) soil vapor guidance matrix. Acetone was detected in each of the soil gas samples; however, acetone is a common laboratory contaminant.

9. Based on an evaluation of the data and information from the investigation, there is some contaminated soil, groundwater, and soil gas present at the Site, particularly related to the historic fill present in each of the soil borings between 0 and 2 feet below grade and on the eastern portion of the Site within soil sample SB-6 (13-15). PCE was detected slightly above NYSDOH AGVs within soil gas samples SG-3 and SG-4. Based on field observations, some of these elevated levels of petroleum and solvent related compounds may be attributed to creosote-covered wood observed beneath an existing concrete foundation observed during the RI at approximately 15 feet below Site grade.

For environmental investigation data, consult reports listed in Section 1.4. Based on an evaluation of the environmental data and information, disposal of hazardous waste is a possibility at this Site.

2.0 DESCRIPTION OF REMEDIATION

2.1 Objectives

The Site remediation and mitigation objectives are:

2.1.1 Soil

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

2.1.2 Groundwater

- Prevent direct exposure to contaminated groundwater.
- Prevent exposure to potential off-site contaminants volatilizing from groundwater.

2.1.3 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.

2.2 Summary of Remedial Action

The proposed plan achieves all of the remedial action goals established for the project. The proposed remedial action is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants and uses standard methods that are well established in the industry.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP Citizen Participation activities according to an approved Citizen Participation Plan.
2. Performance of a Community Air Monitoring Program for particulates and volatile organic carbon compounds.
3. Establishment of Site-Specific (Track 4) Soil Cleanup Objectives (SCOs).
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs

and marking & staking excavation areas.

5. Excavation and removal of soil/fill exceeding Track 4 Site-Specific SCOs within the planned excavation area. The eastern portion of the Site where the partial basement will be located will be excavated to a depth of approximately 12 feet below grade. A small area at the northern portion of the Site will be excavated to a greater depth to accommodate the elevator shaft. The western portion of the Site will be graded for the installation of the first floor slab. Additional excavation and removal of soil from two hot spot locations where contaminants exceed the Site-Specific Track 4 SCOs, to 5 feet and 13.5 feet at the northwestern and southeastern hot spot locations, respectively.
6. Collection and analysis of end-point samples to determine performance of the remedy with respect to attainment of Site-Specific Track 4 SCOs.
7. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a photoionization detector (PID).
8. Removal of underground storage tanks (if encountered) and closure of petroleum spills (if evidence of a spill/leak is encountered during Site excavation) in compliance with applicable local, State and Federal laws and regulations.
9. Transportation and off-Site disposal of all soil/fill material (including hazardous waste, if any) 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.
10. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations (if any).
11. Placement of a demarcation layer above the residual soil/fill.
12. Installation of a vapor barrier system beneath the building slab as well as behind foundation sidewalls of the new building. The vapor barrier will consist of Grace Preprufe® 300R (or equivalent).
13. Construction and maintenance of an engineered composite cover consisting of concrete

building foundations to prevent human exposure to residual soil/fill remaining under the Site.

14. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.

15. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.

16. Submission of a Remedial Closure Report (RCR) that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, lists any changes from this RAWP, and describes all Engineering and Institutional Controls to be implemented at the Site.

17. Submission of an approved Site Management Plan (SMP) in the RCR for long-term management of residual contamination, including plans for operation, monitoring and certification of Engineering and Institutional Controls and reporting at a specified frequency.

18. The Site will continue to be registered with a Restrictive Declaration (RD) at the NYC Buildings Department. Establishment of Engineering Controls and a requirement that management of these controls must be in compliance with an approved SMP. The SMP includes Institutional Controls that prohibit the following: (1) in-ground 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.

2.3 Soil Cleanup Objectives and Soil/Fill Management

Site-Specific Track 4 Soil Cleanup Objectives (SCOs) are proposed for this project. The Site-Specific Track 4 SCOs are shown in Table 1.

Table 1: Site-Specific Track 4 SCOs

	SCO (parts per million)
Lead	1,200 ppm
Total Semivolatile Organic Compounds (SVOCs)	500 ppm

Site-Specific Track 4 SCOs were not established for VOCs; however, if evidence of a petroleum spill is encountered during excavation, CP-51 Table 3 for fuel oil will be used in addition to the Site-Specific Track 4 SCOs to close out the spill with NYSDEC. 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 D. The planned excavation areas are shown on Figure 4.

Any 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.

2.3.1 Estimated Soil/Fill Removal Quantities

The total quantity of soil/fill expected to be excavated and disposed off-site is approximately 4,000 tons. Disposal facilities will be reported to OER when they are identified, prior to the start of remedial action.

2.3.2 End-Point Sampling

Removal actions for development purposes under this plan will be performed in conjunction with confirmatory soil sampling. Two confirmation samples will be collected from the base of the excavation. Sample locations are shown on Figure 4. For comparison to Site-Specific Track 4 SCOs, analytes will only include trigger compounds and elements established on the Site-Specific SCO list.

Hot-spot removal actions, established under this RAWP, will be performed before or in conjunction with post remedial end-point samples to ensure that hot-spots are fully removed. Analytes for end-point sampling will be those parameters that

are driving the hot-spot removal action and have been approved by OER. Frequency for hot-spot end-point sample collection is as follows:

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, if needed, 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 to 3 above.

Post-remediation end-point sample locations and depth will be biased towards the areas and depths of highest contamination identified during previous sampling episodes unless field indicators such as field instrument measurements or visual contamination identified during the remedial action indicate that other locations and depths may be more heavily contaminated. In all cases, post-remediation samples should be biased toward locations and depths of the highest expected contamination.

New York State Environmental Laboratory Accreditation Program (ELAP) certified labs will be used for all confirmation and end-point sample analyses. Labs performing confirmation and end-point sample analyses will be reported in the RCR. The RCR will provide a tabular and map summary of all confirmation and end-point sample results and will include all data including non-detects and applicable standards and/or guidance values. Confirmation samples will be analyzed for compounds and elements as described above utilizing the following methodology:

- Soil analytical methods for endpoint samples will include the Site-Specific Track 4 SCOs.
- If either LNAPL and/or DNAPL are detected, appropriate samples will be collected for characterization and “fingerprint analysis” and required regulatory reporting (i.e., spills hotline) will be performed.

2.3.3 Quality Assurance/Quality Control (QA/QC)

The fundamental QA objective with respect to accuracy, precision, and sensitivity of analysis for laboratory analytical data is to achieve the QC acceptance of the analytical protocol. The accuracy, precision and completeness requirements will be addressed by the laboratory for all data generated.

One blind duplicate sample for every 20 samples collected will be submitted to the approved laboratory for analysis of the same parameters. One trip blank will be submitted to the laboratory with each shipment of soil samples for analysis of VOCs.

Samples will be collected in accordance with the following procedures:

- Record sample observations (e.g., evidence of contamination, PID readings, soil classification) in field log book.
- Collect an aliquot of soil or groundwater using a dedicated and disposable plastic sample spoon or sample bailer and place in laboratory-supplied sample jars. One grab sample will be collected for volatile organic compound analysis, if applicable. One composite sample will be collected for all other analyses.
- Seal and label the sample jars as described below and place in a chilled cooler.

Decontamination Procedures

To avoid contamination and cross-contamination of samples, only dedicated or disposable sampling equipment may be used to collect these samples. All non-disposable equipment involved in field sampling must be decontaminated before being brought to the sampling location, and must be properly decontaminated after use.

Sample Identification

All samples will be consistently identified in all field documentation, chain-of-custody documents and laboratory reports using an alpha-numeric or alpha-alpha

code. For stockpiled soil, the alpha prefix will be “SP” and the numbers following the alpha prefix will correspond to excavated stockpiles, beginning with “1, 2, 3...etc.” For example, the first sample collected from the first stockpile will be labeled “SP-1-1” and the first sample collected from the second stockpile will be labeled “SP-2-1.”

For groundwater samples, the alpha prefix will be “GW” and the number following the prefix will correspond to the sample number. For example, the first groundwater sample collected for sample analysis will be labeled “GW-1” and the second sample will be “GW-2.”

Sample Labeling and Shipping

All sample containers will be labeled with the following information:

- Site identification
- Sample identification
- Date and time of collection
- Analysis(es) to be performed
- Sampler’s initials

Once the samples are collected and labeled, they will be placed in chilled coolers and stored in a cool area away from direct sunlight to await shipment to the laboratory. Soil samples will be shipped to the laboratory at a frequency that will not result in an exceedance of applicable holding times for sample methods. At the start and end of each workday, field personnel will add ice to the coolers as needed.

The samples will be prepared for shipment by placing each sample jar in a sealable plastic bag, then wrapping each bag in bubble wrap to prevent breakage, adding freezer packs and/or fresh ice in sealable plastic bags and the chain-of-custody form. Samples will be shipped overnight (e.g., Federal Express) or transported by a laboratory courier. All coolers shipped to the laboratory will be sealed with mailing tape and a chain-of-custody (COC) seal to ensure that the coolers remain sealed during delivery.

Sample Custody

Field personnel will be responsible for maintaining the sample coolers in a secured location until they are picked up and/or sent to the laboratory. The record of possession of samples from the time they are obtained in the field to the time they are delivered to the laboratory or shipped off-site will be documented on COC forms. The COC forms will contain the following information: project name; names of sampling personnel; sample number; date and time of collection and matrix; and signatures of individuals involved in sample transfer, and the dates and times of transfers. Laboratory personnel will note the condition of the custody seal and sample containers at sample check-in.

Documentation

A sample log book will be maintained. The following information, as a minimum will be recorded to the log.

- Sample identification number
- Sample location
- Field observations
- Sample type
- Analyses
- Date/time of collection
- Collector's name
- Sample procedures and equipment utilized
- Date sent to laboratory/name of laboratory
- Copies of site drawings indicating stockpile numbers and locations

2.3.4 Import and Reuse of Soil

Import of soil onto the Site and reuse of soil already on-site will be performed in conformance with the Soil/Materials Management Plan in Appendix D. The current redevelopment plans do not include importing soil to the Site for backfill and cover soil and the on-site soil/fill is not expected to be reused/relocated on-Site.

2.4 Engineering Controls

The excavation required for the proposed Site development will strive to achieve Site-Specific Track 4 SCOs. Engineering Controls will be employed in the remedial action to address residual contamination remaining at the site after excavation for the proposed building. The Site has two primary Engineering Control Systems, including a composite cover system and a vapor barrier.

2.4.1 Composite Cover System

A permanent composite cover system will cover the entire Site. This cover system will be composed of the proposed new building foundation. The foundation will consist of foundation walls and a twelve-inch thick concrete-building slab. Figure 5 shows the extent of the composite cover system.

The composite cover system is a permanent engineering control for the Site. The system will be inspected and reported at specified intervals as required by this RAWP and the SMP. A Soil Management Plan will be included in the SMP and will outline the procedures to be followed in the event that the composite cover system and underlying residual soil/fill is disturbed after the remedial action is complete. Maintenance of this composite cover system will be described in the SMP in the RCR. Maintenance of this composite cover system will be described in the SMP in the RCR.

2.4.2 Vapor Barrier

As part of development, a vapor barrier will be installed below the foundation slab and walls. The vapor barrier will consist of Grace Preprufe[®] 300R (or equivalent) along the foundation walls and below the lowest level horizontal slab. The vapor barrier will be installed in accordance with the manufacturer's specifications, including those for sealing penetrations through the foundation. Proof of installation of the barrier will be included in the Professional Engineer (P.E.) certified RCR. The barrier specifications are provided in Appendix E. The barrier system is a permanent engineering control for the Site.

3.0 REMEDIAL ALTERNATIVES ANALYSIS

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

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

The following is a detailed description of the alternatives analysis and remedy selection to address impacted media at the Site. As required, two remedial alternatives (including a Track 1 scenario) are evaluated, as follows:

- **Alternative 1:**
 - Establishment of Unrestricted Use (Track 1) Soil Cleanup Objectives (SCOs).
 - Removal of all soil/fill exceeding Track 1 Unrestricted Use SCOs across the Site and confirmatory post-excavation endpoint sampling. Based on the results of the Remedial Investigation, it is expected that this alternative would require excavation to approximately 15 feet below grade throughout the Site to remove all historic fill. This would require over excavation by three feet on the eastern portion of the Site where

excavation for the partial basement is estimated at 12 feet below grade, and 15 feet on the western portion of the Site where no excavation is planned. .

- No engineering or institutional controls are required for a Track 1 cleanup, but a vapor barrier beneath the slab foundation and behind foundation sidewalls of the new building would be installed to prevent future exposures from off-site soil vapor.
- The proposed new building would serve as a final cover over the entire Site.

- **Alternative 2:**

- Establishment of Track 4 Site-Specific SCOs.
- Removal of all soil/fill exceeding Track 4 Site-Specific SCOs to the extent practicable and confirmation that Track 4 has been achieved with post-excavation endpoint sampling. The eastern portion of the Site where the partial basement will be located will be excavated to a depth of approximately 12 feet below grade. A small area at the northern portion of the Site will be excavated to a greater depth to accommodate the elevator shaft. The western portion of the Site will be graded for the installation of the first floor slab. Additional excavation and removal of soil from two hot spot locations where contaminants exceed the Site-Specific Track 4 SCOs, to 5 feet at the northwestern hot spot location and 13.5 feet at the southeastern hot spot locations. The proposed new building would serve as a final cover over the entire Site to eliminate exposure to remaining soil/fill.
- Placement of a vapor barrier beneath the building slab and outside foundation sidewalls to prevent soil vapor from entering the new building.
- Establishment of use restrictions including prohibitions on the use of groundwater from the Site and prohibitions on sensitive Site uses, such as farming or vegetable gardening, to eliminate future exposure pathways.
- Establishment of an approved Site Management Plan (SMP) to ensure long-term management of these engineering and institutional controls including the performance of periodic inspections and certification that the controls are performing as they were intended; and
- The Site will continue to be registered with a Restrictive Declaration at the NYC Buildings Department.

3.1 Threshold Criteria

3.1.1 Protection of Public Health and the Environment

This criterion is an evaluation of the remedy's ability to protect public health and the environment, and an assessment of how risks posed through each existing or potential pathway of exposure are eliminated, reduced, or controlled through

removal, treatment, and implementation of Engineering Controls or Institutional Controls. Protection of public health and the environment must be achieved for all approved remedial actions.

Alternative 1 would be protective of human health and the environment by removing all historic fill and contaminated soil exceeding Track 1 Unrestricted Use SCOs, thus eliminating potential for direct contact with contaminated soil/fill once construction is complete.

Alternative 2 would achieve comparable protections of human health and the environment by excavating the historic fill/contaminated soil within the new building footprint to approximately 12 feet below grade on the eastern portion of the Site where the partial basement will be located and the western portion of the Site will be graded for the installation of the first floor slab. A small area at the northern portion of the Site will be excavated to a greater depth to accommodate the elevator shaft. . . Additional excavation and removal of soil from two hot spot locations where contaminants exceed the Site-Specific Track 4 SCOs, to 5 feet at the northwestern hot spot location and 13.5 feet at the southeastern hot spot locations. This excavation plan will ensure that remaining soil/fill on-site meets Track 4 Site-Specific SCOs to the extent practicable, as well as by placement of Institutional Controls (ICs) and Engineering Controls (ECs), including a vapor barrier and a composite cover system. The composite cover system would prevent direct contact with any remaining on-site soil/fill. Implementing Institutional Controls, including a SMP and continued RD designation of the Site, would ensure that the composite cover system remains intact and protective. The vapor barrier would prevent vapor intrusion in new development and the composite cover system would prevent direct contact with any remaining on-site soil/fill and groundwater. Implementing institutional controls including continuation of the restrictive declaration and a SMP would ensure that the composite cover system remains intact and protective. Establishment of Track 4 Site-Specific SCOs would minimize the risk of contamination leaching into groundwater.

For both alternatives, potential exposure to contaminated soil during construction would be minimized by implementing a Construction Health and Safety Plan (CHASP), an approved Soil and Materials Management Plan (SMMP) and Community Air Monitoring Plan (CAMP). Groundwater encountered during construction would be appropriately managed in accordance with NYSDEC and/or NYCDEP requirements for dewatering. Groundwater is not used for potable water supply. Potential migration of soil vapors into the new building would be prevented by installing a vapor barrier beneath the new slab as part of new construction.

3.2 Balancing Criteria

3.2.1 Compliance with Standards, Criteria and Guidance (SCGs)

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

Alternative 1 would achieve compliance with the remedial goals, chemical-specific SCGs and RAOs by excavating all soil exceeding Track 1 Unrestricted Use SCOs. Compliance with SCGs for soil vapor would also be achieved by installation of a vapor barrier system, and a composite cover system.

Alternative 2 would achieve compliance with the remedial goals, chemical-specific SCGs and RAOs by excavating soil exceeding Track 4 Site Specific SCOs. Compliance with SCGs for soil vapor would also be achieved by installation of a vapor barrier system and a composite cover system. An SMP would ensure that these controls remained protective for the long term.

Health and safety measures contained in the CHASP and CAMP that comply with the applicable SCGs would be implemented during Site redevelopment under this RAWP. For both alternatives, focused attention on means and methods employed during the remedial action would ensure that handling and management of contaminated material would be in compliance with applicable SCGs. These measures would protect on-site workers and the surrounding community from exposure to Site-related contaminants.

3.2.2 Short-Term Effectiveness and Impacts

This evaluation criterion assesses the effects of the alternatives 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.

Both alternatives 1 and 2 have similar short-term effectiveness during their respective implementations, as each requires excavation of historic fill material. Both alternatives would result in short-term dust generation impacts associated with excavation, handling, load out of materials, and truck traffic. Short term impacts would be significantly higher for alternative 1 as excavation of significantly greater amounts of historical fill material would be anticipated below the required excavation depth of the proposed building (approximately 15 feet). However, focused attention to means and methods during the remedial action, including community air monitoring and appropriate truck routing, would minimize the overall impact of these activities.

An additional short-term adverse impact and risk to the community associated with both remedial alternatives is increased truck traffic. Up to approximately 135, 30-ton capacity truck trips would be necessary to transport fill and soil excavated during Site development under alternative 2, whereas under alternative 1, assuming average fill thickness of 15 feet, approximately 370 truck trips would be required.

Both remedial alternatives would also employ appropriate measures to prevent short-term impacts through the use of a Construction Health and Safety Plan (CHASP), an SMMP and a Community Air Monitoring Plan (CAMP), during all on-site soil disturbance activities, and would effectively mitigate the release of significant contaminants into the environment by properly handling and disposing of soil encountered during the development. Both alternatives provide short term

effectiveness in protecting the surrounding community by decreasing the risk of contact with on-site contaminants. Construction workers operating under appropriate management procedures (Site-specific CHASP) would be protected from on-site contaminants through the use of the appropriate personal protective equipment.

3.2.3 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 achieve long-term effectiveness and permanence by permanently removing all impacted soil/fill material. Removal of on-site contaminant sources would prevent future groundwater contamination.

Alternative 2 would provide long-term effectiveness by removing a significant quantity of on-site contamination (up to approximately 4,000 tons of soil/fill are anticipated to be removed), installing a composite cover system across the Site, installing a vapor barrier, maintaining use restrictions, establishing an SMP to ensure long-term management of ICs and ECs, and leaving the RD in place to memorialize these controls for the long term. The SMP would ensure long-term effectiveness of all ECs and ICs by requiring periodic inspection and certification that these controls and use restrictions continue to be in place and are functioning as they were intended, assuring that protections designed into the remedy will provide continued high level of protection in perpetuity.

Both alternatives would result in removal of soil contamination exceeding the SCOs providing the highest level, most effective and permanent remedy over the

long-term with respect to a remedy for contaminated soil, which would eliminate any migration to groundwater. Potential sources of soil vapor and groundwater contamination would also be eliminated as part of the remedy.

3.2.4 Reduction of Toxicity, Mobility, or Volume of Contaminated Material

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

Alternative 1 would permanently eliminate the toxicity, mobility, and volume of contaminants from on-site soil by meeting Track 1 Unrestricted Use SCOs.

Alternative 2 would permanently reduce the toxicity, mobility, and volume of contaminants by removing approximately 4,000 tons of soil/fill present on the Site. Any remaining soil/fill beneath the Site would meet Track 4 Site-Specific SCOs or would be handled as residual contamination addressed via the composite site cover, vapor barrier, and implementation of the SMP. Alternative 1 would eliminate a greater total mass of contaminants on Site due to the additional excavation that would be required under this alternative.

3.2.5 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 proposed remedial action under Alternative 1 would likely not be feasible due to logistical limitations posed by the adjacent property owners. Removal of all soil/fill exceeding Track 1 Unrestricted Use SCOs would require underpinning of adjacent buildings. Underpinning and earthwork approval required for completion of the Site redevelopment and implementation of the remedy is not expected to be granted by adjacent property owners. Alternative 2 is feasible and implementable and uses reliable methods and standard construction technologies not reliant on the authorization of adjacent property owners. The techniques, materials and equipment to implement Alternative 2 are readily available and have been proven effective in remediating and/or mitigating the contaminants associated with the Site. OSHA trained personnel would complete all activities that include excavation and handling of any petroleum-contaminated or other soil with contamination beyond that associated with typical historical fill material. The reliability of Alternative 2 is also high. There are no special difficulties associated with any of the activities proposed.

3.2.6 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.

Although Alternative 1 would eliminate potential costs for investigation or remediation by future landowners or lessees, it would not be cost effective to remove all historic fill and other contaminated soil that exceeds the Unrestricted Use Track 1 SCOs during redevelopment due to the need to maintain structural stability of the adjacent buildings during excavation and the significantly higher volume of soil to be removed. Additionally, the removal of 15 feet of historic fill across the Site would require a dewatering permit. Initial costs associated with Alternative 1 would thus be significantly higher than Alternative 2. Long-term costs are anticipated to be slightly higher for Alternative 2 than Alternative 1, based on the need to implement a Site Management Plan as part of Alternative 2.

In both cases, appropriate public health and environmental protections are achieved.

The remedial plan creates an approach that combines the remedial action with the redevelopment of the Site, including the construction of the building foundation and adjacent properties. The remedial plan is also cost effective in that it will take into consideration the selection of the closest and most appropriate disposal facilities to reduce transportation and disposal costs during the excavation of historic fill and other soil during the redevelopment of the Site.

3.2.7 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 the proposed Site development, no adverse community opinion is anticipated during the project. This RAWP will be subject to and undergo public review under the NYC VCP and will provide the opportunity for detailed public input on the remedial alternatives and the selected remedial action. Any public comments related to environmental remediation will be considered by OER and 11 Greene Street LLC prior to the approval and execution of the remedial plan.

3.2.8 Land Use

This evaluation criterion addresses the proposed use of the Site. 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 floodplains, geography and geology; and current Institutional Controls applicable to the Site.

The remedial alternatives are appropriate with respect to the proposed use and to land uses in the vicinity of the Site. The proposed redevelopment of the Site is compatible with the existing zoning designation and is consistent with recent development patterns. Following remediation, the Site will meet Track 4 Site-Specific SCOs (with residual contamination addressed by Engineering Controls and Institutional Controls), which is appropriate for its planned residential and commercial mixed-use. The Site is surrounded by residential, commercial, and mixed-use properties. The proposed cleanup provides comprehensive protection of public health and the environment for these uses. Improvements in the current environmental condition of the Site achieved by both alternatives are also consistent with the City's goals for cleanup of contaminated land and bringing such land into productive reuse. Both alternatives are equally protective of natural resources and cultural resources.

3.2.9 Sustainability of the Remedial Action

This criterion evaluates the overall sustainability of the remedial action alternatives and the degree to which sustainable means are employed to implement the remedial action including those that take into consideration NYC's sustainability goals defined in *PlaNYC: A Greener, Greater New York*. Sustainability goals may include: maximizing the recycling and reuse of non-virgin materials; reducing the consumption of virgin and non-renewable resources; minimizing energy consumption and greenhouse gas emissions; improving energy efficiency; and promotion of the use of native vegetation and enhancing biodiversity during landscaping associated with Site development.

The remedial plan would take into consideration the shortest trucking routes during off-site disposal of historic fill and other soils, which would reduce greenhouse gas emissions and conserve energy used to fuel trucks. To the extent

practicable, energy efficient building materials, appliances, and equipment will be utilized to complete the development.

4.0 REMEDIAL ACTION MANAGEMENT

4.1 Project Organization and Oversight

Principal personnel who will participate in the remedial action include:

Michelle Lapin, P.E.	AKRF Remedial Director and New York State Professional Engineer
Marc Godick, LEP	AKRF Project Director
Deborah Shapiro, QEP	AKRF Project Manager and Quality Assurance Officer
Mark Jepsen	AKRF Field Team Leader and Site Safety Officer

4.2 Site Security

Site access will be controlled by construction fencing with gated entrances to the Site. Barriers will be installed as needed to delineate and restrict access to the work areas. If there are any work areas of limited size, barrier tape will be sufficient to delineate and restrict access.

4.3 Work Hours

The hours for operation of remedial construction will be from 7 am to 6 pm. These hours conform to the New York City Department of Buildings construction code requirements.

4.4 Construction Health and Safety Plan

The site-specific Construction Health and Safety Plan (CHASP) is included in Appendix A. The Site Safety Coordinator will be Mark Jepsen of AKRF. Remedial work performed under this RAWP will be in full compliance with applicable health and safety laws and regulations, including Site and OSHA worker safety requirements and HAZWOPER requirements. Confined space entry, if any, will comply with OSHA requirements and industry standards and will address potential risks. The parties performing the remedial construction work will ensure that performance of work is in compliance with the CHASP and applicable laws and regulations. The CHASP pertains to remedial and invasive work performed at the Site until 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. The 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.

4.5 Community Air Monitoring Plan

Real-time air monitoring for VOCs and particulate levels at the perimeter of the exclusion zone or work area will be performed using hand held field instrumentation. Continuous monitoring will be performed in the work zone for all ground intrusive activities involving the disturbance of soil 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 monitoring well cap or overturning soil, monitoring during well bailing/purging, and taking a reading prior to leaving a sample location. Depending upon the proximity of potentially exposed individuals, continuous monitoring may be performed during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence. Exceedences of action levels observed during performance of the Community Air Monitoring Plan

(CAMP) will be reported to the OER Project Manager and included in the Daily Report.

