945 BERGEN STREET

BROOKLYN, NEW YORK

Remedial Action Work Plan

OER Project Number: 14EH-N204K
NYCVCP Project Number: 14CVCP242K

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REMEDIAL ACTION WORK PLAN

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LIST OF ACRONYMS

Acronym	Definition
AOC	Area of Concern
AS/SVE	Air Sparging/Soil Vapor Extraction
BOA	Brownfield Opportunity Area
CAMP	Community Air Monitoring Plan
C/D	Construction/Demolition
COC	Certificate of Completion
CQAP	Construction Quality Assurance Plan
CSOP	Contractors Site Operation Plan
DCR	Declaration of Covenants and Restrictions
ECs/ICs	Engineering and Institutional Controls
HASP	Health and Safety Plan
IRM	Interim Remedial Measure
BCA	Brownfield Cleanup Agreement
MNA	Monitored Natural Attenuation
NOC	Notice of Completion
NYC BCP	New York City Brownfield Cleanup Program
NYC DEP	New York City Department of Environmental Protection
NYC DOHMH	New York State Department of Health and Mental Hygiene
NYCRR	New York Codes Rules and Regulations
NYC OER	New York City Office of Environmental Remediation
NYS DEC	New York State Department of Environmental Conservation
NYS DEC DER	New York State Department of Environmental Conservation Division of Environmental Remediation
NYS DOH	New York State Department of Health
NYS DOT	New York State Department of Transportation
ORC	Oxygen-Release Compound
OSHA	United States Occupational Health and Safety Administration

PE	Professional Engineer
PID	Photo Ionization Detector
QEP	Qualified Environmental Professional
QHHEA	Qualitative Human Health Exposure Assessment
RAOs	Remedial Action Objectives
RAR	Remedial Action Report
RAWP	Remedial Action Work Plan or Plan
RCA	Recycled Concrete Aggregate
RD	Remedial Design
RI	Remedial Investigation
RMZ	Residual Management Zone
SCOs	Soil Cleanup Objectives
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SVOC	Semi-Volatile Organic Compound
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound

CERTIFICATION

I, _____, am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the 945 Bergen Street, Brooklyn, NY and OER project No. **14EH-N204K and VCP Number 14CVCP242K.**

I, Nicholas M. Canonico am a Qualified Environmental Professional as defined in §43-140. I have primary direct responsibility for implementation of the remedial action for the 945 Bergen Street Site.

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

PE Stamp

Nicholas M. Canonico
QEP Name

_____
QEP Signature

04-30-14
Date

EXECUTIVE SUMMARY

Crow Hill Development, LLC has applied to enroll in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a 21,876-square foot site located at 945 Bergen Street in Brooklyn, New York. A remedial investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP). The remedial action described in this document provides for the protection of public health and the environment consistent with the intended property use, complies with applicable environmental standards, criteria and guidance and conforms with applicable laws and regulations.

Site Location and Current Usage

The property is located at 945 Bergen Street in Brooklyn, New York and is currently identified as Block 1142 Lot(s) 44 and 48 (Figure 1). There is a tax-lot division in progress that will further subdivide the site into a third tax lot, in preparation for a sale - and then there will be two distinct development parcels. Historic uses of the property derived from Sanborn fire insurance maps included: Nassau Brewery (1908), auto-body manufacturer (1932), and manufacturing (1951-1995) (Phase I, March of 2001). Currently Residential R7A zoning, the area was previously designated Residential R6 and prior to 2006, as an M1-1 zone, light-manufacturing district. This M1-1 zoning category permitted limited commercial uses in addition to manufacturing uses and did not permit new residential uses.

Summary of Proposed Redevelopment Plan

SITE 1 is labeled 'Building A/B' on the Site Owners plan submission. It is the northern two-thirds of the property, bounded by Dean Street (153.5') and Franklin Ave (141') and is a lot size of 21,876'. This portion of the property will be demolished, and a new building of 80,000' – 100,000' will be built. It will have a maximum height of 80'. It will contain approximately 90-120 residential units, with retail on the ground-floor. It will be an L-shaped building with an inner courtyard. Parking will either be on grade, or in one sub-surface level (Figure 2).

The Site Owner has developed new plans and drawings for their current SITE 1 residential development (described above). The blueprints and site maps (Conceptual Plan) are included as Appendix 5 to this RAP.

Summary of the Remedy

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

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP Citizen Participation activities according to an approved Citizen Participation Plan.
2. Performance of a Community Air Monitoring Program for particulates and volatile organic carbon compounds.
3. Preparation of a Construction Health & Safety Plan (CHASP).
4. Establish Site Specific (Track 4) Soil Cleanup Objectives (SCOs).
5. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
6. Excavation and removal of soil/fill exceeding Track 4 SCOs. Footprint of new building will be excavated to a depth of approximately 12 feet below grade for development purposes. The courtyard areas will be excavated for two hotspot removal and at least two feet in rest of courtyard area. .
7. 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.
8. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID. Appropriate segregation of

excavated media on-Site.

9. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Separate management of soils associated with the SVOC hotspot removal. Sampling and analysis of excavated media as required by disposal facilities.
10. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
11. Design and Installation of the active Sub-Slab Depressurization System (SSDS). SSDS will be installed in the old dry well area. If development plans for building is changed from ventilated parking garage to retail/storage, SSDS will be extended beneath the building footprint.
12. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
13. Installation of a vapor barrier/waterproofing system below the concrete slab underneath the building, as well as behind foundation walls of the proposed building. The vapor barrier will consist of Liquid Boot™ Membrane/Liner (60 mil thickness Liquid Boot) or equivalent.
14. Construction and maintenance of an engineered composite cover consisting of 12" thick concrete slab across the footprint of the new building and two feet of clean soil cap in courtyard areas
15. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
16. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
17. Submission of an approved Site Management Plan (SMP) in the Remedial Action Report (RAR) for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency.
18. Submission of a RAR that describes the remedial activities and certifies that the

remedial requirements have been achieved, defines the Site boundaries, and, describes all Engineering and Institutional Controls to be implemented at the Site, and lists any changes from this RAWP.

19. The property will continue to be registered with an E-Designation at the NYC Buildings Department. Establishment of Engineering Controls and Institutional Controls; a requirement that management of these controls must be in compliance with an approved SMP. Institutional Controls will include prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER-approval.

COMMUNITY PROTECTION STATEMENT

The 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 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 and also includes many other elements that address common community concerns, such as community air monitoring, odor, dust and noise controls, hours of operation, good housekeeping and cleanliness, truck management and 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.

Construction Health and Safety Plan. This cleanup plan includes a Construction Health and Safety Plan (CHASP) that is designed to protect community residents and on-Site workers. The elements of this plan are in compliance with safety requirements of the United States Occupational Safety and Health Administration (OSHA). 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 Mr. Jesus Misas and can be reached at (516) 462-2611.

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 (OER). 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 onsite Project Manager Mr. Nicholas Canonico at (516) 244-4069 or NYC Office of Environmental Remediation Project Manager Eric Ilijevich at (212) 788-8841.

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. For this cleanup project, the hours of operation are 7:00AM to 6:00PM Monday through Friday.

Signage. While the cleanup is in progress, a placard will be prominently posted at the main entrance of the property with a laminated project Fact Sheet that states that the project is in the NYC Voluntary Cleanup Program, 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 NYC Office of Environmental Remediation Project Manager Eric Ilijevich at (212) 788-8841 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 will be 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 Brooklyn Public Library - Leonard Branch.

Long-Term Site Management. If long-term protection after the cleanup is needed, 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 or established through a city environmental designation. A certification of continued protectiveness of the cleanup will be required from time to time to show that the approved cleanup is still effective.

REMEDIAL ACTION WORK PLAN

1.0 SITE BACKGROUND

Crow Hill Development, LLC has applied to enroll in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a property located at 945 Bergen Street in the Crown Heights section of Brooklyn, New York (the "Site"). A Remedial Investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP) in a manner that will render the Site protective of public health and the environment consistent with the contemplated end use. This RAWP establishes remedial action objectives, provides a remedial alternatives analysis that includes consideration of a permanent cleanup, and provides a description of the selected remedial action. The remedial action described in this document provides for the protection of public health and the environment, complies with applicable environmental standards, criteria and guidance and applicable laws and regulations.

1.1 SITE LOCATION AND CURRENT USAGE

The property is located at 945 Bergen Street in Brooklyn, New York and is currently identified as Block 1142 Lot(s) 44 and 48 (Figure 1). There is a tax-lot division in progress that will further subdivide the site into a third tax lot, in preparation for a sale - and then there will be two distinct development parcels. Historic uses of the property derived from Sanborn fire insurance maps included: Nassau Brewery (1908), auto-body manufacturer (1932), and manufacturing (1951-1995) (Phase I, March of 2001). Currently Residential R7A zoning, the area was previously designated Residential R6 and prior to 2006, as an M1-1 zone, light-manufacturing district. This M1-1 zoning category permitted limited commercial uses in addition to manufacturing uses and did not permit new residential uses.

1.2 PROPOSED REDEVELOPMENT PLAN

SITE 1 is labeled 'Building A/B' on the Site Owners plan submission. It is the northern two-thirds of the property, bounded by Dean Street (153.5') and Franklin Ave (141') and is a lot size

of 21,876'. This portion of the property will be demolished, and a new building of 80,000' – 100,000' will be built. It will have a maximum height of 80'. It will contain approximately 90-120 residential units, with retail on the ground-floor. It will be an L-shaped building with an inner courtyard. Parking will either be on grade, or in one sub-surface level (Figure 2).

The Site Owner has developed new plans and drawings for their current SITE 1 residential development (described above). The blueprints and site maps (Conceptual Plan) are included as Appendix 5 to this RAP.

The remedial action contemplated under this RAWP may be implemented independently of the proposed redevelopment plan.

1.3 DESCRIPTION OF SURROUNDING PROPERTY

The area surrounding the Site consists of a mix of residential and vacant properties. Figure 6 shows the surrounding land usage of the adjacent properties listed below as well as additional properties located up to 500 feet away from the Site. No hospitals, schools or daycare facilities are located within a 250 ft radius of the Site.

Direction	**Property Description**
North – Opposite side of Grand Street	Block 2783, Lot 39 (737 Grand Street) – Developed with multi-story mixed commercial and residential buildings.
South – Adjacent property	Block 2789, Lot 39 (177 Maujer Street) – Developed with a multi-story residential building.
East – Adjacent property	Block 2789, Lot 11 (740 Grand Street) – Developed with a multi-story residential building.
West – Adjacent property	Block 2789, Lot 4 (262 Graham Avenue) – Developed with a multi-story commercial building.

1.4 REMEDIAL INVESTIGATION

A remedial investigation was performed and the results are documented in a companion document called "*Remedial Investigation Report, 945 Bergen Street*", dated February 2014 (RIR).

1.4.1 Phase I Environmental Site Assessment, ESA

Don Carlo Environmental Services conducted a Phase I Environmental Assessment (Phase I) of the Site in March 2001. The purpose of the Phase I was to identify Recognized Environmental Conditions. The term recognized environmental conditions means the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property. The Phase I identified numerous potential environmental issues at the site including suspected asbestos containing material (ACM) and lead-based paint, underground and above ground storage tanks , an automobile repair pit, several floor drains, and risk of mold/fungal contamination due to pigeon infestation and weather exposure.

1.4.2 Phase II Subsurface Investigation

General Consolidated Industries, Inc., Environmental & Engineering Consultants (GCI) conducted a Phase II Subsurface Investigation (Phase II) at the Site in June 2002. This Phase II was conducted to investigate the environmental concerns outlined in the Phase I Environmental Assessment. Based on the results of the Phase II Subsurface Investigation, six areas of environmental concern (AECs) were identified at the Site. They included the: Redevelopment Area, Auto Repair Pit, Drywell, Drywell Piping System, Aboveground Storage Tanks and Underground Storage Tank.

1.4.3 Phase III Subsurface Investigation

NOVA Consulting conducted a Phase III Subsurface Investigation (Phase III) at the Site between January and April 2006. The Phase III was conducted to further define the six AECs identified in the Phase I and Phase II. Results of the Phase III Subsurface Investigation concluded that (1) no further work was warranted in the Redevelopment Area AEC and the Drywell Piping System AEC and (2) the Auto Repair Pit AEC, Aboveground Storage Tanks and Underground Storage Tank AECs would be closed under the NYSDEC Spill Number 05-12490. Subsequently, the NYSDEC administratively closed the Spill Case on May 15th, 2006.

In regard to the Drywell AEC, NOVA contacted Mr. Randall Austin, the NYSDEC Spills Bureau Chief regarding the procedure for the proper closure of the drywell. As a result of the high soil concentrations of tetrachloroethene (PCE) being defined (horizontally and vertically) and the groundwater not being impacted, Mr. Austin recommended NOVA conduct an interim remedial measure or an emergency spill response under the oversight of the NYSDEC to remediate the Drywell. Subsequently, NOVA established NYSDEC Spill Number 06-00840 for the Drywell.

1.4.4 Site Contamination

Results of the Phase III indicated the soils beneath the Drywell were impacted by PCE to a depth of approximately 60 feet below grade. The highest concentrations of PCE in the soils were detected within the first 30 feet below grade, which was subsequently later removed during the interim remedial measure. During the Phase III, one monitoring well was installed to a depth of 90 feet below grade to test the groundwater quality beneath the Drywell. The groundwater table was recorded at 81 feet below grade. All subsequent groundwater sampling resulted in no exceedances of the groundwater standard. At the conclusion of the Interim Remedial Measure, the soils between 30 and 60 feet below land surface remained at concentrations exceeding the NYSDEC TAGM soil objectives.

As evidenced in earlier investigations, Semi-Volatile Organic Compounds (SVOCs) were also identified in the soils at the property with some exceedances of soil standards.

1.4.5 Interim Remedial Measure (July 2007 Closure Report)

Based upon the existing site conditions (i.e. subsurface geology) and the proposed Site development plans at the time, NOVA conducted a remedial feasibility study. NOVA determined that the most effective remedial alternative would be to remove the source of the PCE contaminated soils to a depth of 35 feet below land surface (bls), in effect, removing the majority (highest concentrations) of the soil contamination from the site. This approach, which was agreed to by the NYSDEC on August 1, 2006 was implemented on July 2007 with the remediation of the on-site drywell.

In April 2007 the drywell structure was removed as well as the contaminated soil around the drywell. Subsequently, a 42-inch diameter borehole was drilled using a bucket auger rig. This was followed by the removal of subsurface material to a depth of 25 feet below land surface with a bucket auger rig. Once the PCE contaminated subsurface material was removed a 4-inch diameter SVE well was installed. Following the installation of the SVE well, the first floor drain system, which included five floor drains that discharged to the drywell, was abandoned and filled with Portland cement. A confirmatory endpoint groundwater sample was collected; the results did not show concentrations of PCE in excess of its groundwater standard.

In July 2007, NOVA submitted a Spill Closure Report to NYSDEC, addressing the activities performed at the Property for the Interim Remedial Measure. These activities included 1) Drywell Demolition, 2) Drywell Remediation, 3) Soil Vapor Extraction Well Installation 4) Contaminated Soil Disposal and 5) Confirmatory Endpoint Sample Collection. Based upon (1) the proper closure and remediation of the Site Drywell in accordance with State and Federal Regulations, (2) The removal from the Site of the PCE source down to a depth of 25 feet, and (3) the results of the groundwater confirmation endpoint sample, the NYSDEC closed Spill Case Number 06-00840 on January 16th, 2008 as recommended by NOVA.

1.4.5 Site Remedial Action Plan (2008)

Following the purchase of the property by Crow Hill Development, LLC from its predecessor, 945 Bergen Street, LLC and subsequent rezoning from Manufacturing M1-1 to Residential R6, NOVA was retained to prepare and execute a RAP. Following the regulatory closure of Identified AECs at the property, NOVA submitted the RAP outlining the steps necessary to manage the remaining potential residual soil vapor contamination to the NYCDEP in early April 2008. On April 18, 2008, NYCDEP issued the Property Owner a Notice of Proceed with the scope of work outlined in the RAP.

1.4.6 Phase II Work Plan (2014)

NOVA developed a Phase II Investigation Work Plan for the referenced site in response to OER requesting a revision to an expired site RAP previously approved by OER in April 2008 (described above), as well as comments offered during a meeting and site visit by OER in

December 2013 and a modification of the development plan by the current property owner, Crow Hill Development LLC. The Work Plan was approved by OER on January 24, 2014 and a completed RIR submitted to OER on February 5, 2014.

1.4.6.1 Phase II Field Investigation

The investigation included soil and soil vapor sample collection at specific locations on SITE 1 to re-examine and confirm prior soil results and conclusions for SVOCs in the shallow subsurface soils as well as VOCs in the vicinity of the Drywell AEC.

Two (2) soil samples (0-2 feet below grade interval) were collected from six (6) test boring locations (12 total). Soil samples were analyzed for VOCs by EPA Method 8260 and SVOCs by EPA Method 8270.

Six (6) sub-slab soil vapor samples were collected on SITE 1. The six soil vapor samples were collected in accordance with the Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH October 2006). Certified clean summa canisters were employed to collect the soil vapor samples. Samples were analyzed by using USEPA Method TO-15.

1.4.6.2 Summary of Environmental Findings

1. Soil sample results were compared to NYSDEC Unrestricted Use (Track 1) and Restricted Residential Use (Track 2) Soil Cleanup Objectives (SCOs) as presented in NYSDEC Part 375-6. Soil/fill samples collected during the 2014 Remedial Investigation showed six VOCs at a detectable concentration; acetone (7.2 µg/Kg), methylene chloride (1.7 µg/Kg), naphthalene (3.4 µg/Kg), tetrachloroethylene (maximum of 3.2 µg/Kg), toluene (1.2 µg/Kg), and trichloroethylene (2.1 µg/Kg). No VOCs were detected at a concentration above Unrestricted Use SCOs.

   Soil/fill samples collected during the 2006 Phase III showed no PCBs at detectable concentrations and no pesticides at a concentration above Unrestricted Use SCOs with the exception of the pesticide 4,4-DDT in one shallow soil sample. No VOCs were detected above Unrestricted Use SCOs, but the VOC naphthalene was detected at a concentration below Unrestricted Use SCOs within two soil borings at a depth of 8-12 feet below grade. Eight SVOCs were detected above Unrestricted Use SCOs, and of these benz(a)anthracene (maximum of 27,000 µg/Kg), benzo(a)pyrene (maximum of 26,000 µg/Kg), benzo(b)fluoranthene (maximum of 23,000 µg/Kg), benzo(k)fluoranthene (max of 23,000 µg/Kg), dibenz(a,h)-anthracene (maximum of

1,900 µg/Kg), and indeno(1,2,3-cd)pyrene (maximum of 12,000 µg/Kg) were detected above Restricted Residential Use SCOs. Five metals including cadmium (max of 4.1 mg/Kg), copper (max of 97 mg/Kg), lead (max of 330 mg/Kg), mercury (max of 0.43 mg/Kg), and zinc (max of 760 mg/Kg) were detected above Unrestricted Use SCOs within 4 of the 20 soil samples. No metals were detected above Restricted Residential SCOs.

2. Groundwater sample results were compared to 6 NYCRR NYSDEC Part 703.5 Groundwater Quality Standards (GQS). The groundwater sample (W-1) collected during the 2006 Phase II showed no detectable concentrations of VOCs, pesticides or PCBs. No SVOCs were detected above GQS, but bis(2-ethylhexyl)phthalate and di-n-butylphthalate were reported at trace concentrations. Metals present in groundwater at levels above GQS include chromium, aluminum, iron, manganese, and sodium The presence of some of these metals in groundwater, specifically those that are common salinity indicators, can be attributed to intrusion or road salting.

   The groundwater sample (W-2, formerly W-58) collected as part of the drywell remediation project (2007 Spill Closure Report) was only analyzed for VOCs. The chlorinated volatile organic compound (CVOC) TCE was reported at a concentration of 2 µg/L (below GQS), and the CVOC PCE was reported at a concentration of 5 µg/L (equal to the GQS).

3. Soil vapor samples collected during the RI were compared to the compounds listed in Table 3.1 Air Guideline Values Derived by the NYSDOH located in the New York State Department of Health (NYSDOH) Final Guidance for Evaluating Soil Vapor Intrusion. Soil vapor samples collected during the 2014 RI indicated petroleum related VOCs and chlorinated VOCs were present at moderate concentrations. Petroleum-related VOCs (BTEX) were detected at a maximum concentration of 100 $\mu g/m^3$. Overall the highest reported concentrations were for acetone (maximum of 384 $\mu g/m^3$). Trichloroethylene (TCE) was detected in all ten soil gas samples and ranged in concentration from 1.29 to 15.6 $\mu g/m^3$. TCE was detected in soil vapor at concentrations above the monitoring level ranges established within the New York State Department of Health (NYSDOH) Final Guidance on Soil Vapor Intrusion (October 2006) values (AGVs). Tetrachloroethylene (PCE) was detected in all ten soil gas samples, and ranged in concentration from 2.44 to 56.9 $\mu g/m^3$. Carbon tetrachloride was detected within nine of the ten soil gas samples at a maximum concentration of 3.14 $\mu g/m^3$ and 1,1,1-trichloethylene (TCA) was detected in only two of the ten soil gas samples at a maximum concentration of 6.87 $\mu g/m^3$. The PCE, carbon tetrachloride and TCA concentrations are below the monitoring level ranges established within the NYSDOH Final Guidance on Soil Vapor Intrusion.

2.0 REMEDIAL ACTION OBJECTIVES

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

Soil

- Prevent direct contact with contaminated soil.
- Prevent exposure to contaminants volatilizing from contaminated soil.

Groundwater

- Groundwater is 81 feet deep and not contaminated.

Soil Vapor

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

3.0 REMEDIAL ALTERNATIVES ANALYSIS

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

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

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

Alternative 1 involves:

- Establishment of Unrestricted Use (Track 1) Soil Cleanup Objectives (SCOs).
- Removal of all soil/fill exceeding Track 1 Unrestricted Use SCOs throughout the Site and confirmation that Track 1 Unrestricted Use SCOs has been achieved with post-excavation endpoint sampling. Based on the results of the Remedial Investigation, it is expected that this alternative would require excavation across the entire Site to a depth of

approximately to 10 feet to removal all historic fill/contaminated soil. Excavation for construction of the new building's cellar level would take place to a depth of approximately 12 feet below new building footprint. If soil/fill containing analytes at concentrations above Unrestricted Use SCOs is still present at the base of the excavation after removal of all soil required for construction of the new building's cellar level is complete, additional excavation will be performed to ensure complete removal of soil that does not meet Track 1 Unrestricted Use SCOs.

- No Engineering or Institutional Controls are required for a Track 1 cleanup, but a vapor and waterproof barrier would be installed beneath the basement foundation and behind foundation sidewalls of the new building as a part of development to prevent any potential future exposures from off-Site soil vapor.
- Placement of a final cover over the entire Site as part of construction.

Alternative 2 involves

- Establishment of Site Specific (Track 4) Site-Specific SCOs.
- Removal of all soil/fill exceeding Track 4 Site-Specific SCOs and confirmation that Track 4 Site-Specific SCOs have been achieved with post-excavation endpoint sampling. Excavation for construction of the new building's cellar level would take place to a depth of approximately 12 feet below the building footprint and at least to two feet below grade in courtyard area. Additional excavation at hotspot areas within courtyard (soil borings B6 and B7) will be conducted to depths of 12 feet below grade. Therefore, if soil/fill containing analytes at concentrations above Track 4 Site-Specific SCOs is still present at the base of the excavation after removal of all soil required for construction of the new building is complete, additional excavation will be performed to meet Track 4 Site-Specific SCOs.
- Placement of a final cover over the entire Site to prevent exposure to remaining soil/fill;

- Installation of a soil vapor barrier/waterproofing system beneath the building slab and along foundation side walls to prevent any potential future exposures from off-Site soil vapor;
- Installation and operation of an active Sub Slab Depressurization System in the areas of old drywell;
- Establishment of use restrictions including prohibitions on the use of groundwater from the Site; prohibitions of sensitive Site uses, such as farming or vegetable gardening, to prevent future exposure pathways; and prohibition of a higher level of land use without OER approval;
- Establishment of an approved Site Management Plan (SMP) to ensure long-term management of these Engineering and Institutional Controls including the performance of periodic inspections and certification that the controls are performing as they were intended. SMP will note that the property owner and property owner's successors and assigns must comply with the approved SMP; and
- The property will continue to be registered with an E-Designation at the NYC Buildings Department.

3.1 THRESHOLD CRITERIA

Protection of Public Health and the Environment

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

Alternative 1 would be protective of human health and the environment by removing contaminated soil/fill exceeding Track 1 Unrestricted Use SCOs and groundwater protection

standards, thus eliminating potential for direct contact with contaminated soil/fill once construction is complete and eliminating the risk of contamination leaching into groundwater.

Alternative 2 would achieve comparable protections of human health and the environment by excavating the historic fill at the Site and by ensuring that remaining soil/fill on-Site meets Track 4 Site-Specific SCOs, as well as by placement of Institutional and Engineering controls, including a composite cover system, a vapor barrier and active SSDS. The composite cover system would prevent direct contact with any remaining on-Site soil/fill. Implementing Institutional Controls including a Site Management Plan and continued “E” designation of property 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 soils or groundwater during construction would be minimized by implementing a Construction Health and Safety Plan, an approved Soil/Materials Management Plan and Community Air Monitoring Plan (CAMP). Potential contact with contaminated groundwater would be prevented as its use is prohibited by city laws and regulations. Potential future migration of off-Site soil vapors into the new building would be prevented by operation of an active SSDS and by installing a vapor barrier below the new building's basement slab and continuing the vapor barrier around foundation walls.

3.2. BALANCING CRITERIA

Compliance with Standards, Criteria and Guidance (SCGs)

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

Alternative 1 would achieve compliance with the remedial goals, chemical-specific SCGs and RAOs for soil through removal of soil to achieve Track 1 Unrestricted Use SCOs and Groundwater Protection Standards. Compliance with SCGs for soil vapor would also be achieved by installing a vapor barrier/waterproofing system below the new building's basement slab and continuing the vapor barrier around foundation walls, as part of development.

Alternative 2 would achieve compliance with the remedial goals, chemical-specific SCGs and RAOs for soil through removal of soil to meet Track 4 Site-Specific SCOs. The Remedial Actions proposed would achieve compliance with the remedial goals, SCGs and RAOs for soil through removal of soil to meet Track 4 Site-Specific SCOs. Compliance with SCGs for soil vapor would also be achieved by active SSDS and by installing a vapor barrier below the new building's basement slab and continuing the vapor barrier around foundation walls. A Site Management Plan would ensure that these controls remained protective for the long term.

Health and safety measures contained in the CHASP and Community Air Monitoring Plan (CAMP) that comply with the applicable SCGs shall 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.

Short-term effectiveness and impacts

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

Both alternatives 1 and 2 have 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 higher for Alternative 1 since excavation of greater amounts of historical fill material is encountered below the courtyard area of new development. However, focused attention to means and methods during the remedial action during a Track 1 removal action, including community air monitoring and appropriate truck routing, would minimize or negate the overall impact of these activities.

Both alternatives would employ appropriate measures to prevent short term impacts, including a Construction Health and Safety Plan (CHASP), a Community Air Monitoring Plan (CAMP) and a Soil/Materials Management Plans (SMMP), during all on-Site soil disturbance activities and would minimize the release of contaminants into the environment, these Remedial Actions provide short term effectiveness in protecting the surrounding community by decreasing the risk of contact with on-Site contaminants. Construction workers operating under appropriate management procedures and a CHASP would be protected from on-Site contaminants (personal protective equipment would be worn consistent with the documented and encountered risks within the respective work zones).

Long-term effectiveness and permanence

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

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

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

assuring that protections designed into the remedy 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 will eliminate any migration to groundwater. Potential sources of soil vapor and groundwater contamination will also be eliminated as part of the remedy.

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 removing all soil in excess of Track 1 - Unrestricted Use SCOs. Alternative 2 would remove most of the historic fill at the Site, and any remaining on-Site soil beneath the new building will meet Track 4 - Site-Specific SCOs. Alternative 1 would eliminate a greater total mass of contaminants on Site.

Implementability

This evaluation criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation, including technical feasibility of construction and operation, reliability of the selected technology, ease of undertaking remedial action, monitoring considerations,

administrative feasibility (e.g. obtaining permits for remedial activities), and availability of services and materials.

The techniques, materials and equipment to implement the Remedial Actions proposed have been proven effective in remediating the contaminants associated with the Site. Both alternatives utilize standard methods that are commonly available and routinely applied by the industry. They use standard materials and services that are well established technology. The reliability of each remedy is also high. There are no special difficulties associated with any of the activities proposed.

Cost effectiveness

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

Since historic fill at the Site was found during the RI to only extend to a depth of up to 8 feet below grade, and the new building requires excavation a depth of 12ft and to a depth of two feet in courtyard areas, the costs associated with Alternative 1 will likely be higher since greater amounts of soil needs to be excavated and removed from courtyard area. However, long-term costs for Alternative 2 are likely higher than Alternative 1 based on implementation of a Site Management Plan as part of Alternative 2.

The remedial plan creates an approach that combines the remedial action with the redevelopment of the Site, including the construction of the building foundation and subgrade structures. 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 soils during the redevelopment of the Site. The Remedial Actions proposed will be acceptable for the current site owner.

Community Acceptance

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

Based on the overall goals of the remedial program, no adverse community opinion is anticipated. The remedial actions provide for protection of public health and the environment and minimize potential contaminant exposures. This RAWP will be subject to a public review under the NYC VCP and will provide the opportunity for detailed public input on the remedial actions. This public comment will be considered by OER prior to approval of this plan. The Citizen Participation Plan for the project is provided in Attachment 1.

Land use

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

The proposed redevelopment of the Site is compatible with its current zoning and is consistent with recent development patterns. Following remediation, the Site will meet either Track 1 Unrestricted Use or Track 4 Site-Specific SCOs, which is appropriate for its planned residential use. Improvements in the current environmental condition of the property achieved by the proposed remedial actions are also consistent with the City's goals for cleanup of contaminated land and bringing such properties into productive reuse. Both alternatives are equally protective of natural resources and cultural resources.

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 removed soils, which would reduce greenhouse gas emissions and conserve energy used to fuel trucks. New York City Clean Soil Bank program may be utilized for reuse of native soils. To the extent practicable, energy efficient building materials, appliances, and equipment will be utilized to complete the development. A complete list of green remedial activities considered as part of the NYC VCP is included in the Sustainability Statement, included as Appendix 2.

4.0 REMEDIAL ACTION

4.1 SUMMARY OF PREFERRED REMEDIAL ACTION

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

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP Citizen Participation activities according to an approved Citizen Participation Plan.
2. Performance of a Community Air Monitoring Program for particulates and volatile organic carbon compounds.
3. Preparation of a Construction Health & Safety Plan (CHASP).
4. Establish Site Specific (Track 4) Soil Cleanup Objectives (SCOs).
5. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas.
6. Excavation and removal of soil/fill exceeding Track 4 SCOs. Footprint of new building will be excavated to a depth of approximately 12 feet below grade for development purposes. The courtyard areas will be excavated for two hotspot removal and at least two feet in rest of courtyard area. .
7. 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.
8. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID. Appropriate segregation of excavated media on-Site.

9. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Separate management of soils associated with the SVOC hotspot removal. Sampling and analysis of excavated media as required by disposal facilities.
10. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs.
11. Design and Installation of the active Sub-Slab Depressurization System (SSDS). SSDS will be installed in the old dry well area. If development plans for building is changed from ventilated parking garage to retail/storage, SSDS will be extended beneath the building footprint.
12. Import of materials to be used for backfill and cover in compliance with this plan and in accordance with applicable laws and regulations.
13. Installation of a vapor barrier/waterproofing system below the concrete slab underneath the building, as well as behind foundation walls of the proposed building. The vapor barrier will consist of Liquid Boot™ Membrane/Liner (60 mil thickness Liquid Boot) or equivalent.
14. Construction and maintenance of an engineered composite cover consisting of 12" thick concrete slab across the footprint of the new building and two feet of clean soil cap in courtyard areas
15. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations.
16. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations.
17. Submission of an approved Site Management Plan (SMP) in the Remedial Action Report (RAR) for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency.
18. Submission of a RAR that describes the remedial activities and certifies that the remedial requirements have been achieved, defines the Site boundaries, and, describes

all Engineering and Institutional Controls to be implemented at the Site, and lists any changes from this RAWP.

19. The property will continue to be registered with an E-Designation at the NYC Buildings Department. Establishment of Engineering Controls and Institutional Controls; a requirement that management of these controls must be in compliance with an approved SMP. Institutional Controls will include prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without OER-approval.

4.2 SOIL CLEANUP OBJECTIVES AND SOIL/FILL MANAGEMENT

The following Track 4 Site-Specific SCOs will be used:

Contaminant	**Track 4 SCOs**
Total SVOCs	250 ppm
Barium	600 ppm
Lead	800 ppm
Mercury	1.5 ppm

Soil and materials management on-Site and off-Site, including excavation, handling and disposal, will be conducted in accordance with the Soil/Materials Management Plan in Attachment D.

Estimated Soil/Fill Removal Quantities

The total quantity of soil/fill expected to be excavated and disposed off-Site is approximately 2,500 tons.

Disposal location(s) will be reported promptly to the OER Project Manager prior to the start of the remedial action.

End-Point Sampling

Removal actions for development purposes under this plan will be performed in conjunction with confirmation soil sampling. Three (3) confirmation samples will be collected from the base of the excavation at locations to be determined by OER. For comparison to Track 1 SCOs, analytes will include VOCs, SVOC, pesticides, PCBs and metals according to analytical methods described below. For comparison to Track 4 SCOs, analytes will only include trigger compounds and elements established on the Track 4 SCO list.

Hot-spot removal actions, whether established under this RAWP or identified during the remedial program, will be performed 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 will be 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, bottom samples should be taken within 24 hours of excavation, and should be taken from the zero to six-inch interval at the excavation floor. Samples taken after 24 hours should be taken at six to twelve inches.

4. For contaminated soil removal, post remediation soil samples for laboratory analysis should be taken immediately after contaminated soil removal. If the excavation is enlarged horizontally, additional soil samples will be taken pursuant to bullets 1-3 above.

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

New York State 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 RAR. The RAR 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. End-point samples will be Confirmation samples will be analyzed for compounds and elements as described above utilizing the following methodology:

Soil analytical methods will include:

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

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

Quality Assurance/Quality Control

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.

Collected samples will be appropriately packaged, placed in coolers and shipped via overnight courier or delivered directly to the analytical laboratory by field personnel. Samples will be containerized in appropriate laboratory provided glassware and shipped in plastic coolers. Samples will be preserved through the use of ice or "cold-packs" to maintain a temperature of $4^{o}C$.

Dedicated disposable sampling materials will be used for the collection endpoint samples, eliminating the need to prepare field equipment (rinsate) blanks. However, if non-disposable equipment is used, (stainless steel scoop, etc.) field rinsate blanks will be prepared at the rate of 1 for every eight samples collected. Decontamination of non-dedicated sampling equipment will consist of the following:

- Gently tap or scrape to remove adhered soil
- Rinse with tap water
- Wash with alconox® detergent solution and scrub
- Rinse with tap water
- Rinse with distilled or deionized water

Prepare field blanks by pouring distilled or deionized water over decontaminated equipment and collecting the water in laboratory provided containers. Trip blanks will be used whenever samples are transported to the laboratory for analysis of VOCs. Trip blanks will not be used for samples to be analyzed for metals, SVOCs or pesticides. One blind duplicate sample will be prepared and submitted for analysis every 20 samples.

Import and Reuse of Soils

Import of soils onto the property and reuse of soils already onsite will be performed in conformance with the Soil/Materials Management Plan in Appendix 3. The estimated quantity of soil to be imported into the Site for backfill and cover soil is 500 tons. The estimated quantity of onsite soil/fill expected to be reused/relocated on Site is 2,200 tons.

4.3 ENGINEERING CONTROLS

Based on the excavation required for the proposed Site development, the Site is expected to achieve Site Specific Track 4 SCOs. Engineering and Institutional Controls are required to address residual contamination remaining at the Site. The following three elements, composite cover system, vapor barrier and SSDS will be incorporated into the foundation design to address residual contamination remaining at the Site.

Composite Cover System

Exposure to residual soil/fill will be prevented by an engineered, composite cover system to be built on the Site. This cover system will be comprised of a 12 inch thick concrete building slab beneath the area of the proposed building.

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 Site Management Plan 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 Site Management Plan in the RAR.

Vapor Barrier

Migration of soil vapor will be mitigated with a combination of building slab and vapor barrier. Due to the historic presence of SVOC's, which have the potential to volatilize and migrate through the soil pores into interior spaces via cracks and joints, a vapor barrier will be installed beneath the entire SITE 1 property to prevent these gases from entering the interior of the building. The vapor barrier selected by the Contractor should be the Liquid Boot™ Membrane/Liner (60 mil thickness Liquid Boot) or equivalent. The Liquid Boot™ Membrane is a fluid applied polymer modified asphaltic emulsion that creates an effective gas vapor barrier. Specifically, Liquid Boot™ provides protection from the migration of methane, hydrogen sulfide, radon, and hydrocarbon vapors in concentrations up to 20,000 ppm. Manufacturer's

information regarding Liquid Boot is provided in Appendix 6. Liquid Boot will also be used on existing joints and cracks to prevent the migration of gases through these areas.

The project's Professional Engineer licensed by the State of New York will have primary direct responsibility for overseeing the implementation of the vapor barrier. The Remedial Action Report will include photographs (maximum of two photos per page) of the installation process, PE/RA certified letter (on company letterhead) from primary contractor responsible for installation oversight and field inspections, and a copy of the manufacturers certificate of warranty.

Active Sub-Slab Depressurization System (SSDS) Installation

As a result of on-site subsurface conditions beneath the former drywell area, it has been determined that soil vapors remain beneath the existing concrete slab. An active SSDS will be installed beneath the former drywell area and vicinity and all connecting subsurface piping will be properly sealed (Figure 3). The active system will vent to the atmosphere with the aid of a mechanical equipment (exhaust fan), located above the roof of the building. Also a pressure control system will be installed to monitor the efficiency of the system. The Specification sheet for the exhaust fan and the pressure control system are presented in figure 5.

If development plans are changed and the building cellar is not used as ventilated parking garage, active SSDS will be required to extend beneath the new building.

The building slab will be removed so that either a series of horizontal extraction pipes or GEOVENT™ can be placed in contact with sub grade material. The conceptual design of the SSDS is illustrated in Figure 3. The SSDS will create a negative pressure field (in relation to ambient pressure) directly under a building slab. VOCs caught in this area of the negative pressure field will be collected and piped to an ambient air discharge point.

<u>Design and Installation of the SSDS</u>

The SSD will be designed in conformance with standard engineering principles and practices. The installation of the SSDS will be conducted under the direct supervision of a professional engineer with specific experience in building vapor mitigation systems, remediation, and/or environmental engineering practices.

The components of an SSDS are as follows (Figure 4):

- A geo-membrane or equivalent is installed between the floor slab and sub grade.
- A permeable layer of open graded material with a minimum thickness of 12 inches is installed between the geo-membrane or equivalent and sub-grade.
- A geo-textile filter is installed to prevent the introduction of fines into the permeable layer.
- Perforated venting pipes or GEOVENT™ are then installed in a grid pattern under the building within the permeable layer.

The active SSDS will vent to atmosphere with the aid of the exhaust fan above the roof level and the efficiency of the system will be monitored with a pressure control meter.

4.4 INSTITUTIONAL CONTROLS

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

Institutional Controls for this remedial action are:

- The property will continue to be registered with an E-Designation at the NYC Buildings Department. This RAWP includes a description of all ECs and ICs and summarizes the requirements of the Site Management Plan which will note that the property owner and property owner's successors and assigns must comply with the approved SMP;

- Submittal of a Site Management Plan approved by OER that provides procedures for appropriate operation, maintenance, inspection, and certification of ECs and IC's. SMP will require that the property owner and property owner's successors and assigns will submit to OER a periodic written statement that certifies that: (1) controls employed at the Site are unchanged from the previous certification or that any changes to the controls were approved by OER; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. OER retains the right to enter the Site in order to evaluate the

continued maintenance of any controls. This certification shall be submitted at a frequency to be determine by OER in the SMP and will comply with RCNY §43-1407(l)(3).

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

4.5 SITE MANAGEMENT PLAN

Site Management is the last phase of remediation and begins with the approval of the Remedial Action Report and issuance of the Notice of Completion (NOC) for the Remedial Action. The Site Management Plan (SMP) describes appropriate methods and procedures to ensure implementation of all ECs and ICs that are required by the DCR and this RAWP. The Site Management Plan is submitted as part of the RAR but will be written in a manner that allows its use as an independent document. Site Management continues until terminated in writing by OER. The property owner is responsible to ensure that all Site Management responsibilities defined in the DCR and the Site Management Plan are implemented.

The SMP will provide a detailed description of the procedures required to manage residual soil/fill left in place following completion of the remedial action in accordance with the Brownfield Cleanup Agreement with OER. This includes a plan for: (1) implementation of EC's and ICs; (2) implementation of monitoring programs; (3) operation and maintenance of EC's; (4) inspection and certification of EC's; and (5) reporting.

Site management activities, reporting, and EC/IC certification will be scheduled by OER on a periodic basis to be established in the SMP and will be subject to review and modification by

OER. The Site Management Plan will be based on a calendar year and certification reports will be due for submission to OER by July 31 of the year following the reporting period.

4.6 QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT

The objective of the qualitative exposure assessment is to identify potential receptors and pathways for human exposure to the contaminants of concern (COC) that are present at, or migrating from, the Site. The identification of exposure pathways describes the route that the COC takes to travel from the source to the receptor. An identified pathway indicates that the potential for exposure exists; it does not imply that exposures actually occur.

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

Known and Potential Sources

<u>Soil</u>

- VOCs were detected at trace levels, all below Unrestricted Use SCOs;
- Metals including cadmium, copper, lead, mercury, and zinc were detected above Unrestricted Use SCOs

<u>Groundwater</u>

- Depth groundwater at the Property is approximately 80 feet. No samples were collected during the 2014 RI.

Soil Vapor

- Soil vapor samples indicated petroleum related VOCs and chlorinated VOCs were present at moderate concentrations.
- Trichloroethene (TCE) was detected at concentrations above the monitoring level ranges established within the New York State Department of Health (NYSDOH) Final Guidance on Soil Vapor Intrusion (October 2006) values (AGVs).
- Tetrachloroethylene (PCE) was detected at low concentrations, below monitoring level range established by NYSDOH.

Potential Routes of Exposure

The five elements of an exposure pathway are: (1) a contaminant source; (2) contaminant release and transport mechanisms; (3) a point of exposure; (4) a route of exposure; and (5) a receptor population. An exposure pathway is considered complete when all five elements of an exposure pathway are documented. A potential exposure pathway exists when any one or more of the five elements comprising an exposure pathway cannot be documented. An exposure pathway may be eliminated from further evaluation when any one of the five elements comprising an exposure pathway has not existed in the past, does not exist in the present, and will never exist in the future. Three potential primary routes exist by which chemicals can enter the body:

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

Nature, Extent, Fate and Transport of Contaminants

SVOCs and metals are present in the historic fill materials throughout the Site. Pesticides were detected in one shallow sample. Dissolved metals including chromium, iron, magnesium, manganese, and sodium were detected above GQS. The TCE in soil vapor was detected above guidance issued by New York State DOH and were not found in any of the on-Site soil or groundwater samples collected.

Receptor Populations

On-Site Receptors – The Site is currently vacant and capped. Access to Site is restricted. Onsite receptors are limited to trespassers and site representatives and visitors granted access to the property. During redevelopment of the Site, the on-Site potential receptors will include construction workers, site representatives, and visitors. Once the Site is redeveloped, the on-Site potential sensitive receptors will include adult and child building residents, workers and visitors.

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

1. Commercial Businesses (up to 0.25 mile) – existing and future
2. Residential Buildings (up to 0.25 mile) – existing and future
3. Building Construction/Renovation (up to 0.25 mile) – existing and future
4. Pedestrians, Trespassers, Cyclists (up to .25 mile) – existing and future
5. Schools (up to .25 mile) – existing and future

Existence of Human Health Exposure

Current Conditions: The potential for exposure to surficial historic fill is limited due to the concrete foundation slab of the current onsite building which occupies the entire Lot. The Site is served by the public water supply and groundwater use for potable supply is prohibited, groundwater is 81 feet deep and is not used at the Site and there is no potential for exposure. Under current conditions, accumulation of soil vapor within the on-Site structures does not appear to be a significant concern because soil vapor SVOC concentrations are low.

Construction/Remediation Activities: Once redevelopment activities begin, construction workers will come into direct contact with surface and subsurface soils, as a result of on-Site construction and excavation activities. On-Site construction workers potentially could ingest, inhale or have dermal contact with any exposed impacted soil, and fill. Similarly, off-Site receptors could be exposed to dust and vapors from on-Site activities. During construction, on-Site and off-Site exposures to contaminated dust from on-Site will be addressed through the Soil/Materials

Management Plan, dust controls, and through the implementation of the Community Air Monitoring Program and a Construction Health and Safety Plan.

Overall Human Health Exposure Assessment

There are potential complete exposure pathways (i.e., source, route to exposure, receptor population) for the current condition. There is a potential complete exposure pathway that requires mitigation during implementation of the remedy. There is no complete exposure pathway under future conditions after the site is developed. This assessment takes into consideration the reasonably anticipated use of the site, which includes a residential structure, SSDS and a subsurface vapor barrier system for the building. Potential post-construction use of groundwater is not considered an option because groundwater in this area of New York City is not used as a potable water source. There is no surface water in close proximity to the Site that could be impacted or threatened.

Based upon this analysis, complete on-Site exposure pathways appear to be present only during the current unremediated phase and the remedial action phase. Under current conditions, on-Site exposure pathways exist for those given access to the Site or trespassers. During remedial construction, on-Site and off-Site exposures to contaminated dust from historic fill material will be addressed through dust controls, and through the implementation of the Community Air Monitoring Program, the Soil/Materials Management Plan, and a Construction Health and Safety Plan. After the remedial action is complete, there will be no remaining exposure pathways to on-Site soil/fill, as all soil above Unrestricted Use SCOs will have been removed and a vapor barrier system as well as a Sub-Slab Depressurization System will have been installed as part of development.

5.0 REMEDIAL ACTION MANAGEMENT

5.1 PROJECT ORGANIZATION AND OVERSIGHT

Principal personnel who will participate in the remedial action include onsite Project Manager Mr. Nicholas Canonico, Site Safety Office Mr. Jesus Misas and NYC Office of Environmental Remediation Project Manager Eric Ilijevich.

The Qualified Environmental Professionals (QEP) for this project is Mr. Nicholas Canonico.