4.5.1 VOC Monitoring, Response Levels, and Actions

VOCs will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work using roving handheld field instrumentation. The air monitoring stations will be mobile (not fixed) and their locations will be dependent on the daily work activities. 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 will be recorded and be available for OER personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

4.5.2 Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored at periodic intervals at the upwind and downwind perimeters of the exclusion zone from temporary particulate monitoring locations with portable hand-held mobile, roving (not fixed) field instrumentation. 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. The following describes particulate response levels and actions:

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) 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 $150 \mu\text{g}/\text{m}^3$ 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 $150 \mu\text{g}/\text{m}^3$ 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 $150 \mu\text{g}/\text{m}^3$ of the upwind level and in preventing visible dust migration.

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

4.6 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 RAWP by OER does not constitute satisfaction of these requirements and will not be a substitute for any required permit.

4.7 Site Preparation

4.7.1 Pre-Construction Meeting

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

4.7.2 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.

4.7.3 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 Mark-out Ticket will be retained by the contractor prior to the start of drilling, excavation or other invasive subsurface operations. Overhead utilities may also be present within the anticipated work zones. Electrical hazards associated with drilling in the vicinity of overhead utilities will be prevented by maintaining a safe distance between overhead power lines and drill rig masts.

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

4.7.4 Equipment and Material Staging

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations. Staging and storage of equipment and materials will be contained within the secured Site. By the nature of the work involved in this project, equipment and materials will be moved to different areas within the secured Site as work progresses.

4.7.5 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.

4.7.6 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.

4.8 Traffic Control

Drivers of trucks leaving the Site with soil/fill will be instructed to proceed without stopping in the vicinity of the Site to prevent neighborhood impacts. The planned route on local roads for trucks leaving the Site will be reported to OER when they are identified and prior to the start of remedial action.

4.9 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.

4.10 Reporting and Record Keeping

4.10.1 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 data, if any; and
- Photographs of notable Site conditions and activities.

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

An alpha-numeric grid map will be used to identify locations described in reports submitted to OER. The alpha-numeric grid is shown on Figure 6.

4.10.2 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).

4.11 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.

4.12 Deviations from the Remedial Action Work Plan

All changes to the RAWP 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 RAWP will include a request for approval for the change from OER noting the following:

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

5.0 REMEDIAL CLOSURE REPORT

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

- Information required by this RAWP.
- 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 RAWP and associated design documents.
- Tabular summary of all end point sampling results (if necessary), 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 (if any).
- 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 RCR. The certification will include the following statements:

I, Michelle Lapin, 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 341 Canal Street/11 Greene Street site, VCP Site Number TBD.

I certify that the OER-approved Remedial Action Work Plan dated December 2014 and Stipulations in a letter, 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.

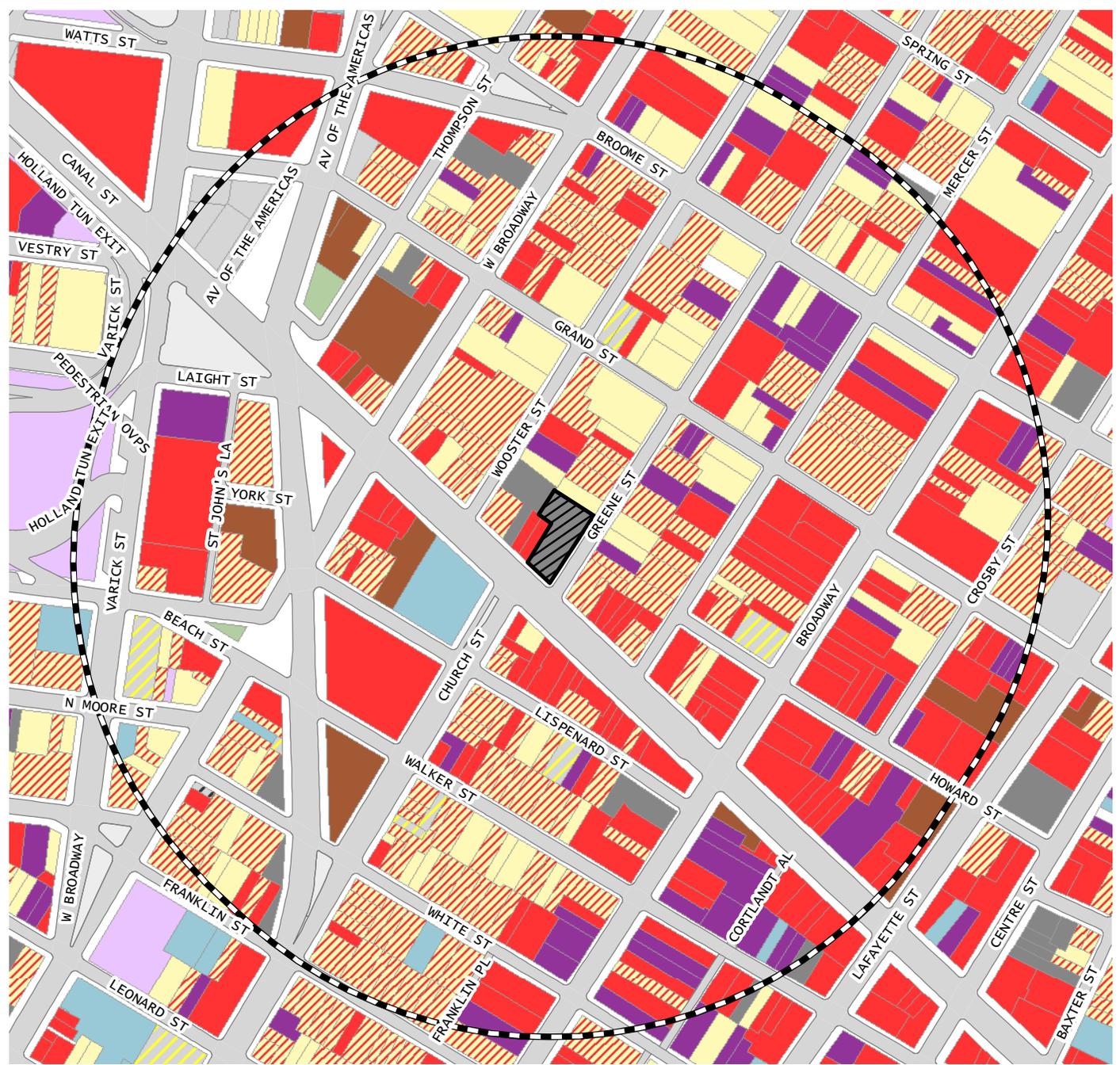
6.0 SCHEDULE

The following table 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 10-month remediation period is anticipated.

Schedule Milestone	Approximate Remedial Action Start Date
OER Approval of RAWP	December 2014
Demolition of On-Site Structure	December 2014
Soil Waste Classification Testing	December 2014/January 2015
Mobilization of Heavy Equipment/Security	January 2015
Remedial Excavation	January/February 2015
Installation of Concrete Foundation/Vapor Barrier	April/May 2015
Submit Remedial Closure Report	Fall 2015

FIGURES

© 2011 AKRF, Inc. Environmental Consultants O:\Projects\12054 - 11 GREENE ST\Hazmat\Fig 3 Surrounding Land Use.mxd



Legend

Property Boundary	Parking Facilities
1000 ft radius	Public Facilities and Institutions
Land Use 2014	
No Data	Residential
Commercial and Office Buildings	Residential with Commercial Below
Hotels	Transportation and Utility
Industrial and Manufacturing	Vacant Land
Open Space and Outdoor Recreation	Vacant Building
	Under Construction

Source: NYCDCP (NYC Dept. of City Planning) GIS database

0 125 250 500
Feet

341 Canal/11 Greene Street
Manhattan, New York



DATE 12/7/2014
PROJECT No. 12054
FIGURE 3

SURROUNDING LAND USE

Engineering, P.C.
440 Park Avenue South, New York, N.Y. 10016



- LEGEND:**
- PROJECT SITE BOUNDARY
 - PROPOSED HOTSPOT EXCAVATION TO 5' BELOW GRADE
 - EXCAVATION TO 12' BELOW GRADE
 - PROPOSED HOTSPOT EXCAVATION TO 13.5' BELOW GRADE
 - EXCAVATION TO 15.5' BELOW GRADE
 - PROPOSED HOTSPOT ENDPOINT SAMPLE LOCATION
 - PROPOSED CONFIRMATION ENDPOINT SAMPLE LOCATION



341 Canal/11 Greene Street
Manhattan, New York

AKRF
Engineering, P.C.
440 Park Avenue South, New York, NY 10016

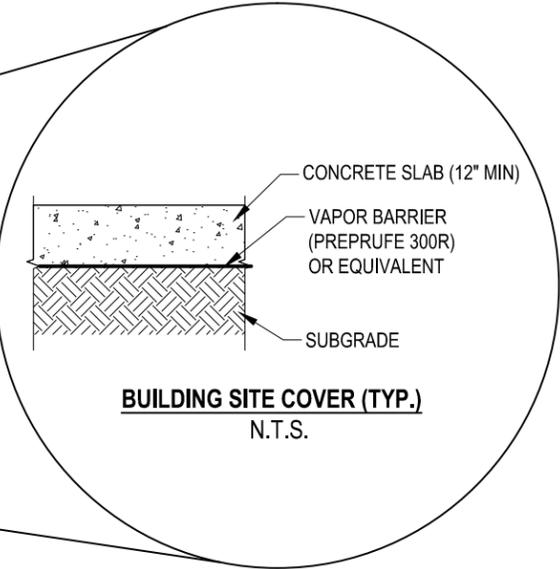
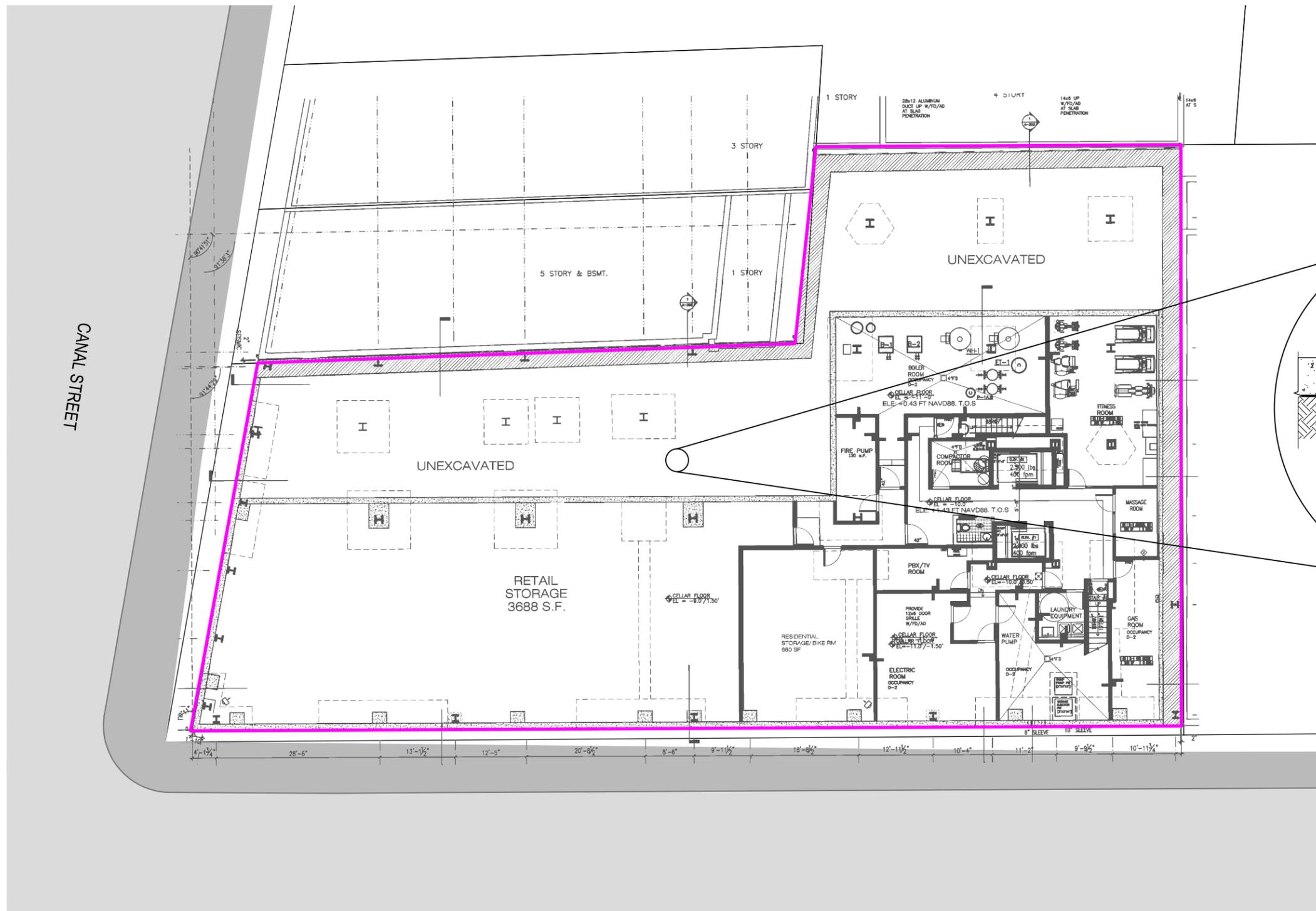
**PROPOSED EXCAVATION AREA AND
ENDPOINT SAMPLE LOCATION PLAN**

DATE
12.7.2014

PROJECT NO.
12054

SCALE
as shown

FIGURE
4



BUILDING SITE COVER (TYP.)
N.T.S.

LEGEND:
— PROJECT SITE BOUNDARY



Engineering, P.C.
440 Park Avenue South, New York, NY 10016

341 Canal/11 Greene Street
Manhattan, New York

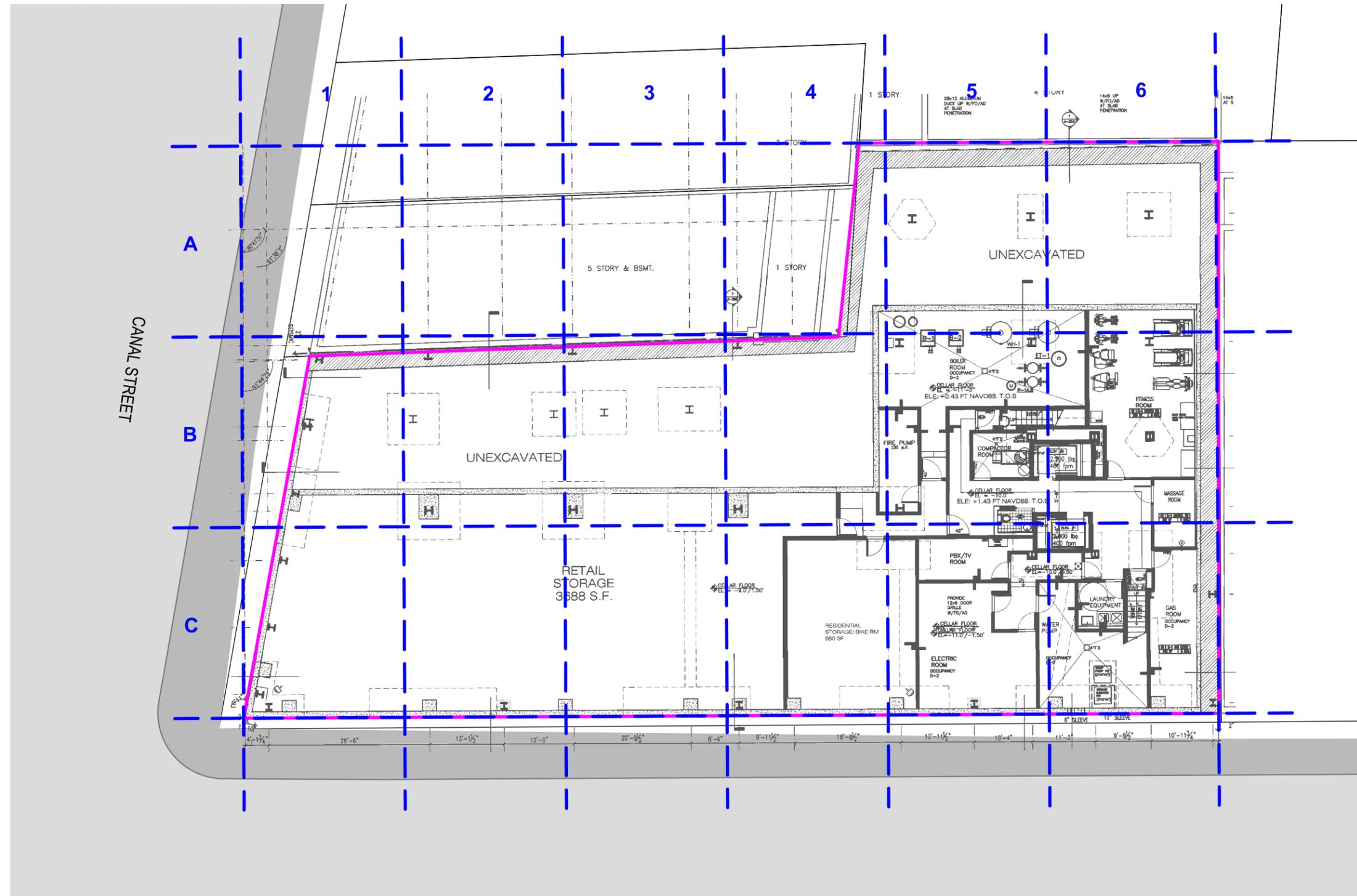
EXTENT OF COMPOSITE SITE COVER SYSTEM

DATE
12.7.2014

PROJECT NO.
12054

SCALE
as shown

FIGURE
5



LEGEND:

 PROJECT SITE BOUNDARY

 ALPHA NUMERIC SOIL CHARACTERIZATION GRID



341 Canal/11 Greene Street
Manhattan, New York

SITE PLAN WITH ALPHANUMERIC GRID

AKRF
Engineering, P.C.
440 Park Avenue South, New York, NY 10016

DATE
12.7.2014

PROJECT NO.
12054

SCALE
as shown

FIGURE
6



Legend

-  Site Location
-  Route To Hospital
-  Hospital Location



341 Canal/11 Greene Street
Manhattan, New York

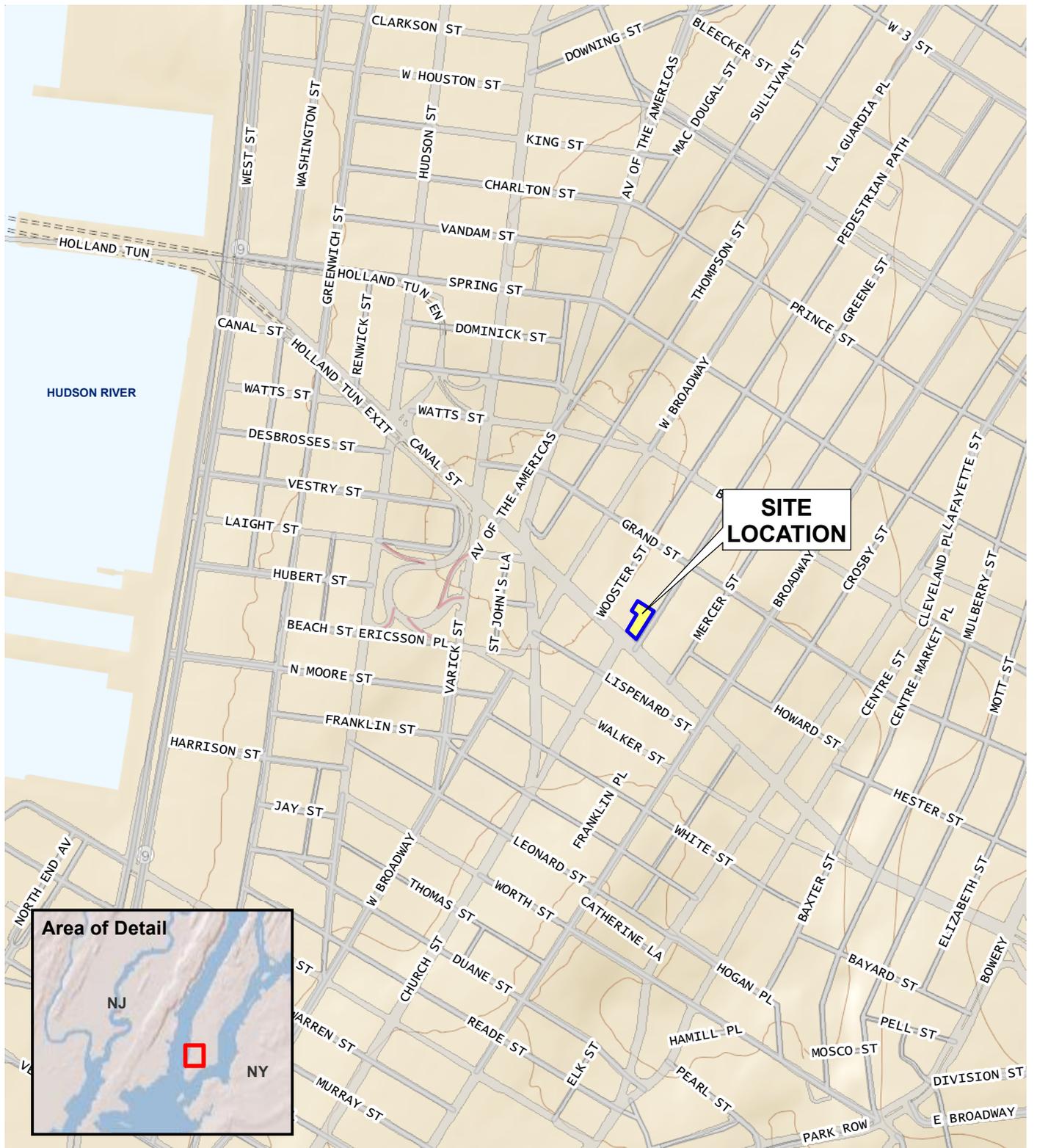
HOSPITAL LOCATION MAP



Engineering, P.C.
440 Park Avenue South, New York, N.Y. 10016

DATE	12/7/2014
PROJECT No.	12054
FIGURE	1

© 2014 AKRF, Inc. Environmental Consultants O:\Projects\12054 - 11 GREENE ST\Hazmat\Fig_1_prop_loc_map.mxd



SOURCE
 USGS 7.5 Minute Topographic Map
 Jersey City Quad 2011



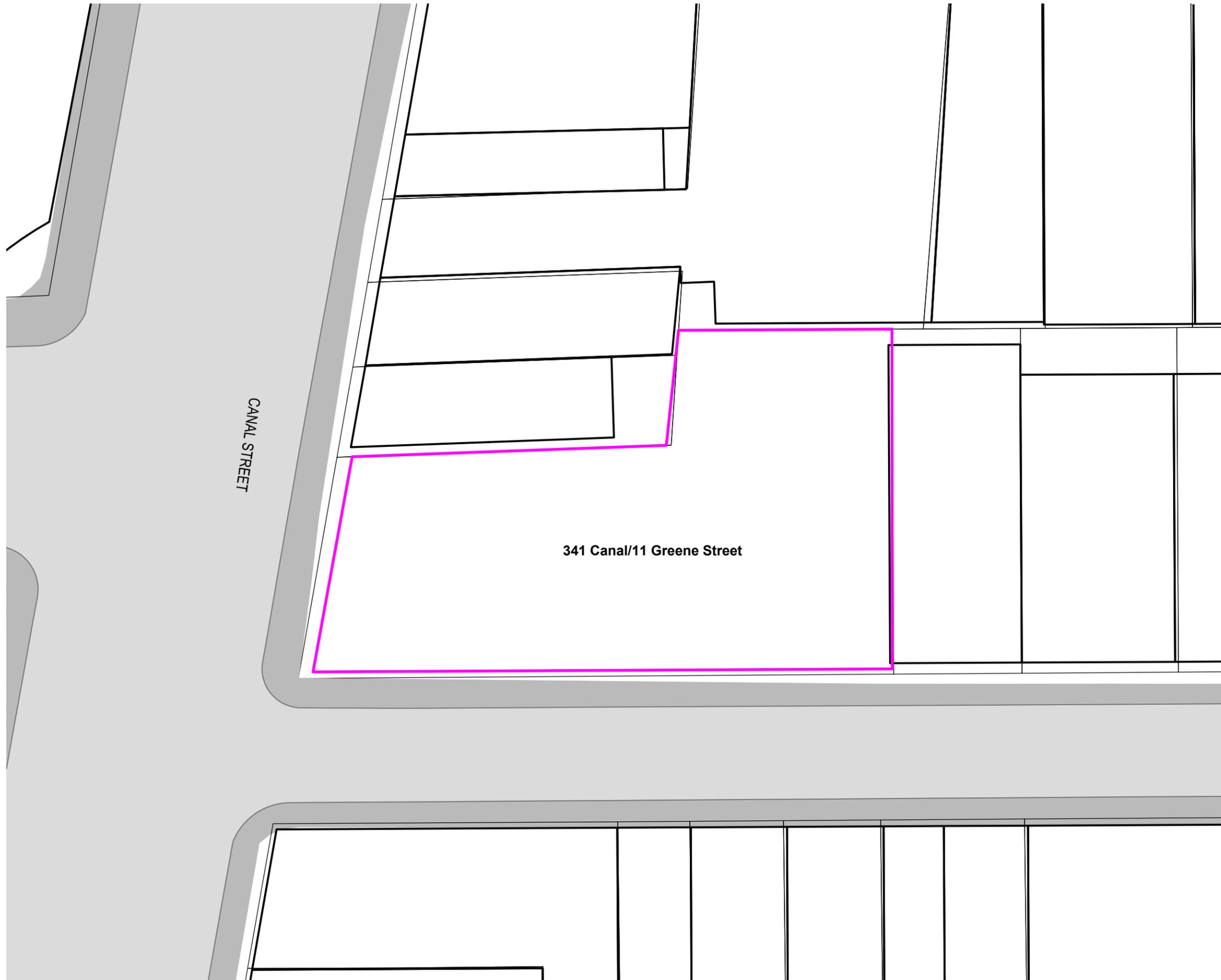
341 Canal/11 Greene Street
 Manhattan, New York

SITE LOCATION



Engineering, P.C.
 440 Park Avenue South, New York, N.Y. 10016

DATE	12/7/2014
PROJECT No.	12054
FIGURE	1



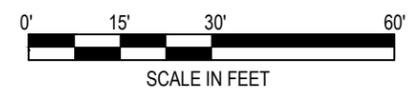
CANAL STREET

341 Canal/11 Greene Street



LEGEND:

- PROJECT SITE BOUNDARY
- LOT LINE



Map Source:
NYCDDCP (NYC Dept. of City Planning 2014) GIS database

341 Canal/11 Greene Street
Manhattan, New York

SITE PLAN

DATE
12.7.2014

PROJECT NO.
12054

SCALE
as shown

FIGURE
2



Engineering, P.C.
440 Park Avenue South, New York, NY 10016

APPENDIX A
CONSTRUCTION HEALTH AND SAFETY PLAN
(CHASP)

341 Canal Street/11 Greene Street
MANHATTAN, NEW YORK

Construction Health and Safety Plan

VCP Site Number: TBD
Restrictive Declaration Site Number: 15RHAZ158M
CEQR Number: 07DCP038M

Prepared for:
11 Greene Street LLC
174 Hudson Street, 6th Floor
New York, NY 10013

Prepared by:



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

DECEMBER 2014

TABLE OF CONTENTS

1.0	PURPOSE	1
2.0	APPLICABILITY	1
3.0	SITE DESCRIPTION	1
3.1	General Information	1
3.2	Hazard Potential	1
3.3	Hazard Evaluation	3
3.3.1	Hazards of Concern	3
3.3.2	Physical Characteristics.....	3
3.3.3	Hazardous Materials.....	4
3.3.4	Known and Suspect Chemicals of Concern	4
3.3.5	West Nile Virus.....	5
4.0	HEALTH AND SAFETY OFFICER	5
5.0	TRAINING	5
6.0	GENERAL WORK PRACTICES	6
7.0	PERSONAL PROTECTIVE EQUIPMENT & AIR MONITORING.....	6
7.1	Personal Protective Equipment.....	6
7.2	Work Zone Air Monitoring	7
8.0	DECONTAMINATION PROCEDURES	8
8.1	Personnel Decontamination.....	8
8.2	Sampling Equipment Decontamination.....	9
8.3	Heavy Equipment Decontamination.....	9
9.0	EMERGENCY RESPONSE.....	9
9.1	Emergency Procedures	9
9.1.1	Chemical Exposure	9
9.1.2	Personal Injury	10
9.1.3	Evacuation Procedures	10
9.1.4	Procedures Implemented in the Event of a Major Fire, Explosion, or Emergency	10
9.1.5	Spill Response.....	11
9.2	Hospital Directions.....	11
9.3	CHASP Contact Information.....	11
10.0	APPROVAL & ACKNOWLEDGMENTS OF CHASP	12

FIGURES

Figure 1 - Hospital Location Map

APPENDICES

- Appendix A - Potential Health Effects from On-site Contaminants
- Appendix B - West Nile Virus/St. Louis Encephalitis Prevention
- Appendix C - Report Forms
- Appendix D - Emergency Hand Signals

1.0 PURPOSE

The purpose of this Construction Phase Environmental Health and Safety Plan (“CHASP”) is to assign responsibilities, establish personnel protection standards and mandatory safety practices and procedures, and provide for contingencies that may arise during construction at the Site. The CHASP is intended to minimize health and safety risks resulting from the known and potential presence of hazardous materials on the Site.