5.2 SITE SECURITY

Site access will be controlled by a DOB approved construction fence. For work areas of limited size, barrier tape will be sufficient to delineate and restrict access.

5.3 WORK HOURS

The hours for operation of remedial construction will be from 7:00AM to 6:00PM. These hours conform to the New York City Department of Buildings construction code requirements.

5.4 CONSTRUCTION HEALTH AND SAFETY PLAN

The Construction Health and Safety Plan is included in Appendix 4. The Site Safety Coordinator will be Mr. Jesus Misas. 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 the issuance of the Notice of Completion.

All field personnel involved in remedial activities will participate in training required under 29 CFR 1910.120, including 40-hour hazardous waste operator training and annual 8-hour refresher training. Site Safety Officer will be responsible for maintaining workers training records.

Personnel entering any exclusion zone will be trained in the provisions of the CHASP and be required to sign a CHASP acknowledgment. Site-specific training will be provided to field personnel. Additional safety training may be added depending on the tasks performed. Emergency telephone numbers will be posted at the site location before any remedial work begins. A safety meeting will be conducted before each shift begins. Topics to be discussed include task hazards and protective measures (physical, chemical, environmental); emergency procedures; PPE levels and other relevant safety topics. Meetings will be documented in a log book or specific form.

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

5.5 COMMUNITY AIR MONITORING PLAN

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

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

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

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

All 15-minute readings must be recorded and be available for OER personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

Particulate Monitoring, Response Levels, and Actions

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

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/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 mcg/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 mcg/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.

5.6 AGENCY APPROVALS

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

5.7 SITE PREPARATION

Pre-Construction Meeting

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

Mobilization

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

Utility Marker Layouts, Easement Layouts

The presence of utilities and easements on the Site will be fully investigated prior to the performance of invasive work such as excavation or drilling under this plan by using, at a minimum, the One-Call System (811). Underground utilities may pose an electrocution, explosion, or other hazard during excavation or drilling activities. All invasive activities will be performed incompliance with applicable laws and regulations to assure safety. Utility companies and other responsible authorities will be contacted to locate and mark the locations, and a copy of the Markout Ticket will be retained by the contractor prior to the start of drilling, excavation or other invasive subsurface operations. Overhead utilities may also be present within the anticipated work zones. Electrical hazards associated with drilling in the vicinity of overhead utilities will be prevented by maintaining a safe distance between overhead power lines and drill rig masts.

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

Dewatering

Groundwater is anticipated at approximately 80 feet in depth and dewatering is not expected. In the event that dewatering of groundwater during construction will be necessary, the water will be disposed into the New York City combined sanitary/storm sewer system. A permit to discharge will be obtained from the New York City Department of Environmental Protection (NYCDEP). As part of the permit to discharge, the location of discharge will be based on the Site-Specific requirements of the DEP. The need for pretreatment will be determined by DEP's requirements for the discharge permit. If pretreatment is required by the DEP, it will be performed in accordance with the requirements of the DEP.

Equipment and Material Staging

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations. Staging locations will be reported to OER prior to the start of the remedial action.

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.

Truck Inspection Station

An outbound-truck inspection station will be set up close to the Site exit. Before exiting the NYC VCP 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.

Extreme Storm Preparedness and Response Contingency Plan

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

Storm Preparedness

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

Storm Response

At the conclusion of an extreme storm event, as soon as it is safe to access the property, a complete inspection of the property will be performed. A site inspection report will be submitted to OER at the completion of site inspection and after the site security is assessed. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm event and significant differences will be noted. Damage from storm conditions that result in acute public safety threats, such as downed power lines or imminent collapse of buildings, structures or equipment will be reported to public safety authorities via appropriate means such as calling 911. Petroleum spills will be reported to NYS DEC within 2 hours of identification

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

Storm Response Reporting

A site inspection report will be submitted to OER at the completion of site inspection. An inspection report established by OER is available on OER's website (www.nyc.gov/oer) and will be used for this purpose. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm event and significant differences will be noted. The site inspection report will be sent to the OER project manager and will include the site name, address, tax block and lot, site primary and alternate contact name and phone number. Damage and soil release assessment will include: whether the project had stockpiles; whether stockpiles were damaged; photographs of damage and notice of plan for repair; report of whether soil from the site was dislocated and whether any of the soil left the site; estimates of the volume of soil that left the site, nature of impact, and photographs; description of erosion damage; description of equipment damage; description of damage to the remedial program or the construction

program, such as damage to the support of excavation; presence of onsite or offsite exposure pathways caused by the storm; presence of petroleum or other spills and status of spill reporting to NYS DEC; description of corrective actions; schedule for corrective actions. This report should be completed and submitted to OER project manager with photographs within 24 hours of the time of safe entry to the property after the storm event.

5.8 TRAFFIC CONTROL

Drivers of trucks leaving the NYC VCP Site with soil/fill will be instructed to proceed without stopping in the vicinity of the site to prevent neighborhood impacts.

5.9 DEMOBILIZATION

Demobilization will include:

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

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

5.10 REPORTING AND RECORD KEEPING

Daily Reports

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

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

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

Record Keeping and Photo-Documentation

Job-site record keeping for all remedial work will be performed. These records will be maintained on-Site during the project and will be available for inspection by OER staff. Representative photographs will be taken of the Site prior to any remedial activities and during major remedial activities to illustrate remedial program elements and contaminant source areas.

Photographs will be submitted at the completion of the project in the RAR in digital format (i.e. jpeg files).

5.11 COMPLAINT MANAGEMENT

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

5.12 DEVIATIONS FROM THE REMEDIAL ACTION WORK PLAN

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

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

6.0 REMEDIAL ACTION REPORT

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

- Information required by this RAWP;
- 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 and all material characterization results, QA/QC results for end-point sampling, and other sampling and chemical analysis performed as part of the remedial action and DUSR;
- 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.
- Continue registration of the property with an E-Designation by the NYC Department of Buildings.

- Reports and supporting material will be submitted in digital form.

Remedial Action Report Certification

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

I, _____, am currently a professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for the 945 Bergen Street Site 14EH-N204K

I, _____, am a qualified Environmental Professional. I had primary direct responsibility for implementation remedial program for the 945 Bergen Street Site 14EH-N204K. (Optional)

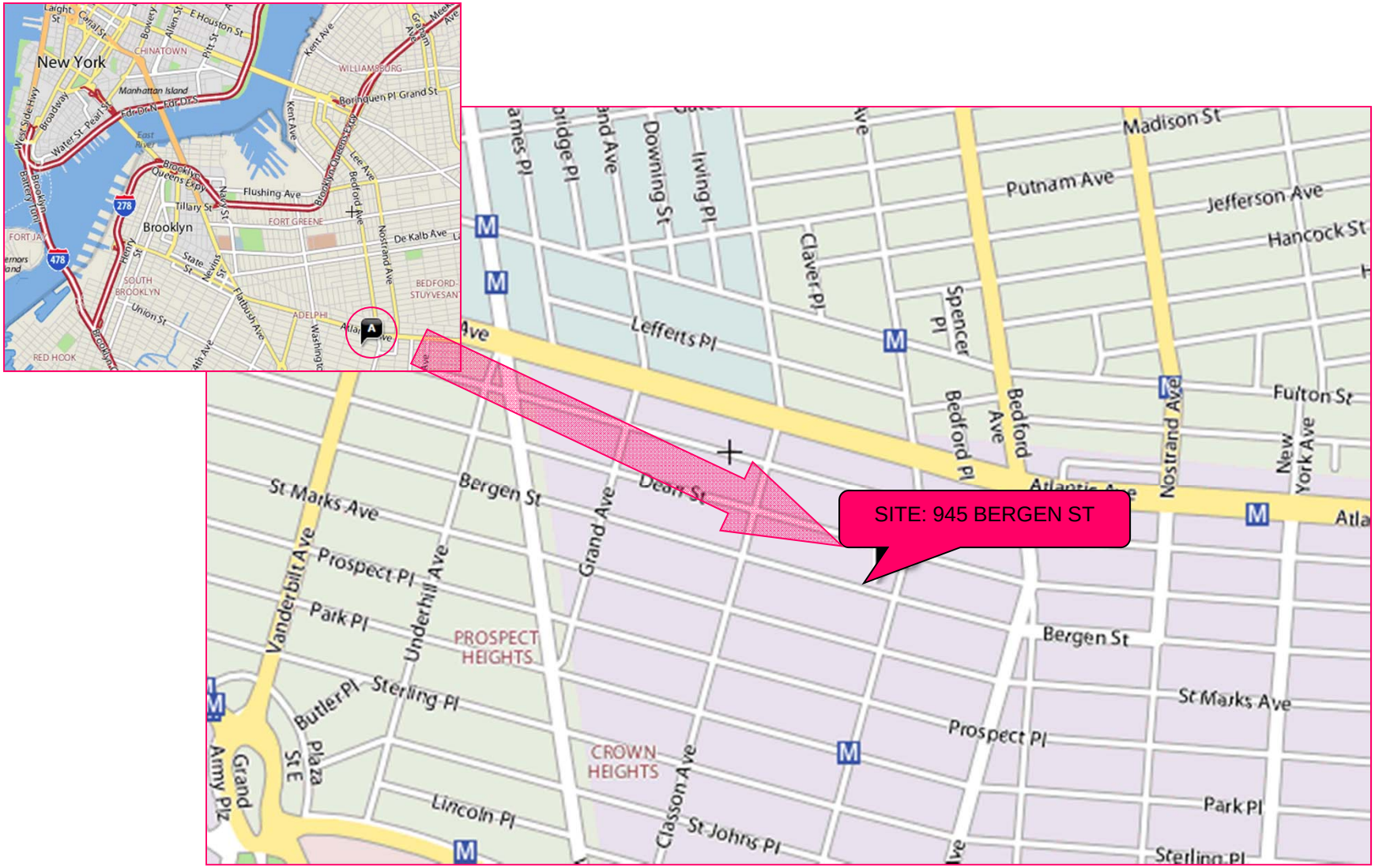
I certify that the OER-approved Remedial Action Work Plan dated month day year and Stipulations in a letter dated month day, year; if any were implemented and that all requirements in those documents have been substantively complied with. I certify that contaminated soil, fill, liquids or other material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

7.0 SCHEDULE

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

Schedule Milestone	Weeks from Remedial Action Start	Duration (weeks)
OER Approval of RAWP		4
Fact Sheet 2 announcing start of remedy		0
Mobilization	5	1
Remedial Excavation	9	4
Vapor Barrier Installation	17	8
Active Sub-slab Depressurization System	19	2
Backfill	21	2
Demobilization	22	1
Submit Remedial Action Report	26	4

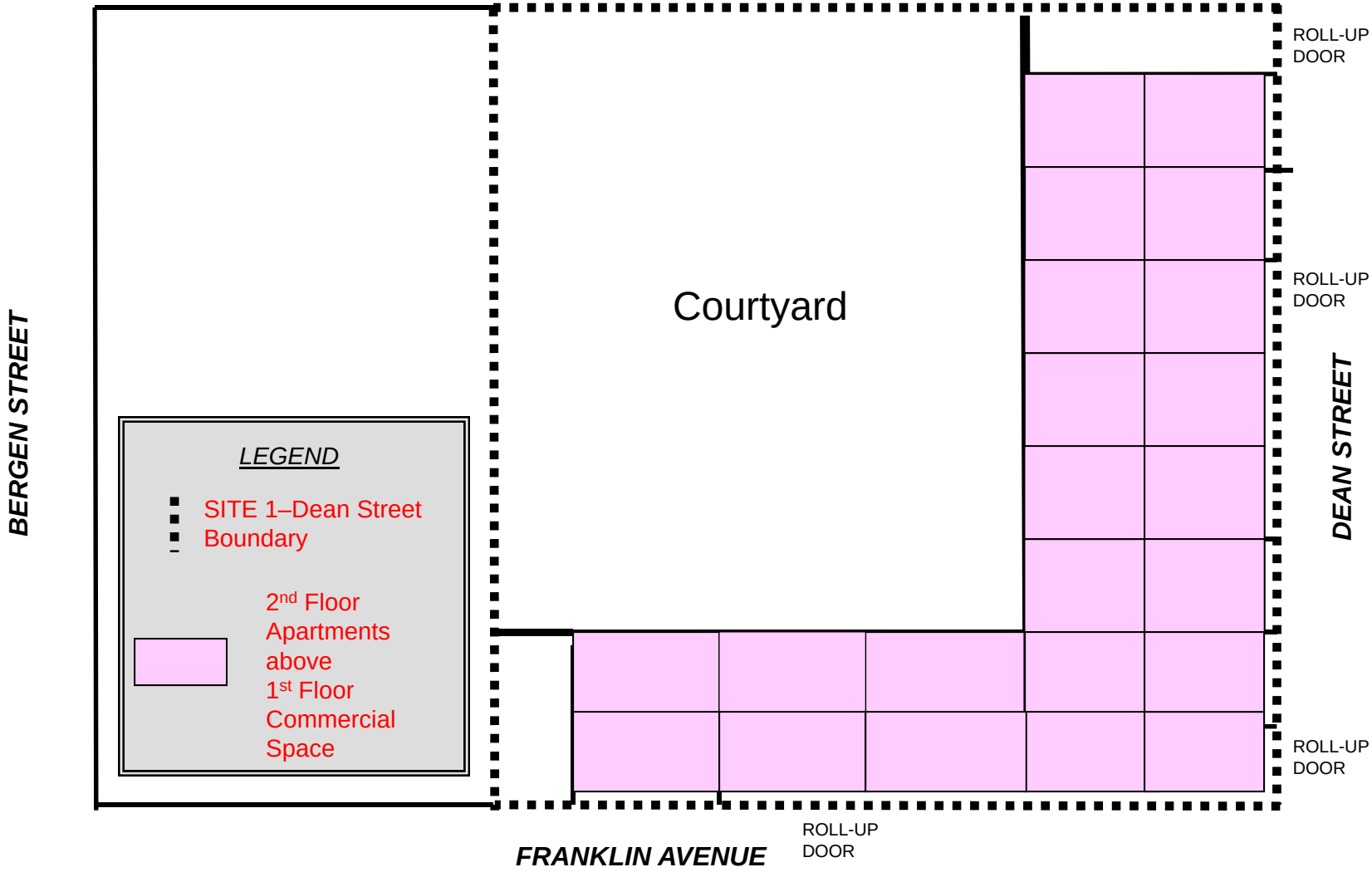
FIGURES



Project No. NY13802					PROJECT MANAGER: N. Canonico
SCALE: NOT TO SCALE					DATE CHECKED: 02-05-14
DRAWING STATUS	Draft		Final	X	DATE APPROVED: 02-05-14

Nova Consulting

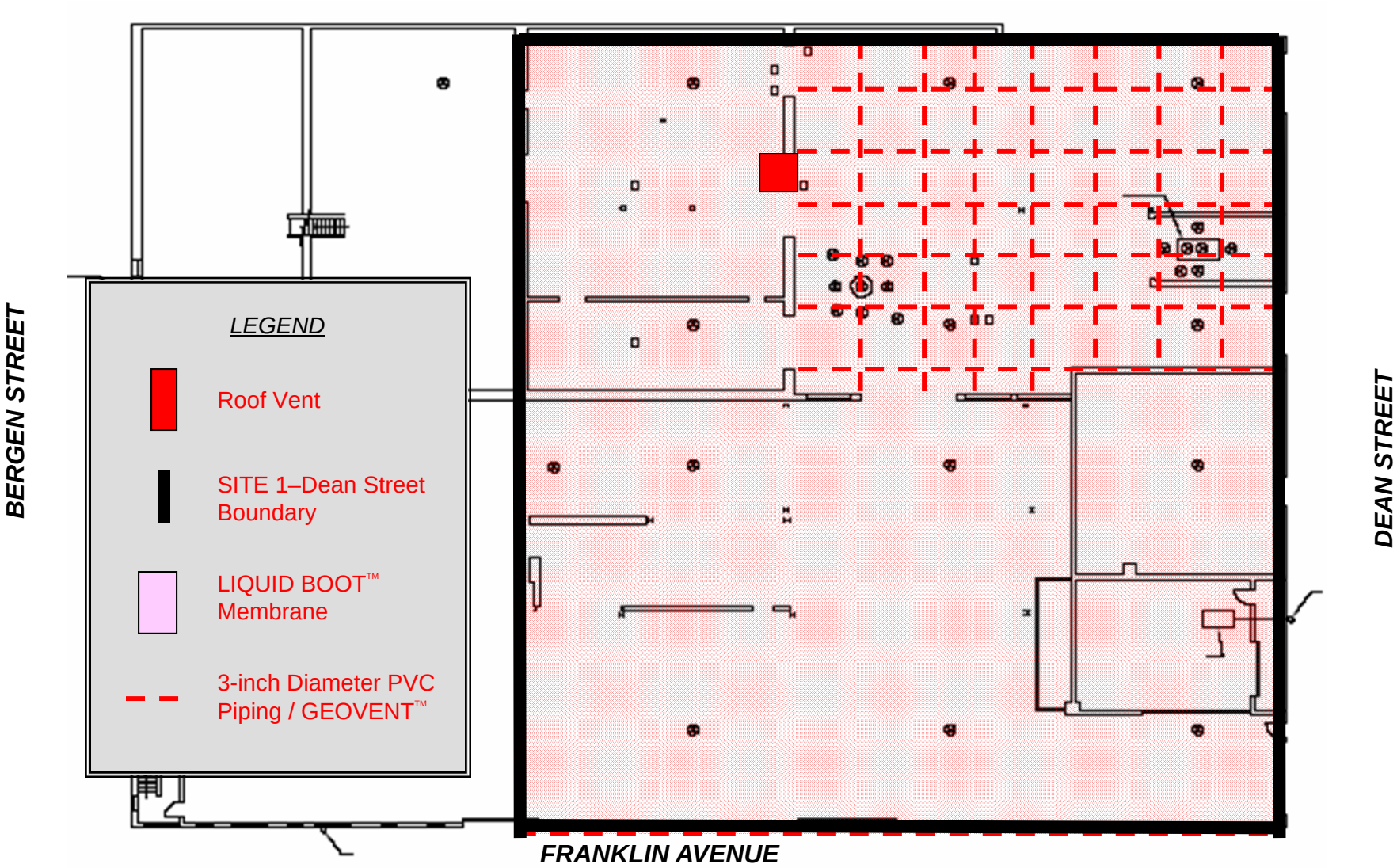
FIGURE 1
LOCATION MAP
945 Bergen Street, Brooklyn NY



Project No. NY13802					PROJECT MANAGER: N. Canonico
SCALE: NOT TO SCALE					DATE CHECKED: 02-05-14
DRAWING STATUS	Draft		Final	X	DATE APPROVED: 02-05-14

Nova Consulting

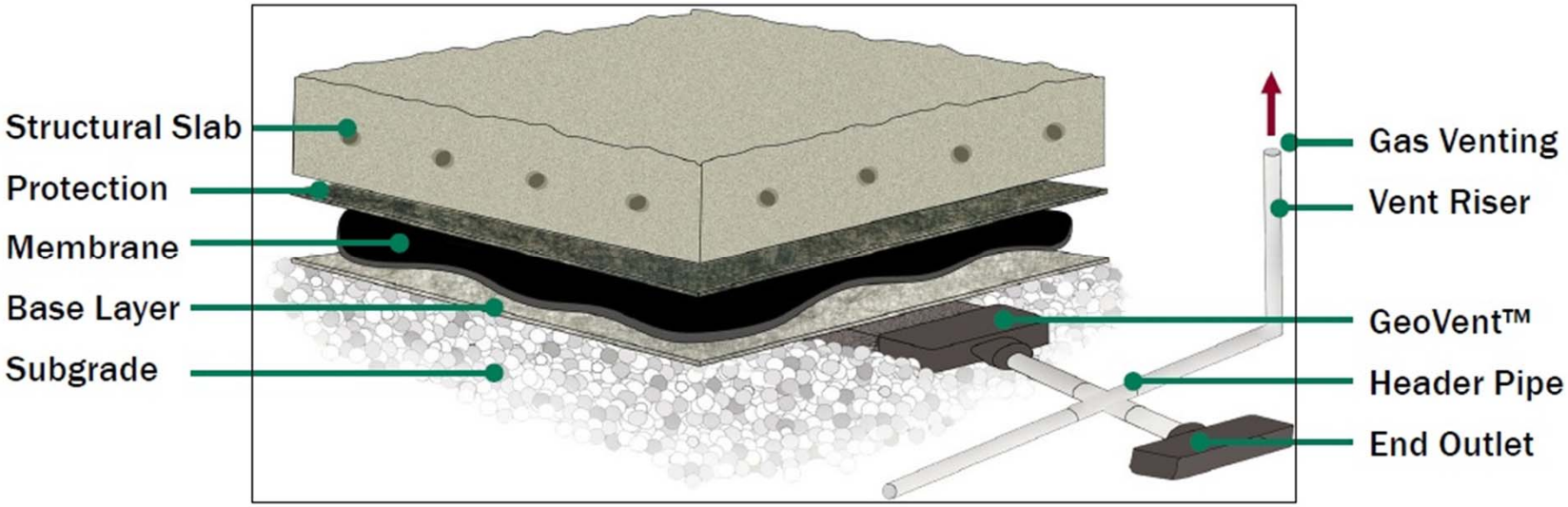
FIGURE 2
PROPOSED SITE PLAN
945 Bergen Street, Brooklyn NY



Project No. NY13802					PROJECT MANAGER: N. Canonico
SCALE: NOT TO SCALE					DATE CHECKED: 02-05-14
DRAWING STATUS	Draft		Final	X	DATE APPROVED: 02-05-14

Nova Consulting

FIGURE 3
PROPOSED SUB SLAB DEPRESSURIZATION
PIPING LAYOUT / GEOVENT™
945 Bergen Street, Brooklyn NY



LIQUID BOOT™ MEMBRANE
&
GEOVENT™

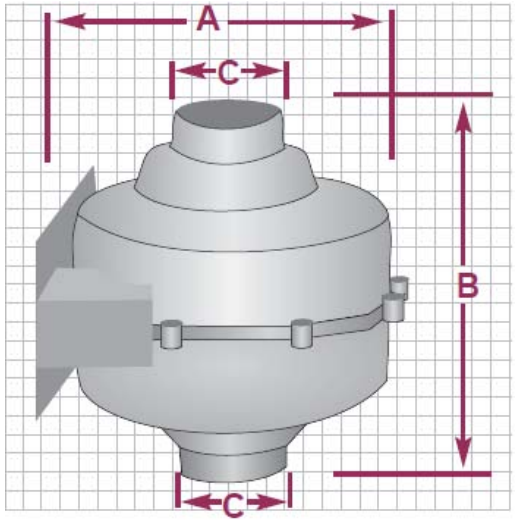
NOT TO SCALE

® 2014 AMCOL INTERNATIONAL CORPORATION

Project No. NY13802					PROJECT MANAGER: N. Canonico
SCALE: NOT TO SCALE					DATE CHECKED: 02-05-14
DRAWING STATUS	Draft		Final	X	DATE APPROVED: 02-05-14