This plan is not designed to address potential geotechnical, mechanical, or structural safety concerns, nor to supersede or replace any OSHA regulation and/or local and state construction codes or regulations.

2.0 APPLICABILITY

Work subject to this CHASP includes activities that disturb the existing soil on-site. The contractors and their subcontractors involved in the construction project will provide a copy of this CHASP to their employees whose work involves any potential exposure to the on-site chemical hazards, and will complete all work in accordance with this CHASP.

3.0 SITE DESCRIPTION

3.1 General Information

The Site is located at 341 Canal Street/11 Greene Street in the SoHo section of Manhattan, New York and is identified as Block 229, Lot 1 on the New York City Tax Map. The Site is approximately 13,200-square feet and is bounded by commercial and residential spaces to the north, Canal Street to the south, Greene Street to the east, and a parking garage and mixed-use commercial and residential spaces to the west. Currently, the Site is asphalt-paved and is used for public parking.

The proposed development project consists of a seven-story mixed-use commercial and residential building with a partial basement totaling approximately 66,000 gross square feet. The basement and first floors will be used for commercial/retail purposes, with mechanical equipment, storage, and auxiliary space in the basement level. The second through seventh floors will be used for residential purposes, comprising 31 dwelling units. Roof terraces and mechanical equipment will occupy the roof. There will be no on-site parking. The current zoning designation is M1-5B (special mixed-use district for residential and industrial uses in loft buildings). The proposed use is consistent with existing zoning for the Site.

3.2 Hazard Potential

A Remedial Investigation (RI) was performed by AKRF, Inc. (AKRF) and an Environmental Assessment Statement, a Phase I Environmental Assessment, and a Subsurface Soil Quality Characterization were previously performed by others at the Site to compile and evaluate data and information necessary to develop this CHASP. Significant findings of the RI which are pertinent to the development activities proposed for the Site include the following:

Soil/fill samples collected during the RI were compared to the Part 375 Unrestricted Use Soil Cleanup Objectives (USCOs) and Part 375 Restricted Residential Soil Cleanup Objectives (RRSCOs). A review of the soil/fill analytical results showed that the VOC acetone was detected in soil samples SB-3 (0-2) and SB-4 (13-15) at concentrations of 0.17 and 0.16 parts per million (ppm), respectively, above its USCO, but below its RRSCO. Benzene, m-xylene and p-xylene, o-

xylene, and toluene were detected in soil sample SB-6 (13-15) at concentrations of 0.87 ppm, 4.3 ppm, 1.7 ppm, and 2.8 ppm, respectively, above their respective USCOs, but below their respective RRSCOs. The SVOCs 4-methylphenol, acenaphthene, fluorene, and phenol were detected above their respective USCOs in soil sample SB-6 (13-15) and chrysene was detected above its USCO in soil sample SB-4 (13-15), but below its RRSCO. Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene were detected in soil sample SB-6 (13-15), above their respective RRSCOs at concentrations ranging from 7.8 ppm to 180 ppm. Indeno(1,2,3-cd)pyrene was also detected in soil sample SB-4 (13-15) above its RRSCO at a concentration of 0.67 ppm. The metals barium (max of 509 ppm), lead (max of 1,970 ppm), mercury (max of 0.47 ppm), nickel (max of 46.4 ppm), and/ or zinc (max of 425 ppm) were detected above their respective USCOs and/or RRSCOs in soil samples SB-1 (3-5), SB-2 (0-2), SB-3 (10.5-12.5), SB-4 (0-2), SB-4 (13-15), SB-5 (3-5), SB-6 (0-2), and SB-6 (13-15). The PCB Aroclor 1248 was detected in soil sample SB-3 (10.5-12.5) at a concentration of 0.18 ppm, above the total PCB USCO of 0.1 ppm, but below the RRSCO of 1.0 ppm. No pesticides were detected above respective USCOs or RRSCOs in the soil samples. Soil samples SB-2 (13-15), SB-3 (10.5-12.5), SB-4 (0-2), and SB-6 (13-15) were not analyzed for pesticides.

Groundwater samples collected during the RI were compared to the NYSDEC Class GA Ambient Standards. A review of the groundwater analytical results showed that the VOCs 1,2-dichloropropane, benzene, and chloroform were detected in at least one of the groundwater samples above their respective Class GA standard. No SVOCs were detected in the groundwater samples above their respective Class GA standard. Four total metals (iron, magnesium, manganese, and sodium) and three dissolved metals (magnesium, manganese, and sodium) were detected above the Class GA standards in groundwater sample TW-3. No PCBs or pesticides were detected in the groundwater samples above Class GA standards. Groundwater sample TW-3 was not analyzed for pesticides.

Soil gas samples collected during the RI were compared to the NYSDOH Soil Vapor Intrusion Air Guidance Values (AGVs). A review of the soil gas analytical results identified the presence of 16 VOCs in the soil gas samples. VOCs associated with petroleum [including benzene, toluene, ethylbenzene, xylenes (collectively referred to as BTEX), 1,2,4- and 1,3-dichlorobenzene, and 2,2,4-trimethylpentane, n-butane, n-heptane, and n-hexane)] were detected at concentrations up to 67 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). Solvent-related VOCs [including isopropyl alcohol, PCE, and methyl ethyl ketone (MEK)] were detected at concentrations up to 720 $\mu\text{g}/\text{m}^3$. PCE was detected in SG-3 and SG-4 at concentrations of 37 $\mu\text{g}/\text{m}^3$ and 32 $\mu\text{g}/\text{m}^3$, respectively, above its AGV of 30 $\mu\text{g}/\text{m}^3$. Low-level concentrations of these VOCs were also detected in the ambient air sample AA-1. The PCE concentrations are in the no further action and take reasonable and practical actions to identify source(s) and reduce exposures category established within the state DOH soil vapor guidance matrix. Acetone was detected in each of the soil gas samples; however, acetone is a common laboratory contaminant.

Based on an evaluation of the data and information from the investigation, there is some contaminated soil, groundwater, and soil gas present at the Site, particularly related to the historic fill present in each of the soil borings between 0 and 2 feet below grade and on the eastern portion of the Site within soil sample SB-6 (13-15). PCE was detected slightly above NYSDOH AGVs within soil gas samples SG-3 and SG-4. Based on field observations, some of these elevated levels of petroleum and solvent related compounds may be attributed to apparent creosote-covered wood observed beneath an existing concrete foundation observed during the RI at approximately 15 feet below Site grade. These conditions have been considered in relation to the

development of this CHASP and worker safety during the redevelopment activities associated with the Site.

3.3 Hazard Evaluation

The most likely routes of exposure are breathing of volatile and semivolatile compounds or particulate-laden air released during soil disturbing activities, dermal contact, and accidental ingestion. Appendix A includes specific health effects from the known on-site chemicals. The remaining sections of this CHASP address procedures (including training, air monitoring, work practices and emergency response) to reduce the potential for unnecessary and unacceptable exposure to these contaminants.

The potential adverse health effects from these detected contaminants are diverse. Many of these compounds are known or suspected to result in chronic illness from long-term exposures. However, due to the limited nature of the proposed construction, only acute effects are a potential concern.

This CHASP addresses potential environmental hazards from the presence of hazardous materials. It is not intended to address the normal hazards of construction work, which are separately covered by OSHA regulations and/or local and state construction codes and regulations. Although some of the chemicals of concern listed in the sections below were not detected during the Phase II study conducted, they are included here as a precaution.

3.3.1 Hazards of Concern

Check all that apply		
<input checked="" type="checkbox"/> Organic Chemicals	<input checked="" type="checkbox"/> Inorganic Chemicals	<input type="checkbox"/> Radiological
<input type="checkbox"/> Biological	<input type="checkbox"/> Explosive/Flammable	<input type="checkbox"/> Oxygen Deficient Atm.
<input checked="" type="checkbox"/> Heat Stress	<input checked="" type="checkbox"/> Cold Stress	<input type="checkbox"/> Other
Comments: No personnel are permitted to enter permit confined spaces.		

3.3.2 Physical Characteristics

Check all that apply		
<input checked="" type="checkbox"/> Liquid	<input checked="" type="checkbox"/> Solid	<input type="checkbox"/> Sludge
<input checked="" type="checkbox"/> Vapors	<input type="checkbox"/> Unknown	<input type="checkbox"/> Other
Comments:		

3.3.3 Hazardous Materials

Check all that apply					
Chemicals	Solids	Sludges	Solvents	Oils	Other
<input type="checkbox"/> Acids	<input checked="" type="checkbox"/> Ash	<input type="checkbox"/> Paints	<input checked="" type="checkbox"/> Halogens	<input type="checkbox"/> Transformer	<input type="checkbox"/> Lab
<input type="checkbox"/> Caustics	<input type="checkbox"/> Asbestos	<input type="checkbox"/> Metals	<input type="checkbox"/> Petroleum	<input type="checkbox"/> Other DF	<input type="checkbox"/> Pharm.
<input type="checkbox"/> Pesticides	<input type="checkbox"/> Tailings	<input type="checkbox"/> POTW	<input type="checkbox"/> Other	<input checked="" type="checkbox"/> Motor or Hydraulic Oil	<input type="checkbox"/> Hospital
<input checked="" type="checkbox"/> Petroleum	<input checked="" type="checkbox"/> Other: Fill Material	<input type="checkbox"/> Other – Tars & Other NAPL		<input checked="" type="checkbox"/> Gasoline	<input type="checkbox"/> Rad.
<input type="checkbox"/> Inks				<input checked="" type="checkbox"/> Fuel Oil	<input type="checkbox"/> MGP
<input checked="" type="checkbox"/> PCBs					<input type="checkbox"/> Mold
<input checked="" type="checkbox"/> Metals					<input type="checkbox"/> Cyanide
<input checked="" type="checkbox"/> Other: VOCs & SVOCs					

3.3.4 Known and Suspect Chemicals of Concern

Chemicals	REL/PEL/STEL (ppm)	Health Hazards
Acetone	REL= 590 mg/m ³ PEL= 2,400 mg/m ³	Irritation eyes, nose throat; headache; dizziness; central nervous system depression; dermatitis.
Barium	REL = 0.5 mg/m ³ PEL = 0.5 mg/m ³	Irritation eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscles spasm; slow pulse; extrasystoles; hypokalemia.
Benzene	REL = 0.1 ppm PEL = 1 ppm STEL = 5 ppm	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude, dermatitis; bone marrow depression, potential occupational carcinogen.
Chloroform	REL= 9.78 mg/m ³ [60-minute] PEL= 240 mg/m ³	Irritation eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude; anesthesia; enlarged liver; [potential occupational carcinogen]
Lead	REL = 0.05 mg/m ³ PEL = 0.05 mg/m ³	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension.
Manganese	REL= 1 mg/m ³ PEL= 5 mg/m ³ STEL= 3 mg/m ³	Manganism; asthenia; insomnia; mental confusion; metal fume fever; lower back pain; vomiting; malaise; lassitude; kidney damage.
Mercury	REL = 0.1 mg/m ³ PEL = 0.05 mg/m ³	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria.
Naphthalene	REL= 50 mg/m ³ PEL= 50 mg/m ³	Irritation eyes; headache; confusion; excitement; malaise; nausea; vomiting; abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria; renal shutdown; dermatitis; optical neuritis; corneal damage.
Nickel	REL= 0.007 mg/m ³ PEL= 0.007 mg/m ³	Headache; dizziness; nausea; vomiting; epigastric pain; substernal pain; cough; hyperpnoea; cyanosis; lassitude; leukocytosis; pneumonitis; delirium; convulsions.
Polychlorinated Biphenyls(PCBs)	REL = 0.001 mg/m ³ PEL = 0.5 mg/m ³ [skin]	Irritation eyes; chloracne; liver damage; reproductive effects; potential occupational carcinogen.
Phenol	REL= 19 mg/m ³ PEL= 19 mg/m ³ [skin]	Irritation eyes, nose, throat; anorexia, weight loss; lassitude; muscle ache, pain; dark urine; cyanosis; liver, kidney damage;

Chemicals	REL/PEL/STEL (ppm)	Health Hazards
		skin burns; dermatitis; ochronosis; tremor, convulsions, twitching.
Tetrachloroethene	REL = Minimize workplace exposure concentrations OSHA PEL = 100 ppm	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]
Toluene	REL = 100 ppm PEL = 200 ppm STEL = 300 ppm	Irritation eyes, nose; lassitude, confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage.
Xylenes	REL = 100 ppm PEL = 100 ppm	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, poor coordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis.
Comments: REL = National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit PEL = OSHA Permissible Exposure Limit STEL = OSHA Short Term Exposure Limit		

3.3.5 West Nile Virus

The only way to avoid infection of West Nile Virus and St. Louis encephalitis is to avoid mosquito bites. Information provided by the CDC Division of Vector-Borne Infectious Diseases on this issue is provided in Appendix B.

4.0 HEALTH AND SAFETY OFFICER

The contractor or engineer will designate one of its personnel as the Site Safety Officer (“SSO”). The SSO will be a competent person responsible for the implementation of this plan. The SSO will have completed a 40-hour training course (up-dated by an annual refresher) that meets OSHA requirements of 29 CFR Part 1910, Occupational Safety and Health Standards. The SSO has stop-work authorization, which he/she will execute on his/her determination of an imminent safety hazard, emergency situation, or other potentially dangerous situation. If the SSO must be absent from the site, he/she will designate a suitably qualified replacement that is familiar with the CHASP. If work is stopped for any reason, the NYC OER would be notified immediately.

5.0 TRAINING

All those who enter the work area while intrusive activities are being performed must recognize and understand the potential hazards to health and safety. All construction personnel upon entering the site must attend a brief training meeting, its purpose being to:

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

Each member of the construction crew will be instructed in these objectives before he/she goes onto the Site. Construction personnel will be responsible for identifying potential hazards in the work zone. The SSO or other suitably trained individual will be responsible for conducting the training program. Others who enter the Site must be accompanied by a suitably-trained construction worker.

6.0 GENERAL WORK PRACTICES

To protect the health and safety of the field personnel, all field personnel will adhere to the guidelines listed below during activities involving subsurface disturbance in contaminated areas.

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

7.0 PERSONAL PROTECTIVE EQUIPMENT & AIR MONITORING

7.1 Personal Protective Equipment

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

AKRF field personnel and other site personnel will wear, at a minimum, Level D personal protective equipment. The protection will be based on the air monitoring described in Section 7.2.

Level of Protection Summary

LEVEL OF PROTECTION & PPE	Excavation and Other Earth Moving Activities
Level D (x) Steel Toe Shoes (x) Hard Hat (within 25 ft of excavator) (x) Work Gloves (x) Safety Glasses () Face Shield (x) Ear Plugs (within 25 ft of excavator or jackhammer) () Latex Gloves	Yes
Level D – Modified <i>(in addition to Level D)</i> (x) Tyvek Coveralls (x) Nitrile Gloves () Overboots () Saranex Coveralls	As necessary
Level C (in addition to Level D – Modified) (x) Half-Face Respirator () Full Face Respirator () Full-Face PAPR () Particulate Cartridge () Organic Cartridge (x) Dual Organic/Particulate Cartridge	If PID > 10 ppm or particulate > 5 mg/m ³ (in breathing zone)
Comments: Cartridges to be changed out at least once per shift unless warranted beforehand (e.g., more difficult to breath or any odors detected).	

7.2 Work Zone Air Monitoring

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

Action Levels and Required Safety Response Actions

Instrument	Task to be Monitored	Action Level	Response Action
PID (OVM 580B or equivalent)	All Soil Movement Activities	Less than 10 ppm in breathing zone.	Level D or D-Modified
		Between 10 and 50 ppm	Level C
		More than 50 ppm	Stop work. Resume work when readings are less than 50 ppm.
Particulate monitor (Dustrak, MIE 1000 Personal DataRam or equivalent)	All Soil Movement Activities	Less than 5 mg/m ³	Level D
		Between 5 mg/m ³ and 125 mg/m ³	Level C. Apply dust suppression measures. If < 2.5 mg/m ³ , resume work using Level D. Otherwise, use Level C.
		Above 125 mg/m ³	Stop work. Apply additional dust suppression measures. Resume work when less than 125 mg/m ³ .

Field personnel will be trained in the proper operation of all field instruments at the start of the field program. Instruction manuals for the equipment will be on file at the Site for referencing proper operation, maintenance, and calibration procedures.

The equipment will be calibrated according to manufacturer specifications at the start of each day of fieldwork. If an instrument fails calibration, the project manager will be contacted immediately to obtain a replacement instrument and arrange for repairs. A calibration log will be maintained to record the date of each calibration, any failure to calibrate and corrective actions taken. The PID will be calibrated each day using 100 parts per million (ppm) isobutylene standard gas.

8.0 DECONTAMINATION PROCEDURES**8.1 Personnel Decontamination**

Personnel decontamination (decon), if deemed necessary by the SSO, will take place in a designated decontamination area. This area will be delineated during each stage of work. Personnel decontamination will consist of the following steps:

- Soap and potable water wash and potable water rinse of gloves;
- Coverall removal (if applicable);
- Glove removal;
- Disposable clothing removal; and
- Field wash of hands and face.

8.2 Sampling Equipment Decontamination

Any non-disposable sampling equipment for confirmatory sampling or other equipment that is in contact with contaminated materials will be decontaminated in accordance with the following procedure:

- Double wash with solution of Simple Green[®] and clean tap water;
- Double rinse with clean tap water;
- Rinse with clean distilled water; and
- Allow equipment to air dry.

8.3 Heavy Equipment Decontamination

If heavy equipment comes in contact with contaminated materials, it will be decontaminated prior to being relocated to a clean area or leaving the site. A designated decontamination pad will be constructed, where soil, dust, or oil will be washed off the exterior, undercarriage, and wheels or tracks of the equipment. Wash water will be collected for treatment and/or disposal.

9.0 EMERGENCY RESPONSE

9.1 Emergency Procedures

In the event that an emergency develops on Site, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on site; and
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.
- A spill of oil or other hazardous materials.

General emergency procedures, and specific procedures for personal injury, chemical exposure and radiation exposure, are described below. In the event of an accident or emergency, an Incident Report form should be filled out and placed in the project file. An example Weekly Safety Report Form and Incident Report Form are provided in Appendix C. Information on emergency hand signals is provided in Appendix D.

9.1.1 Chemical Exposure

If a member of the field crew demonstrates symptoms of chemical exposure the procedures outlined below should be followed:

- Another team member (buddy) should remove the individual from the immediate area of contamination. The buddy should communicate to the SSO (via voice and hand signals) of the chemical exposure. The SSO should contact the appropriate emergency response agency.
- Precautions should be taken to avoid exposure of other individuals to the chemical.
- If the chemical is on the individual's clothing, the chemical should be neutralized or removed if it is safe to do so.

- If the chemical has contacted the skin, the skin should be washed with copious amounts of water.
- In case of eye contact, an emergency eye wash should be used. Eyes should be washed for at least 15 minutes.
- All chemical exposure incidents must be reported in writing to the SSO. The SSO is responsible for completing the Incident Report Form.

9.1.2 Personal Injury

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

- Another team member (buddy) should signal the SSO that an injury has occurred.
- A field team member trained in first aid can administer treatment to an injured worker.
- If deemed necessary, the victim should then be transported to the nearest hospital or medical center. If necessary, an ambulance should be called to transport the victim.
- The SSO is responsible for making certain that an Incident Report Form is completed. This form is to be submitted to the SSO. Follow-up action should be taken to correct the situation that caused the accident.
- Any incident (near miss, property damage, first aid, medical treatment, etc.) must be reported.

A first-aid kit, eye-wash, and blood-borne pathogens kit will be kept on-site during the field activities.

9.1.3 Evacuation Procedures

- The SSO will initiate evacuation procedures by signaling to leave the Site or containment structure;
- All personnel in the work area should evacuate the area and meet in the common designated area;
- All personnel suspected to be in or near the contract work area should be accounted for and the whereabouts or missing persons determined immediately; and
- The SSO will then give further instruction.

9.1.4 Procedures Implemented in the Event of a Major Fire, Explosion, or Emergency

- Notify the paramedics and/or fire department, as necessary;
- Signal the evacuation procedure previously outlined and implement the entire procedure;
- Isolate the area;
- Stay upwind of any fire;
- Keep the area surrounding the problem source clear after the incident occurs;
- Complete accident report for and distribute to appropriate personnel.

9.1.5 Spill Response

All personnel must take every precaution to minimize the potential for spills during Site operations. Any spill will be reported immediately to the SSO. The SSO will immediately report any spills to the NYSDEC Spill Hotline. The OER will be provided with the spill numbers assigned by the NYSDEC.

Spill control apparatus (sorbent materials) will be located on-Site. All materials used for the clean-up of spills will be containerized and labeled separately from other wastes. The SSO, in consultation with AKRF’s Project Manager, will determine if additional spill response measures are required.

9.2 Hospital Directions

The location of the nearest hospital, as shown on Figure 1 Hospital Location Map, is **New York Presbyterian/Lower Manhattan Hospital**. The address of the hospital is 170 William Street, New York, NY 10038. Directions to the hospital are provided below.

Hospital Information and Directions

Hospital Name:	New York Presbyterian/Lower Manhattan Hospital
Phone Number:	(212) 312-5000
Address/Location:	170 William Street, New York, NY 10038
Directions to ER:	Head Northeast on Greene Street toward Grand Street. RIGHT onto Grant Street. RIGHT onto Lafayette Street. Lafayette turns SLIGHTLY RIGHT and becomes Centre Street. Merge onto Park Row. LEFT onto Spruce Street. RIGHT onto Gold Street. The emergency room will be on the RIGHT hand side of the street.

9.3 CHASP Contact Information

- AKRF Project Director – Marc Godick (914) 922-2356 (office)
- AKRF Project Manager – Deborah Shapiro (646) 388-9544 (office)
- AKRF Project Manager (Alternate) – Stephen Malinowski.....(631) 574-3724 (office)
- OER Project Manager – Horace Zhang.....(212) 341-2034 (office)
- Site Safety Officer (SSO) – Mark Jepsen(646) 388-9567 (office)
- SSO (Alternate) – Amy Jordan.....(646)388-9864 (office)
- New York Presbyterian/ Lower Manhattan Hospital..... (212) 312-5000
- Ambulance, Fire and Police Departments..... 911
- Local Poison Control (212) 764-7667
 pm/weekend (212) 340-4494
- NYSDEC Spill Response Team..... (800) 457-7362

FIGURE



Legend

-  Site Location
-  Route To Hospital
-  Hospital Location



341 Canal/11 Greene Street
Manhattan, New York



DATE	11/25/2014
PROJECT No.	12054
FIGURE	1

HOSPITAL LOCATION MAP

Environmental Consultants
440 Park Avenue South, New York, N.Y. 10016

APPENDIX A
POTENTIAL HEALTH EFFECTS FROM ON-SITE CONTAMINANTS

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

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

What is acetone?

(Pronounced äs/'i-tön')

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

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

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

What happens to acetone when it enters the environment?

- A large percentage (97%) of the acetone released during its manufacture or use goes into the air.
- In air, about one-half of the total amount breaks down from sunlight or other chemicals every 22 days.
- It moves from the atmosphere into the water and soil by rain and snow. It also moves quickly from soil and water back to air.

- Acetone doesn't bind to soil or build up in animals.
- It's broken down by microorganisms in soil and water.
- It can move into groundwater from spills or landfills.
- Acetone is broken down in water and soil, but the time required for this to happen varies.

How might I be exposed to acetone?

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

How can acetone affect my health?

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

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

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

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

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

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

How likely is acetone to cause cancer?

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

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

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

Methods are available to measure the amount of acetone in your breath, blood, and urine. The test can tell you how much acetone you were exposed to, although the amount that

people have naturally in their bodies varies with each person. The tests can't tell you if you will experience any health effects from the exposure.