Nova Consulting

FIGURE 4
PROPOSED GAS VAPOR MITIGATION SYSTEM
945 Bergen Street, Brooklyn NY



RadonAway

ETL tested to UL Standard 507 for indoor or outdoor use

ENERVEX
GREEN BEFORE GREEN WAS IN

EBC30 Modulating Pressure Controller

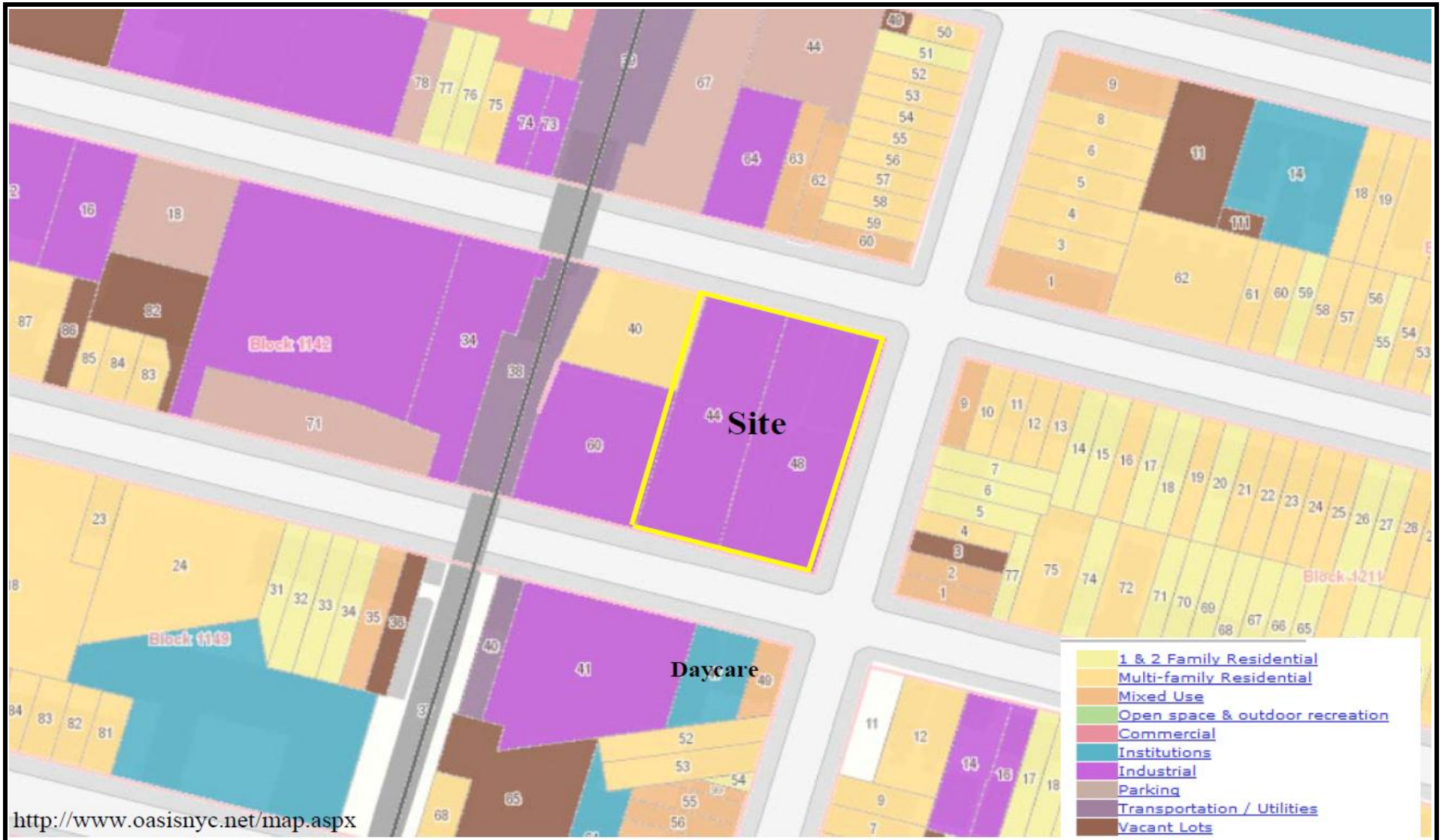
Model	Dimensions		
	A	B	C
GP301	12.5”	13”	3”

- Constant pressure fan speed controller
- Provides 0-10V or 10-120V signal
- ETL and ETLc listed

Model	Watts	Max. Pressure “WC	Typ. CFM vs. Static Pressure WC			
			1.0”	1.5”	2.0”	2.5”
GP301	55-90	2.6	92	77	45	10

Range of Operation	Output
0-0.6 WC	10-120 VAC / 0-10 VDC

Project No. NY13802					PROJECT MANAGER: N. CANONICO
SCALE: NOT TO SCALE					DATE CHECKED: 03-20-14
DRAWING STATUS	Draft		Final	X	DATE APPROVED: 03-20-14
Nova Consulting					FIGURE 5 PROPOSED EXHAUST FAN AND PRESSURE CONTROL SYSTEM 945 Bergen Street, Brooklyn, NY



Project No. NY13802					PROJECT MANAGER: N. CANONICO
SCALE: 1:1					DATE CHECKED:
DRAWING STATUS	Draft		Final	X	DATE APPROVED:
Nova Consulting					FIGURE 6 SURROUNDING LAND USE MAP 945 Bergen Street, Brooklyn, NY

APPENDICES

APPENDIX 1
CITIZEN PARTICIPATION PLAN

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

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

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

Repositories. A document repository is maintained in the nearest public library that maintains evening and weekend hours. This document repository is intended to house, for community review, all principal documents generated during the cleanup program including Remedial Investigation plans and reports, Remedial Action work plans and reports, and all public notices and fact sheets produced during the lifetime of the remedial project. Crow Hill Development, LLC will inspect the repositories to ensure that they are fully populated with project information. The repository for this project is:

Repository Name: Brooklyn Library Leonard Branch
Repository Address: 81 Devoe St. at Leonard St., Brooklyn NY 11215
Repository Telephone Number: 718-486-3365
Repository Hours of Operation:

Mon	10:00 AM - 6:00 PM
Tue	1:00 PM - 8:00 PM
Wed	10:00 AM - 6:00 PM
Thu	10:00 AM - 6:00 PM
Fri	10:00 AM - 6:00 PM
Sat	10:00 AM - 5:00 PM
Sun	closed

Digital Documentation. NYC OER strongly encourages the use of digital documents in repositories as a means of minimizing paper use while also increasing convenience in access and ease of use.

Identify Issues of Public Concern.

The major issues of concern to the public will be potential impacts of nuisance odors and dust during the disturbance of fill soils at the Site. This work will be performed in accordance with procedures which will be specified under a detailed Remedial Program which considers and takes preventive measures for exposures to future residents of the property and those on adjacent properties during construction. Detailed plans to monitor the potential for exposure including a Construction Health and Safety Plan and a Community Air Monitoring Plan are required components of the remedial program. Implementation of these plans will be under the direct oversight of the New York City Department of Environmental Remediation (NYCOER).

These plans will specify the following worker and community health and safety activities during remedial activity at the Site:

- On-Site air monitoring for worker protection,
- Perimeter air monitoring for community protection.

The Construction Health and Safety Plan and the Community Air Monitoring Plan prepared as part of the Remedial Action Work Plan will be available for public review at the document repository.

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

Citizen Participation Milestones. Public notice and public comment activities occur at several steps during a typical NYC VCP project. See flow chart on the following page, which identifies when during the NYC VCP public notices are issued: These steps include:

- **Public Notice of the availability of the Remedial Investigation Report and Remedial Action Work Plan and a 30-day public comment period on the Remedial Action Work Plan.**

  Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the availability of the Remedial Investigation Report and Remedial Action Work Plan and the initiation of a 30-day public comment period on the Remedial Action Work Plan. The Fact Sheet summarizes the findings of the RIR and provides details of the RAWP. The public comment period will be extended an additional 15 days upon public request. A public meeting or informational session will be conducted by OER upon request.

- **Public Notice announcing the approval of the RAWP and the start of remediation**

  Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the approval of the RAWP and the start of remediation.

- **Public Notice announcing the completion of remediation, designation of Institutional and Engineering Controls and issuance of the Notice of Completion**

- Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the completion of remediation, providing a list of all Institutional and Engineering Controls implemented for to the Site and announcing the issuance of the Notice of Completion.

APPENDIX 2

SUSTAINABILITY STATEMENT

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

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

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

Reduce Consumption of Virgin and Non-Renewable Resources. Reduced consumption of virgin and non-renewable resources lowers the overall environmental impact of the project on the region by conserving these resources.

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

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

APPENDIX 3

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 RAR. Soil screening will

be performed during invasive work performed during the remedy and development phases prior to issuance of the Notice of Completion.

1.2 STOCKPILE METHODS

Excavated soil from suspected areas of contamination (e.g., hotspots, USTs, drains, etc.) will be stockpiled separately and will be segregated from clean soil and construction materials. Stockpiles will be used only when necessary and will be removed as soon as practicable. While stockpiles are in place, they will be inspected daily, and before and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. Excavated soils will be stockpiled on, at minimum, double layers of 8-mil minimum sheeting, will be kept covered at all times with appropriately anchored plastic tarps, and will be routinely inspected. Broken or ripped tarps will be promptly replaced.

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

1.3 CHARACTERIZATION OF EXCAVATED MATERIALS

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

1.4 MATERIALS EXCAVATION, LOAD-OUT AND DEPARTURE

The PE/QEP overseeing the remedial action will:

- oversee remedial work and the excavation and load-out of excavated material;
- ensure that there is a party responsible for the safe execution of invasive and other work performed under this work plan;

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

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

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

1.5 OFF-SITE MATERIALS TRANSPORT

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

Outbound truck transport routes will be 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.

1.6 MATERIALS DISPOSAL OFF-SITE

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

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

All impacted soil/fill or other waste excavated and removed from the Site will be managed as regulated material and will be disposed in accordance with applicable laws and regulations. Historic fill and contaminated soils taken off-Site will be handled as solid waste and will not be disposed at a Part 360-16 Registration Facility (also known as a Soil Recycling Facility).

Waste characterization will be performed for off-Site disposal in a manner required by the receiving facility and in conformance with its applicable permits. Waste characterization sampling and analytical methods, sampling frequency, analytical results and QA/QC will be reported in the RAR. A manifest system for off-Site transportation of exported materials will be employed. Manifest information will be reported in the RAR. Hazardous wastes derived from

on-Site will be stored, transported, and disposed of in compliance with applicable laws and regulations.

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

1.7 MATERIALS REUSE ON-SITE

Soil and fill that is derived from the property that meets the soil cleanup objectives established in this plan may be reused on-Site. 'Reuse on-Site' means material that is excavated during the remedy or development, does not leave the property, and is relocated within the same property and on comparable soil/fill material, and addressed pursuant to the NYC VCP agreement subject to Engineering and Institutional Controls.

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

1.8 DEMARCATION

After completion of hotspot removal and any other invasive remedial activities, and prior to backfilling, the top of the residual soil/fill will be defined by one of three methods: (1) placement of a demarcation layer. The demarcation layer will consist of geosynthetic fencing or equivalent material to be placed on the surface of residual soil/fill to provide an observable reference layer. A description or map of the approximate depth of the demarcation layer will be provided in the SMP; or (2) a land survey of the top elevation of residual soil/fill before the placement of cover soils, pavement and associated sub-soils, or other materials or structures or, (3) all materials beneath the approved cover will be considered impacted and subject to site management after the

remedy is complete. Demarcation may be established by one or any combination of these three methods. As appropriate, a map showing the method of demarcation for the Site and all associated documentation will be presented in the RAR.

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

1.9 IMPORT OF BACKFILL SOIL FROM OFF-SITE SOURCES

This Section presents the requirements for imported fill materials to be used below the cover layer and within the clean soil cover layer. All imported soils will meet OER-approved backfill and cover soil quality objectives for this Site.

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

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

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

All materials received for import to the Site will be approved by a PE/QEP and will be in compliance with provisions in this RAWP. The RAR 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 RAR. A PE/QEP is responsible to ensure that the facility is compliant with 6NYCRR Part 360 registration and permitting requirements for the period of acquisition of RCA. RCA imported from compliant facilities will not require additional testing, unless required by NYSDEC under its terms for operation of the facility. RCA imported to the Site must be derived from recognizable and uncontaminated concrete. RCA material is not acceptable for, and will not be used as cover material.

1.10 FLUIDS MANAGEMENT

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable laws and regulations. Liquids discharged into the New York City sewer system will receive prior approval by New York City Department of Environmental Protection (NYC DEP). The NYC DEP regulates discharges to the New York City sewers under Title 15, Rules of the City of New York Chapter 19. Discharge to the New York City sewer system will require an authorization and sampling data demonstrating that the

groundwater meets the City's discharge criteria. The dewatering fluid will be pretreated as necessary to meet the NYC DEP discharge criteria. If discharge to the City sewer system is not appropriate, the dewatering fluids will be managed by transportation and disposal at an off-Site treatment facility.

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

1.11 STORM-WATER POLLUTION PREVENTION

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

1.12 CONTINGENCY PLAN

This contingency plan is developed for the remedial construction to address the discovery of unknown structures or contaminated media during excavation. Identification of unknown contamination source areas during invasive Site work will be promptly communicated to OER's Project Manager. Petroleum spills will be reported to the NYS DEC Spill Hotline. These findings will be included in the daily report. If previously unidentified contaminant sources are found during on-Site remedial excavation or development-related excavation, sampling will be

performed on contaminated source material and surrounding soils and reported to OER. Chemical analytical testing will be performed for TAL metals, TCL volatiles and semi-volatiles, TCL pesticides and PCBs, as appropriate.

1.13 ODOR, DUST AND NUISANCE CONTROL

Odor Control

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

This odor control plan is capable of controlling emissions of nuisance odors. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. OER will be notified of all odor complaint events. Implementation of all odor controls, including halt of work, will be the responsibility of the PE/QEP's certifying the Remedial Action Report.

Dust Control

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

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

This dust control plan is capable of controlling emissions of dust. If nuisance dust emissions are identified, work will be halted and the source of dusts will be identified and corrected. Work will not resume until all nuisance dust emissions have been abated. OER will be notified of all dust complaint events. Implementation of all dust controls, including halt of work, will be the responsibility of the PE/QEP's responsible for certifying the Remedial Action Report.

Other Nuisances

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

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

APPENDIX 4

CONSTRUCTION HEALTH AND SAFETY PLAN

1.0 INTRODUCTION

This Construction Health and Safety Plan (CHASP) has been developed to protect the health and safety of the on-site personnel and the general public during implementation of the Remedial Action Plan (RAP) for SITE 1 at 945 Bergen Street, Brooklyn, New York (Block 1142, Lots 44 and 48) (Site). This CHASP addresses the potential physical and chemical hazards that workers and/or the public may face while performing the planned activities. It establishes procedures to minimize exposure through safe work practices, monitoring and personal protective equipment. The CHASP has been developed to conform with the requirements of the United States Environmental Protection Agency Standard Operating Safety Guide (USEPA, 1988) and the United States Department of Labor, Occupational Safety and Health Administration (OSHA) regulation, Title 29 Code of Federal Regulations, Part 1910.120 (29 CFR Part 1910.120), "Hazardous Waste Operations and Emergency Response".

2.0 MANAGEMENT

All excavating equipment will be provided by and operated by Crow Hill Development, LLC. (CHD) based in Brooklyn, New York or their designee. Nova Consulting (NOVA) or CHD designee will provide environmental consulting services during the entire remediation project and will be responsible for the implementation and reporting requirements of the approved RAP for the Site as well as the approved CHASP. NOVA or CHD designee will also be acting as the Site Safety Officer (SSO). The SSO will be responsible for ensuring that the RAP and associated construction operations are performed in accordance with the requirements of the CHASP. The SSO is empowered to make the routine decisions regarding working conditions, monitoring, and safety equipment selection. At the beginning of each day, personnel will be briefed on the

expected activities for that day by the SSO. Should the SSO witness activities not in conformance with this CHASP at any time during the construction operations, he may direct CHD to take immediate corrective action.

3.0 SITE DESCRIPTION

The property is located at 945 Bergen Street in Brooklyn, NY and is currently identified as Block 1142 Lot(s) 44 and 48. There is a tax-lot division in progress that will further subdivide the site into a third tax lot, in preparation for a sale - and then there will be two distinct development parcels. The area is currently zoned R7A. As a result of the recent rezoning, CHD must address the requirements of a Restrictive Declaration (See Attached Conceptual Plan Appendix 5).

Site 1 – This is labeled 'Building A/B' in our plan submission. It is the northern two-thirds of the site, bounded by Dean Street (153.5') and Franklin Ave (141') and is a lot size of 21,876'. This site will be demolished, and a new building of 80,000' – 100,000' will be built. It will have a maximum height of 80'. It will contain approximately 90-120 residential units, with retail on the ground-floor. It will be an L-shaped building with an inner courtyard. Parking will either be on grade, or in one sub-surface level.

4.0 CONSTRUCTION

Construction activities that will be conducted at the Site will be implemented in accordance with the requirements of the RAP, while adhering to the site-specific construction CHASP.

The following design elements of the site development will be conducted in sequential order to allow for the uniform excavating, staging, testing, and disposal of Site surface soils and fill materials:

1. Surface Soil and Fill Excavation
2. Surface Soil and Fill Staging
3. Active Sub-Slab Depressurization (SSD) System Installation
4. Vapor Barrier Installation
5. Backfilling and Grading
6. Dust Suppression

5.0 HAZARD EVALUATION

The potential physical and chemical hazards associated with the Site have been evaluated based on previous environmental site assessments (Phase I & II Environmental Site Assessments, Phase III Subsurface Investigation, Interim Remedial Measure and Phase II Remedial Investigation), current information available, visual inspection, and professional judgment.

On-site soil contaminants include volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs). The primary contaminants of concern are chlorinated solvents. The potential chemical hazards, which may be encountered during on-site activities, include:

- Possible inhalation of toxic gases (e.g., Tetrachloroethene (PCE) and other chlorinated solvents) during excavation and soil management operations
- Possible inhalation of truck and equipment exhaust
- Possible dermal contact with volatile and non-volatile compounds contained in materials excavated during excavation and soil management operations

Inhalation hazards will be protected against as described in the subsection entitled Air Monitoring. Wearing adequate protective clothing as described in the subsection entitled Protective Equipment shall guard against dermal contact with non-volatile or volatile compounds. Given the distance to receptors and the location of the Drywell AEC to the property line, protection of the general public with respect to inhalation issues will not be a concern for this project. However, if these conditions change, this CHASP will be reviewed and appropriate adjustments will be made to ensure the proper protection of the general public.

The primary potential exposure pathway is through inhalation. The data presented in Table 1 below were used in this CHASP to establish action levels for air monitoring during soil excavation activities. A PCE fact sheet prepared by the New York State Department of Health (NYSDOH) is provided in Attachment 1.

Table 1 Permissible Exposure Limits for Primary Contaminants of Concern

Contaminant of Concern	8-hour Time Weighted Average	Acceptable Ceiling Concentration	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift	
			Concentration	Maximum Duration
1,2-Dichloroethene	50 ppm	100 ppm	200 ppm	5 minutes in 3 hours
Tetrachloroethene (PCE)	100 ppm	200 ppm	300 ppm	5 minutes in 3 hours
Trichloroethene	100 ppm	200 ppm	300 ppm	5 minutes in 2 hours

Physical hazards typically encountered at excavation work sites may be a concern during this program. These include slip, trip and fall hazardous associated with excavations, trenches, uneven terrain, slippery ground surfaces, and the operation of heavy equipment. Basic safety apparel such as hard hats, steel-toed work shoes, and safety glasses will be utilized as necessary to reduce physical hazard potential. Additionally, due to the expected deep excavation, fall protection equipment will also be required for any worker completing tasks within the boundaries of the excavation.

Work involving the use of heavy equipment will have hazards associated with their use. These may include being struck by or entangled in moving parts or equipment while in motion. Precautions that should be taken to preclude injuries include:

- Training personnel in proper equipment operating procedures
- Ensuring that equipment is equipped with proper shields and guards around exposed moving parts and pinch points
- Inspecting equipment regularly to maintain it in proper working order
- Keeping non-essential personnel out of the work area
- Prohibiting loose-fitting clothing or loose long hair around moving equipment
- Maintaining designated speed limits onsite
- Not exceeding rated load capacity of equipment
- In areas where equipment operators have limited sight distance, providing a second person to assist in equipment operation or navigation (in particular when backing up vehicles)
- Setting parking brakes before shutting off vehicles

While slip, trip, and fall hazards are possible within the work zone; precautions will be taken to maintain the working area free of unnecessary materials, equipment or conditions, which may cause these hazards.

6.0 CONFINED SPACE

A confined space is defined as any location that has limited openings for entry and egress, is not intended for continuous employee occupancy, and is so enclosed that natural ventilation may not reduce air contaminants to levels below the threshold limit value (TLV). Examples of confined spaces include: manholes, stacks, pipes, storage tanks, trailers, tank cars, pits, sumps, hoppers, and bins. Entry into confined spaces without the proper precautions could result in injury and/or impairment or death due to:

- An atmosphere that is flammable or explosive
- Lack of sufficient oxygen to support life

- Contact with or inhalation of toxic materials
- General safety or work area hazards such as steam or high pressure materials

The overall objectives of this chapter are to provide the minimum safety requirements to be followed while entering, exiting and working in confined spaces during environmental restoration work. This section provides pertinent details on the following:

- Hazard assessment
- Hazard controls
- Entry procedures
- Opening a confined space
- Atmospheric testing
- Emergency response

6.1 Hazard Assessment

A hazard assessment should be completed prior to any entry into a confined space. The hazard assessment should identify the sequence of work to be performed in the confined space, the specific hazards known or anticipated, and the control measures to be implemented to eliminate or reduce each of the hazards to an acceptable level. No entry should be permitted until the hazard assessment has been reviewed and discussed by all persons engaged in the activity. Personnel who enter confined spaces should be informed of known or potential hazards associated with the confined spaces to be entered.

6.2 Hazard Controls

Hazard controls include changes in the work processes and/or working environment with the objective of:

- Controlling the health hazards either by eliminating the responsible agents
- Reducing health hazards below harmful levels
- Preventing the contaminants from coming into contact with the workers

The following order of precedence should be followed in reducing confined space risks:

- Engineering controls, such as ventilation to limit exposure to hazards
- Work practice controls, such as wetting of hazardous dusts, frequent cleaning
- Use of PPE, such as air purifying or supplied-air respirators

6.2.1 Engineering Controls

Engineering controls are those controls that eliminate or reduce the hazard through implementation of sound engineering practices.

Ventilation is one of the most common engineering controls used in confined spaces. When ventilation is used to remove atmospheric contaminants from the confined space, the space should be ventilated until the atmosphere is within the acceptable ranges. Ventilation should be maintained during the occupancy if there is a potential for the atmospheric conditions to move out of the acceptable range. When ventilation is not possible or feasible, the qualified person prior to authorizing entry should determine alternate protective measures or methods to remove air contaminants and protect occupants. Conditions regarding continuous forced air ventilation should be used as follows:

- Employees should not enter the space until the forced air ventilation has eliminated any hazardous atmosphere

- Forced air ventilation should be so directed as to ventilate the immediate areas where an employee is or will be present within the space
- Continuous ventilation is maintained until all employees have left the space
- Air supply for forced air ventilation should be from a clean source

6.2.2 Work Practice

Work practice (administrative) controls are those controls, which eliminate or reduce the hazard through changes in the work practice (e.g., rotating workers, reducing the amount of worker exposure, and housekeeping). Cleaning/decontamination should be the preferred method of reducing exposure to hazardous materials. Where this is not practicable, PPE should be worn by the entry personnel to provide appropriate protection against the hazards that may be present.

6.3 Entry Procedures

The following are requirements for standard entry:

- Training to establish personnel proficiency in the duties required
- Atmospheric testing for entry
- Atmospheric monitoring during the entry

The internal atmosphere should be tested with a calibrated, direct-reading instrument before an employee enters the space. If a hazardous atmosphere is detected during entry:

- The space should be evaluated to determine how the hazardous atmosphere developed

- Measures should be implemented to protect employees before any subsequent entry takes place

Personnel should be prohibited from entering hazardous atmospheres without wearing proper respiratory equipment as determined by qualified entry supervisors.