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

Has the federal government made recommendations to protect human health?

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

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

Glossary

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

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1994. Toxicological profile for acetone. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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



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

HIGHLIGHTS: Exposure to barium occurs mostly in the workplace or from drinking contaminated water. Ingesting drinking water containing levels of barium above the EPA drinking water guidelines for relatively short periods of time can cause gastrointestinal disturbances and muscle weakness. Ingesting high levels for a long time can damage the kidneys. Barium and barium compounds have been found in at least 798 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is barium?

Barium is a silvery-white metal which exists in nature only in ores containing mixtures of elements. It combines with other chemicals such as sulfur or carbon and oxygen to form barium compounds.

Barium compounds are used by the oil and gas industries to make drilling muds. Drilling muds make it easier to drill through rock by keeping the drill bit lubricated. They are also used to make paint, bricks, ceramics, glass, and rubber.

Barium sulfate is sometimes used by doctors to perform medical tests and to take x-rays of the gastrointestinal tract.

What happens to barium when it enters the environment?

- Barium gets into the air during the mining, refining, and production of barium compounds, and from the burning of coal and oil.
- The length of time that barium will last in air, land, water, or sediments depends on the form of barium released.
- Barium compounds, such as barium sulfate and barium carbonate, which do not dissolve well in water, can last a long time in the environment.

Barium compounds, such as barium chloride, barium nitrate, or barium hydroxide, that dissolve easily in water usually do not last in these forms for a long time in the environment. The barium in these compounds that is dissolved in water quickly combines with sulfate or carbonate that are naturally found in water and become the longer lasting forms (barium sulfate and barium carbonate).

Fish and aquatic organisms can accumulate barium.

How might I be exposed to barium?

- Ingesting small amounts present in your food and water or breathing air containing very low levels of barium.
- Living in areas with unusually high natural levels of barium in the drinking water.
- Working in a job that involves barium production or use.
- Living or working near waste sites where barium has been disposed of.

How can barium affect my health?

The health effects of the different barium compounds depend on how well the compound dissolves in water or in the stomach contents. Barium compounds that do not dissolve well, such as barium sulfate, are not generally harmful.

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

Barium has been found to potentially cause gastrointestinal disturbances and muscular weakness when people are exposed to it at levels above the EPA drinking water standards for relatively short periods of time. Some people who eat or drink amounts of barium above background levels found in food and water for a short period may experience vomiting, abdominal cramps, diarrhea, difficulties in breathing, increased or decreased blood pressure, numbness around the face, and muscle weakness. Eating or drinking very large amounts of barium compounds that easily dissolve can cause changes in heart rhythm or paralysis and possibly death. Animals that drank barium over long periods had damage to the kidneys, decreases in body weight, and some died.

How likely is barium to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have not classified barium as to its carcinogenicity. The EPA has determined that barium is not likely to be carcinogenic to humans following ingestion and that there is insufficient information to determine whether it will be carcinogenic to humans following inhalation exposure.

How can barium affect children?

We do not know whether children will be more or less sensitive than adults to barium toxicity. A study in rats that swallowed barium found a decrease in newborn body weight; we do not know if a similar effect would be seen in humans.

How can families reduce the risks of exposure to barium?

The greatest potential source of barium exposure is through food and drinking water. However, the amount of barium in foods and drinking water are typically too low to be of concern.

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

There is no routine medical test to determine whether you have been exposed to barium. Doctors can measure barium in body tissues and fluids, such as bones, blood, urine, and feces, using very complex instruments. These tests cannot be used to predict the extent of the exposure or potential health effects.

The geometric mean barium level measured in the U.S. general population aged 6 and older is reported by the Centers for Disease Control and Prevention (CDC) as 1.44 µg/g creatinine (measured in urine).

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 2.0 milligrams of barium per liter of drinking water (2.0 mg/L), which is the same as 2 ppm.

The Occupational Safety and Health Administration (OSHA) has set Permissible Exposure Limits (PELs) of 0.5 milligrams of soluble barium compounds per cubic meter of workplace air (0.5 mg/m³) for 8 hour shifts and 40 hour work weeks. The OSHA limits for barium sulfate dust are 15 mg/m³ of total dust and 5 mg/m³ for respirable fraction.

The National Institute for Occupational Safety and Health (NIOSH) has set Recommended Exposure Limits (RELs) of 0.5 mg/m³ for soluble barium compounds. The NIOSH has set RELs of 10 mg/m³ (total dust) for barium sulfate and 5 mg/m³ (respirable fraction).

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Barium and Compounds (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



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

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

What is benzene?

(Pronounced bĕn'zĕn')

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

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

What happens to benzene when it enters the environment?

- Industrial processes are the main source of benzene in the environment.
- Benzene can pass into the air from water and soil.
- It reacts with other chemicals in the air and breaks down within a few days.
- Benzene in the air can attach to rain or snow and be carried back down to the ground.

- It breaks down more slowly in water and soil, and can pass through the soil into underground water.
- Benzene does not build up in plants or animals.

How might I be exposed to benzene?

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

How can benzene affect my health?

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

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

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

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

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

How likely is benzene to cause cancer?

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

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

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

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

Has the federal government made recommendations to protect human health?

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

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

Glossary

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

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

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

Metabolites: Breakdown products of chemicals.

Milligram (mg): One thousandth of a gram.

Pesticide: A substance that kills pests.

References

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

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



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

HIGHLIGHTS: Exposure to chloroform can occur when breathing contaminated air or when drinking or touching the substance or water containing it. Breathing chloroform can cause dizziness, fatigue, and headaches. Breathing chloroform or ingesting chloroform over long periods of time may damage your liver and kidneys. It can cause sores if large amounts touch your skin. This substance has been found in at least 717 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is chloroform?

(Pronounced klôr'ə-fôrm')

Chloroform is a colorless liquid with a pleasant, nonirritating odor and a slightly sweet taste. It will burn only when it reaches very high temperatures.

In the past, chloroform was used as an inhaled anesthetic during surgery, but it isn't used that way today. Today, chloroform is used to make other chemicals and can also be formed in small amounts when chlorine is added to water.

Other names for chloroform are trichloromethane and methyl trichloride.

What happens to chloroform when it enters the environment?

- Chloroform evaporates easily into the air.
- Most of the chloroform in air breaks down eventually, but it is a slow process.
- The breakdown products in air include phosgene and hydrogen chloride, which are both toxic.
- It doesn't stick to soil very well and can travel through soil to groundwater.

- Chloroform dissolves easily in water and some of it may break down to other chemicals.
- Chloroform lasts a long time in groundwater.
- Chloroform doesn't appear to build up in great amounts in plants and animals.

How might I be exposed to chloroform?

- Drinking water or beverages made using water containing chloroform.
- Breathing indoor or outdoor air containing it, especially in the workplace.
- Eating food that contains it.
- Skin contact with chloroform or water that contains it, such as in swimming pools.

How can chloroform affect my health?

Breathing about 900 parts of chloroform per million parts air (900 ppm) for a short time can cause dizziness, fatigue, and headache. Breathing air, eating food, or drinking water containing high levels of chloroform for long periods of time may damage your liver and kidneys. Large amounts of chloroform can cause sores when chloroform touches your skin.

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

It isn't known whether chloroform causes reproductive effects or birth defects in people.

Animal studies have shown that miscarriages occurred in rats and mice that breathed air containing 30 to 300 ppm chloroform during pregnancy and also in rats that ate chloroform during pregnancy. Offspring of rats and mice that breathed chloroform during pregnancy had birth defects. Abnormal sperm were found in mice that breathed air containing 400 ppm chloroform for a few days.

How likely is chloroform to cause cancer?

The Department of Health and Human Services (DHHS) has determined that chloroform may reasonably be anticipated to be a carcinogen.

Rats and mice that ate food or drank water with chloroform developed cancer of the liver and kidneys.

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

Although the amounts of chloroform in the air that you exhale and in blood, urine, and body tissues can be measured, there is no reliable test to determine how much chloroform you have been exposed to or whether you will experience any harmful effects.

The measurement of chloroform in body fluids and tissues may help to determine if you have come into contact with large amounts of chloroform, but these tests are useful for only a short time after you are exposed. Chloroform in your body might also indicate that you have come into contact with other chemicals.

Has the federal government made recommendations to protect human health?

The EPA drinking water limit for total trihalomethanes, a class of chemicals that includes chloroform, is 100 micrograms per liter of water (100 µg/L).

The EPA requires that spills or accidental releases of 10 pounds or more of chloroform into the environment be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set the maximum allowable concentration of chloroform in workroom air during an 8-hour workday in a 40-hour workweek at 50 ppm.

Glossary

Carcinogenicity: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Ingesting: Taking food or drink into your body.

Microgram (µg): One millionth of a gram.

Miscarriage: Pregnancy loss.

ppm: Parts per million.

References

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

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



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

HIGHLIGHTS: Exposure to lead can happen from breathing workplace air or dust, eating contaminated foods, or drinking contaminated water. Children can be exposed from eating lead-based paint chips or playing in contaminated soil. Lead can damage the nervous system, kidneys, and reproductive system. Lead has been found in at least 1,272 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is lead?

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

Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays. Because of health concerns, lead from paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years. The use of lead as an additive to gasoline was banned in 1996 in the United States.

What happens to lead when it enters the environment?

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

How might I be exposed to lead?

- Eating food or drinking water that contains lead. Water pipes in some older homes may contain lead solder. Lead can leach out into the water.

- Spending time in areas where lead-based paints have been used and are deteriorating. Deteriorating lead paint can contribute to lead dust.

- Working in a job where lead is used or engaging in certain hobbies in which lead is used, such as making stained glass.

- Using health-care products or folk remedies that contain lead.

How can lead affect my health?

The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system. It may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anemia. Exposure to high lead levels can severely damage the brain and kidneys in adults or children and ultimately cause death. In pregnant women, high levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production.

How likely is lead to cause cancer?

We have no conclusive proof that lead causes cancer in humans. Kidney tumors have developed in rats and mice that had been given large doses of some kind of lead compounds. The Department of Health and Human Services

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

(DHHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens and the EPA has determined that lead is a probable human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

How can lead affect children?

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

Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomachache, muscle weakness, and brain damage. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth.

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

How can families reduce the risks of exposure to lead?

- Avoid exposure to sources of lead.
- Do not allow children to chew on mouth surfaces that may have been painted with lead-based paint.
- If you have a water lead problem, run or flush water that has been standing overnight before drinking or cooking with it.
- Some types of paints and pigments that are used as make-up or hair coloring contain lead. Keep these kinds of products away from children
- If your home contains lead-based paint or you live in an area contaminated with lead, wash children's hands and faces

often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

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

A blood test is available to measure the amount of lead in your blood and to estimate the amount of your recent exposure to lead. Blood tests are commonly used to screen children for lead poisoning. Lead in teeth or bones can be measured by X-ray techniques, but these methods are not widely available. Exposure to lead also can be evaluated by measuring erythrocyte protoporphyrin (EP) in blood samples. EP is a part of red blood cells known to increase when the amount of lead in the blood is high. However, the EP level is not sensitive enough to identify children with elevated blood lead levels below about 25 micrograms per deciliter ($\mu\text{g}/\text{dL}$). These tests usually require special analytical equipment that is not available in a doctor's office. However, your doctor can draw blood samples and send them to appropriate laboratories for analysis.

Has the federal government made recommendations to protect human health?

The Centers for Disease Control and Prevention (CDC) recommends that states test children at ages 1 and 2 years. Children should be tested at ages 3–6 years if they have never been tested for lead, if they receive services from public assistance programs for the poor such as Medicaid or the Supplemental Food Program for Women, Infants, and Children, if they live in a building or frequently visit a house built before 1950; if they visit a home (house or apartment) built before 1978 that has been recently remodeled; and/or if they have a brother, sister, or playmate who has had lead poisoning. CDC considers a blood lead level of 10 $\mu\text{g}/\text{dL}$ to be a level of concern for children.

EPA limits lead in drinking water to 15 μg per liter.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for lead (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



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

HIGHLIGHTS: Manganese is a trace element and eating a small amount from food or water is needed to stay healthy. Exposure to excess levels of manganese may occur from breathing air, particularly where manganese is used in manufacturing, and from drinking water and eating food. At high levels, it can cause damage to the brain. Manganese has been found in at least 869 of the 1,669 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is manganese?

Manganese is a naturally occurring metal that is found in many types of rocks. Pure manganese is silver-colored, but does not occur naturally. It combines with other substances such as oxygen, sulfur, or chlorine. Manganese occurs naturally in most foods and may be added to some foods.

Manganese is used principally in steel production to improve hardness, stiffness, and strength. It may also be used as an additive in gasoline to improve the octane rating of the gas.

What happens to manganese when it enters the environment?

- ❑ Manganese can be released to the air, soil, and water from the manufacture, use, and disposal of manganese-based products.
- ❑ Manganese cannot break down in the environment. It can only change its form or become attached to or separated from particles.
- ❑ In water, manganese tends to attach to particles in the water or settle into the sediment.
- ❑ The chemical state of manganese and the type of soil determine how fast it moves through the soil and how much is retained in the soil.
- ❑ The manganese-containing gasoline additive may degrade in the environment quickly when exposed to sunlight, releasing manganese.

How might I be exposed to manganese?

- ❑ The primary way you can be exposed to manganese is by eating food or manganese-containing nutritional supplements. Vegetarians who consume foods rich in manganese such as grains, beans and nuts, as well as heavy tea drinkers, may have a higher intake of manganese than the average person.
- ❑ Certain occupations like welding or working in a factory where steel is made may increase your chances of being exposed to high levels of manganese.
- ❑ Manganese is routinely contained in groundwater, drinking water, and soil at low levels. Drinking water containing manganese or swimming or bathing in water containing manganese may expose you to low levels of this chemical.

How can manganese affect my health?

Manganese is an essential nutrient, and eating a small amount of it each day is important to stay healthy.

The most common health problems in workers exposed to high levels of manganese involve the nervous system. These health effects include behavioral changes and other nervous system effects, which include movements that may become slow and clumsy. This combination of symptoms when sufficiently severe is referred to as "manganism". Other less severe nervous system effects such as slowed hand movements have been observed in

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

some workers exposed to lower concentrations in the work place.

Nervous system and reproductive effects have been observed in animals after high oral doses of manganese.

How likely is manganese to cause cancer?

The EPA concluded that existing scientific information cannot determine whether or not excess manganese can cause cancer.

How can manganese affect children?

Studies in children have suggested that extremely high levels of manganese exposure may produce undesirable effects on brain development, including changes in behavior and decreases in the ability to learn and remember. We do not know for certain that these changes were caused by manganese alone. We do not know if these changes are temporary or permanent. We do not know whether children are more sensitive than adults to the effects of manganese, but there is some indication from experiments in laboratory animals that they may be.

Studies of manganese workers have not found increases in birth defects or low birth weight in their offspring. No birth defects were observed in animals exposed to manganese.

How can families reduce the risks of exposure to manganese?

- Children are not likely to be exposed to harmful amounts of manganese in the diet. However, higher-than-usual amounts of manganese may be absorbed if their diet is low in iron. It is important to provide your child with a well-balanced diet.
- Workers exposed to high levels of airborne manganese in certain occupational settings may accumulate manganese dust on their work clothes. Manganese-contaminated work

clothing should be removed before getting into your car or entering your home to help reduce the exposure hazard for yourself and your family.

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

Several tests are available to measure manganese in blood, urine, hair, or feces. Because manganese is normally present in our body, some is always found in tissues or fluids.

Because excess manganese is usually removed from the body within a few days, past exposures are difficult to measure with common laboratory tests.

Has the federal government made recommendations to protect human health?

The EPA has determined that exposure to manganese in drinking water at concentrations of 1 mg/L for up to 10 days is not expected to cause any adverse effects in a child.

The EPA has established that lifetime exposure to 0.3 mg/L manganese is not expected to cause any adverse effects.

The FDA has determined that the manganese concentration in bottled drinking water should not exceed 0.05 mg/L.

The Occupational Health and Safety Administration (OSHA) has established a ceiling limit (concentration that should not be exceeded at any time during exposure) of 5 mg/m³ for manganese in workplace air.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2008. Toxicological Profile for Manganese (Draft for Public Comment). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



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

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

What is mercury?

(Pronounced mŭr/kyə-rē)

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

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

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

What happens to mercury when it enters the environment?

- Inorganic mercury (metallic mercury and inorganic mercury compounds) enters the air from mining ore deposits, burning coal and waste, and from manufacturing plants.
- It enters the water or soil from natural deposits, disposal of wastes, and volcanic activity.

- Methylmercury may be formed in water and soil by small organisms called bacteria.
- Methylmercury builds up in the tissues of fish. Larger and older fish tend to have the highest levels of mercury.

How might I be exposed to mercury?

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

How can mercury affect my health?

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

Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea,

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation.

How likely is mercury to cause cancer?

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

How can mercury affect children?

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

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

How can families reduce the risk of exposure to mercury?

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

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

Pregnant women and children should keep away from

rooms where liquid mercury has been used.

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

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

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

Has the federal government made recommendations to protect human health?

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

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

The Occupational Safety and Health Administration (OSHA) has set limits of 0.1 milligram of organic mercury per cubic meter of workplace air (0.1 mg/m³) and 0.05 mg/m³ of metallic mercury vapor for 8-hour shifts and 40-hour work weeks.

References

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

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



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

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

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

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

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

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

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

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

1-Methylnaphthalene and 2-methylnaphthalene are expected to act like naphthalene in air, water, or soil because they have similar chemical and physical properties.

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

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

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

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

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

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

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

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

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

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

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

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

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

Hospitals have reported many cases of hemolytic anemia in children, including newborns and infants, who either ate naphthalene mothballs or deodorants cakes or who were in close contact with clothing or blankets stored in naphthalene mothballs. Naphthalene can move from a pregnant woman's blood to the unborn baby's blood. Naphthalene has been detected in some samples of breast milk from the general U.S. population, but not at levels that are expected to be of concern.

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

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

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

❑ Families can reduce the risks of exposure to naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene by avoiding smoking tobacco, generating smoke during cooking, or using

fireplaces or heating appliances in their homes.

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

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

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

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

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

Has the federal government made recommendations to protect human health?

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

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

References

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

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



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

HIGHLIGHTS: Nickel is a hard, silvery-white metal used to make stainless steel and other metal alloys. Skin effects are the most common effects in people who are sensitive to nickel. Workers who breathed very large amounts of nickel compounds have developed lung and nasal sinus cancers. Nickel has been found in at least 709 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is nickel?

(Pronounced nĭk'əl)

Nickel is a very abundant element. In the environment, it is found primarily combined with oxygen (oxides) or sulfur (sulfides). It is found in all soils and is emitted from volcanos.

Pure nickel is a hard, silvery-white metal that is combined with other metals to form mixtures called alloys. Some of the metals that nickel can be alloyed with are iron, copper, chromium, and zinc. These alloys are used in the making of metal coins and jewelry and in industry for making metal items.

Nickel compounds are also used for nickel plating, to color ceramics, to make some batteries, and as substances known as catalysts that increase the rate of chemical reactions. Nickel and its compounds have no characteristic odor or taste.

What happens to nickel when it enters the environment?

- Small nickel particles in the air settle to the ground or are taken out of the air in rain.
- Much of the nickel in the environment is found with soil and sediments because nickel attaches to particles that contain iron or manganese, which are often present in soil and sediments.

- Nickel does not appear to collect in fish, plants, or animals used for food.

How might I be exposed to nickel?

- By breathing air or smoking tobacco containing nickel.
- By eating food containing nickel, which is the major source of exposure for most people.
- By drinking water which contains small amounts of nickel.
- By handling coins and touching other metals containing nickel, such as jewelry.

How can nickel affect my health?

Nickel is required to maintain health in animals. A small amount of nickel is probably essential for humans, although a lack of nickel has not been found to affect the health of humans.

The most common adverse health effect of nickel in humans is an allergic reaction. People can become sensitive to nickel when jewelry or other things containing it are in direct contact with the skin. Once a person is sensitized to nickel, further contact with it will produce a reaction. The most common reaction is a skin rash at the site of contact.

Less frequently, some people who are sensitive to nickel

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

have asthma attacks following exposure to nickel. People who are sensitive to nickel have reactions when it is in contact with the skin, and some sensitized persons react when they eat nickel in food, drink it in water, or breathe dust containing it.

Lung effects, including chronic bronchitis and reduced lung function, have been observed in workers who breathed large amounts of nickel. Current levels of nickel in workplace air are much lower than in the past, and today few workers show symptoms of nickel exposure.

People who are not sensitive to it must eat very large amounts of nickel to show adverse health effects. Workers who accidentally drank water containing very high levels of nickel (100,000 times more than in normal drinking water) had stomachaches and effects on their blood and kidneys.

Animal studies show that breathing high levels of nickel compounds may result in inflammation of the respiratory tract. Eating or drinking large amounts of nickel has been reported to cause lung disease in dogs and rats and to affect the stomach, blood, liver, kidneys, immune system, and reproduction and development in rats and mice.

How likely is nickel to cause cancer?

The Department of Health and Human Services (DHHS) has determined that nickel and certain nickel compounds may reasonably be anticipated to be carcinogens. Cancers of the lung and nasal sinus have resulted when workers breathed dust containing high levels of nickel compounds while working in nickel refineries or nickel processing plants.

When rats and mice breathed nickel compounds for a lifetime, nickel compounds that were hard to dissolve caused cancer, while a soluble nickel compound did not cause cancer.

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

Measurements of the amount of nickel in your blood, feces, and urine can be used to estimate your exposure to nickel. These measurements are most useful if the type of nickel compound you have been exposed to is known. However, these tests cannot predict whether you will experience any health effects.

Has the federal government made recommendations to protect human health?

The EPA recommends that children drink water containing no more than 0.04 milligrams of nickel per liter of water (0.04 mg/L) for 1-10 days of exposure.

The Occupational Safety and Health Administration (OSHA) has set an occupational exposure limit of 1 milligram of nickel per cubic meter of air (1 mg/m³) for an 8-hour workday, 40-hour workweek.

Glossary

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Milligram (mg): One thousandth of a gram.

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

Soluble: Dissolves in water.

References

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

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



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

HIGHLIGHTS: Polychlorinated biphenyls (PCBs) are a mixture of individual chemicals which are no longer produced in the United States, but are still found in the environment. Health effects that have been associated with exposure to PCBs include acne-like skin conditions in adults and neurobehavioral and immunological changes in children. PCBs are known to cause cancer in animals. PCBs have been found in at least 500 of the 1,598 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polychlorinated biphenyls?

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor.

PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

What happens to PCBs when they enter the environment?

- PCBs entered the air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs.
- PCBs can still be released to the environment from hazardous waste sites; illegal or improper disposal of industrial wastes and consumer products; leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators.
- PCBs do not readily break down in the environment and thus may remain there for very long periods of time. PCBs can travel long distances in the air and be deposited in areas far away from where they were released. In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil.
- PCBs are taken up by small organisms and fish in water. They are also taken up by other animals that eat these

aquatic animals as food. PCBs accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

How might I be exposed to PCBs?

- Using old fluorescent lighting fixtures and electrical devices and appliances, such as television sets and refrigerators, that were made 30 or more years ago. These items may leak small amounts of PCBs into the air when they get hot during operation, and could be a source of skin exposure.
- Eating contaminated food. The main dietary sources of PCBs are fish (especially sportfish caught in contaminated lakes or rivers), meat, and dairy products.
- Breathing air near hazardous waste sites and drinking contaminated well water.
- In the workplace during repair and maintenance of PCB transformers; accidents, fires or spills involving transformers, fluorescent lights, and other old electrical devices; and disposal of PCB materials.

How can PCBs affect my health?

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs.

Animals that ate food containing large amounts of PCBs for short periods of time had mild liver damage and some died. Animals that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. Other effects

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects.

How likely are PCBs to cause cancer?

Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The Department of Health and Human Services (DHHS) has concluded that PCBs may reasonably be anticipated to be carcinogens. The EPA and the International Agency for Research on Cancer (IARC) have determined that PCBs are probably carcinogenic to humans.

How can PCBs affect children?

Women who were exposed to relatively high levels of PCBs in the workplace or ate large amounts of fish contaminated with PCBs had babies that weighed slightly less than babies from women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, lasted for several years. Other studies suggest that the immune system was affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects caused by exposure to PCBs or of health effects of PCBs in older children. The most likely way infants will be exposed to PCBs is from breast milk. Transplacental transfers of PCBs were also reported. In most cases, the benefits of breastfeeding outweigh any risks from exposure to PCBs in mother's milk.

How can families reduce the risk of exposure to PCBs?

- You and your children may be exposed to PCBs by eating fish or wildlife caught from contaminated locations. Certain states, Native American tribes, and U.S. territories have issued advisories to warn people about PCB-contaminated fish and fish-eating wildlife. You can reduce your family's exposure to PCBs by obeying these advisories.
- Children should be told not play with old appliances,

electrical equipment, or transformers, since they may contain PCBs.

- Children should be discouraged from playing in the dirt near hazardous waste sites and in areas where there was a transformer fire. Children should also be discouraged from eating dirt and putting dirty hands, toys or other objects in their mouths, and should wash hands frequently.
- If you are exposed to PCBs in the workplace it is possible to carry them home on your clothes, body, or tools. If this is the case, you should shower and change clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

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

Tests exist to measure levels of PCBs in your blood, body fat, and breast milk, but these are not routinely conducted. Most people normally have low levels of PCBs in their body because nearly everyone has been environmentally exposed to PCBs. The tests can show if your PCB levels are elevated, which would indicate past exposure to above-normal levels of PCBs, but cannot determine when or how long you were exposed or whether you will develop health effects.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 0.0005 milligrams of PCBs per liter of drinking water (0.0005 mg/L). Discharges, spills or accidental releases of 1 pound or more of PCBs into the environment must be reported to the EPA. The Food and Drug Administration (FDA) requires that infant foods, eggs, milk and other dairy products, fish and shellfish, poultry and red meat contain no more than 0.2-3 parts of PCBs per million parts (0.2-3 ppm) of food. Many states have established fish and wildlife consumption advisories for PCBs.

References

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

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



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

HIGHLIGHTS: Phenol is both a manufactured chemical and a natural substance. Phenol is used as a disinfectant and is found in a number of consumer products. Skin exposure to high amounts can produce skin burns, liver damage, dark urine, irregular heart beat, and even death. Ingestion of concentrated phenol can produce internal burns. Phenol has been found in at least 595 of the 1,678 National Priority List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is phenol?

Phenol is both a manufactured chemical and a natural substance. It is a colorless-to-white solid when pure. The commercial product is a liquid. Phenol has a distinct odor that is sickeningly sweet and tarry.

You can taste and smell phenol at levels lower than those that are associated with harmful effects. Phenol evaporates more slowly than water, and a moderate amount can form a solution with water. Phenol can catch fire.

Phenol is used primarily in the production of phenolic resins and in the manufacture of nylon and other synthetic fibers. It is also used in slimicides (chemicals that kill bacteria and fungi in slimes), as a disinfectant and antiseptic, and in medicinal preparations such as mouthwash and sore throat lozenges.

What happens to phenol when it enters the environment?

- Following small, single releases, phenol is rapidly removed from the air (generally, half is removed in less than a day).
- Phenol generally remains in the soil only about 2 to 5 days.
- Phenol can remain in water for a week or more.
- Larger or repeated releases of phenol can remain in the air, water, and soil for much longer periods of time.

- Small amounts of phenol may be found in organisms that live in contaminated water.
- Phenol does not build up in fish, other animals, or plants.

How might I be exposed to phenol?

- You may be exposed to phenol if you live near landfills or hazardous waste sites that contain phenol or near facilities manufacturing phenol.
- You may be exposed to very low levels in your home because it is found in a number of consumer products, including mouthwashes, gargles, and throat lozenges.
- You may be exposed to phenol if you undergo "chemical peels" to remove skin lesions with phenol-containing products or are treated for chronic pain or spasticity with injections of phenol.
- Low levels of phenol are found in some foods, including smoked summer sausage, fried chicken, mountain cheese, and some species of fish.
- Smoking or inhaling second hand smoke will expose you to phenol.
- Low levels of phenol can be present in air and drinking water.

How can phenol affect my health?

Short-term exposure to phenol in the air can cause respiratory irritation, headaches, and burning eyes. People who had skin exposure to high amounts of phenol had skin burns, liver damage, dark urine, irregular heart beat, and

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

some died. Ingestion of high concentrations of phenol has resulted in internal burns and death. The effects of prolonged exposure to low levels of phenol in air or of ingestion of low levels of phenol are uncertain because almost always there has been simultaneous exposure to other chemicals.

In animals, breathing air with high levels of phenol resulted in irritation of the lungs. Repeated exposures induced muscle tremors and loss of coordination. Exposure to high concentrations of phenol in the air for several weeks caused paralysis and severe injury to the heart, liver, kidneys, and lungs, and in some cases, death. Some animals that drank water with very high concentrations of phenol suffered muscle tremors and loss of coordination.

Phenol can have beneficial effects when used medically as an antiseptic or anesthetic.

How likely is phenol to cause cancer?

It is not known if phenol causes cancer in humans. Cancer developed in mice when phenol was applied to the skin several times per week for the lifetime of the animal. Phenol did not cause cancer in mice or rats that drank water containing it for 2 years. The International Agency for Research on Cancer (IARC) and the EPA have determined that phenol is not classifiable as to its carcinogenicity to humans.

How can phenol affect children?

Children are exposed to phenol in the same way adults are, except for exposures of adults at work. However, children are at greater risk of accidentally ingesting or spilling on their skin home products that contain phenol. Vomiting and lethargy were the most frequent signs of toxicity observed in children who accidentally ingested phenol and were treated at a poison control center.

Phenol has caused minor birth defects and low birth weight in animals generally at exposure levels that also were toxic to the pregnant mothers.

How can families reduce the risks of exposure to phenol?

- Avoiding environmental tobacco smoke, which contains phenol, will reduce phenol exposures.
- Always store household products and over-the-counter medications that contain phenol in their original labeled containers out of the reach of children.

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

There is a urine test that can tell if you have been exposed to phenol recently (within 1 or 2 days). However, the test cannot tell if you were exposed only to phenol because many substances are converted to phenol in the body. The test also cannot tell whether adverse health effects might result from the exposure. The test for phenol is not routinely performed at your doctor's office, but your doctor can take samples and send them to a testing laboratory.

Has the federal government made recommendations to protect human health?

The EPA lifetime health advisory for phenol in water is 2 milligrams per liter (2 mg/L). EPA requires that spills of 1,000 pounds or more of phenol to the environment be reported to the Agency.

The Occupational Safety and Health Administration (OSHA) has set a limit of 5 parts per million (ppm) in air to protect workers during 8-hour work shifts.

The National Institute for Occupational Safety and Health (NIOSH) recommends a limit of 5 ppm for phenol in workroom air over a 10-hour workday and that the concentration of phenol should not exceed 16 ppm during a 15-minute period.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2006. Toxicological Profile for Phenol (Draft for Public Comment). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



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

HIGHLIGHTS: Tetrachloroethylene is a manufactured chemical used for dry cleaning and metal degreasing. Exposure to very high concentrations of tetrachloroethylene can cause dizziness, headaches, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death. Tetrachloroethylene has been found in at least 771 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is tetrachloroethylene?

(Pronounced tět'rə-klôr' 0-ěth'ə-lēn')

Tetrachloroethylene is a manufactured chemical that is widely used for dry cleaning of fabrics and for metal-degreasing. It is also used to make other chemicals and is used in some consumer products.

Other names for tetrachloroethylene include perchloroethylene, PCE, and tetrachloroethene. It is a nonflammable liquid at room temperature. It evaporates easily into the air and has a sharp, sweet odor. Most people can smell tetrachloroethylene when it is present in the air at a level of 1 part tetrachloroethylene per million parts of air (1 ppm) or more, although some can smell it at even lower levels.

What happens to tetrachloroethylene when it enters the environment?

- Much of the tetrachloroethylene that gets into water or soil evaporates into the air.
- Microorganisms can break down some of the tetrachloroethylene in soil or underground water.
- In the air, it is broken down by sunlight into other chemicals or brought back to the soil and water by rain.
- It does not appear to collect in fish or other animals that live in water.

How might I be exposed to tetrachloroethylene?

- When you bring clothes from the dry cleaners, they will release small amounts of tetrachloroethylene into the air.
- When you drink water containing tetrachloroethylene, you are exposed to it.

How can tetrachloroethylene affect my health?

High concentrations of tetrachloroethylene (particularly in closed, poorly ventilated areas) can cause dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death.

Irritation may result from repeated or extended skin contact with it. These symptoms occur almost entirely in work (or hobby) environments when people have been accidentally exposed to high concentrations or have intentionally used tetrachloroethylene to get a "high."

In industry, most workers are exposed to levels lower than those causing obvious nervous system effects. The health effects of breathing in air or drinking water with low levels of tetrachloroethylene are not known.

Results from some studies suggest that women who work in dry cleaning industries where exposures to tetrachloroethyl-

ToxFAQs Internet home page via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

ene can be quite high may have more menstrual problems and spontaneous abortions than women who are not exposed. However, it is not known if tetrachloroethylene was responsible for these problems because other possible causes were not considered.

Results of animal studies, conducted with amounts much higher than those that most people are exposed to, show that tetrachloroethylene can cause liver and kidney damage. Exposure to very high levels of tetrachloroethylene can be toxic to the unborn pups of pregnant rats and mice. Changes in behavior were observed in the offspring of rats that breathed high levels of the chemical while they were pregnant.

How likely is tetrachloroethylene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that tetrachloroethylene may reasonably be anticipated to be a carcinogen. Tetrachloroethylene has been shown to cause liver tumors in mice and kidney tumors in male rats.

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

One way of testing for tetrachloroethylene exposure is to measure the amount of the chemical in the breath, much the same way breath-alcohol measurements are used to determine the amount of alcohol in the blood.

Because it is stored in the body's fat and slowly released into the bloodstream, tetrachloroethylene can be detected in the breath for weeks following a heavy exposure.

Tetrachloroethylene and trichloroacetic acid (TCA), a breakdown product of tetrachloroethylene, can be detected in the blood. These tests are relatively simple to perform. These tests aren't available at most doctors' offices, but can be per-

formed at special laboratories that have the right equipment.

Because exposure to other chemicals can produce the same breakdown products in the urine and blood, the tests for breakdown products cannot determine if you have been exposed to tetrachloroethylene or the other chemicals.

Has the federal government made recommendations to protect human health?

The EPA maximum contaminant level for the amount of tetrachloroethylene that can be in drinking water is 0.005 milligrams tetrachloroethylene per liter of water (0.005 mg/L).

The Occupational Safety and Health Administration (OSHA) has set a limit of 100 ppm for an 8-hour workday over a 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that tetrachloroethylene be handled as a potential carcinogen and recommends that levels in workplace air should be as low as possible.

Glossary

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Milligram (mg): One thousandth of a gram.

Nonflammable: Will not burn.

References

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

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



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

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

What is toluene?

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

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

What happens to toluene when it enters the environment?

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

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

Toluene does not usually stay in the environment long.

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

How might I be exposed to toluene?

Breathing contaminated workplace air or automobile exhaust.

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

Drinking contaminated well-water.

Living near uncontrolled hazardous waste sites containing toluene products.

How can toluene affect my health?

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

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

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

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

High levels of toluene may affect your kidneys.

How likely is toluene to cause cancer?

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

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

How can toluene affect children?

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

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

How can families reduce the risk of exposure to toluene?

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

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

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

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

Has the federal government made recommendations to protect human health?

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

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

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

References

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

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



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

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

What is xylene?

(Pronounced zī'lēn)

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

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

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

What happens to xylene when it enters the environment?

- Xylene has been found in waste sites and landfills when discarded as used solvent, or in varnish, paint, or paint thinners.
- It evaporates quickly from the soil and surface water into the air.

- In the air, it is broken down by sunlight into other less harmful chemicals.
- It is broken down by microorganisms in soil and water.
- Only a small amount of it builds up in fish, shellfish, plants, and animals living in xylene-contaminated water.

How might I be exposed to xylene?

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

How can xylene affect my health?

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

ToxFAQs Internet home page via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

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

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

How likely is xylene to cause cancer?

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

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

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

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

Has the federal government made recommendations to protect human health?

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

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

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

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

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

Glossary

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

Carcinogenic: Having the ability to cause cancer.

CAS: Chemical Abstracts Service.

ppm: Parts per million.

Solvent: A liquid that can dissolve other substances.

References

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

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



APPENDIX B
WEST NILE VIRUS/St. LOUIS ENCEPHALITIS PREVENTION

WEST NILE VIRUS/ST. LOUIS ENCEPHALITIS PREVENTION

The following section is based upon information provided by the CDC Division of Vector-Borne Infectious Diseases. Symptoms of West Nile Virus include fever, headache, and body aches, occasionally with skin rash and swollen lymph glands, with most infections being mild. More severe infection may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and, rarely, death. Most infections of St. Louis encephalitis are mild without apparent symptoms other than fever with headache. More severe infection is marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, occasional convulsions (especially infants) and spastic (but rarely flaccid) paralysis. The only way to avoid infection of West Nile Virus and St. Louis encephalitis is to avoid mosquito bites. To reduce the chance of mosquito contact:

- Stay indoors at dawn, dusk, and in the early evening.
- Wear long-sleeved shirts and long pants whenever you are outdoors.
- Spray clothing with repellents containing permethrin or DEET (N, N-diethyl-meta-toluamide), since mosquitoes may bite through thin clothing.
- Apply insect repellent sparingly to exposed skin. An effective repellent will contain 35% DEET. DEET in high concentrations (greater than 35%) provides no additional protection.
- Repellents may irritate the eyes and mouth.
- Whenever you use an insecticide or insect repellent, be sure to read and follow the manufacturer's directions for use, as printed on the product.

APPENDIX C
REPORT FORMS

WEEKLY SAFETY REPORT FORM

Week Ending: _____ Project Name/Number: _____

Report Date: _____ Project Manager Name: _____

Summary of any violations of procedures occurring that week:

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

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

Comments:

Name: _____ Company: _____

Signature: _____ Title: _____

INJURED - ILL:

Name: _____ SSN: _____

Address: _____ Age: _____

Length of Service: _____ Time on Present Job: _____

Time/Classification: _____

SEVERITY OF INJURY OR ILLNESS:

___ Disabling ___ Non-disabling ___ Fatality

___ Medical Treatment ___ First Aid Only

ESTIMATED NUMBER OF DAYS AWAY FROM JOB: _____

NATURE OF INJURY OR ILLNESS: _____

CLASSIFICATION OF INJURY:

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

Part of Body Affected: _____

Degree of Disability: _____

Date Medical Care was Received: _____

Where Medical Care was Received: _____

Address (if off-site): _____

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

PROPERTY DAMAGE:

Description of Damage: _____

Cost of Damage: \$ _____

ACCIDENT/INCIDENT LOCATION: _____

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

Was weather a factor?: _____

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

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

ON-SITE ACCIDENTS/INCIDENTS:

Level of personal protection equipment required in Site Safety Plan:

Modifications:

Was injured using required equipment?:

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

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

ACCIDENT/INCIDENT REPORT REVIEWED BY:

SSO Name Printed

SSO Signature

OTHERS PARTICIPATING IN INVESTIGATION:

Signature

Title

Signature

Title

Signature

Title

ACCIDENT/INCIDENT FOLLOW-UP: Date: _____

Outcome of accident/incident: _____

Physician's recommendations: _____

Date injured returned to work: _____

Follow-up performed by:

Signature

Title

ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM

APPENDIX D
EMERGENCY HAND SIGNALS

EMERGENCY SIGNALS

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

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

EMERGENCY HAND SIGNALS

OUT OF AIR, CAN'T BREATHE!



Hand gripping throat

**LEAVE AREA IMMEDIATELY,
NO DEBATE!**

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

NEED ASSISTANCE!



Hands on top of head

**OKAY! – I'M ALL RIGHT!
- I UNDERSTAND!**



Thumbs up

NO! - NEGATIVE!



Thumbs down

APPENDIX C
REPORT FORMS

WEEKLY SAFETY REPORT FORM

Week Ending: _____ Project Name/Number: _____

Report Date: _____ Project Manager Name: _____

Summary of any violations of procedures occurring that week:

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

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

Comments:

Name: _____ Company: _____

Signature: _____ Title: _____

INJURED - ILL:

Name: _____ SSN: _____

Address: _____ Age: _____

Length of Service: _____ Time on Present Job: _____

Time/Classification: _____

SEVERITY OF INJURY OR ILLNESS:

___ Disabling ___ Non-disabling ___ Fatality

___ Medical Treatment ___ First Aid Only

ESTIMATED NUMBER OF DAYS AWAY FROM JOB: _____

NATURE OF INJURY OR ILLNESS: _____

CLASSIFICATION OF INJURY:

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

Part of Body Affected: _____

Degree of Disability: _____

Date Medical Care was Received: _____

Where Medical Care was Received: _____

Address (if off-site): _____

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

PROPERTY DAMAGE:

Description of Damage: _____

Cost of Damage: \$ _____

ACCIDENT/INCIDENT LOCATION: _____

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

Was weather a factor?: _____

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

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

ON-SITE ACCIDENTS/INCIDENTS:

Level of personal protection equipment required in Site Safety Plan:

Modifications:

Was injured using required equipment?:

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

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

ACCIDENT/INCIDENT REPORT REVIEWED BY:

SSO Name Printed

SSO Signature

OTHERS PARTICIPATING IN INVESTIGATION:

Signature

Title

Signature

Title

Signature

Title

ACCIDENT/INCIDENT FOLLOW-UP: Date: _____

Outcome of accident/incident: _____

Physician's recommendations: _____

Date injured returned to work: _____
Follow-up performed by: _____

Signature

Title

ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM

APPENDIX D
EMERGENCY HAND SIGNALS

EMERGENCY SIGNALS

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

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

EMERGENCY HAND SIGNALS

OUT OF AIR, CAN'T BREATHE!



Hand gripping throat

**LEAVE AREA IMMEDIATELY,
NO DEBATE!**

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

NEED ASSISTANCE!



Hands on top of head

OKAY! – I'M ALL RIGHT!

- I UNDERSTAND!



Thumbs up

NO! - NEGATIVE!



Thumbs down

APPENDIX B
PROPOSED DEVELOPMENT PLANS

		ISSUED TO DOB - 06.27.2014	DD 50% - 09.18.2014
ARCHITECTURAL:			
T-001.00	COVER SHEET	03.31.2014	*
Z-100.00	ZONING MAPS	03.31.2014	*
Z-101.00	ZONING MAPS	03.31.2014	*
Z-102.00	AREA CALCULATIONS	03.31.2014	*
Z-103.00	MECHANICAL DEDUCTIONS	03.31.2014	*
Z-104.00	GREEN ZONE DEDUCTIONS	03.31.2014	*
A-100.00	AREA MAP	03.31.2014	*
A-101.00	ZONING MAPS	03.31.2014	*
A-102.00	AREA CALCULATIONS	03.31.2014	*
A-103.00	PERSPECTIVE EVALUATION	03.31.2014	*
A-104.00	PERSPECTIVE EVALUATION	03.31.2014	*
A-105.00	SITE PLAN	03.31.2014	*
A-106.00	ADA-ACCESSIBILITY - BATHROOMS	03.31.2014	*
A-107.00	ADA-ACCESSIBILITY - BATHROOMS	03.31.2014	*
A-108.00	ADA-ACCESSIBILITY - KITCHENS	03.31.2014	*
A-119.00	BUILDING CODE NOTES & ABBREVIATIONS	03.31.2014	*
A-110.00	BUILDING CODE NOTES	03.31.2014	*
A-111.00	GENERAL NOTES	03.31.2014	*
A-120.00	EGRESS PLAN - CELLAR	03.31.2014	*
A-121.00	EGRESS PLAN - FIRST FLOOR	03.31.2014	*
A-122.00	EGRESS PLAN - MEZZANINE	03.31.2014	*
A-123.00	EGRESS PLAN - 2ND FLOOR	03.31.2014	*
A-124.00	EGRESS PLAN - 3RD TO 5TH FLOORS	03.31.2014	*
A-125.00	EGRESS PLAN - 6TH FLOOR	03.31.2014	*
A-126.00	EGRESS PLAN - 6TH FLOOR MEZZ + 7TH FLOOR	03.31.2014	*
A-127.00	EGRESS PLAN - ROOF	03.31.2014	*
A-200.00	CELLAR FLOOR PLAN	03.31.2014	*
A-201.00	FIRST FLOOR PLAN	03.31.2014	*
A-202.00	MEZZANINE PLAN	03.31.2014	*
A-203.00	2ND FLOOR PLAN	03.31.2014	*
A-204.00	3RD TO 5TH FLOOR PLANS	03.31.2014	*
A-205.00	6TH FLOOR PLAN	03.31.2014	*
A-206.00	6TH FLOOR MEZZANINE + 7TH FLOOR PLAN	03.31.2014	*
A-207.00	ROOF PLAN	03.31.2014	*
A-208.00	UPPER ROOF PLAN	03.31.2014	*
A-210.00	PARTIAL PLAN - CELLAR		*
A-211.00	PARTIAL PLAN - CELLAR		*
A-212.00	PARTIAL PLAN - CELLAR		*
A-213.00	PARTIAL PLAN - FIRST FLOOR		*
A-214.00	PARTIAL PLAN - FIRST FLOOR		*
A-215.00	PARTIAL PLAN - FIRST FLOOR		*
A-216.00	PARTIAL PLAN - 2ND FLOOR		*
A-217.00	PARTIAL PLAN - 2ND FLOOR		*
A-218.00	PARTIAL PLAN - 3RD TO 5TH FLOORS		*
A-219.00	PARTIAL PLAN - 3RD TO 5TH FLOORS		*
A-220.00	PARTIAL PLAN - 6TH FLOOR		*
A-221.00	PARTIAL PLAN - 6TH FLOOR		*
A-222.00	PARTIAL PLAN - 6TH FLOOR MEZZ + 7TH FLOOR		*
A-223.00	PARTIAL PLAN - 6TH FLOOR MEZZ + 7TH FLOOR		*
A-250.00	RCP-CELLAR FLOOR PLAN	03.31.2014	*
A-251.00	RCP-FIRST FLOOR PLAN	03.31.2014	*
A-252.00	RCP-MEZZANINE FLOOR PLAN	03.31.2014	*
A-253.00	RCP-2ND FLOOR PLAN	03.31.2014	*
A-254.00	RCP-3RD TO 5TH FLOOR PLANS	03.31.2014	*
A-255.00	RCP-6TH FLOOR PLANS	03.31.2014	*
A-256.00	RCP-6TH MEZZANINE + 7TH FLOOR PLAN	03.31.2014	*
A-301.00	BUILDING SECTIONS	03.31.2014	*
A-302.00	BUILDING CROSS SECTION	03.31.2014	*
A-303.00	BUILDING SECTION	03.31.2014	*
A-304.00	BUILDING SECTION AT STAIRS	03.31.2014	*
A-305.00	BUILDING SECTION	03.31.2014	*
A-401.00	GREEN STREET ELEVATIONS	03.31.2014	*
A-402.00	CANAL STREET ELEVATIONS	03.31.2014	*
A-403.00	WEST ELEVATION	03.31.2014	*
A-404.00	NORTH ELEVATION	03.31.2014	*
A-405.00	ROOF COURT ELEVATIONS	03.31.2014	*
A-501.00	WALL SECTIONS	03.31.2014	*
A-502.00	WALL SECTIONS	03.31.2014	*
A-503.00	WALL SECTIONS	03.31.2014	*
A-504.00	WALL SECTIONS	03.31.2014	*
A-505.00	WALL SECTIONS	03.31.2014	*
A-506.00	WALL SECTIONS	03.31.2014	*
A-507.00	STAIR SECTIONS	03.31.2014	*
A-508.00	STAIR SECTIONS	03.31.2014	*
A-509.00	STAIR DETAILS	03.31.2014	*
A-510.00	STAIR DETAILS	03.31.2014	*
A-511.00	EXTERIOR WALL DETAILS	03.31.2014	*
A-512.00	EXTERIOR WALL DETAILS	03.31.2014	*
A-513.00	EXTERIOR WALL DETAILS	03.31.2014	*
A-514.00	EXTERIOR WALL DETAILS	03.31.2014	*
A-515.00	EXTERIOR WALL DETAILS	03.31.2014	*
A-516.00	PARTIAL BUILDING SECTION	03.31.2014	*
A-517.00	PARTIAL BUILDING SECTION	03.31.2014	*
A-518.00	PARTIAL BUILDING SECTION	03.31.2014	*
A-519.00	PARTIAL BUILDING SECTION	03.31.2014	*
A-520.00	PARTIAL BUILDING SECTION	03.31.2014	*
A-521.00	PARTIAL BUILDING SECTION	03.31.2014	*
A-522.00	PARTIAL BUILDING SECTION	03.31.2014	*
A-523.00	PARTIAL BUILDING SECTION	03.31.2014	*
A-524.00	PARTIAL BUILDING SECTION	03.31.2014	*
A-525.00	PARTIAL BUILDING SECTION	03.31.2014	*
A-600.00	DOOR SCHEDULE	03.31.2014	*
A-601.00	DOOR TYPES	03.31.2014	*
A-602.00	DOOR JAMB & SADDLE DETAILS	03.31.2014	*
A-603.00	WINDOW SCHEDULE	03.31.2014	*
A-604.00	WINDOW SCHEDULE	03.31.2014	*
A-605.00	PARTITION TYPES	03.31.2014	*
A-606.00	FINISH SCHEDULE	03.31.2014	*
A-607.00	COMPACTOR ROOM	03.31.2014	*
A-810.00	BATHROOM PLANS	03.31.2014	*
A-811.00	BATHROOM PLANS	03.31.2014	*
BPP-001	BUILDERS PAVEMENT PLAN	03.31.2014	*
BPP-002	BUILDERS PAVEMENT PLAN	03.31.2014	*

		ISSUED TO DOB - 07.17.2014	DD 50% - 09.18.2014
STRUCTURAL			
FO-100.00	FOUNDATION PLAN	*	*
FS-200.00	FOUNDATION DETAILS	*	*
FS-201.00	FOUNDATION DETAILS I	*	*
FS-202.00	FOUNDATION DETAILS II	*	*
FS-300.00	FOUNDATION SECTIONS	*	*
S-101.00	GROUND FLOOR FRAMING PLAN	*	*
S-102.00	2ND FLOOR FRAMING PLAN	*	*
S-103.00	3RD & 5TH FLOOR FRAMING PLAN	*	*
S-104.00	GROUND FLOOR FRAMING PLAN	*	*
S-105.00	GROUND FLOOR FRAMING PLAN	*	*
S-106.00	6TH FLOOR FRAMING PLAN	*	*
S-107.00	6TH FLOOR MEZZANINE + 7TH FLOOR FRAMING PLAN	*	*
S-108.00	ROOF FRAMING PLAN	*	*
S-400.00	WIND/SEISMIC FRAME ELEVATIONS	*	*
S-500.00	COLUMN SCHEDULE	*	*
S-600.00	TYPICAL SUPERSTRUCTURE DETAILS	*	*
S-601.00	TYPICAL SUPERSTRUCTURE DETAILS 1	*	*
S-602.00	TYPICAL SUPERSTRUCTURE DETAILS 2	*	*
S-700.00	SUPERSTRUCTURE SECTIONS	*	*
MECHANICAL			
M-101.00	NOTES & SYMBOLS	*	*
M-102.00	MECHANICAL SPECIFICATIONS I	*	*
M-103.00	MECHANICAL SPECIFICATIONS II	*	*
M-200.00	MECHANICAL CELLAR FLOOR PLAN	*	*
M-201.00	MECHANICAL 1ST FLOOR PLAN	*	*
M-202.00	MECHANICAL 1ST FLOOR MEZZANINE PLAN	*	*
M-203.00	MECHANICAL 2ND FLOOR PLAN	*	*
M-204.00	MECHANICAL 3RD FLOOR PLAN	*	*
M-205.00	MECHANICAL 4TH FLOOR PLAN	*	*
M-206.00	MECHANICAL 5TH FLOOR PLAN	*	*
M-207.00	MECHANICAL 6TH FLOOR PLAN	*	*
M-208.00	MECHANICAL 6TH MEZZ + 7TH FLOOR PLAN	*	*
M-209.00	MECHANICAL ROOF PLAN	*	*
M-210.00	MECHANICAL UPPER ROOF PLAN	*	*
M-301.00	MECHANICAL EQUIPMENT SCHEDULE I	*	*
M-302.00	MECHANICAL EQUIPMENT SCHEDULE II	*	*
M-303.00	CONDENSER/HOT WATER FLOW RISER DIAGRAM	*	*
M-304.00	CONDENSATE DRAIN FLOW RISER DIAGRAM	*	*
M-305.00	MECHANICAL DETAILS I	*	*