6.4 Opening a Confined Space

Any conditions making it unsafe to remove an entrance cover should be eliminated before the cover is removed. When entrance covers are removed, a railing, temporary cover, or other temporary barrier that will prevent anyone from falling through the opening should promptly guard the opening. This barrier or cover should protect each employee working in the space from foreign objects entering the space.

6.5 Atmospheric Testing

Atmospheric test data is needed prior to entry into any confined space. Atmospheric testing is required for two distinct purposes: evaluation of the hazards of the permit space and verification that acceptable conditions exist for entry into that space. If a person must go into the space to obtain the needed data, then Standard Confined Space Entry Procedures should be followed (i.e., rescue team, attendant, entry supervisor). Before entry into a confined space, a qualified person should conduct testing for hazardous atmospheres. The internal atmosphere should be tested with a calibrated, direct-reading instrument for the following, in the order given:

- Oxygen content
- Flammable gases and vapors
- Potential toxic air contaminants

Testing equipment used in specialty areas should be listed or approved for use in such areas. This listing or approval should be from nationally recognized testing laboratories such as Underwriters Laboratories or Factory Mutual Systems.

6.5.1 Evaluation Testing

The atmosphere of a confined space should be analyzed using equipment of sufficient sensitivity and specificity. The analysis should identify and evaluate any hazardous atmospheres that may exist or arise, so that appropriate permit entry procedures can be developed and acceptable entry conditions stipulated for that space. Evaluation and interpretation of these data and development of the entry procedure should be done by, or reviewed by, a technically qualified professional (e.g., OSHA consultation service, certified industrial hygienist, registered safety engineer, certified safety professional).

6.5.2 Verification Testing

A confined space that may contain a hazardous atmosphere should be tested for residues of all identified or suspected contaminants. The evaluation testing should permit specified equipment to determine that residual concentrations at the time of testing and entry are within acceptable limits. Results of testing (i.e., actual concentration) should be recorded on the permit. The atmosphere should be periodically retested to verify that atmospheric conditions remain within acceptable entry parameters. Initial testing of atmospheric conditions and subsequent tests after a job has been stopped should be done with the ventilation systems shut down. If the confined space is vacated for any period of time, the atmosphere of the confined space should be retested before re-entry is permitted. Further testing should be conducted with ventilation systems turned on to ensure the contaminants are removed and that the ventilation system is not causing a hazardous condition.

6.5.3 Acceptable Limits

The atmosphere of the confined spaces should be considered within acceptable limits whenever the following conditions are maintained:

- Oxygen - 19.5% to 23.5%
- Flammability - less than 10% of the Lower Flammable Limit (LFL)
- Toxicity - less than recognized ACGIH exposure limits or other published exposure levels (e.g. OSHA PELs, NIOSH RELs)

Whenever testing of the atmosphere indicates levels of oxygen, flammability, or toxicity that are not within acceptable limits, entry should be prohibited until appropriate controls are implemented. If the source of the contaminant cannot be determined, precautions should be adequate to deal with the worst possible condition in the confined space. If there is the possibility that the confined space atmosphere can become unacceptable while the work is in progress, the atmosphere should be constantly monitored and procedures and equipment should be provided to allow the employees to quickly and safely exit the confined space.

6.6 Ingress / Egress Safeguards

Means for safe entry and exit should be provided for confined spaces. Each entry and exit point should be evaluated to determine the most effective methods and equipment to be utilized to enable employees to safely enter and exit the confined space.

Appropriate retrieval equipment or methods should be used whenever a person enters a confined space. Use of retrieval equipment may be waived by the designated qualified persons if use of the equipment increases the overall risks of entry or does not contribute to the rescue. A

mechanical device should be available to retrieve personnel from vertical type confined spaces greater than five feet in depth.

6.7 Emergency Response

6.7.1 Emergency Response Plan

A plan of action should be written with provisions to conduct a timely rescue for individuals in a confined space should an emergency arise.

6.7.2 Retrieval Systems or Methods to Facilitate Non-entry Rescue

Retrieval systems should be used whenever an authorized person enters a permit space, unless the equipment increases the overall risk of entry or the equipment would not contribute to the rescue of the entrant. Retrieval systems should have a chest or full body harness and a retrieval line attached at the center of the back near shoulder level or above the head. If harnesses are not feasible or create a greater hazard, wristlets may be used in lieu of the harness. The retrieval line should be firmly fastened outside the space so that rescue can begin as soon as anyone is aware that retrieval is necessary. A mechanical device should be available to retrieve personnel from vertical confined spaces more than five feet deep.

7.0 PROTECTIVE EQUIPMENT

The SSO is responsible for determining the appropriate personal protective equipment to be used in each work area based on the type of operations being performed and the action levels specified herein. The use of additional personal protective equipment shall be determined by the SSO as necessary based on the contaminants reported at the Site, their reported concentrations, and the potential for dermal contact. Specific types of personal protective equipment shall be determined

by the SSO and shall be chosen based on chemical resistance and break-through time information of the contaminant of concern.

Based on the hazard evaluation, all on-site work will be initiated in Level D protection. If the established action level is exceeded, the level of protection will be upgraded to Level C. The decision to upgrade the level of protection will be made by the SSO in consultation with the Construction Manager. The following is a description of the personal protective equipment required for each level:

Level D

- Hard hat
- Disposable coveralls (optional)
- Safety glasses, goggles, or face shield
- Steel-toe and shank, chemical-resistant boots
- Chemical-resistant gloves
- Hearing protection, noise reduction rating (NNR) of 35 decibels

Level C

- Full face air purifying respirator equipped with approved filter cartridges
- Hard hat
- Disposable coveralls (optional)
- Steel-toe and shank, chemical-resistant boots
- Chemical-resistant gloves
- Hearing protection, noise reduction rating (NNR) or 35 decibels

Level B

- Positive pressure, full-face piece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA (NIOSH approved)
- Hooded chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one or two-piece chemical-splash suit; disposable chemical-resistant overalls)
- Coverall
- Gloves, outer, chemical-resistant
- Gloves, inner, chemical-resistant

- Boots, outer, chemical-resistant steel toe and shank
- Boot-covers, outer, chemical-resistant (disposable)
- Hard hat

No changes to the specified level of protection, other than those specified in the CHASP, shall be made without approval of the SSO.

8.0 AIR MONITORING/ACTION LEVELS

8.1 Volatile Organic Compounds

The current OSHA permissible exposure limit (PEL) for PCE is 100 ppm, as an 8-hr time-weighted average (TWA). The acceptable ceiling concentration is 200 ppm for 5 min in any 3-hr period, not to exceed a maximum peak of 300 ppm.

The SSO will monitor the air within the breathing zone and excavation areas with a direct reading photo-ionization detector (PID) for the presence of volatile organic compounds (VOCs). The breathing zone is defined as the area from shoulder height to waist height. Air monitoring will be conducted daily, prior to initiation of field activities and periodically during soil excavation. Site workers will also be monitoring via vapor monitor badges. Additionally, perimeter monitoring and community air monitoring will be conducted at the start of each workday, periodically during each day, and whenever changes in the site activities occur that may impact air quality. Community air monitoring will be conducted at the door to the building.

The survey instrument to be utilized for monitoring will be a PID, which is particularly sensitive to halogenated organic compounds such as vinyl chloride. The PID devices will utilize a lamp with an ionization potential of 10.6 eV (for the Photovac Tip) or 10.2 eV (for the HNu). They will be calibrated in accordance with the manufacturer's recommendations prior to the start of each day. Colorimetric tubes for benzene and vinyl chloride may be used periodically to provide data on the concentration of the specific compounds, if necessary. Although these two

compounds are not expected to be present, they have the most restrictive permissible exposure limits (PELs) of all the VOCs that could potentially be present.

When a VOC concentration greater than or equal to 1.0 ppm above background is sustained for a period of at least 1 minute in the breathing zone as measured with the PID, colorimetric tubes will be utilized to determine whether specific compounds are present. A positive reading in excess of 1.0 ppm on a benzene or vinyl chloride colorimetric tube will temporarily suspend the digging operations to allow the area to ventilate. During this period, the workers will move to an upwind area to limit their potential exposure. Perimeter monitoring will be conducted during this time to ensure that there are no impacts to the surrounding community. Work in Level D protection will resume when the benzene and/or vinyl chloride concentrations fall below 1.0 ppm, which will be confirmed with additional colorimetric tubes.

If air monitoring indicates that VOCs excluding benzene and vinyl chloride are present at 5.0 ppm or greater above background, Level C protection employing on organic vapor cartridge shall be required for work to continue. Perimeter monitoring will be conducted during this time to ensure that there are no impacts to the surrounding community. If CHD employees are certified; have been properly fit tested; and have the appropriate equipment available, they will be utilized to perform the work. If not, a private certified contractor will be retained.

Although it is not anticipated outside of the drywell excavation, if air monitoring indicates that VOCs excluding benzene and vinyl chloride are present at 25.0 ppm or greater above background, the SSO will raise the level of protection to Level B protection employing a full face, positive pressure, supplied air respirators, If air monitoring indicates that benzene alone or vinyl chloride alone are each less than 1.0 ppm above background but a combination of VOCs and benzene and vinyl chloride are present at 5.0 ppm or greater above background, protective measures including, but not limited to, saran-coated Tyvek™ and supplied air respirators shall be required for work to continue.

8.2 Equipment Calibration and Maintenance

All monitoring equipment will be calibrated and maintained in accordance with manufacturer's recommendations. A copy of the user's manual for each piece of monitoring equipment will be maintained in the field.

9.0 SITE CONTROL

Prior to the start of construction operations, the SSO shall divide the area surrounding the work into three zones: restricted zone (exclusion zone), decontamination zone (contaminant reduction zone), and a clean zone (support zone). The exclusion zone is a limited access area, which shall be established at the location of the immediate work area where the greatest potential hazards exist. Personnel shall only enter and exit the exclusion zone by passing through the decontamination zone. The clean zone shall serve as a meeting and storage area and shall be the only zone on-site where eating, drinking, and smoking will be allowed. Maintaining access control between work zones will be the responsibility of the SSO. All visitors to the Site, requiring entrance beyond the clean zone, will be required to read, understand, and sign this CHASP and demonstrate current OSHA HAZWOPER training and medical monitoring. Additionally, if a visitor wishes to enter the restricted zone, the visitor must document current fit testing and supply his or her own respirator and appropriate cartridges. All visitor's names and affiliations will be recorded on a visitor's log. Attachment 2

10.0 DECONTAMINATION

10.1 Personal Protective Equipment

Upon leaving the exclusion zone, all personnel must undergo appropriate decontamination, **as necessary.** The decontamination requirements will depend on the level of protection used within the exclusion zone. The decontamination area will contain a tub of wash water, a tub of rinse water, a plastic-lined drum for disposal of expendable clothing, and a first aid kit.

For complete decontamination, all personnel will observe the following procedures upon leaving the exclusion zone:

- Wash outer boots and outer gloves in tub of decontamination solution, which shall consist of detergent in water.
- Rinse outer boots and outer gloves in tub of rinse water.
- Remove outer boots and outer gloves and place in disposal drum.
- If using a respirator, remove respirator, dispose of cartridge if necessary, and place respirator in plastic bag.
- Remove and dispose of disposable chemical resistant suit.
- Remove and dispose of inner gloves.

Respirators (if used) shall be sanitized daily, allowed to air dry and stored in plastic bags. Reusable equipment (rubber boots, etc.) shall be decontaminated properly, allowed to air dry and stored in plastic bags. Disposable equipment shall be placed in plastic bags or drums and disposed of properly. Personnel shall wash face and hands before leaving the decontamination area.

Decontamination solutions shall be supplied at the decontamination zone. The wash solution will consist of water and detergent such as Alconox or sodium phosphate; and the rinse solution will consist of clean water.

Contaminated wash solutions shall be collected for disposal at an on-site location approved by the Engineer. All other disposable health and safety equipment will be decontaminated and disposed of as non-hazardous waste.

10.2 Equipment Decontamination

Equipment will be cleaned of any visible excess material prior to leaving the exclusion zone, **as necessary**. Soiled equipment will be brushed to remove surface soil and debris and then washed with a detergent solution, rinse water, and pressurized steam as deemed necessary.

Large equipment shall be decontaminated by steam cleaning prior to leaving the site if necessary. Smaller equipment shall be decontaminated by washing with a detergent solution and rinsing with clean water. The rinse water will be disposed of at an on-site location approved by the Engineer. The SSO will monitor decontamination procedures.

11.0 TRAINING

Personnel working on-site performing test pit operations, and any personnel who must enter an exclusion zone, must be familiar with the site hazards and employ appropriate safety procedures. All workers entering restricted or decontamination zones must show current documentation of OSHA HAZWOPER training and medical monitoring. Additionally, workers entering the restricted zone must document current fit testing.

12.0 HEALTH MONITORING

This work is expected to occur during the spring months when ambient temperatures may be high. Increased physical demands on workers occur as a result of increased air temperature and humidity. Wearing PPE also increases the demands on workers, due to:

- Added weight of the equipment
- Reduced visibility
- Reduced mobility
- Loss of the body's natural cooling processes
- Increased energy consumption by the body
- Lack of sufficient fluid replenishment

Other factors that influence the occurrence of heat related disorders or conditions include environmental conditions, clothing, workload, and the individual characteristics of workers. Workers should be pre-screened prior to beginning operations. Once baseline values are obtained, they can be used to effectively assess the health of workers during and immediately after operations (e.g., pulse, blood pressure, body temperature, body weight).

Because of the variability of these factors and the compounding effect that each may have on an individual's health, a physiological monitoring program should be established.

Personnel who are not required to wear PPE are not immune to the potential hazards of heat related disorders or conditions and should be included in the monitoring program.

The guidance for workers wearing permeable clothing is specified in the current version of the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values for Heat Stress. If actual clothing differs from the ACGIH standard ensemble in insulation value and/or wind and vapor permeability, changes should be made to the monitoring requirements and work rest period to account for these differences. Table 11-1 provides the suggested frequency of physiological monitoring for fit and acclimatized workers.

The ACGIH TLV guide contains a separate table for workers wearing semi-permeable and impermeable encapsulating clothing. In these situations, refer to this table.

TABLE 11-1

Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers

Adjusted Temperature Calculation	Normal Work Clothing	Impermeable Clothing
90 F (32.2 C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5 - 90.0 F (30.8 - 32.2 C)	After each 60 minutes of work	After each 30 minutes of work
82.5 - 87.5 F	After each 90 minutes of work	After each 60 minutes of work

(28.1 - 30.8 C)

77.5 - 82.5 F After each 120 minutes of work After each 90 minutes of work

(25.3 - 28.1 C)

72.5 - 77.5 F After each 150 minutes of work After each 120 minutes of work

(22.5 - 25.3 C)

The following parameters should be used when monitoring workers:

- Heart rate - Count the radial pulse as early as possible in the rest period to ensure a more accurate reading. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period at the same length. If, at the end of the following work period, the heart rate still exceeds 110 beats per minute, shorten the work period again by one-third.

- Oral Temperature - The utilization of oral temperature applies to the time immediately after the worker leaves the contamination reduction zone. Using a clinical thermometer, take the temperature for three minutes. If the oral temperature exceeds 99.6 F (37.6 C), shorten the next work cycle by one-third, without a change to the rest period. If the oral temperature still exceeds 99.6 F (37.6 C) at the end of the following work period, shorten the next work cycle by one-third. Do not permit a worker to perform duties requiring a semi-permeable or impermeable garment if the oral temperature exceeds 100.6 F (38.1 C).

- Ear Canal Readings - Ear canal readings are a valid method to monitor the temperature of workers who remain in the contamination reduction zone.

- Body Water Loss - Measure body weight to see if enough fluids are being consumed to prevent dehydration.

Should a worker exhibit these symptoms, the on-site SSO shall be consulted immediately so that proper measures can be taken to correct the condition.

13.0 CONTINGENCY PLAN/EMERGENCY PROCEDURES

The SSO shall be notified of Site construction emergencies. CHD shall be responsible for ensuring that the appropriate emergency procedures are followed and for maintaining a first aid kit in the vicinity of field operations and treating the injured parties. On-site personnel will use the standard emergency procedures described in the following sections.

The main Site evacuation route is through the overhead doors onto Dean Street. If this exit route is blocked or inaccessible, evacuation shall be made through the building exits onto Bergen Street.

On-site verbal communications should not be a problem since it is expected that all tasks will be performed in Level D protection. However, should verbal communications be difficult at times due to personal protective equipment or noise, a universal set of hand signals will be used. They are as follows:

Hand gripping throat:	Can’t breathe.
Place hands around waist:	Leave work area immediately.
Hand on top of head:	Need assistance.
Thumbs up:	OK I’m all right.

Thumbs down: No Negative.

Should job-related injuries occur, they would be reported to the SSO. If medical attention is needed, the injured worker will be decontaminated, if necessary and/or possible, prior to leaving the Site. The SSO will investigate the cause of the accident and corrective measures will be taken before the work can resume. It will be the responsibility of the SSO to complete an accident reporting form (OSHA 101) for all injuries, and issue copies to appropriate organizations.

In addition, the following safe work practices will be in effect:

- No eating, drinking, or smoking in the exclusion zone
- No sources of ignition, such as matches or lighters, will be permitted in the exclusion or support zones
- During hazardous weather conditions, such as lighting and thunderstorms, work will cease immediately

14.0 FIRE/EXPLOSION OR ACCIDENTS CAUSING POTENTIAL OFF-SITE MIGRATION OF ON-SITE CONTAMINANTS

In the event a fire or explosion occurs, or in the event an accident or unavoidable occurrence results in the potential off-site migration of site-related contaminants, the SSO shall notify the New York City Fire and Police Departments and on-site workers shall be moved to a safe distance from the area. The air downwind of any fire or explosion shall be monitored immediately to protect workers and the nearby community. All other appropriate notifications will be made in accordance with existing Fire and Police Department notification procedures, including notifying the community downwind of the Site and taking other appropriate measures.

15.0 PERSONAL PROTECTIVE EQUIPMENT FAILURE

If any site worker experiences a failure or alteration of protective equipment that affects the protection factor, that person shall immediately leave the exclusion zone. Re-entry shall not be permitted until the equipment has been repaired or replaced.

16.0 EMERGENCY TELEPHONE NUMBERS

Cellular phones will be available on-site.
The emergency telephone numbers are as follows:

Emergency Assistance (Fire Department/Ambulance/Police)	911
Poison Control Center	1-800-282-3171
National Response Center	1-800-424-8802
USEPA Region II Emergency Response:	1-800-424-9346
NYSDEC Spill Hotline	1-800-457-7362

The New York State One-Call Service numbers are as follows:

Cable Companies	1-800-272-4480
Consolidated Edison	1-800-272-4480
Department Public Works	1-800-272-4480
Verizon	1-800-272-4480
Brooklyn Union Gas	1-800-272-4480
NYCDEP-Water and Sewer	1-800-272-4480

NEAREST HOSPITAL

The hospital is located east-northeast of the subject site at the following address:

INTERFAITH HOSPITAL & MEDICAL CENTER

1545 Atlantic Avenue -Brooklyn, New York (See Figure 3) Tel: 718-613-4000

DIRECTIONS

1. Start out going WEST on BERGEN ST toward CLASSON AVENUE (0.1miles)
2. Turn RIGHT onto CLASSON AVENUE (0.1 miles)
3. Turn RIGHT onto ATLANTIC AVENUE (1.0 miles)
4. Turn SLIGHT LEFT to stay on ATLANTIC AVENUE (0.1 miles)
5. Make a U-TURN at TROY AVE onto ATLANTIC AVENUE (0.1 miles)
6. End at 1545 ATLANTIC AVE BROOKLYN NY

17.0 COMMUNITY HEALTH AND SAFETY

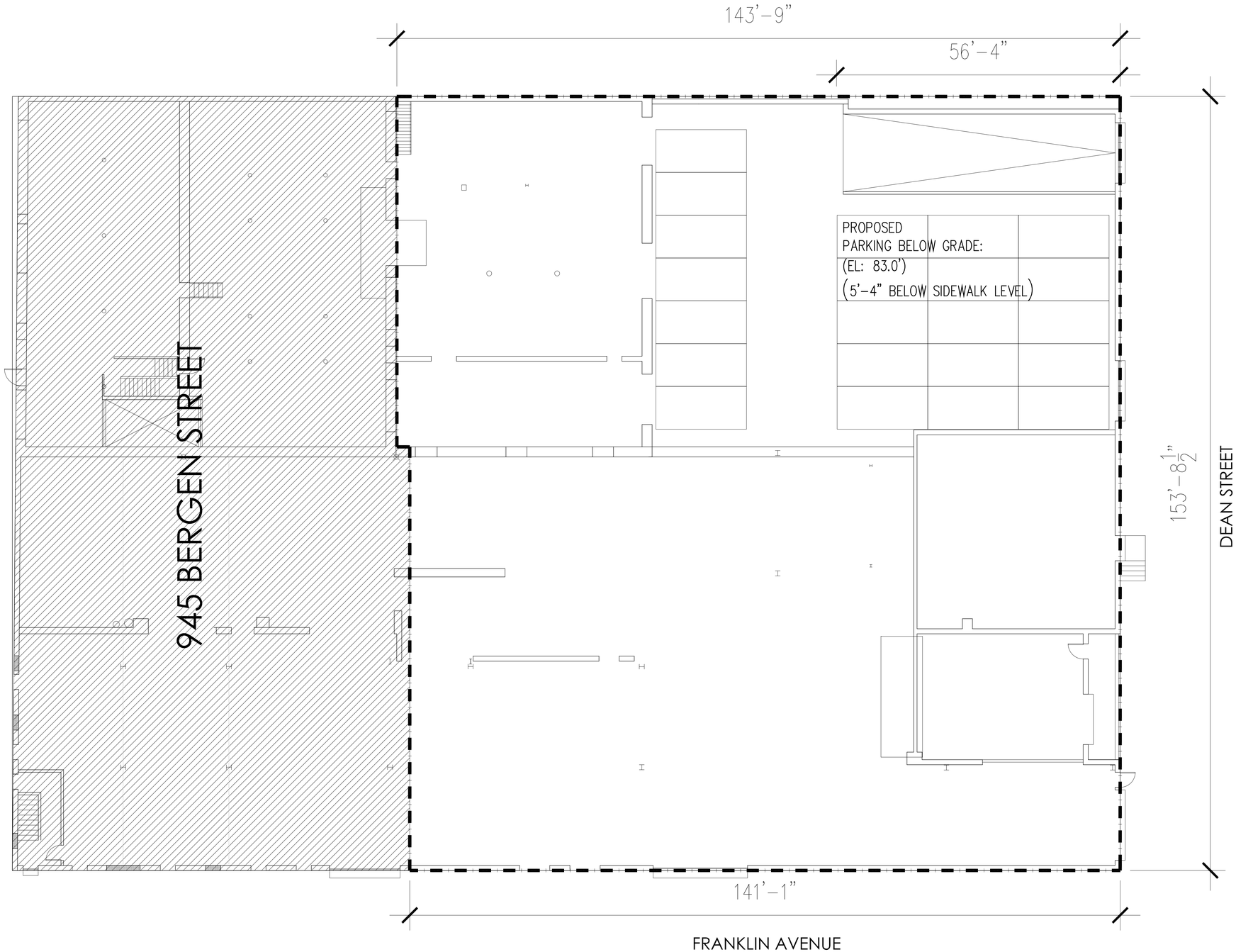
This CHASP has been prepared to ensure the safety of on-site personnel and the general public. The implementation of the requirements stipulated in this CHASP should result in eliminating the potential for off-site exposure pathways. In addition, it should be noted that the on-site excavation will be sealed or shored as soon as the work associated with it is completed, and if necessary, exposed soil areas will be sprayed with water to reduce dust. Moreover, should the SSO become aware of any accident or unavoidable occurrence which may result in the potential off-site migration of on-site contaminants, he shall immediately alert the Fire and Police Departments and shall implement procedures outlined by the Fire and Police Departments for alerting and protecting the local community.