		ISSUED TO DOB - 07.10.2014	DD 50% - 09.18.2014
ELECTRICAL			
E-100.00	ELECTRICAL SYMBOLS & NOTES	*	*
E-101.00	LIGHTING SCHEDULE	*	*
E-102.00	SECURITY & COMMUNICATION LEYEND	*	*
E-103.00	ELECTRICAL LOW VOLTAGE NOTES	*	*
E-200.00	CELLAR POWER PLAN	*	*
E-200A.00	CELLAR LOW VOLTAGE PLAN	*	*
E-201.00	CELLAR LIGHTING PLAN	*	*
E-202.00	1ST FLOOR LIGHTING PLAN	*	*
E-203.00	1ST FLOOR POWER PLAN	*	*
E-203A.00	1ST FLOOR LOW VOLTAGE PLAN	*	*
E-204.00	1ST FLOOR MEZZ LIGHTING PLAN	*	*
E-205.00	1ST FLOOR MEZZ POWER PLAN	*	*
E-205A.00	1ST FLOOR MEZZ LOW VOLTAGE PLAN	*	*
E-206.00	2ND FLOOR LIGHTING PLAN	*	*
E-207.00	2ND FLOOR POWER PLAN	*	*
E-207A.00	2ND FLOOR LOW VOLTAGE PLAN	*	*
E-208.00	3RD FLOOR LIGHTING PLAN	*	*
E-208.00	3RD FLOOR POWER PLAN	*	*
E-209A.00	3RD FLOOR LOW VOLTAGE PLAN	*	*
E-210.00	4TH FLOOR LIGHTING PLAN	*	*
E-211.00	4TH FLOOR POWER PLAN	*	*
E-211A.00	4TH FLOOR LOW VOLTAGE PLAN	*	*
E-212.00	5TH FLOOR LIGHTING PLAN	*	*
E-213.00	5TH FLOOR POWER PLAN	*	*
E-213A.00	5TH FLOOR LOW VOLTAGE PLAN	*	*
E-214.00	6TH FLOOR LIGHTING PLAN	*	*
E-215.00	6TH FLOOR POWER PLAN	*	*
E-215A.00	6TH FLOOR LOW VOLTAGE PLAN	*	*
E-216.00	6TH FLOOR MEZZ + 7TH FLOOR LIGHTING PLAN	*	*
E-217.00	6TH FLOOR MEZZ + 7TH FLOOR POWER PLAN	*	*
E-217A.00	6TH FLOOR MEZZ + 7TH FLOOR LOW VOLTAGE PLAN	*	*
E-218.00	ROOF LIGHTING PLAN	*	*
E-219.00	ROOF POWER PLAN	*	*
E-219A.00	ROOF LOW VOLTAGE PLAN	*	*
E-220.00	UPPER ROOF LIGHTING PLAN	*	*
E-300.00	POWER RISER DIAGRAM	*	*
E-301.00	INTERCOM-DOOR RELEASE-CCTV RISER DIAGRAM	*	*
E-302.00	TV CONDUIT RISER DIAGRAM	*	*
E-303.00	ELECTRICAL SCHEDULE SHEET SERVICE EQUIPMENT	*	*
E-304.00	ELECTRICAL SCHEDULE SHEET I	*	*
E-305.00	ELECTRICAL SCHEDULE SHEET II	*	*
E-306.00	ELECTRICAL SCHEDULE SHEET III	*	*
E-400.00	ELECTRICAL SPECIFICATIONS & NOTES	*	*
PLUMBING			
P-100.00	SITE PLAN, NOTES, SYMBOLS & LEYEND	*	*
P-101.00	PLUMBING FIXTURE & EQUIPMENT SCHEDULE	*	*
P-200.00	CELLAR FLOOR PLAN	*	*
P-201.00	CELLAR-CW-HW & GAS	*	*
P-202.00	1ST FLOOR PLAN	*	*
P-203.00	1ST FLOOR MEZZANINE PLAN	*	*
P-204.00	1ST FLOOR MEZZANINE CW-HW & GAS	*	*
P-205.00	2ND FLOOR PLAN	*	*
P-206.00	3RD FLOOR PLAN	*	*
P-207.00	4TH FLOOR PLAN	*	*
P-208.00	5TH FLOOR PLAN	*	*
P-209.00	6TH FLOOR PLAN	*	*
P-210.00	6TH FLOOR MEZZ + 7TH FLOOR PLAN	*	*
P-211.00	ROOF PLAN	*	*
P-212.00	UPPER ROOF PLAN	*	*
P-300.00	SANITARY RISER DIAGRAM - A	*	*
P-301.00	SANITARY RISER DIAGRAM - B	*	*
P-302.00	DOMESTIC RISER DIAGRAM - A	*	*
P-303.00	DOMESTIC RISER DIAGRAM - B	*	*
P-304.00	DOMESTIC RISER DIAGRAM - C	*	*
P-305.00	STORM RISER DIAGRAM	*	*
P-306.00	GAS RISER DIAGRAM	*	*
P-307.00	SYSTEM NOTES & DETAILS	*	*
P-308.00	SYSTEM SCHEDULES & DETAILS	*	*
P-400.00	NOTES & SPECIFICATIONS	*	*

		ISSUED TO DOB - 07.10.2014	DD 50% - 09.18.2014
SPRINKLER			
SP/SD-100.00	NOTES & LEGEND	*	*
SP/SD-101.00	NOTES	*	*
SP/SD-200.00	CELLAR FLOOR PLAN	*	*
SP/SD-201.00	1ST FLOOR PLAN	*	*
SP/SD-202.00	1ST FLOOR MEZZANINE PLAN	*	*
SP/SD-203.00	2ND FLOOR PLAN	*	*
SP/SD-204.00	3RD FLOOR PLAN	*	*
SP/SD-205.00	4TH FLOOR PLAN	*	*
SP/SD-206.00	5TH FLOOR PLAN	*	*
SP/SD-207.00	6TH FLOOR PLAN	*	*
SP/SD-208.00	6TH FLOOR MEZZANINE + 7TH FLOOR PLAN	*	*
SP/SD-209.00	ROOF PLAN	*	*
SP/SD-300.00	SPRINKLER & STANDPIPE RISER DIAGRAM	*	*
SP/SD-301.00	STANDPIPE PRESSURIZATION RISER DIAGRAM	*	*
SP/SD-302.00	SPRINKLER & STANDPIPE DETAILS	*	*
SP/SD-303.00	SPRINKLER & STANDPIPE DETAIL PLAN	*	*
SP/SD-400.00	COMBINED SPRINKLER & STANDPIPE SPECIFICATIONS	*	*
FIRE ALARM			
FA-100.00	DIAGRAM & SPECIFICATIONS	*	*
FA-200.00	CELLAR FLOOR PLAN	*	*
FA-201.00	1ST FLOOR PLAN	*	*
FA-202.00	1ST FLOOR MEZZANINE PLAN	*	*
FA-203.00	2ND FLOOR PLAN	*	*
FA-204.00	3RD FLOOR PLAN	*	*
FA-205.00	4TH FLOOR PLAN	*	*
FA-206.00	5TH FLOOR PLAN	*	*
FA-207.00	6TH FLOOR PLANS	*	*
FA-208.00	6TH FLOOR MEZZANINE + 7TH FLOOR PLAN	*	*
FA-209.00	ROOF PLAN	*	*
FA-210.00	UPPER ROOF PLAN	*	*
FA-300.00	RISER DIAGRAM	*	*

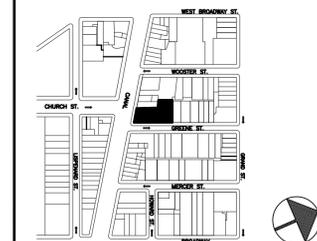


THE GENERAL CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND REPORT ALL ERRORS AND OMISSIONS TO THE ARCHITECTS. DO NOT SCALE THE DRAWINGS. THIS DRAWING SHALL NOT BE USED FOR CONSTRUCTION PURPOSES UNTIL SIGNED BY THE CONSULTANTS.

09.17.2014 50 % DESIGN DOCUMENTS
08.22.2014 ISSUED TO N.Y.C. D.O.B.
07.25.2014 ISSUED FOR OWNER REVIEW
6.27.2014 ISSUED TO N.Y.C. D.O.B.

REV DATE DESCRIPTION

NB # 121186135



THE GENERAL CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND REPORT ALL ERRORS AND OMISSIONS TO THE ARCHITECTS. DO NOT SCALE THE DRAWINGS. THIS DRAWING SHALL NOT BE USED FOR CONSTRUCTION PURPOSES UNTIL SIGNED BY THE CONSULTANTS.

GENERAL SITE INFORMATION:

BLOCK : 229
 LOT : 1
 MAP: 12 A
 ZONING DISTRICT: M1-5B
 LOT SITE AREA = 13,199.86 SF

SOHO CAST IRON HISTORIC DISTRICT
 COMMUNITY BOARD 2

**ZONING CALCULATIONS
 APPLICABLE SECTION**

- 74-712(a) USES PERMITTED BY SPECIAL PERMIT
 USES PROPOSED : UG-2 RESIDENTIAL BY SPECIAL PERMIT AND UG-6 COMMERCIAL BY SPECIAL PERMIT
- 74-712(a)(1)(ii) FLOOR AREA PERMITTED FAR 5.0
 PROPOSED FAR RESIDENTIAL 4.10 , UNDER 23-145
 PROPOSED FAR COMMERCIAL 0.89 , UNDER 43-12
 PROPOSED FAR TOTAL = 4.99 , UNDER 74-712 (a)(1)(ii)
 13,199.86 SF x 5 = 65,996 SF
 PROPOSED GROSS FLOOR AREA RESIDENTIAL = 54,239 SF
 PROPOSED FLOOR AREA COMMERCIAL = 11,710 SF
 PROPOSED FLOOR AREA TOTAL = 65,949 SF
- 74-712(a)(iii) DWELLING UNITS PERMITTED
 MINIMUM DWELLING UNIT SIZE OF 1,200 SF: COMPLIES
 NUMBER OF DWELLING UNITS ALLOWABLE: 45
 NUMBER OF DWELLING UNITS PROPOSED: 31

- 43-25 SIDE YARDS REGULATIONS
 REQUIRED: NONE
 PROPOSED: NONE
- 74-712(a)(1)(i), 23-47 & 23-86 REAR YARDS (INTERIOR LOT) REGULATIONS
 REQUIRED: MIN 30'
 PROPOSED: 34'
- 43-311 REAR YARDS (CORNER LOT) REGULATIONS
 REQUIRED: NONE
 PROPOSED: NONE
- 74-712(a)(1)(IV), 32-60 SIGN REGULATIONS
 ALL SIGNAGE SHALL CONFORM TO APPLICABLE REGULATIONS OF SECTION 32-60 PERTAINING TO C2 DISTRICT
- 13-12 ACCESSORY OFF-STREET PARKING REGULATIONS
 REQUIRED: NONE
 PROPOSED: NONE
- 44-52 LOADING BERTH REGULATIONS
 REQUIRED: NONE
 PROPOSED: NONE
- 43-43 MAXIMUM HEIGHT OF FRONT WALL & REQUIRED FRONT SETBACK

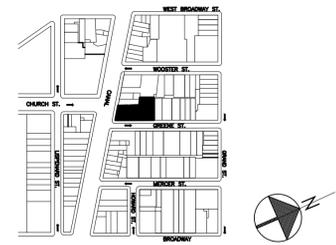
MAXIMUM FRONT WALL PERMITTED:
 85' OR SIX STORIES, WHICHEVER IS LESS.
 WALL HEIGHT PROPOSED: 88'
 NUMBER OF STORIES: 6 (STREET WALL)
 TOTAL NUMBER OF STORIES: 7
 TOTAL BUILDING HEIGHT PROPOSED: 99'-2"

SKY EXPOSURE PLANE
 CANAL (WIDE STREET): 5.6 TO 1
 GREENE (NARROW STREET): 2.7 TO 1

SETBACK REGULATIONS
 MINIMUM SETBACK FRONTING A NARROW STREET: 20'-0"
 PROPOSED SETBACK (GREENE STREET): 20'
 MINIMUM SETBACK FRONTING A WIDE STREET: 15'-0"
 PROPOSED SETBACK (CANAL): 15'

REV	DATE	DESCRIPTION
09.17.2014	50 % DESIGN DOCUMENTS	
08.22.2014	ISSUED TO N.Y.C. D.O.B.	
07.25.2014	ISSUED FOR OWNER REVIEW	
6.27.2014	ISSUED TO N.Y.C. D.O.B.	

NB # 121186135



11 GREENE STREET
 NEW YORK, NY 10013

**GWATHMEY SIEGEL
 KAUFMAN &
 ASSOCIATES
 ARCHITECTS llc**

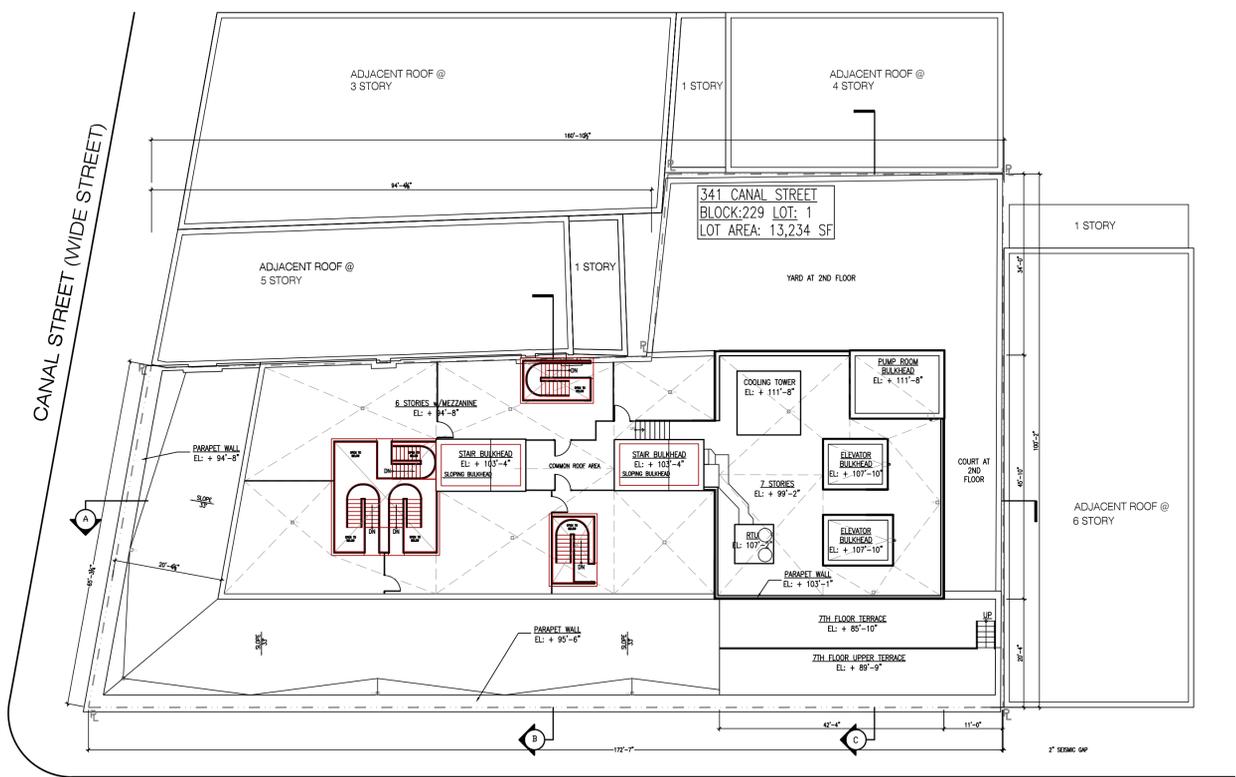
525 Broadway
 New York, NY 10012
 212.947.1240
 212.967.0890 fax

GENE KAUFMAN ARCHITECT PC
 525 BROADWAY, NEW YORK, N.Y. 10012
 TEL. (212) 625-8700 FAX. (212) 625-8867

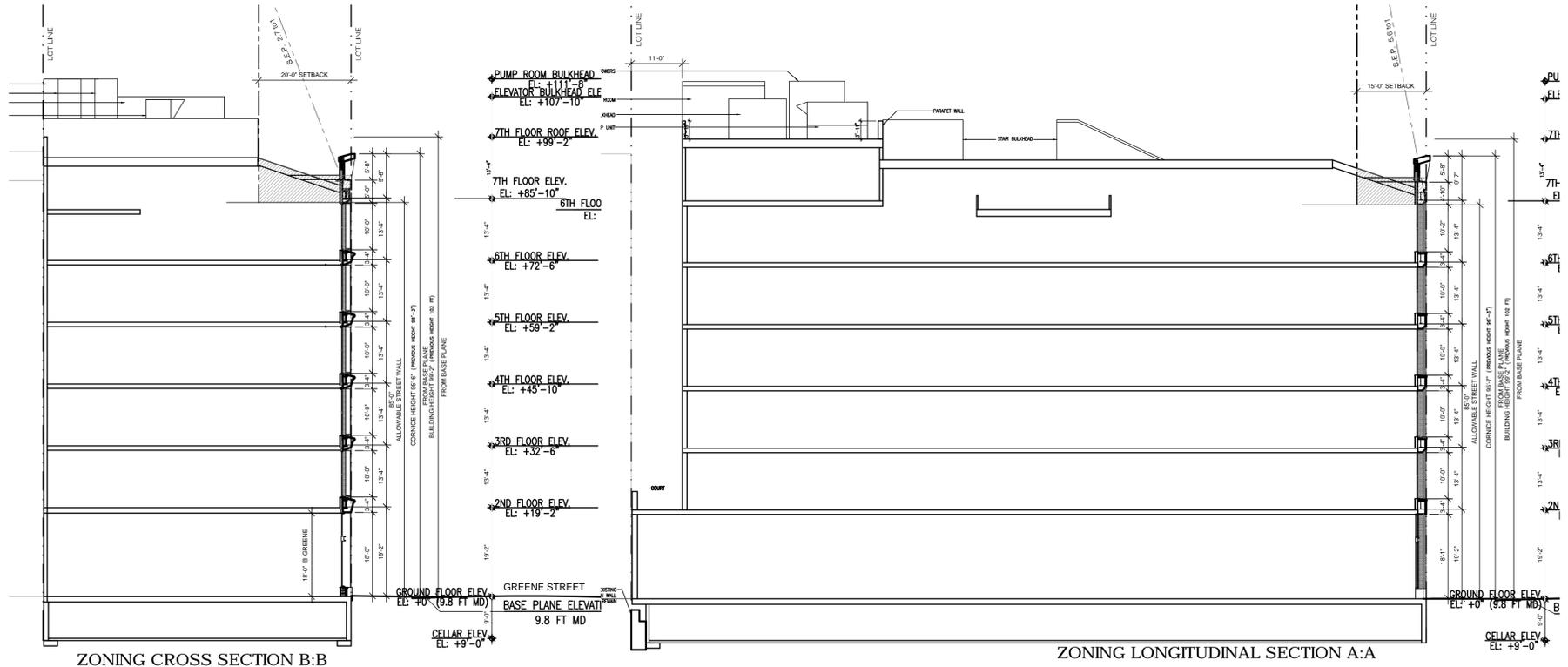
ZONING CALCULATION & ANALYSIS

SEAL & SIGNATURE: _____ DATE: 03-31-2014
 SCALE: N.T.S.
 DRAWING NUMBER: _____

Z-101.00



GREENE STREET (NARROW STREET)

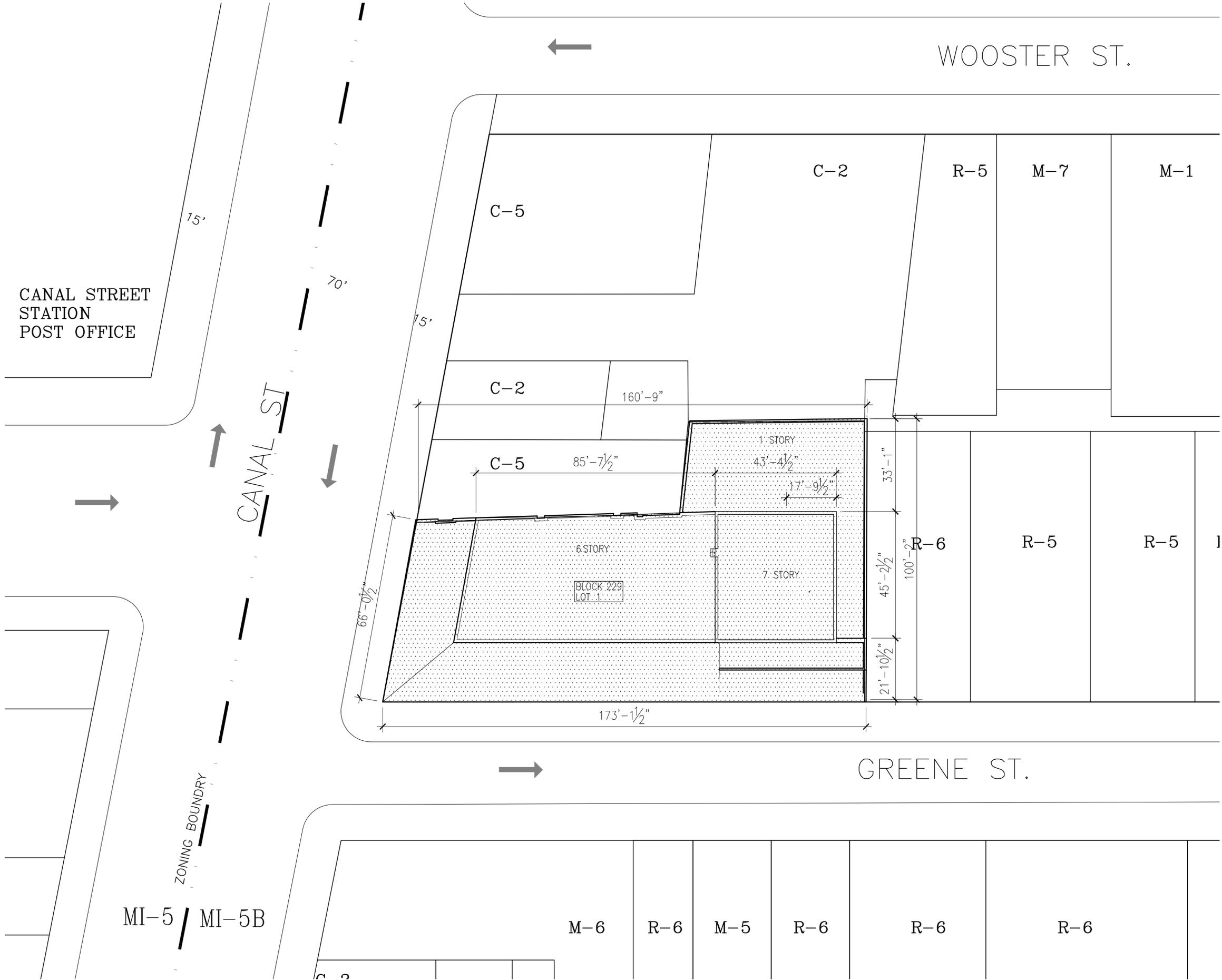


ZONING CROSS SECTION B:B

ZONING LONGITUDINAL SECTION A:A

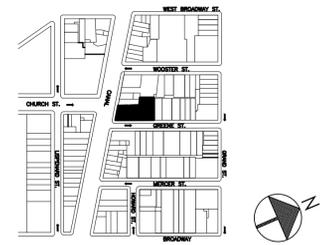
FLOOR	RESIDENTIAL GROSS SF	COMMERCIAL GROSS SF	TOTAL ZONING SF
CELLAR	4,709	3,806	0
FIRST	1,389	11,710	12,695
SECOND	10,472	0	9,787
THIRD	10,472	0	9,787
FOURTH	10,472	0	9,787
FIFTH	10,472	0	9,787
SIXTH	10,472	0	9,787
SIXTH FLOOR MEZZANINE+SEVEN	4,491	0	4,319
TOTAL FLOOR AREAS	62,949	15,516	65,949
CELLAR + MECHANICAL DEDUCTIONS	8,709	3,806	

THE GENERAL CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND REPORT ALL ERRORS AND OMISSIONS TO THE ARCHITECTS. DO NOT SCALE THE DRAWINGS. THIS DRAWING SHALL NOT BE USED FOR CONSTRUCTION PURPOSES UNTIL SIGNED BY THE CONSULTANTS.



REV	DATE	DESCRIPTION
09.17.2014	50 % DESIGN DOCUMENTS	
08.22.2014	ISSUED TO N.Y.C. D.O.B.	
07.25.2014	ISSUED FOR OWNER REVIEW	
6.27.2014	ISSUED TO N.Y.C. D.O.B.	

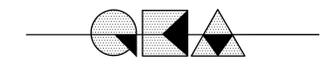
NB # 121186135



11 GREENE STREET
NEW YORK, NY 10013

GWATHMEY SIEGEL
KAUFMAN &
ASSOCIATES
ARCHITECTS llc

525 Broadway
New York, NY 10012
212.947.1240
212.967.0890 fax

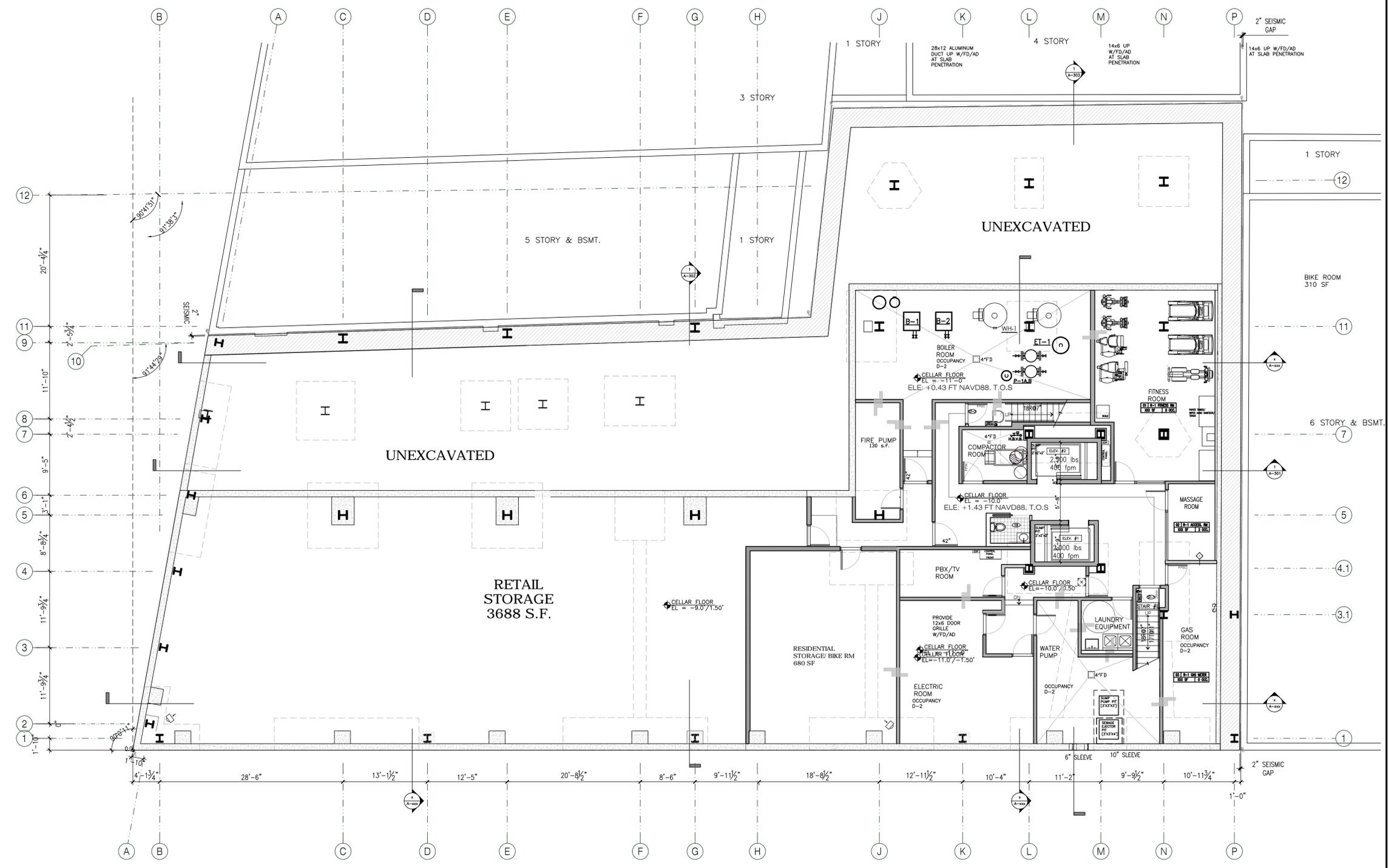


GENE KAUFMAN ARCHITECT PC
525 BROADWAY, NEW YORK, N.Y. 10012
TEL. (212) 625-8700 FAX. (212) 625-8867

SITE PLAN

SEAL & SIGNATURE:	DATE: 03-31-2014
	SCALE: 1/16" = 1'-0"
	DRAWING NUMBER:
	A105.00
	###B0F###

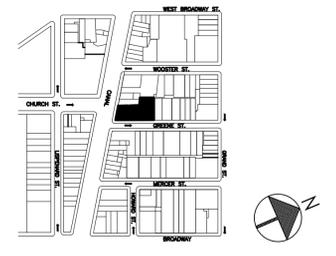
THE GENERAL CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND REPORT ALL ERRORS AND OMISSIONS TO THE ARCHITECTS. DO NOT SCALE THE DRAWINGS. THIS DRAWING SHALL NOT BE USED FOR CONSTRUCTION PURPOSES UNTIL SIGNED BY THE CONSULTANTS.



1 CELLAR FLOOR PLAN
 1/8" = 1'-0"

REV	DATE	DESCRIPTION
09.17.2014	50 % DESIGN DOCUMENTS	
08.22.2014	ISSUED TO N.Y.C. D.O.B.	
07.25.2014	ISSUED FOR OWNER REVIEW	
6.27.2014	ISSUED TO N.Y.C. D.O.B.	

NB # 121186135



11 GREENE STREET
 NEW YORK, NY 10013

GWATHMEY SIEGEL KAUFMAN & ASSOCIATES ARCHITECTS llc

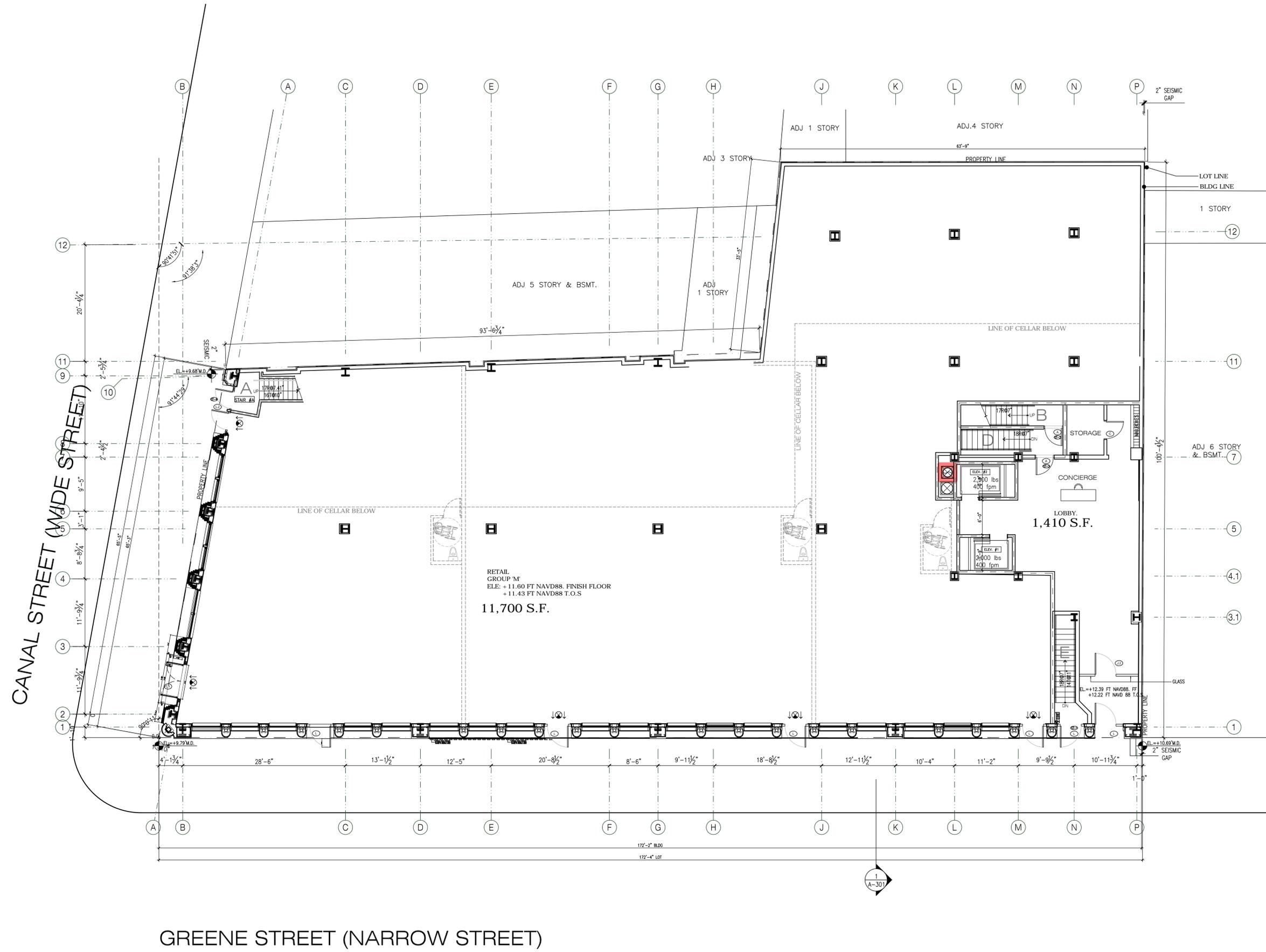
525 Broadway
 New York, NY 10012
 212.947.1240
 212.967.0890 fax

GENE KAUFMAN ARCHITECT PC
 525 BROADWAY, NEW YORK, N.Y. 10012
 TEL. (212) 625-8700 FAX. (212) 625-8867

CELLAR FLOOR PLAN

SEAL & SIGNATURE:	DATE: 03-31-2014
	SCALE: 1/8" = 1'-0"
	DRAWING NUMBER:
	A-200.00
	###B0F###

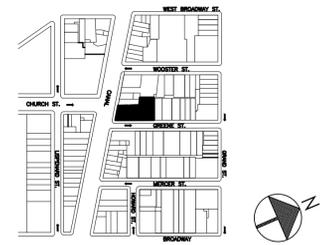
THE GENERAL CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND REPORT ALL ERRORS AND OMISSIONS TO THE ARCHITECTS. DO NOT SCALE THE DRAWINGS. THIS DRAWING SHALL NOT BE USED FOR CONSTRUCTION PURPOSES UNTIL SIGNED BY THE CONSULTANTS.



RECORD SET OF FLOOR PLANS AS APPROVED & FROZEN BY OWNERSHIP
DATE: 09-10-2014

REV	DATE	DESCRIPTION
09.17.2014	50 % DESIGN DOCUMENTS	
08.22.2014	ISSUED TO N.Y.C. D.O.B.	
07.25.2014	ISSUED FOR OWNER REVIEW	
6.27.2014	ISSUED TO N.Y.C. D.O.B.	

NB # 121186135



11 GREENE STREET
NEW YORK, NY 10013

GWATHMEY SIEGEL
KAUFMAN &
ASSOCIATES
ARCHITECTS llc

525 Broadway
New York, NY 10012
212.947.1240
212.967.0890 fax

GENE KAUFMAN ARCHITECT PC
525 BROADWAY, NEW YORK, N.Y. 10012
TEL. (212) 625-8700 FAX. (212) 625-8867

FIRST FLOOR PLAN

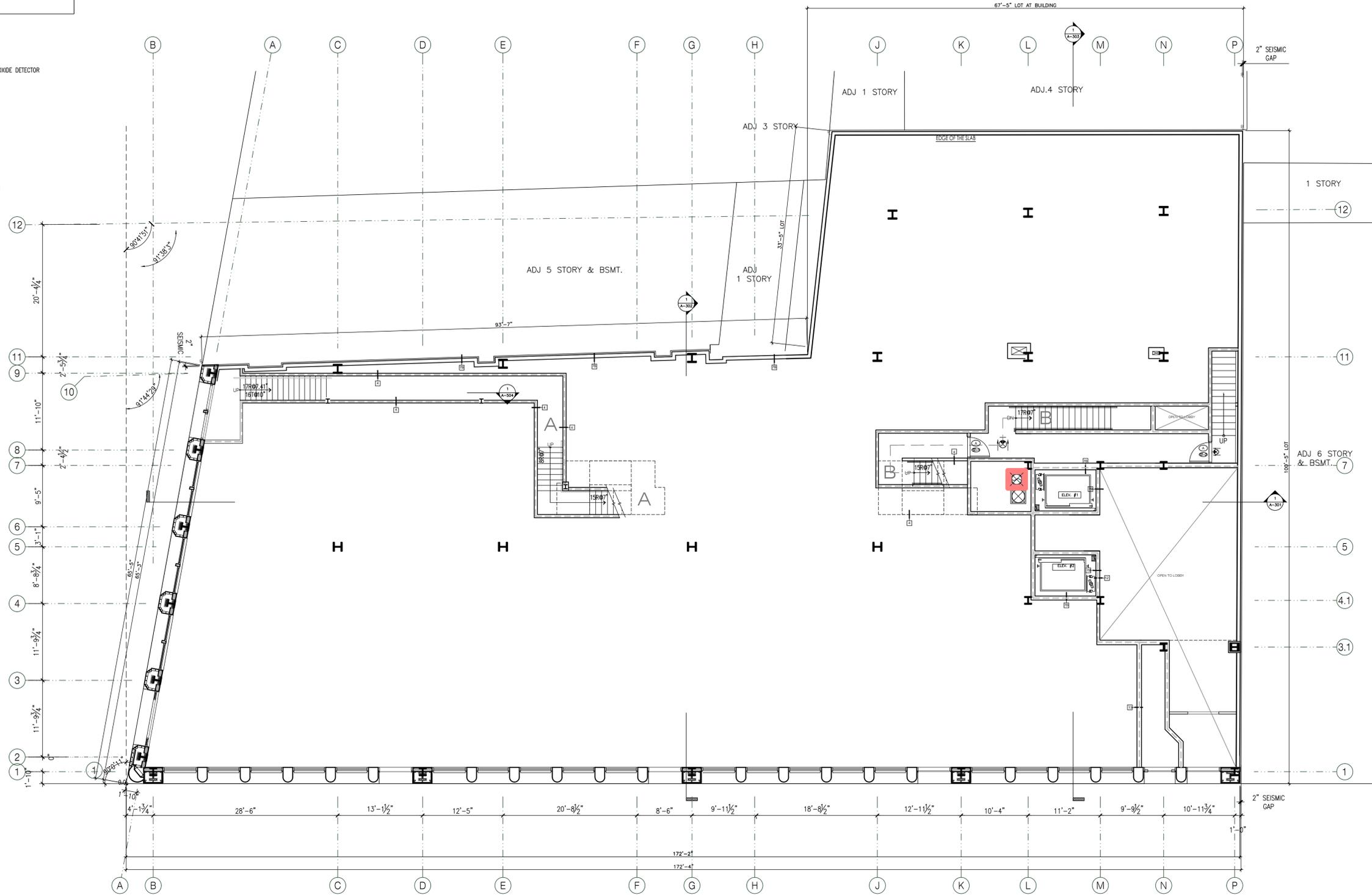
1 FIRST FLOOR PLAN
1/8" = 1'-0"

SEAL & SIGNATURE:	DATE: 03-31-2014
	SCALE: 1/8" = 1'-0"
	DRAWING NUMBER:
	A-201.00
	###B0F###

NOTE:
GENERAL CONTRACTOR IS TO COORDINATE ALL PLUMBING RISERS SLAB PENETRATIONS (LOCATIONS AND SIZES) IN FIELD. GENERAL CONTRACTOR IS TO PROVIDE REINFORCEMENT AROUND ALL PENETRATIONS AS PER APPROVED STRUCTURAL REBAR SHOP DRAWINGS.

LEGEND:

-  EXIT SIGN
-  SMOKE & CARBON MONOXIDE DETECTOR
-  S.D. SMOKE DETECTOR
-  HEAT DETECTOR
-  PARTITION TYPE
-  FIRE EXTINGUISHER
-  WINDOW TYPE
-  DOOR TYPE
-  MECHANICAL VENTILATION
-  ROOF DRAIN
-  AREA DRAIN
-  FLOOR DRAIN

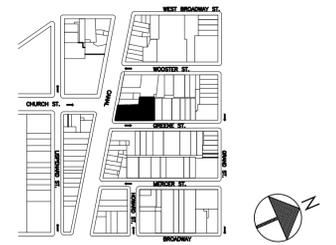


NOTE:
SEE DRAWINGS A-506,
A-506.1, A-506.2 FOR STAIR
DETAILS

THE GENERAL CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND REPORT ALL ERRORS AND OMISSIONS TO THE ARCHITECTS. DO NOT SCALE THE DRAWINGS. THIS DRAWING SHALL NOT BE USED FOR CONSTRUCTION PURPOSES UNTIL SIGNED BY THE CONSULTANTS.

REV	DATE	DESCRIPTION
09.17.2014	50 % DESIGN DOCUMENTS	
08.22.2014	ISSUED TO N.Y.C. D.O.B.	
07.25.2014	ISSUED FOR OWNER REVIEW	
6.27.2014	ISSUED TO N.Y.C. D.O.B.	

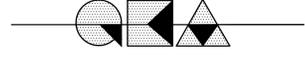
NB # 121186135



11 GREENE STREET
NEW YORK, NY 10013

GWATHMEY SIEGEL
KAUFMAN &
ASSOCIATES
ARCHITECTS llc

525 Broadway
New York, NY 10012
212.947.1240
212.967.0890 fax



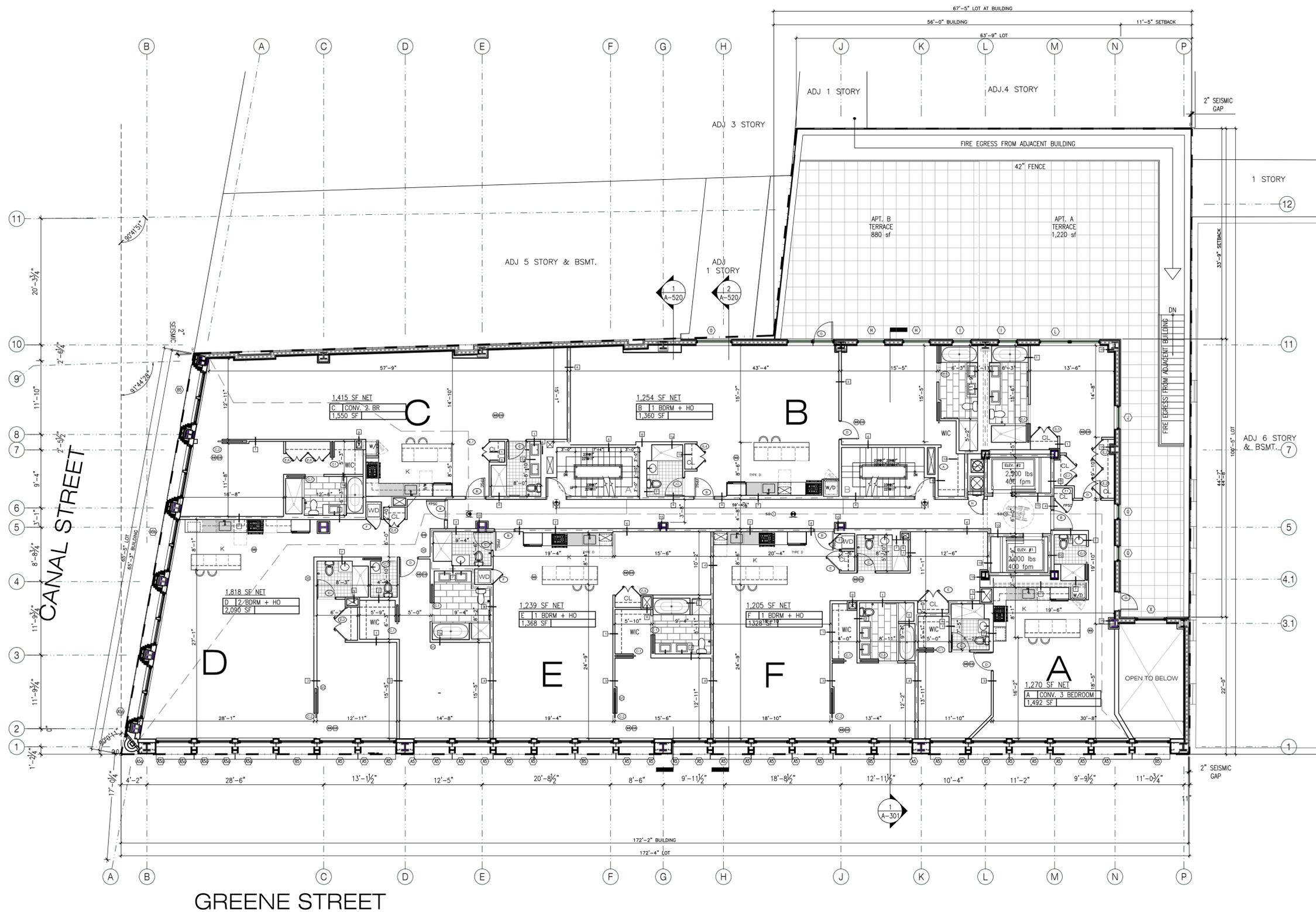
GENE KAUFMAN ARCHITECT PC
525 BROADWAY, NEW YORK, N.Y. 10012
TEL. (212) 625-8700 FAX. (212) 625-8867

FIRST FLOOR MEZZANINE PLAN

SEAL & SIGNATURE:	DATE: 03-31-2014
	SCALE: 1/8" = 1'-0"
	DRAWING NUMBER:
	A-202.00
	###B0F###

1 FIRST FLOOR MEZZANINE PLAN
1/8" = 1'-0"

THE GENERAL CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND REPORT ALL ERRORS AND OMISSIONS TO THE ARCHITECTS. DO NOT SCALE THE DRAWINGS. THIS DRAWING SHALL NOT BE USED FOR CONSTRUCTION PURPOSES UNTIL SIGNED BY THE CONSULTANTS.

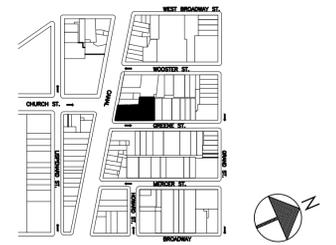


1 SECOND FLOOR PLAN
1/8" = 1'-0"

RECORD SET OF FLOOR PLANS AS APPROVED & FROZEN BY OWNERSHIP DATE: 09-10-2014

REV	DATE	DESCRIPTION
09.17.2014	50 % DESIGN DOCUMENTS	
08.22.2014	ISSUED TO N.Y.C. D.O.B.	
07.25.2014	ISSUED FOR OWNER REVIEW	
6.27.2014	ISSUED TO N.Y.C. D.O.B.	

NB # 121186135



**11 GREENE STREET
NEW YORK, NY 10013**

**GWATHMEY SIEGEL
KAUFMAN &
ASSOCIATES
ARCHITECTS llc**

525 Broadway
New York, NY 10012
212.947.1240
212.967.0890 fax

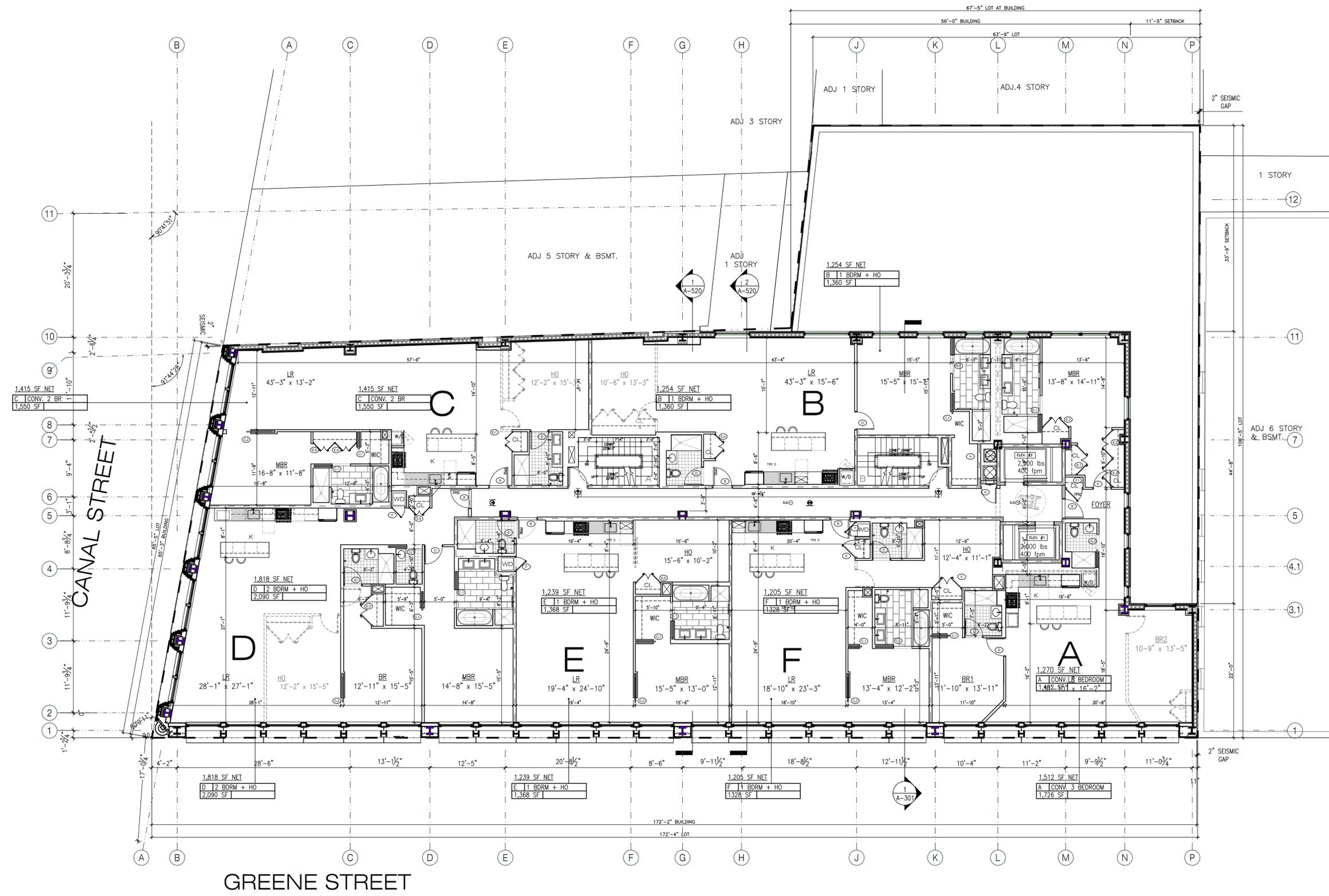
GENE KAUFMAN ARCHITECT PC
525 BROADWAY, NEW YORK, N.Y. 10012
TEL. (212) 625-8700 FAX. (212) 625-8867

SECOND FLOOR PLAN

SEAL & SIGNATURE:	DATE: 03-31-2014
	SCALE: 1/8" = 1'-0"
	DRAWING NUMBER: A-203.00

28 OF 57

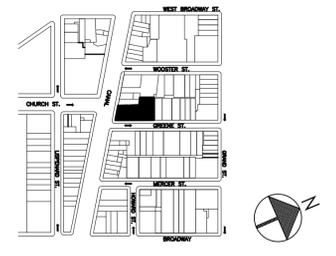
THE GENERAL CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND REPORT ALL ERRORS AND OMISSIONS TO THE ARCHITECTS. DO NOT SCALE THE DRAWINGS. THIS DRAWING SHALL NOT BE USED FOR CONSTRUCTION PURPOSES UNTIL SIGNED BY THE CONSULTANTS.



RECORD SET OF FLOOR PLANS AS APPROVED & FROZEN BY OWNERSHIP
DATE: 09-10-2014

REV	DATE	DESCRIPTION
09.17.2014	50 % DESIGN DOCUMENTS	
08.22.2014	ISSUED TO N.Y.C. D.O.B.	
07.25.2014	ISSUED FOR OWNER REVIEW	
6.27.2014	ISSUED TO N.Y.C. D.O.B.	