18.0 REFERENCES

1. 29 CFR 1910.146, "Permit-required Confined Spaces."
2. National Safety Council Data Sheet 12304-0704, "Confined Space Entry Control System for Research and Development Operations."
3. American National Standard Institute (ANSI) Z117.1-1989, "Safety Requirements for Confined Spaces."
4. DHHS (NIOSH) Publication No. 87-113, "Working With Confined Spaces."
5. ANSI Z 244.1-1982, "Lockout/Tagout of Energy Sources."
6. 29 CFR 1910.147, "The Control of Hazardous Energy (Lockout/Tagout)."

APPENDIX 5

CONCEPTUAL APPROACH/PROPOSED BUILDING PLANS



1 GROUND FLOOR PLAN
1/16"=1'-0"

BLDG A/B:

Parcel Size: 21,876.57 SF

FAR: 4.0 = 87,506 SF

BLDG A/B Foot Print:
(Comm. Ground Floor w/ Parking below grade): ~15,788 SF

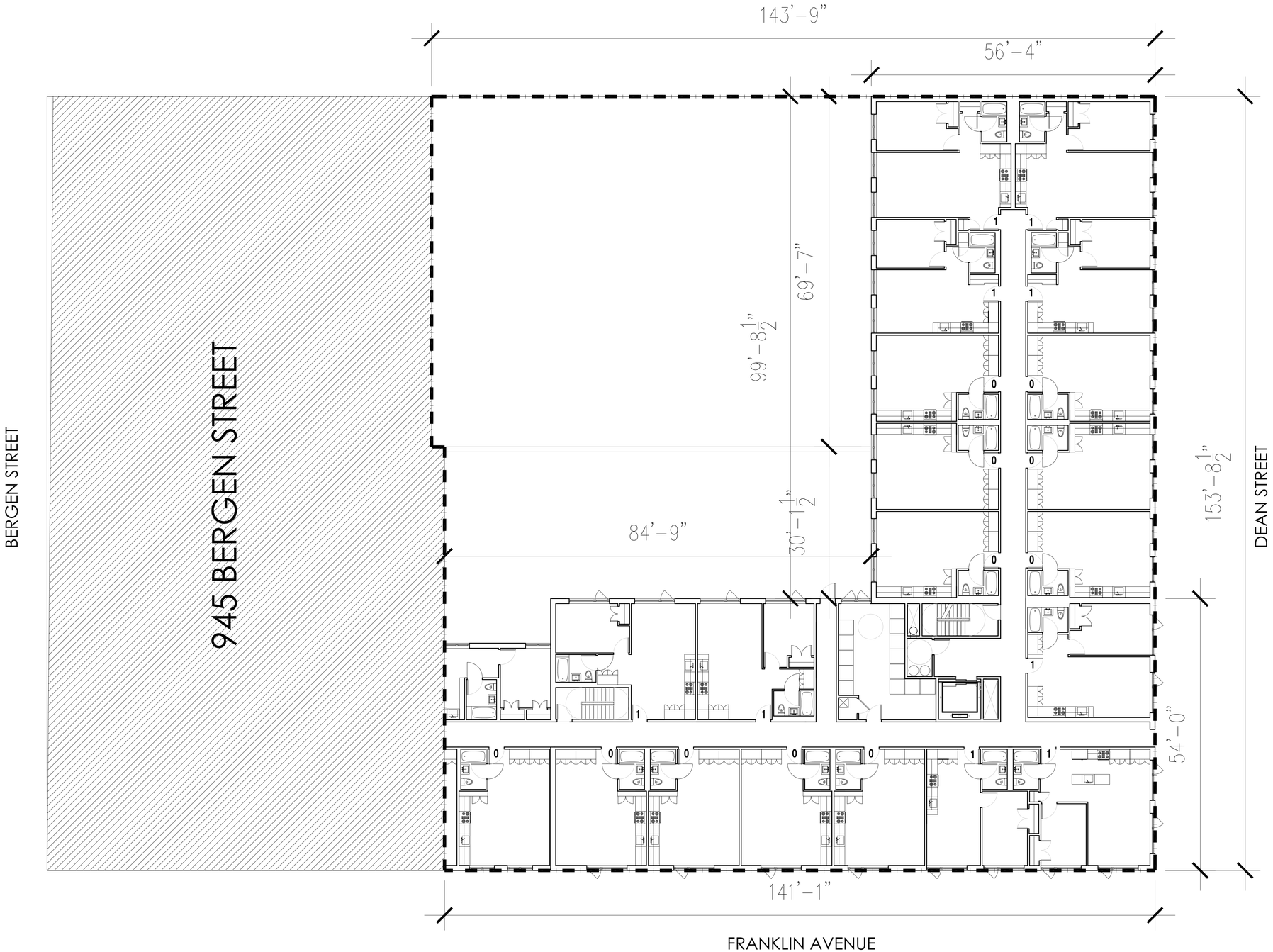
BLDG A/B Residential Portion:
(Stories 2-7): ~13,048 SF

Potential Basement for parts of or entire Parcel:
12 ft below grade
NOTES:

- BUILDING HEIGHT AND STORIES BASED ON ASSUMPTION FOR A FAR OF 4.0.

- DRAWIING BASED ON PREVIOUS DESIGN. NEWLY PROPOSED DESIGN MAY BE DIFFERENT.

PROJECT	DRAWING		REV#	DATE	ID
Bergen Street	BUILDING A/B	SK-08			
DATE 04/07/14	SCALE 1/16 " = 1'-0"	©FORMACTIV			



1 SECOND FLOOR PLAN
1/16"=1'-0"

BLDG A/B:

Parcel Size: 21,876.57 SF

FAR: 4.0 = 87,506 SF

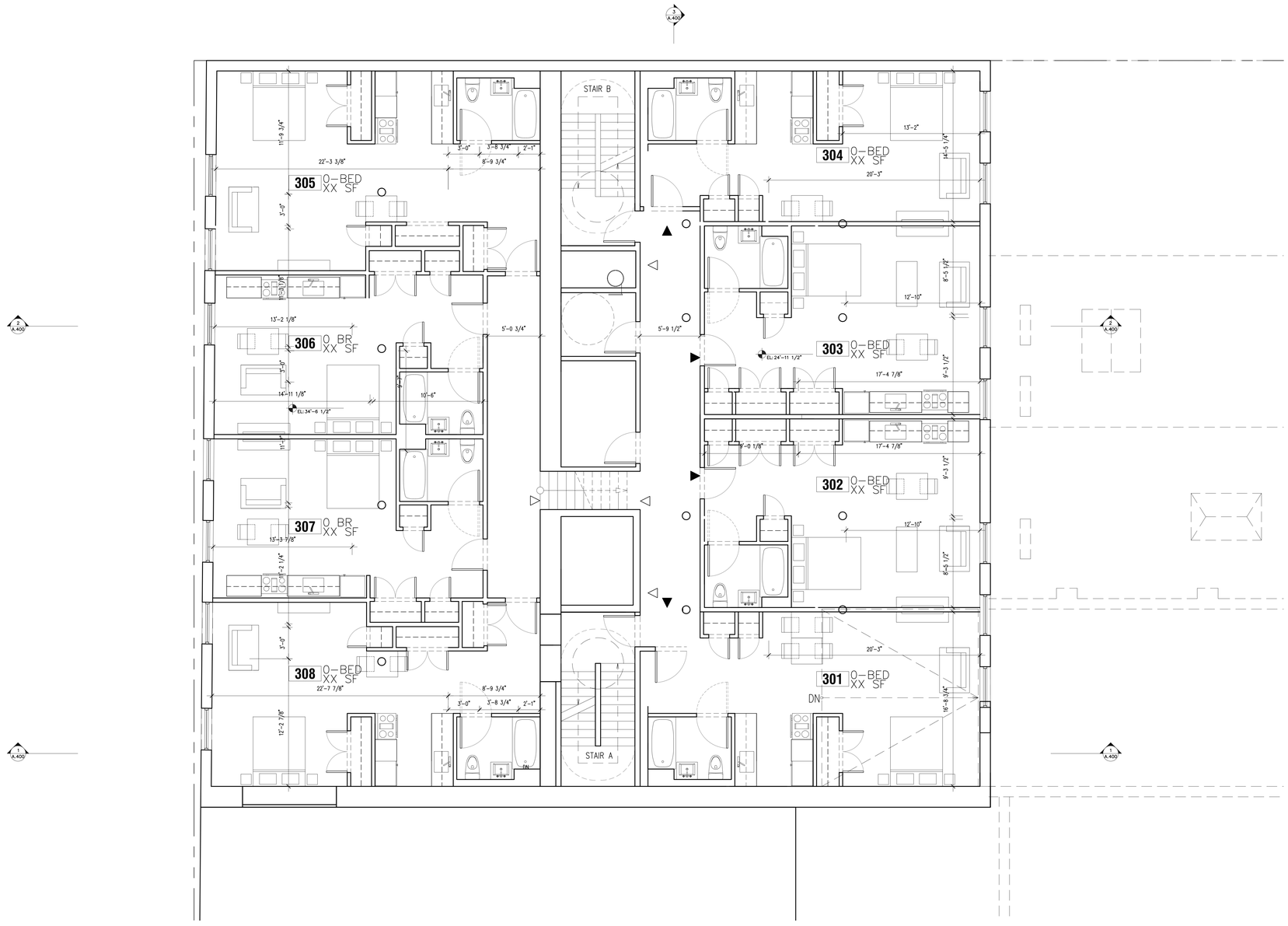
BLDG A/B Foot Print (Comm. Ground Floor): ~15,788 SF
BLDG A/B Residential Portion (Stories 2-7): ~13,048 SF

Potential Basement for parts of or entire Parcel:
12 ft below grade

NOTES:

- BUILDING HEIGHT AND STORIES BASED ON ASSUMPTION FOR A FAR OF 4.0.
- DRAWIING BASED ON PREVIOUS DESIGN. NEWLY PROPOSED DESIGN MAY BE DIFFERENT.

PROJECT	DRAWING	SK-05	REV#	DATE	ID
Bergen Street	BUILDING A/B				
DATE 01/06/14	SCALE 1/16 " = 1'-0"	©FORMACTIV			



1 THIRD FLOOR PLAN

1/4"=1'-0"

N

LEGEND

1 HR RATED SEPARATION/DIVISION

2 HR RATED SEPARATION/DIVISION

▲ CLASS 'A' FIRE DOOR (3/4 HR); 1 1/2 EXIT UNITS (EU)

△ CLASS 'B' FIRE DOOR (1 1/2HR); 1 1/2 EXIT UNITS (EU)

EXIT SIGN, ARROW INDICATES DIRECTION OF EGRESS

PATH OF TRAVEL

CO HARDWIRED CARBON MONOXIDE & SMOKE DETECTORS, IN COMPLIANCE WITH RS 17-13 AND INSTALLED IN ACCORDANCE WITH 17-14 SHALL BE PROVIDED IN EVERY DWELLING UNIT WITHIN 15 FEET OF PRIMARY ENTRANCE OF EACH BEDROOM. (LL 7/04)

TRAVEL DISTANCE SUMMARY

OCCUPANCY GROUP			POINT	
302/ OFFICE	B	TRAVEL DISTANCE	P-1	43'-1" < 200' COMPLIES
308/ OFFICE	B	TRAVEL DISTANCE	P-2	38'-1" < 200' COMPLIES

OCCUPANCY LOAD & EGRESS CALCULATIONS

ROOM/ SPACE	OCCUPANCY GROUP	NET FLOOR AREA (SF)	NET FLOOR AREA PER OCCUPANT (SF)	OCCUPANTS	REQUIRED EXIT WIDTH FOR STAIRS	STAIRS EXIT WIDTH PROVIDED	REQUIRED EXIT WIDTH FOR DOORS	DOORS EXIT WIDTH PROVIDED	REMARKS
301 OFFICE	B	319 SF	100	4	4 X .3 (INCHES PER OCCUPANT)= 1.2"		4 X .2 (INCHES PER OCCUPANT)= 0.8"		
302 OFFICE	B	537 SF	100	6	6 X .3 (INCHES PER OCCUPANT)= 1.8"		6 X .2 (INCHES PER OCCUPANT)= 1.2"		
303 OFFICE	B	533 SF	100	6	6 X .3 (INCHES PER OCCUPANT)= 1.8"		6 X .2 (INCHES PER OCCUPANT)= 1.2"		
304 OFFICE	B	313 SF	100	4	4 X .3 (INCHES PER OCCUPANT)= 1.2"		4 X .2 (INCHES PER OCCUPANT)= 0.8"		
306 OFFICE	B	668 SF	100	7	7 X .3 (INCHES PER OCCUPANT)= 2.1"		7 X .2 (INCHES PER OCCUPANT)= 1.4"		
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	TOTAL	3,656 SF		42	12.6"	44" (146 CAPACITY) 42 < 146 COMPLIES	8.4"	36" (180 CAPACITY) X 2 DOORS 42/2= 21 < 180 COMPLIES	

PROJECT
937 BERGEN STREET

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CROW HILL DEVELOPMENT LLC

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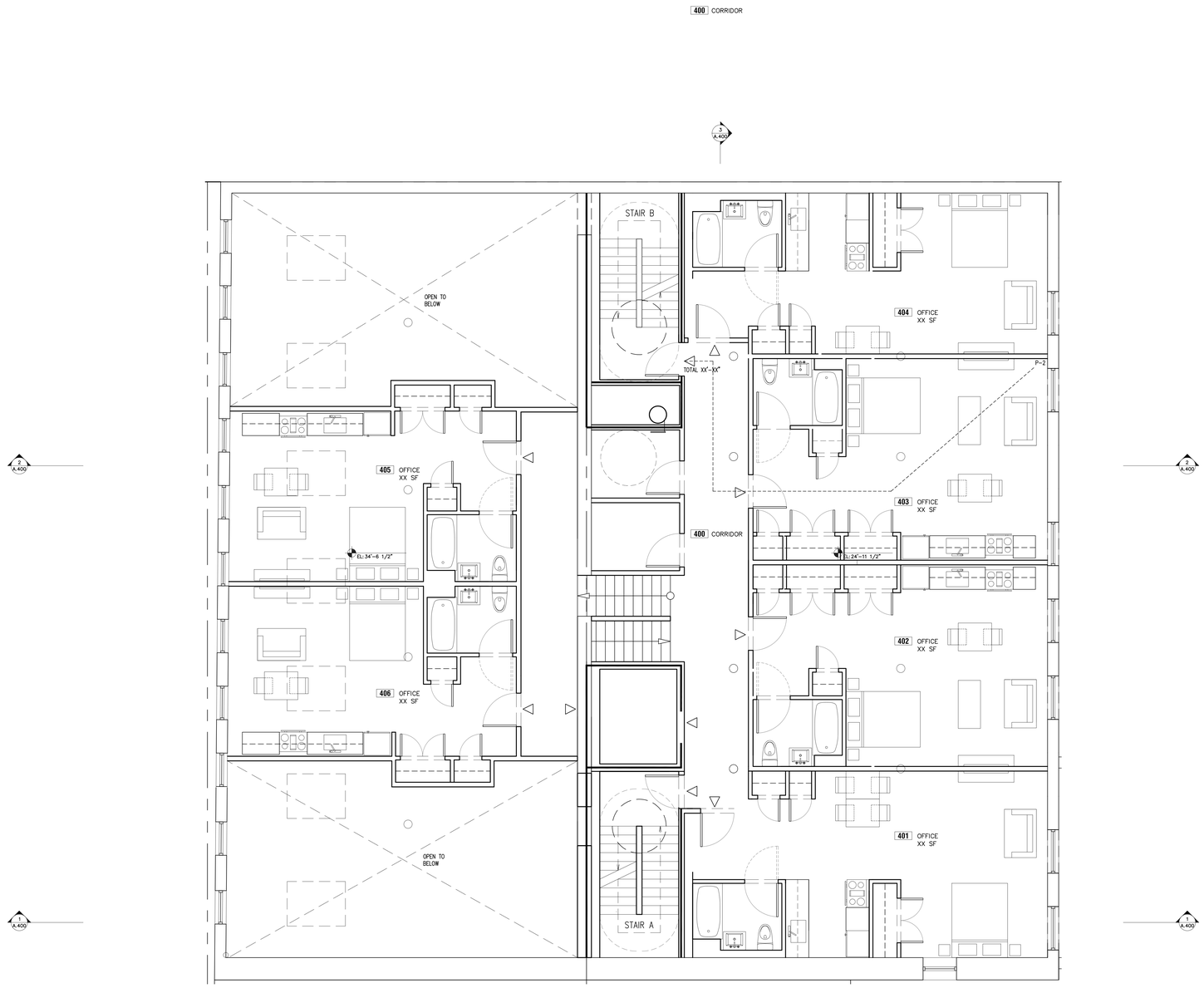

1 FOURTH FLOOR PLAN

1/4"=1'-0"

N

LEGEND

- 1 HR RATED SEPARATION/DIVISION
- 2 HR RATED SEPARATION/DIVISION
- CLASS 'A' FIRE DOOR (3/4 HR); 1 1/2 EXIT UNITS (EU)
- CLASS 'B' FIRE DOOR (1 1/2HR); 1 1/2 EXIT UNITS (EU)
- EXIT SIGN, ARROW INDICATES DIRECTION OF EGRESS
- PATH OF TRAVEL
- HARDWIRED CARBON MONOXIDE & SMOKE DETECTORS, IN COMPLIANCE WITH RS 17-13 AND INSTALLED IN ACCORDANCE WITH 17-14 SHALL BE PROVIDED IN EVERY DWELLING UNIT WITHIN 15 FEET OF PRIMARY ENTRANCE OF EACH BEDROOM. (LL 7/04)

TRAVEL DISTANCE SUMMARY

OCCUPANCY GROUP			POINT	
402/ OFFICE	B	TRAVEL DISTANCE	P-1	43'-1" < 200' COMPLIES
308/ OFFICE	B	TRAVEL DISTANCE	P-2	38'-1" < 200' COMPLIES

OCCUPANCY LOAD & EGRESS CALCULATIONS

ROOM/ SPACE	OCCUPANCY GROUP	NET FLOOR AREA (SF)	NET FLOOR AREA PER OCCUPANT (SF)	OCCUPANTS	REQUIRED EXIT WIDTH FOR STAIRS	STAIRS EXIT WIDTH PROVIDED	REQUIRED EXIT WIDTH FOR DOORS	DOORS EXIT WIDTH PROVIDED	REMARKS
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303 OFFICE	B	533 SF	100	6	6 X .3 (INCHES PER OCCUPANT)= 1.8"		6 X .2 (INCHES PER OCCUPANT)= 1.2"		
304 OFFICE	B	313 SF	100	4	4 X .3 (INCHES PER OCCUPANT)= 1.2"		4 X .2 (INCHES PER OCCUPANT)= 0.8"		
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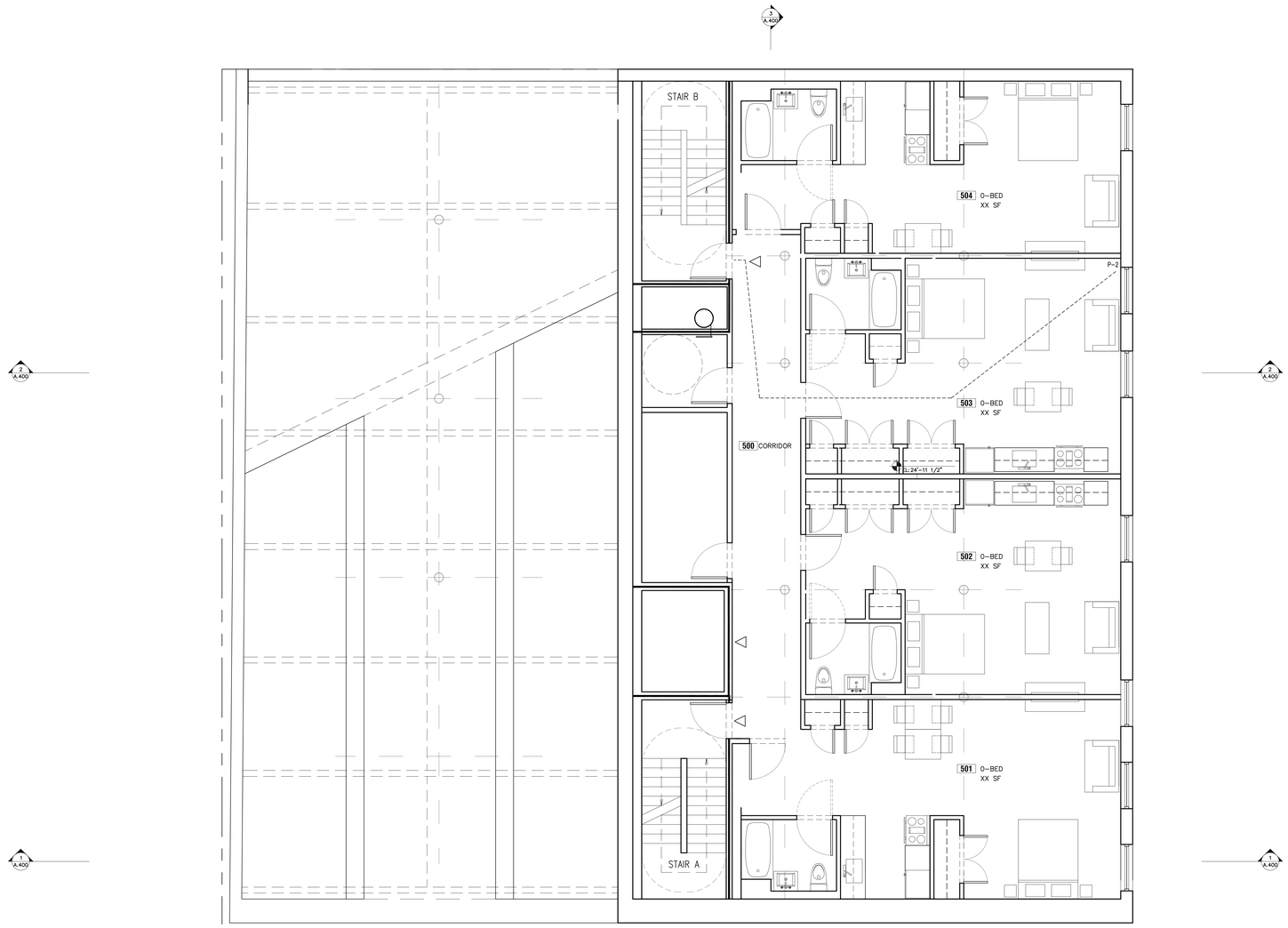

1 FIFTH FLOOR PLAN

1/4"=1'-0"

N

LEGEND

- 1 HR RATED SEPARATION/DIVISION
- 2 HR RATED SEPARATION/DIVISION
- CLASS 'A' FIRE DOOR (3/4 HR); 1 1/2 EXIT UNITS (EU)
- CLASS 'B' FIRE DOOR (1 1/2HR); 1 1/2 EXIT UNITS (EU)
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TRAVEL DISTANCE SUMMARY