NB # 121186135



11 GREENE STREET
NEW YORK, NY 10013

GWATHMEY SIEGEL
KAUFMAN &
ASSOCIATES
ARCHITECTS llc

525 Broadway
New York, NY 10012
212.947.1240
212.967.0890 fax

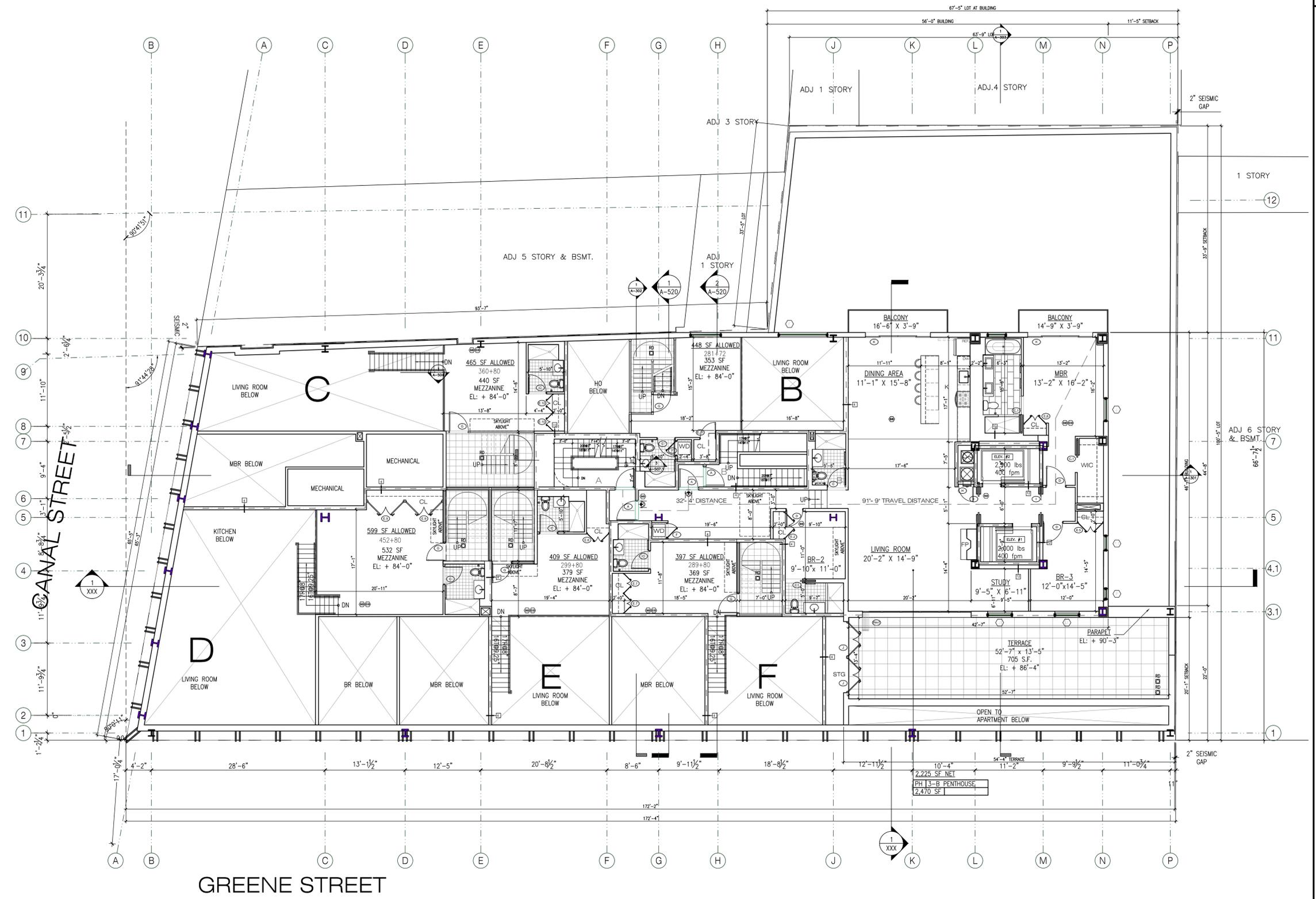
GENE KAUFMAN ARCHITECT PC
525 BROADWAY, NEW YORK, N.Y. 10012
TEL. (212) 625-8700 FAX. (212) 625-8867

3RD TO 5TH FLOOR PLANS

1 3RD TO 5TH FLOOR PLANS
1/8" = 1'-0"

SEAL & SIGNATURE:	DATE: 03-31-2014
	SCALE: 1/8" = 1'-0"
	DRAWING NUMBER:
	A-204.00
	29 OF 57

THE GENERAL CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND REPORT ALL ERRORS AND OMISSIONS TO THE ARCHITECTS. DO NOT SCALE THE DRAWINGS. THIS DRAWING SHALL NOT BE USED FOR CONSTRUCTION PURPOSES UNTIL SIGNED BY THE CONSULTANTS.

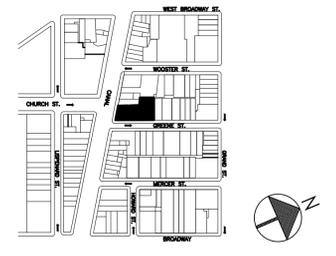


1 6TH FL. MEZZ + 7TH FL. PLAN
1/8" = 1'-0"

RECORD SET OF FLOOR PLANS AS APPROVED & FROZEN BY OWNERSHIP
DATE: 09-10-2014

REV	DATE	DESCRIPTION
09.17.2014	50 % DESIGN DOCUMENTS	
08.22.2014	ISSUED TO N.Y.C. D.O.B.	
07.25.2014	ISSUED FOR OWNER REVIEW	
6.27.2014	ISSUED TO N.Y.C. D.O.B.	

NB # 121186135



11 GREENE STREET
NEW YORK, NY 10013

GWATHMEY SIEGEL
KAUFMAN &
ASSOCIATES
ARCHITECTS llc

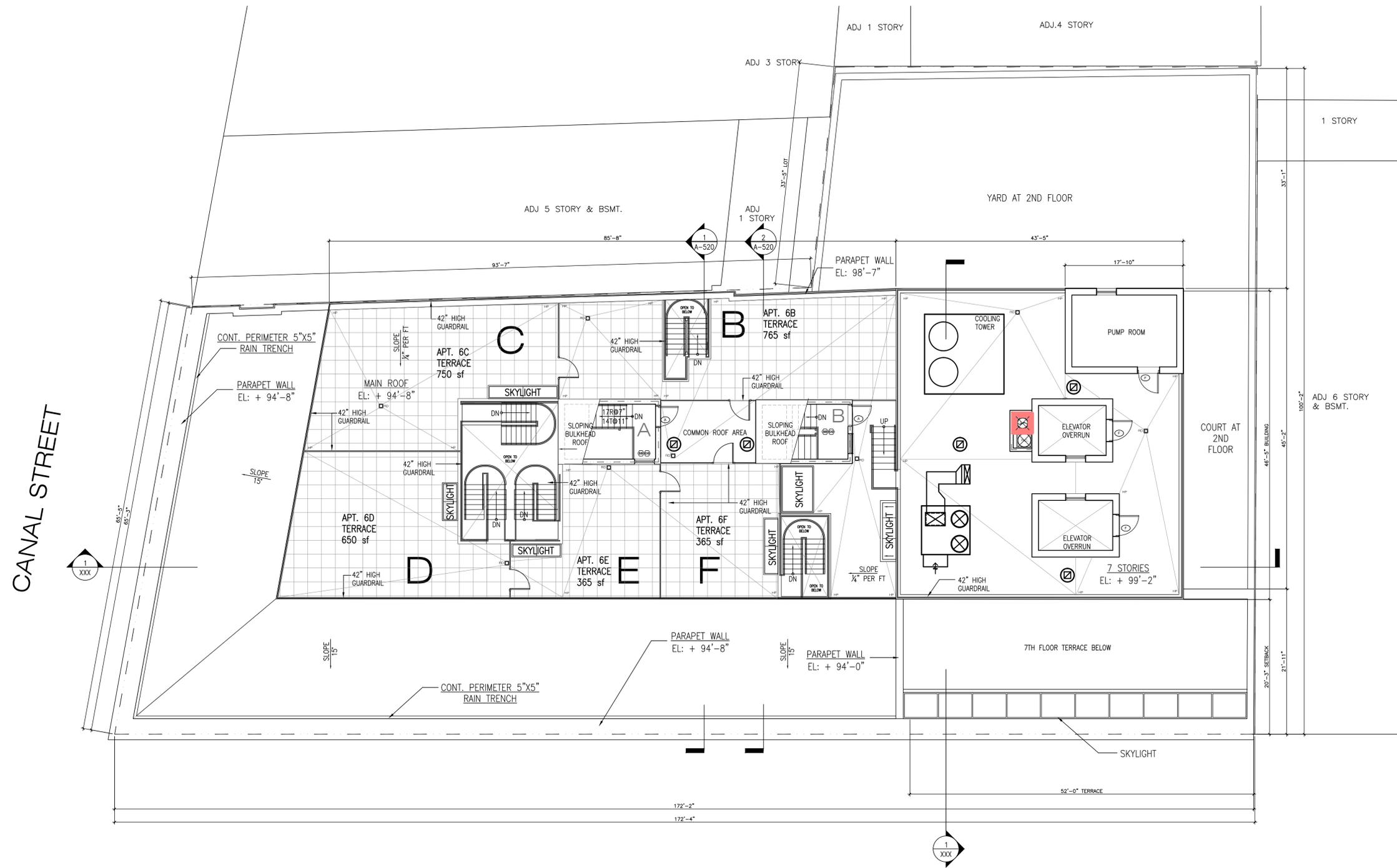
525 Broadway
New York, NY 10012
212.947.1240
212.967.0890 fax

GENE KAUFMAN ARCHITECT PC
525 BROADWAY, NEW YORK, N.Y. 10012
TEL. (212) 625-8700 FAX. (212) 625-8867

6TH FL MEZZ + 7TH FL. PLAN

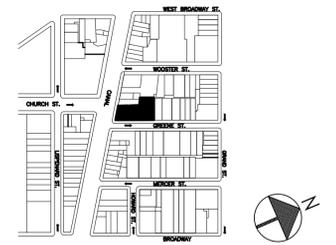
SEAL & SIGNATURE:	DATE: 03-31-2014
	SCALE: 1/8" = 1'-0"
	DRAWING NUMBER:
	A-206.00
	###B0F###

THE GENERAL CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND REPORT ALL ERRORS AND OMISSIONS TO THE ARCHITECTS. DO NOT SCALE THE DRAWINGS. THIS DRAWING SHALL NOT BE USED FOR CONSTRUCTION PURPOSES UNTIL SIGNED BY THE CONSULTANTS.



REV	DATE	DESCRIPTION
09.17.2014	50 % DESIGN DOCUMENTS	
08.22.2014	ISSUED TO N.Y.C. D.O.B.	
07.25.2014	ISSUED FOR OWNER REVIEW	
6.27.2014	ISSUED TO N.Y.C. D.O.B.	

NB # 121186135



11 GREENE STREET
NEW YORK, NY 10013

GWATHMEY SIEGEL
KAUFMAN &
ASSOCIATES
ARCHITECTS llc

525 Broadway
New York, NY 10012
212.947.1240
212.967.0890 fax

GENE KAUFMAN ARCHITECT PC
525 BROADWAY, NEW YORK, N.Y. 10012
TEL. (212) 625-8700 FAX. (212) 625-8867

ROOF PLAN

SEAL & SIGNATURE:	DATE: 03-31-2014
	SCALE: 1/8" = 1'-0"
	DRAWING NUMBER:
	A-207.00
	###B0F###

GREENE STREET

1 ROOF PLAN
1/8" = 1'-0"

APPENDIX C
PREVIOUS ENVIRONMENTAL REPORTS (CD)

APPENDIX D
SOIL/MATERIALS MANAGEMENT PLAN

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 soil will be stockpiled on, at minimum, 6-mil 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 50 feet from the property boundaries, where possible. Hay bales or equivalent will surround soil stockpiles except for areas where access by equipment is required. Silt fencing and hay bales will be used as needed near catch basins, surface waters and other discharge points.

1.3 Characterization of Excavated Materials

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

1.4 Materials Excavation, Load-Out and Departure

The PE/QEP overseeing the remedial action will:

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

1.7 Materials Reuse On-Site

On-site soil/fill is not expected to be reused or relocated on-site. If required, soil and fill that is derived from the Site that meets the soil cleanup objectives established in this plan may be reused on-Site. “Reuse on-site” means material that is excavated during the remedy or development, does not leave the Site, and is relocated within the same Site 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 RAWP are followed. The expected location for placement of reused material is shown in the RAWP.

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

The Grace Preprufe[®] 300R (or equivalent) vapor barrier will serve as a demarcation between the Site building and unexcavated soil exceeding Site-Specific Track 4 SCOs that will remain on-Site.

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 current redevelopment plan does not include the importation of soil to be used as a cap. If these plans change and a soil cover becomes necessary, 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; and
- Clean recycled concrete aggregate (RCA) from facilities permitted or registered by the regulations of NYSDEC.

All materials received for import to the Site will be approved by a PE/QEP and will be in compliance with provisions in this RAWP. 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 Stormwater Pollution Prevention

Applicable laws and regulations pertaining to stormwater pollution prevention will be addressed during the remedial program. Erosion and sediment control measures identified in this 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 soil and reported to OER. Chemical analytical testing will be performed for TAL metals, TCL volatiles and semi-volatiles, TCL pesticides and PCBs, as appropriate.

1.13 Odor, Dust and Nuisance Control

Odor Control

All necessary means will be employed to prevent on- and off-site odor nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) use of foams to cover exposed odorous soil. 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 RCR.

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

The current redevelopment plan does not include the importation of a clean soil cover. The planned landscaped area is on the grade level support platform above the rail lines. If these plans change and a soil cover becomes necessary, 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. All imported soil will be uncontaminated, clean soil that meets the lesser of the appropriate NYSDEC 6 NYCRR Part 375-6.8(a) Restricted Residential 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 is 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 RCR:

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).

APPENDIX E
SPECIFICATIONS FOR VAPOR BARRIER

Grace Below Grade Waterproofing

PREPRUFE® 300R Plus & 160R Plus

Pre-applied waterproofing membranes that bond integrally to poured concrete for use below slabs or behind basement walls on confined sites

Description

Preprufe® 300R Plus & 160R Plus membranes are unique composite sheets comprising, a thick HDPE film, an aggressive pressure sensitive adhesive a weather resistant protective coating and an adhesive to adhesive seam overlap.

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 Plus System includes:

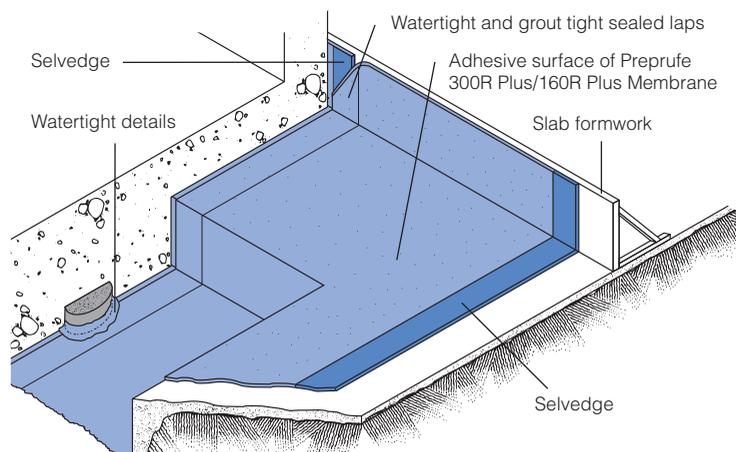
- **Preprufe 300R Plus**—heavy-duty grade for use below slabs and on rafts (i.e. mud slabs). Designed to accept the placing of heavy reinforcement using conventional concrete spacers.
- **Preprufe 160R Plus**—thinner grade for blindside, zero property line applications against soil retention systems.
- **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 Plus & 160R Plus 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 turned 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 adhesive to adhesive watertight laps and detailing**
- **Provides a barrier to water, moisture and gas**—physically isolates the structure from the surrounding ground
- **Easy roll/kick out installation**—reduces installation time and cost
- **Release Liner free**—expedites installation and reduces construction site waste
- **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 Plus has colored zip strips at the top and bottom of the seam area on the edge of the roll. Both zip strips cover an aggressive adhesive. Once the yellow zip strip on the top of the membrane and the blue zip strip on the bottom of the membrane are removed, a strong adhesive to adhesive bond is achieved in the overlap area.

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 <40°F (<4°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 Plus Low Temperature (LT) is available for low temperature condition applications. Refer to Preprufe Plus LT data sheet for more information.

Horizontal substrates—Kick out or roll out the membrane HDPE film side to the substrate with the yellow zip strip facing towards the concrete pour. End laps should be staggered to avoid a build up of layers. Leave yellow and blue zip strips on the membrane until overlap procedure is completed.

Accurately position succeeding sheets to overlap the previous sheet 3 in. (75 mm) along the marked selvedge with the blue zip strip on top of the yellow zip strip. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Peel back and remove both the yellow and blue zip strips in the overlap area to achieve an adhesive to adhesive bond at the overlap. Ensure a continuous bond is achieved without creases and roll firmly with a heavy roller.

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 yellow zip strip 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. Accurately position succeeding sheets to overlap the previous sheet 3 in. (75 mm) along the marked selvedge with the blue zip strip on top of the yellow zip strip. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Peel back and remove both the yellow and

blue zip strips in the overlap area to achieve an adhesive to adhesive bond at the 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 2). Immediately remove tinted 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 tinted 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 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. Provide temporary protection from concrete over splash for areas of the Preprufe membrane that are adjacent to a concrete pour.

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

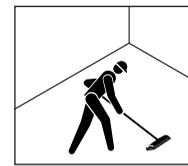
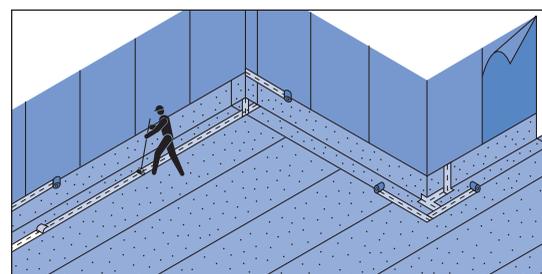
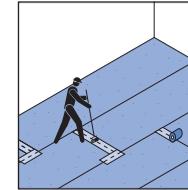


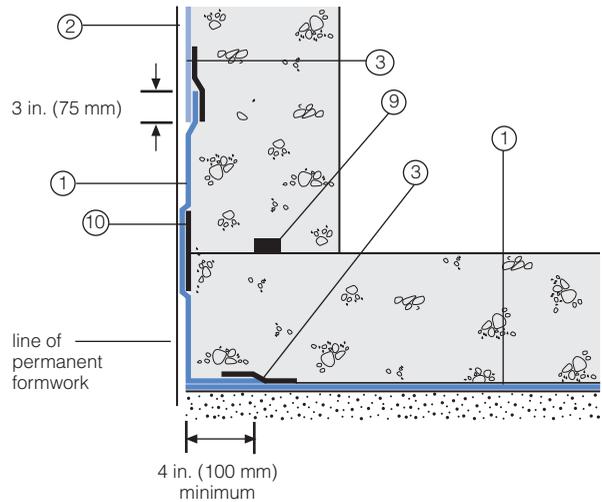
Figure 2



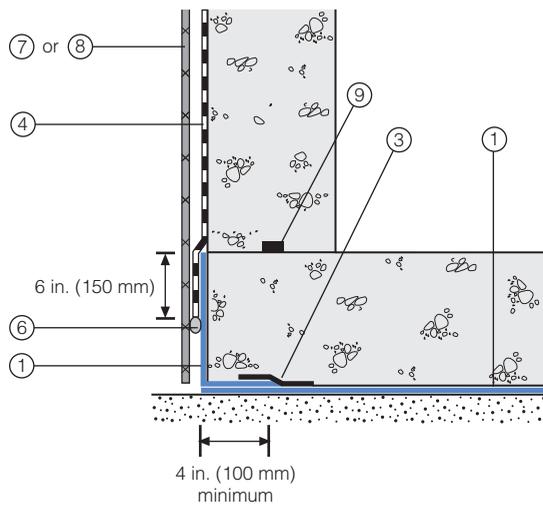
Detail Drawings

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).

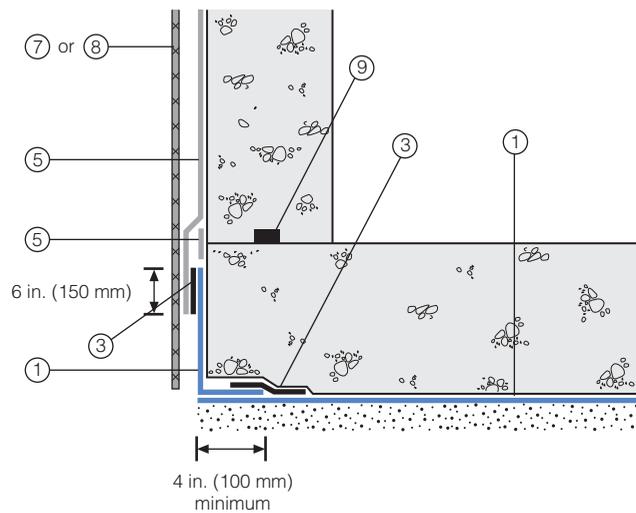
Wall base detail against permanent shutter



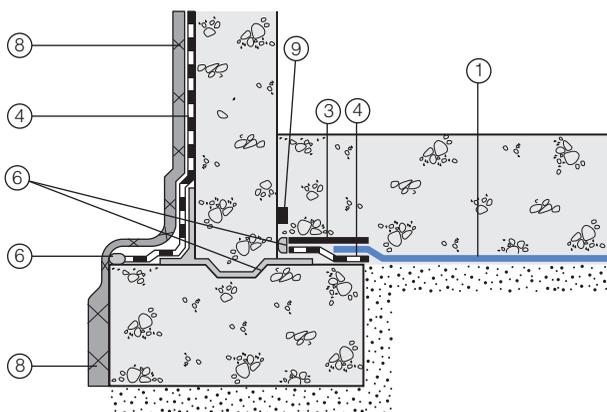
Bituthene wall base detail (Option 1)



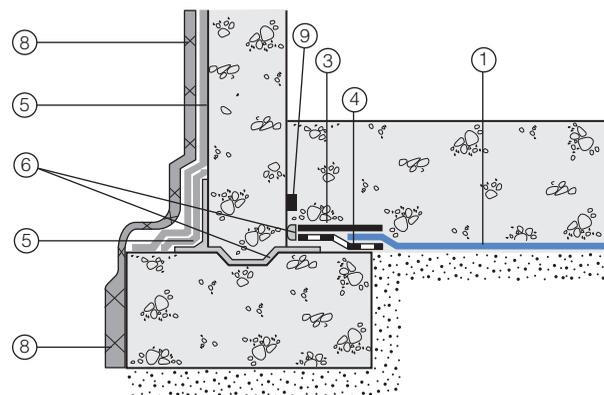
Procor wall base detail (Option 1)



Bituthene wall base detail (Option 2)



Procor wall base detail (Option 2)



- 1 Preprufe 300R Plus
- 2 Preprufe 160R Plus
- 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 Plus Membrane	Preprufe 160R Plus Membrane	Preprufe Tape (LT or HC*)
Thickness	0.046 in. (1.2 mm)	0.032 in. (0.8 mm)	
Roll size	3 ft. 10 in. x 102 ft. (1.17m x 31.15m)	3 ft. 10 in. x 120 ft. (1.17m x 36.6m)	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 Plus	Typical Value 160R Plus	Test Method
Color	white	white	
Thickness	0.046 in. (1.2 mm)	0.032 in. (0.8 mm)	ASTM D3767
Lateral Water Migration Resistance	Pass at 231 ft (71 m) of hydrostatic head pressure	Pass at 231 ft (71 m) of hydrostatic head pressure	ASTM D5385, modified ¹
Low temperature flexibility	Unaffected at -20°F (-29°C)	Unaffected at -20°F (-29°C)	ASTM D1970
Resistance to hydrostatic head	231 ft (71 m)	231 ft (71 m)	ASTM D5385, modified ²
Elongation	500%	500%	ASTM D412, modified ³
Tensile strength, film	4000 psi (27.6 MPa)	4000 psi (27.6 MPa)	ASTM D412
Crack cycling at -9.4°F (-23°C), 100 cycles	Unaffected, Pass	Unaffected, Pass	ASTM C836 ⁴
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 ⁵
Lap peel adhesion at 72°F (22°C)	8 lbs/in. (1408 N/m)	8 lbs/in. (1408 N/m)	ASTM D1876, modified ⁶
Lap peel adhesion at 40°F (4°C)	8 lbs/in. (1408 N/m)	8 lbs/in. (1408 N/m)	ASTM D1876, modified ⁶
Permeance to water vapor transmission	0.01 perms (0.6 ng/(Pa x s x m ²))	0.01 perms (0.6 ng/(Pa x s x m ²))	ASTM E96, method B

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 Preprufe membrane and allowed to cure (7 days minimum)
- 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 at 72°F (22°C).

Specification Clauses

Preprufe 300R Plus or 160R Plus 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. All Preprufe 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 lifted and carried by a minimum of two persons.

www.graceconstruction.com

For technical assistance call toll free at 866-333-3SBM (3726)

Aador is a trademark and Preprufe, Bituthene and Hydroduct are registered trademarks of W. R. Grace & Co.—Conn. Procor is a U.S. registered trademark of W. R. Grace & Co.—Conn., and is used in Canada under license from PROCOR LIMITED.

We hope the information here will be helpful. It is based on data and knowledge considered to be true and accurate and is offered for the users' consideration, investigation and verification, but we do not warrant the results to be obtained. Please read all statements, recommendations or suggestions in conjunction with our conditions of sale, which apply to all goods supplied by us. No statement, recommendation or suggestion is intended for any use which would infringe any patent or copyright. W. R. Grace & Co.—Conn., 62 Whittemore Avenue, Cambridge, MA 02140. In Canada, Grace Canada, Inc., 294 Clements Road, West, Ajax, Ontario, Canada L1S 3C6.

This product may be covered by patents or patents pending.
PF-189 Printed in U.S.A. 02/13

Copyright 2013. W. R. Grace & Co.—Conn.
FA/PDF

GRACE