OCCUPANCY GROUP			POINT	
503/ OFFICE	B	TRAVEL DISTANCE	P-1	38'-1" < 200' COMPLIES

OCCUPANCY LOAD & EGRESS CALCULATIONS

ROOM/ SPACE	OCCUPANCY GROUP	NET FLOOR AREA (SF)	NET FLOOR AREA PER OCCUPANT (SF)	OCCUPANTS	REQUIRED EXIT WIDTH FOR STAIRS	STAIRS EXIT WIDTH PROVIDED	REQUIRED EXIT WIDTH FOR DOORS	DOORS EXIT WIDTH PROVIDED	REMARKS
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PROJECT
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FIFTH FLOOR

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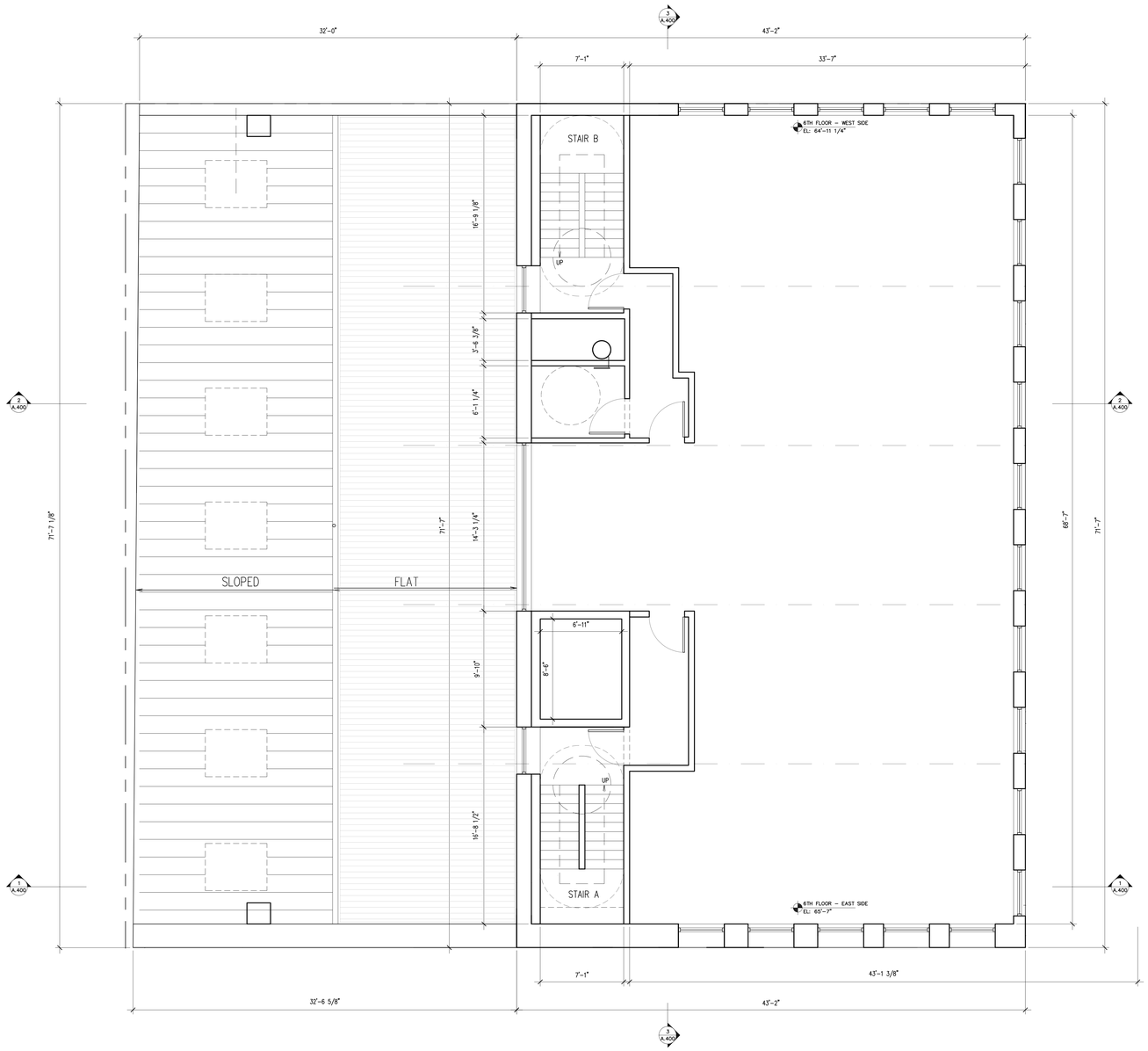
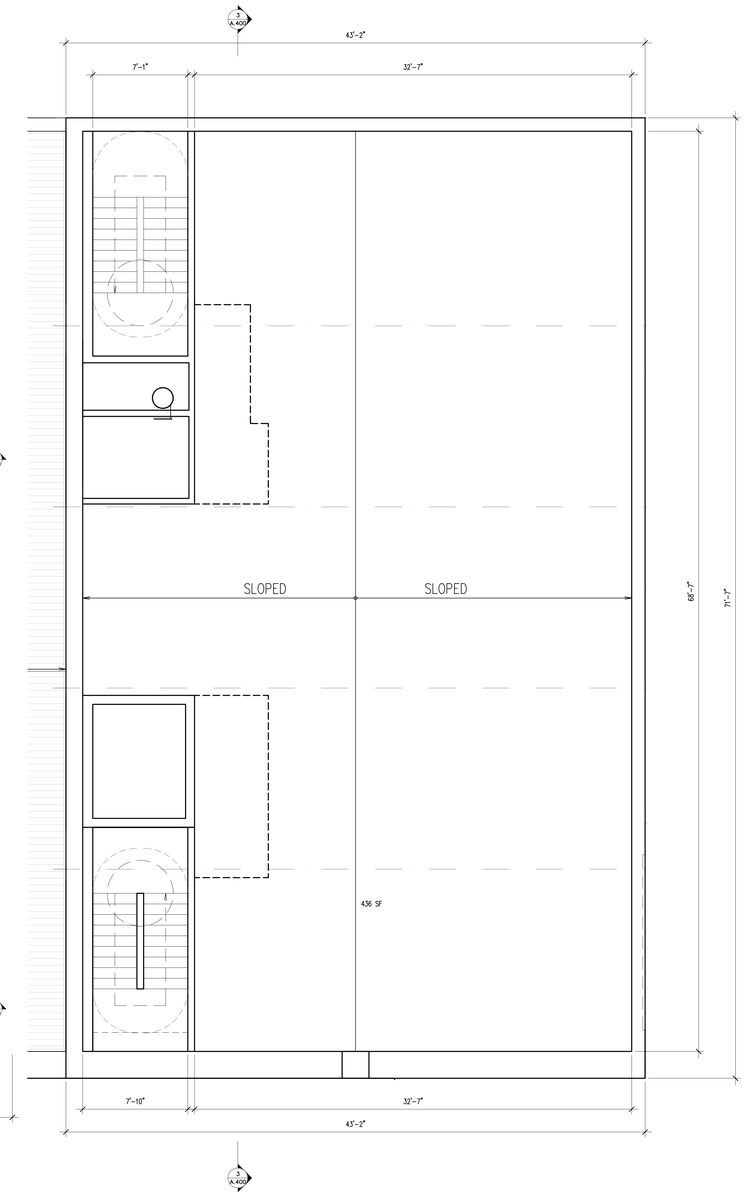


1 SIXTH FLOOR PLAN

1/4"=1'-0"



2 MEZZANINE PLAN

1/4"=1'-0"

N

LEGEND

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TRAVEL DISTANCE SUMMARY

OCCUPANCY GROUP			POINT	
600/ LIVING AREA	B	TRAVEL DISTANCE	P=1	50'-10" < 200' COMPLIES

OCCUPANCY LOAD & EGRESS CALCULATIONS

ROOM/ SPACE	OCCUPANCY GROUP	NET FLOOR AREA (SF)	NET FLOOR AREA PER OCCUPANT (SF)	OCCUPANTS	REQUIRED EXIT WIDTH FOR STAIRS	STAIRS EXIT WIDTH PROVIDED	REQUIRED EXIT WIDTH FOR DOORS	DOORS EXIT WIDTH PROVIDED	REMARKS
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PROJECT
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BROOKLYN, NEW YORK

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SIXTH FLOOR

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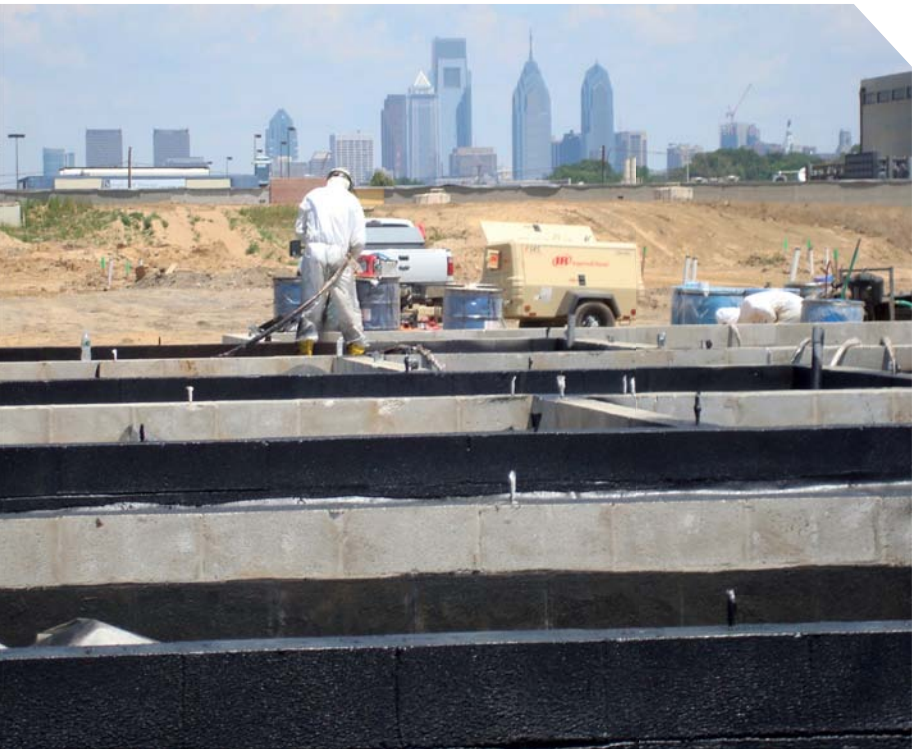
APPENDIX 6

LIQUID BOOT MANUFACTURERS INFORMATION

GAS VAPOR MITIGATION SYSTEMS

FOR PROTECTION AGAINST VAPOR INTRUSION

- ***LIQUID BOOT*** ® Gas Vapor Barrier System
- ***LIQUID BOOT*** ® **PLUS** Gas Vapor Barrier System
- **CoreFlex**™ Gas Vapor Barrier & Waterproofing System
- **GeoVent**™ Gas Venting System



With more than 60 years of experience, CETCO is an industry leader in Gas Vapor Mitigation technologies and solutions.

To speak to a technical expert about our innovative Gas Vapor Barrier and Venting Systems and how they can be custom tailored to your specific project, call us at 800-527-9948 to be connected to a representative in your area.

CETCO®

LIQUID BOOT® Gas Vapor Barrier System

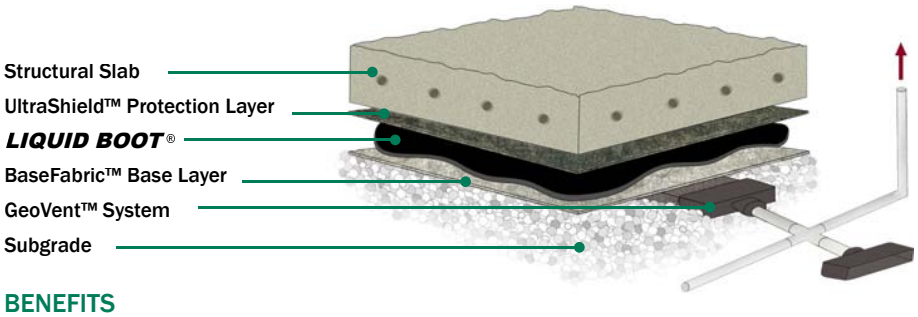
"Trusted protection against vapor intrusion for over 25 years"

SYSTEM DESCRIPTION

Liquid Boot® is a seamless, spray-applied, water-based membrane containing no VOCs, which provides a barrier against vapor intrusion into structures. Liquid Boot® is installed under slab and on below grade vertical walls as a gas vapor barrier to minimize vapor and nuisance water migration into buildings and is ideal for methane migration control. Liquid Boot® spray-application directly to penetrations, footings, grade beams, pile caps, etc., provides for a fully-adhered gas vapor barrier system.

TYPICAL USES

- Underslab and below-grade vertical wall gas vapor barrier, used to minimize vapor and nuisance water (non-hydrostatic conditions) migration into buildings
- Ideal for methane migration control
- Concrete water reservoir and tank liner used to prevent water seepage into concrete



BENEFITS

- Spray application provides excellent sealing of penetrations, eliminating mechanical fastening
- Seamless, monolithic membrane eliminates seaming-related membrane failures
- Unique formulation provides superior protection from methane gases and water vapor
- Fully adhered system reduces risk of gas migration

LIQUID BOOT® CHEMICAL & PHYSICAL PROPERTIES*		
Additional technical information is located at http://remediation.cetco.com		
CHEMICAL PROPERTY	**TEST METHOD**	**RESULT**
Acid Exposure (10% H_2SO_4 for 90 days)	ASTM D543	Less than 1% weight change
Benzene Diffusion Coefficient	Tested at 43,000 ppm	2.90×10^{-11} m^2/day
Chemical Resistance: VOCs, BTEXs (tested at 20,000 ppm)	ASTM D543	Less than 1% weight change
Diesel (1000 mg/l), Ethylbenzene (1000 mg/l), Naphthalene (5000 mg/l) and Acetone (500 mg/l) Exposure for 7 days	ASTM D543	Less than 1% weight change; Less than 1% tensile strength change
Hydrogen Sulfide Gas Permeability	ASTM D1434	None detected
Methane Permeability	ASTM 1434-82	Passed**
Microorganism Resistance	ASTM D4068-88	Passed**
Oil Resistance	ASTM D543-87	Passed**
PCE Diffusion Coefficient	Tested at 120 mg/L	1.32×10^{-13} m^2/sec
Radon Permeability	Tested by U.S. Department of Energy	Zero permeability to Radon (222Rn)
TCE Diffusion Coefficient	Tested at 524 mg/L	9.07×10^{-13} m^2/sec

PHYSICAL PROPERTY	**TEST METHOD**	**RESULT**
Accelerated Weathering & Ultraviolet Exposure	ASTM D822	No adverse effect after 500 hours
Bonded Seam Strength	ASTM D6392	Passed**
Dead Load Seam Strength	City of Los Angeles	Passed**
Elongation	ASTM D412	1,332% - Ø reinforcement, 90% recovery
Environmental Stress-Cracking	ASTM D1693-78	Passed**
Freeze-Thaw Resistance (100 Cycles)	ASTM A742	Meets criteria. No spalling or disbondment
Heat Aging	ASTM D4068-88	Passed**
Soil Burial	ASTM E154-88	Passed
Tensile Bond Strength to Concrete	ASTM D413	2,707 lbs/ft^2 uplift force
Tensile Strength	ASTM D412	58 p.s.i. without reinforcement

*For additional Liquid Boot® technical information, please refer to the technical section on our website at **http://remediation.cetco.com**

**Passes all Los Angeles City and County Methane Criteria

GeoVent™ Gas Venting System

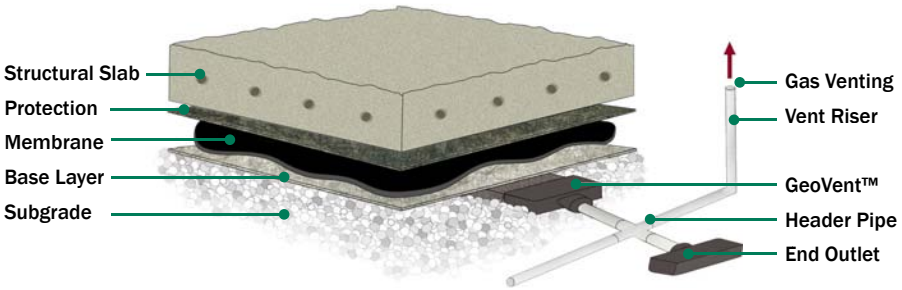
"GeoVent eliminates the need for costly and labor-intensive trenching."

SYSTEM DESCRIPTION

Venting systems are typically installed in conjunction with a gas vapor barrier when volatile or explosive gases are present. GeoVent™ is a low profile pressure relief, trenchless collection and venting system designed to improve venting efficiency and reduce installation costs. GeoVent™ has several advantages over trenched installations and can be used as an "active" or "passive" venting system depending on the specific project. Used in conjunction with Liquid Boot® or CoreFlex™ gas vapor barrier systems, GeoVent™ can alleviate the accumulation of gas vapors under the slab.

TYPICAL USE

- GeoVent™ is designed for use as active or passive under-slab venting when used with all CETCO gas vapor mitigation systems.



DESIGN CONSIDERATIONS

- Venting systems should be properly designed to adequately relieve pressure and reduce gas concentrations from beneath the structure
- CETCO provides assistance with GeoVent layouts/design grids
- CETCO provides assistance with detail drawings for these types of systems

BENEFITS

- Installed directly on subgrade eliminating costly trenching and potential interference or damage to existing underground utilities
- Placed in closer proximity to the gas vapor barrier allowing for more effective venting of any accumulated gas vapor
- Greater opening area per lineal foot of pipe and integral filter fabric allowing for higher ventilation efficiency
- Installed at a higher elevation reducing susceptibility to inundation from perched groundwater that may accumulate beneath the building foundation
- Flow characteristics meet or exceed that of a typical trenched installation. The overall capacity of the system is far in excess of typical gas flux rates

GeoVent™ CHEMICAL & PHYSICAL PROPERTIES

CORE PROPERTY	TEST METHOD	RESULT
Compressive Strength	ASTM D 1621	9,500 psf
Flow Rate (Hydraulic gradient = .1)	ASTM D 4716	30 gpm/ft/width
Thickness	ASTM D 1777	1.0 in.

FABRIC PROPERTY	TEST METHOD	RESULT
A.O.S.	ASTM D 4751	70 US Sieve
Fabric - Mass / Unit Area	ASTM D 5261	4.0 oz/yd^2
Flow Rate	ASTM D 4491	140 gpm/ft^2
Grab Tensile Strength	ASTM D 4632	100 lbs.
Permeability	ASTM D 4491	0.21 cm/sec
Puncture Strength	ASTM D 4833	65 lbs.
UV Resistance	ASTM D 4355	70%

*For additional GeoVent™ technical information, please refer to the technical section on our website at **http://remediation.cetco.com**

CETCO® Quality Assurance

"CETCO provieds a nation-wide network of approved installers and inspectors."

CERTIFIED INSTALLERS AND INSPECTORS

In any proper gas vapor barrier system installation, it is important to perform QA/QC measures to ensure successful installations. CETCO maintains a nationwide network of certified installers and inspectors that are trained in the proper installation and inspection procedures of a CETCO gas vapor barrier system. CETCO pioneered the use of a smoke test, which is currently recognized by top guidance organizations as a reliable quality control method performed on CETCO gas vapor barrier systems.

SMOKE TESTING FOR GAS VAPOR BARRIER SYSTEMS

A smoke test is a method of ensuring that a membrane is free of holes. Smoke is pumped under the membrane for a specified period of time while the surface of the membrane is observed for minute holes where the smoke is clearly visible. During the smoke test, any holes detected can immediately be repaired. This process has been completed under hundreds of structures and found to be highly successful. The smoke testing process assures engineers, developers, and owners alike that they are getting a fully tested, gas-tight membrane installation.

THE SMOKE TESTING PROCESS

1. Equipment set-up

2. Starting smoke test

3. Punctured detected by smoke

4. Close-up of puncture

5. Repair by certified installer

6. Fully patched membrane

A GLOBAL ENVIRONMENTAL COMPANY

CETCO®, a wholly owned subsidiary of AMCOL® International Corporation, is a diversified global environmental company providing innovative products and practical solutions to challenging regulatory and construction problems. CETCO delivers a complete range of products and services built around engineering support, technical assistance, innovative product solutions and leadership in research and development.

For additional technical information and case studies on CETCO remediation products and applications, visit us on the web at http://remediation.cetco.com or call 800-527-9948 to be connected to a technical representative in your area.

LIQUID BOOT® Brownfield Membrane/Liner

Examination
All surfaces to receive gas vapor barrier shall be inspected and approved by the applicator at least one day prior to commencing work.

Surface Preparation
Provide 24 inch minimum clearance out from surfaces to receive the gas vapor barrier. The application surface shall be prepared and provided to the applicator in accordance with manufacturer's specifications listed below:

A. Concrete/Shotcrete/Masonry
Concrete surfaces shall be light broom finish or smoother, free of any dirt, debris, loose material, release agents or curing compounds. Fill all voids more than ¼ inch deep and 1.4 inch wide. Masonry joints, cold joints, and form joints shall be struck smooth. All penetrations shall be prepared in accordance with manufacturer's specifications. Provide a ¾ inch minimum cant of LIQUID BOOT or other suitable material as approved by manufacturer, at all horizontal or vertical transitions and other inside corners of 120 or less. Allow to cure overnight before the application of LIQUID BOOT. All cracks or cold joints greater than 1/16 inch must be completely grouted with non-shrink grout as approved by engineer. Install Hardcast reinforcing tape over all cold joints, cracks and form tie holes (after holes and cracks are grouted).

B. Dirt & Gravel
The sub-grade shall be moisture conditioned and compacted to a minimum relative compaction of 90 percent or as specified by civil/geotechnical engineer. The finished surface shall be smooth, uniform, free of debris and standing water. Remove all stones or dirt clods greater than ¼ inch. (NOTE: aggregate sub-bases shall be rolled flat, free from any protruding sharp edges). Penetrations shall be prepared in accordance with manufacturer's specifications. All form stakes that penetrate the membrane shall be or rebar which shall be bent over and left in the slab. Trenches shall be cut oversize to accommodate gas vapor barrier membrane and protection course with perpendicular to sloped sides and maximum obtainable compaction. Adjoining grade shall be finish graded and compacted. Excavated walls shall be vertical or slope back, free of roots and protruding rocks. Specific sub grade preparation shall be designed by a qualified civil or geotechnical engineer. If organic materials with potential for growth (ie: seeds or grasses) exist within the sub-base, spray apply soil sterilant at the sterilant manufacturer's recommended rate.

Installation

Installation on Concrete/ Shotcrete/Masonry (follow the procedures below carefully)

A. Refer to section 3.03.30 Sealing Around Penetrations for procedures to seal around penetrations.
B. Provide a 3.4 inch minimum cant of LIQUID BOOT or other suitable material as approved by manufacturer, at all horizontal to vertical transitions and other inside corners of 120 or less. **Allow to cure overnight before the application of LIQUID BOOT.**
C. Delineate a test area **on site** with a minimum dimension of 10 feet by 10 feet (3m by 3m). Apply LIQUID BOOT to a thickness of 60 mils and let it cure for **24 hours**. Observe for blisters. If minor or no blistering occurs, proceed to the next step. (See note regarding blisters). If significant blistering does occur, apply a thin *10 mil) tack coat of LIQUID BOOT. "A" side without catalyst to the entire concrete surface and allow to cure before proceeding. (See also information regarding blister repair).
D. Spray apply LIQUID BOOT to a 60 mil minimum dry thickness. Increase thickness to 100 dry mils if shotcrete is to be applied directly to membrane. If a second coat is required, remove any standing water from the membrane before proceeding with the second application.
E. Do not penetrate membrane. Keep membrane free of dirt and debris and traffic until a protective cover is in place. It is the responsibility of the general Contractor to insure that the membrane and the protection system are not penetrated.
F. After membrane has cured and checked for proper thickness and flaws, install protection material pursuant to manufacturer's instructions. NOTE: All testing or inspection to be performed prior to placing protection course.

NON-HORIZONTAL SURFACES: spray on non-horizontal surfaces should begin at the bottom and work towards the top. This method allows the product to adhere to the surface before hitting catalyst runoff.
Note: due to the nature of concrete as a substrate, it is normal for some blistering to occur. This is caused by either concrete's tendency to off-gas or water that is temporarily trapped between the concrete and the membrane. With time and the applied pressure of backfill or over-slab, blisters will absorb into the concrete without detriment to the membrane. A small number of blister heads should be sampled and checked for proper membrane thickness. If the samples have the minimum required membrane thickness, then the remaining blisters should not be punctured or cut. If the samples have less than the minimum required membrane thickness, then the area can either be re-sprayed to obtain the proper thickness, or the blisters can be cut out and the area re-sprayed or patched with LIQUID BOOT Trowel Grade.

Installation on Dirt Surfaces and Mudslabs

A. Roll out Liquid Boot BaseFabric geotextile on sub-grade with the heat rolled side facing up. Overlap seams a minimum of six inches (6”). Lay geotextile tight at all inside corners. Apply a thin (10mil) tack coat of LIQUID BOOT “A” side without catalyst within the seam overlap. Line trenches with geotextile extending at least six inches (6”) onto adjoining sub-grade if slab and footings are to be sprayed separately. Overlap seams a minimum of six inches (6”). Lay geotextile tight at all inside corners. Apply a thin (10mil) tack coat of LIQUID BOOT “A” side without catalyst within the seam overlap.
B. Minimize the use of nails to secure the geotextile to the dirt subgrade. Remove all nails before spraying membrane, if possible. Nails that cannot be removed from the dirt subgrade are to be patched with geotextile or hardcast. Apply a thin tack coat of LIQUID BOOT under the geotextile patch, when patching with geotextile.
C. Refer to section “Sealing Around Penetrations” for procedures to seal around penetrations.
D. Spary apply LIQUID BOOT onto geotextile to an 60 mil minimum dry thickness. Increase thickness to 100 dry mils if shotcrete is to be applied directly to membrane. If a second coat is required, remove any standing water from the nembrane before proceeding with the second application.
E. Do not penetrate membrane. Keep membrane free of dirt, debris and traffic until a protective cover is in place. It is the responsibility of the General Contractor to insure that the membrane and the protection system are not penetrated.
F. After membrane has cured and checked for proper thickness and flaws, install protection material pursuant to manufacturer’s instructions. NOTE: all testing or inspection to be performed prior to placing protection course.

Option 2 (For Gas Vapor Membrane Only)

A. Clean all penetrations. All metal penetrations shall be sanded clean with emery cloth.
B. For applications requiring LIQUID BOOT BaseFabric geotextile, roll out geotextile on sub-grade with the heat-rolled side facing up, overlapping seams a minimum of six inches (6”). Cut the geotextile around penetrations so that it lays flat on the sub-grade. Lay geotextile tight at all inside corners. Apply a thin (10 mil) tack coat of LIQUID BOOT “A” side without catalyst within the seam overlap.
C. Spray-apply LIQUID BOOT to surrounding areas as specified for the particular application to an 60 mil minimum dry thickness. At the base of penetration install a minimum ¾ inch thick membrane cant of LIQUID BOOT or other suitable material as approved by manufacturer. Extend the membrane at 60 mil thickness up the penetration a mimumum of three

inches (3”). Allow to cure overnight before proceeding to D (See manufacturer’s standard detail).

D. Spray apply LIQUID BOOT the membrane at an 60 mil thickness three inches (3”) around the base of penetration and up the penetration, completely encapsulation the collar assembly to a height of one and one half inches (1 ½”) minimum above the membrane as described in C above. (see attached manufacturer’s standard detail)
E. Allow LIQUID BOOT to cure completely before proceeding to step “F”.
F. Wrap penetration with polypropylene cable tie at a point two inches (2”) above the base of the penetration. Tighten the cable tie firmly so as to squeeze, but not cut, the cured membrane collar.

Field Quality Control

Field quality control is very important of all LIQUID BOOT applications. Applicators should check their own work for coverage, thickness and all around good workmanship before calling for inspections. The membrane must be cured at least overnight before inspecting for dry-thickness, holes, shadow shrinkage, and any other membrane damage. If water testing is to be performed, allow the membrane to cure at least 72 hours prior to the water test. When thickness or integrity is in question the membrane should be tested in the proper manner as described below. However, over-sampling defeats the intent of inspections. Inspectors should always use visual and tactile measurement to guide them. Areas suspected to being too thin to the touch should be measured with the gauges to determine the exact thickness. With practice and by comparing tactile measurements with those of the gauges, fingers become very accurate tools.

On Concrete/Shotcrete/Masonry & Other Hard Surfaces

A. Membrane may be checked for proper thickness with a blunt-nose depth gauge, taking one reading every 500 square feet. Record the readings. Mark the test area for repair, if necessary.
B. If necessary, test areas are to be patched over with LIQUID BOOT to a 60 mils minimum dry thickness, extending a minimum of one inch (1”) beyond the test perimeter.

On Dirt and Other Soft Substrates

A. Samples may be cut from the membrane and geotextile sandwich to a maximum area of 2 square inches. Measure the thickness with a mil-reading caliper, per 500 square feet. Deduct the plain geotextile thickness to determine the thickness of LIQUID BOOT membrane. Mark the test area for repair.
B. Voids left by sampling are to be patched with geotextile overlapping the void by a minimum of two inches (2”). Apply a thin tack coat of LIQUID BOOT under the geotextile patch. Then spray or trowel apply LIQUID

BOOT to an 60 mils minimum dry thickness, extending at least three inches (3”) beyond geotextile patch.

Smoke Testing For Holes (optional)

Holes or other breaches in the membrane can be detected by conducting a smoke test. This involves pumping smoke under the membrane for a specified period of time, under a specified pressure, which varies from project to project. Contact LBI Technologies for information about this test.

APPENDIX 7

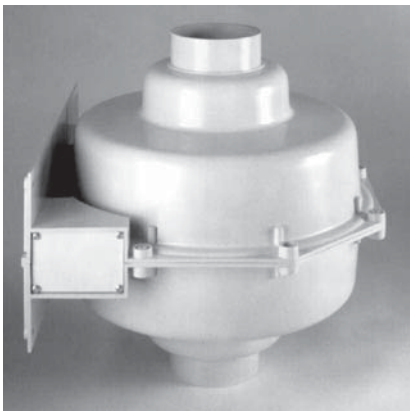
EXHAUST FAN AND PRESSURE CONTROL SYSTEM

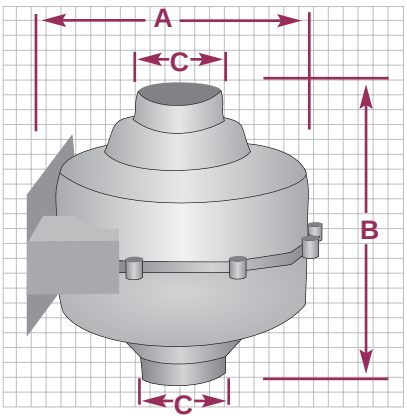
RadonAway™

GP Series

Radon Mitigation Fans

Specially designed for radon mitigation, GP Series Fans provide a wide range of performance that makes them ideal for most subslab radon mitigation systems.





- **5-Year Warranty**
- **Mounts on duct pipe or with integral flange**
- **3" diameter ducts for use with 3" or 4" pipe**
- **Electrical box for hard wire or plug in**
- **ETL Listed - for indoor or outdoor use.**

Model	Dimensions		
	A	B	C Duct Size
GP series	12.5"	13"	3"

The following chart shows performance of GP Series fans:

Model	Watts	Maximum Pressure "WC	Typical CFM vs. Static Pressure WC						
			1.0"	1.5"	2.0"	2.5"	3.0"	3.5"	4.0"
GP201	40-60	2.0	82	58	5	-	-	-	-
GP301	55-90	2.6	92	77	45	10	-	-	-
GP401	60-110	3.4	93	82	60	40	15	-	-
GP501	70-140	4.2	95	87	80	70	57	30	10

Choice of model is dependent on certain building characteristics including sub-slab materials and should be made by a radon professional.

For Further Information Contact:

0902
P/N 02002

Modulating Pressure Control
EBC 30

Use

The EBC 30 is a draft or pressure control device that can monitor and maintain a constant draft or pressure by varying the speed of a fan(s) or the position of an actuator. It can be used with models RSV, IPVB, BESB and MDF.

Typical uses are: 1) Controlling draft in a mechanical draft system serving boilers and water heaters, 2) Controlling position of an over-draft damper serving boilers and water heaters, 3) Controlling duct pressure in a dryer venting system or a ventilation system, or 4) Controlling the supply of combustion air to a mechanical room.

Description

The EBC 30 features “Plug-n-Play” to automatically detect connections, setting requirements and accessories during initial start-up. A rotation check feature makes it easy to determine the rotation of a 3-phase fan motor.

The control can provide a 0-10V signal to a Variable Frequency Drive (VFD) or actuator. An add-on board can supply 0-120VAC power directly to the mechanical draft fan or air supply ventilator. It can interlock with up to 6 heating appliances, and an unlimited number of additional heating appliances can be handled by using one or more ES12, Relay Box. An integrated Proven Draft Switch function assures that if sufficient draft cannot be maintained, the control will lock out the appliance(s) within an adjustable time period. Automatic reset avoids nuisance lockouts and the need for manual reset.

The EBC 30 can be set up for intermittent operation so it pre-purges the stack prior to the boiler(s) start and post-purges up to 30 minutes after boiler stop. Alternatively, it can be set up for continuous operation where the fan runs continuously but modulates and runs at idle speed, if no appliances are operating.

The programmable processor allows manual overrides, manual operation; low and high limit fan speeds. An Operating Priority set up option allows one or more appliance to operate during electrical or mechanical failure of the fan(s) provided the draft requirement can be met and safe operation assured. It automatically checks for fan operation every two hours and goes back to normal operation, if appropriate.

A bearing cycle activation rotates the fan motor(s) once every 24 hours if the fan(s) has not operated within the last 24 hours.

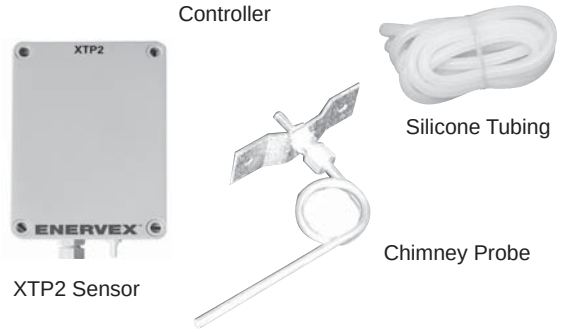
Required draft and pressures can be maintained and shown via a LCD-panel. A self-diagnostics panel with LED-diodes verifies proper operation. The control maintains an error log including the last 10 fault codes.

Material

The housing is made in steel and is NEMA 1 rated.

Standard Equipment

Control box and XTP2 Sensor with 6’ silicone tubing and a stack probe.



Listings

ETL listed to UL508 and CSA C22.2 No. 14-95 – Standard for Industrial Control Equipment (ETL Report 3028824A)
Component in ETL listed CASV System (ETL Report 045099A)
Component in ETL listed MCAS System (ETL Report J99*18091-003)
Component in ETL listed MDVS System (ETL Report J99*18091-004)
CE Compliant
Manufactured at ISO 9001 certified plant.

Approvals

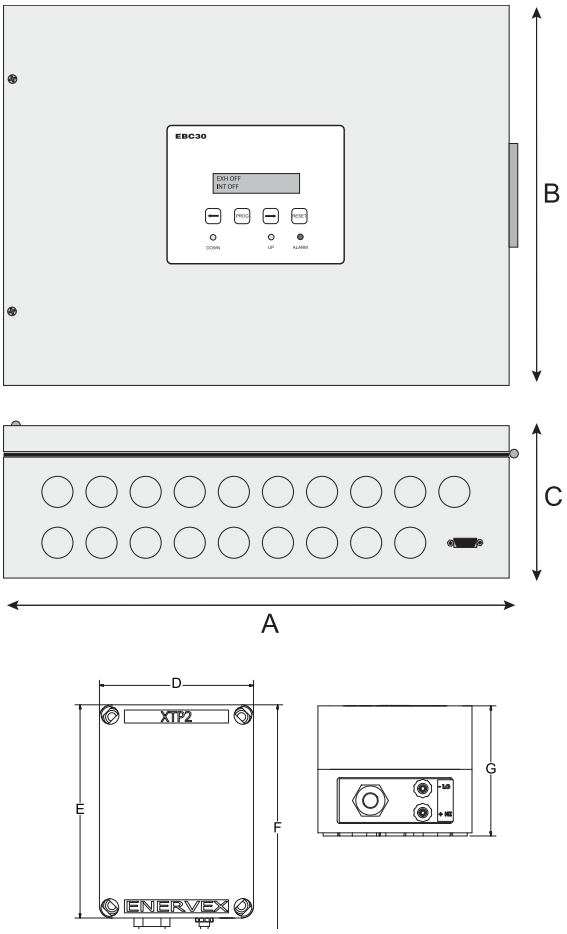
OSHPD Preapproval Of Manufacturer's Certification (OPM) No. OSP-0343-10

Warranty

2-Year Factory Warranty

Specifications

EBC 30 Control		
Power Supply	V	1x120VAC
Amperage	A	6.3
Operating Temperature	°F/°C	-4 to 122/-20 to 50
Range of Operation	inWC/Pa	0-0.6/0-150
Tolerance	inWC/Pa	0.01/3 +/-10%
Control Signal	mA	max. 10
Control Relay		Max. 120 VAC/8A
Output	VAC	10-120
	VDC	0-10
Dimensions	A in/mm	14.65/372
	B in/mm	11.03/280
	C in/mm	4.22/107
Weight	lbs/kg	8.9/4.0
EMC Standard	Emission	EN 50 081-1
	Immunity	EN 50 082-2
XTP2 Sensor		
Power Supply	VDC	12-36
Amperage	mA	<20
Output	VDC	0-10
Operating Temperature	°F/°C	0 to 160 / -18 to 71
Accuracy	inWC/Pa	+/-0.08%
Dimensions	D in/mm	3.70 / 94
	E in/mm	5.12 / 130
	F in/mm	6.18 / 157
Weight	lbs/kg	.6 / .3
Stack Probe		
Dimensions	H in/mm	4.25/108
	I in/mm	3.50/89



Programmable features:

1. Rotation check
2. Exhaust (draft) setting
3. Exhaust mode
4. Exhaust pre-purge time and speed mode
5. Exhaust post-purge time and speed mode
6. Exhaust sensor range
7. Exhaust alarm limit
8. Exhaust alarm delay
9. Exhaust speed min and max
10. Intake set
11. Intake mode
12. Intake pre-purge time and speed mode
13. Intake post-purge time and speed mode
14. Intake sensor range
15. Intake alarm limit
16. Intake alarm delay
17. Intake speed min and max
18. Language
19. Display units
20. Display light
21. Alarm reset
22. Service triac board
23. Service override exhaust
24. Service override intake
25. Service override alarm mode
26. Option priority mode
27. Option bearing cycle
28. Manual exhaust/intake

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ENERVEX®
GREEN BEFORE GREEN WAS IN

RadonAway™

RadonAway Ward Hill, MA IN014 Rev E

XP/GP/XR Series Fan Installation Instructions

Please Read And Save These Instructions.

DO NOT CONNECT POWER SUPPLY UNTIL FAN IS COMPLETELY INSTALLED. MAKE SURE ELECTRICAL SERVICE TO FAN IS LOCKED IN "OFF" POSITION. DISCONNECT POWER BEFORE SERVICING FAN.

1. **WARNING!** Do not use fan in hazardous environments where fan electrical system could provide ignition to combustible of flammable materials.

2. **WARNING!** Do not use fan to pump explosive or corrosive gases.

3. **WARNING!** Check voltage at the fan to insure it corresponds with nameplate.

4. **WARNING!** Normal operation of this device may affect the combustion airflow needed for safe operation of fuel burning equipment. Check for possible backdraft conditions on all combustion devices after installation.

5. **NOTICE!** There are no user serviceable parts located inside the fan unit. **Do NOT attempt to open.** Return unit to the factory for service.

6. All wiring must be in accordance with local and national electrical codes.

DynaVac - XP/XR Series		DynaVac - GP Series	
XP101	p/n 23008-1,-2	GP201	p/n 23007-1
XP151	p/n 23010-1,-2	GP301	p/n 23006-1,-2
XP201	p/n 23011-1,-2	GP401	p/n 23009-1
XR161	p/n 23018-1,-2	GP501	p/n 23005-1,-2
XR261	p/n 23019-1,-2		

1.0 SYSTEM DESIGN CONSIDERATIONS

1.1 INTRODUCTION

The DynaVac GP/XP/XR Series Radon Fans are intended for use by trained, professional Radon mitigators. The purpose of this instruction is to provide additional guidance for the most effective use of a DynaVac Fan. This instruction should be considered as a supplement to EPA standard practices, state and local building codes and state regulations. In the event of a conflict, those codes, practices and regulations take precedence over this instruction.

1.2 ENVIRONMENTALS

The GP/XP/XR Series Fans are designed to perform year-round in all but the harshest climates without additional concern for temperature or weather. For installations in an area of severe cold weather, please contact RadonAway for assistance. When not in operation, the fan should be stored in an area where the temperature is never less than 32 degrees F. or more than 100 degrees F.

1.3 ACOUSTICS

The GP/XP/XR Series Fan, when installed properly, operates with little or no noticeable noise to the building occupants. The velocity of the outgoing air should be considered in the overall system design. In some cases the "rushing" sound of the outlet air may be disturbing. In these instances, the use of a RadonAway Exhaust Muffler is recommended.

1.4 GROUND WATER

In the event that a temporary high water table results in water at or above slab level, water may be drawn into the riser pipes thus blocking air flow to the GP/XP/XR Series Fan. The lack of cooling air may result in the fan cycling on and off as the internal temperature rises above the thermal cutoff and falls upon shutoff. Should this condition arise, it is recommended that the fan be turned off until the water recedes allowing for return to normal operation.

1.5 SLAB COVERAGE

The GP/XP/XR Series Fan can provide coverage up to 2000+ sq. ft. per slab penetration. This will primarily depend on the sub-slab material in any particular installation. In general, the tighter the material, the smaller the area covered per penetration. Appropriate selection of the GP/XP/XR Series Fan best suited for the sub-slab material can improve the slab coverage. The GP & XP series have a wide range of models to choose from to cover a wide range of subslab material. The higher static suction fans are generally used for tighter subslab materials. The XR Series is specifically designed for high flow applications such as stone/gravel and drain tile. Additional suction points can be added as required. It is recommended that a small pit (5 to 10 gallons in size) be created below the slab at each suction hole.

1.6 CONDENSATION & DRAINAGE

Condensation is formed in the piping of a mitigation system when the air in the piping is chilled below its dew point. This can occur at points where the system piping goes through unheated space such as an attic, garage or outside. The system design must provide a means for water to drain back to a slab hole to remove the condensation. The GP/XP/XR Series Fan **MUST** be mounted vertically plumb and level, with the outlet pointing up for proper drainage through the fan. Avoid mounting the fan in any orientation that will allow water to accumulate inside the fan housing. The GP/XP/XR Series Fans are **NOT** suitable for underground burial.

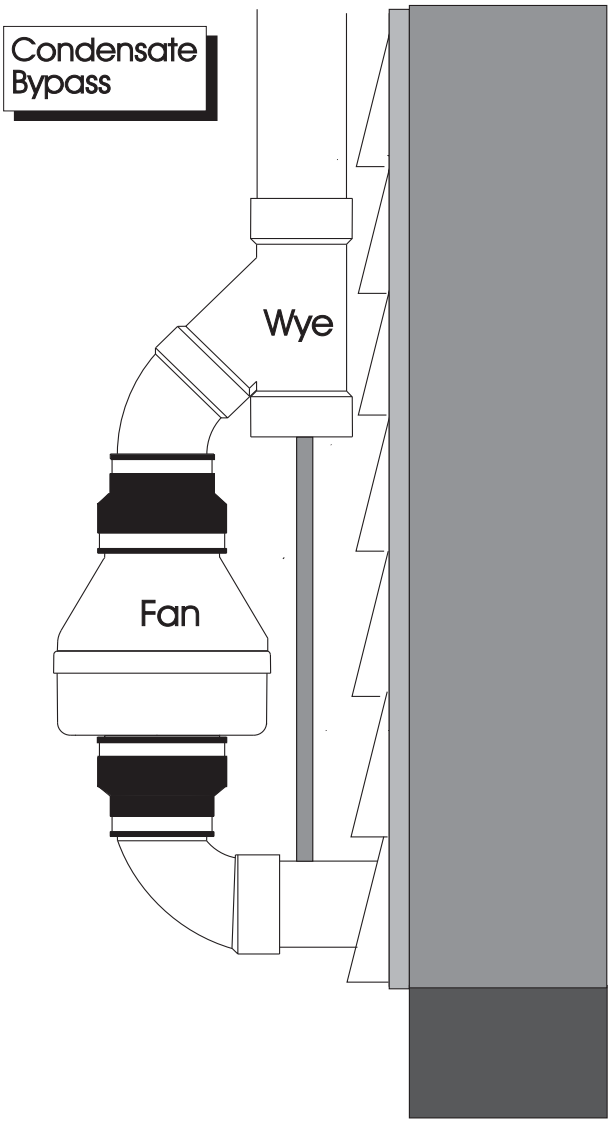
For GP/XP/XR Series Fan piping, the following table provides the minimum recommended pipe diameter and pitch under several system conditions.

Pipe Dia.	Minimum Rise per Foot of Run* @25 CFM	@50 CFM	@100 CFM
4″	1/8″	1/4″	3/8″
3"	1/4"	3/8"	1 1/2"

*Typical GP/XP/XR Series Fan operational flow rate is 25 - 90 CFM.
(For more precision, determine flow rate by using the chart in the addendum.)

Under some circumstances in an outdoor installation a condensate bypass should be installed in the outlet ducting as shown. This may be particularly true in cold climate installations which require long lengths of outlet ducting or where the outlet ducting is likely to produce large amounts of condensation because of high soil moisture or outlet duct material. Schedule 20 piping and other thin-walled plastic ducting and Aluminum downspout will normally produce much more condensation than Schedule 40 piping.

The bypass is constructed with a 45 degree Wye fitting at the bottom of the outlet stack. The bottom of the Wye is capped and fitted with a tube that connects to the inlet piping or other drain. The condensation produced in the outlet stack is collected in the Wye fitting and drained through the bypass tube. The bypass tubing may be insulated to prevent freezing.



1.7 "SYSTEM ON" INDICATOR

A properly designed system should incorporate a "System On" Indicator for affirmation of system operation. A manometer, such as a U-Tube, or a vacuum alarm is recommended for this purpose.

1.8 ELECTRICAL WIRING

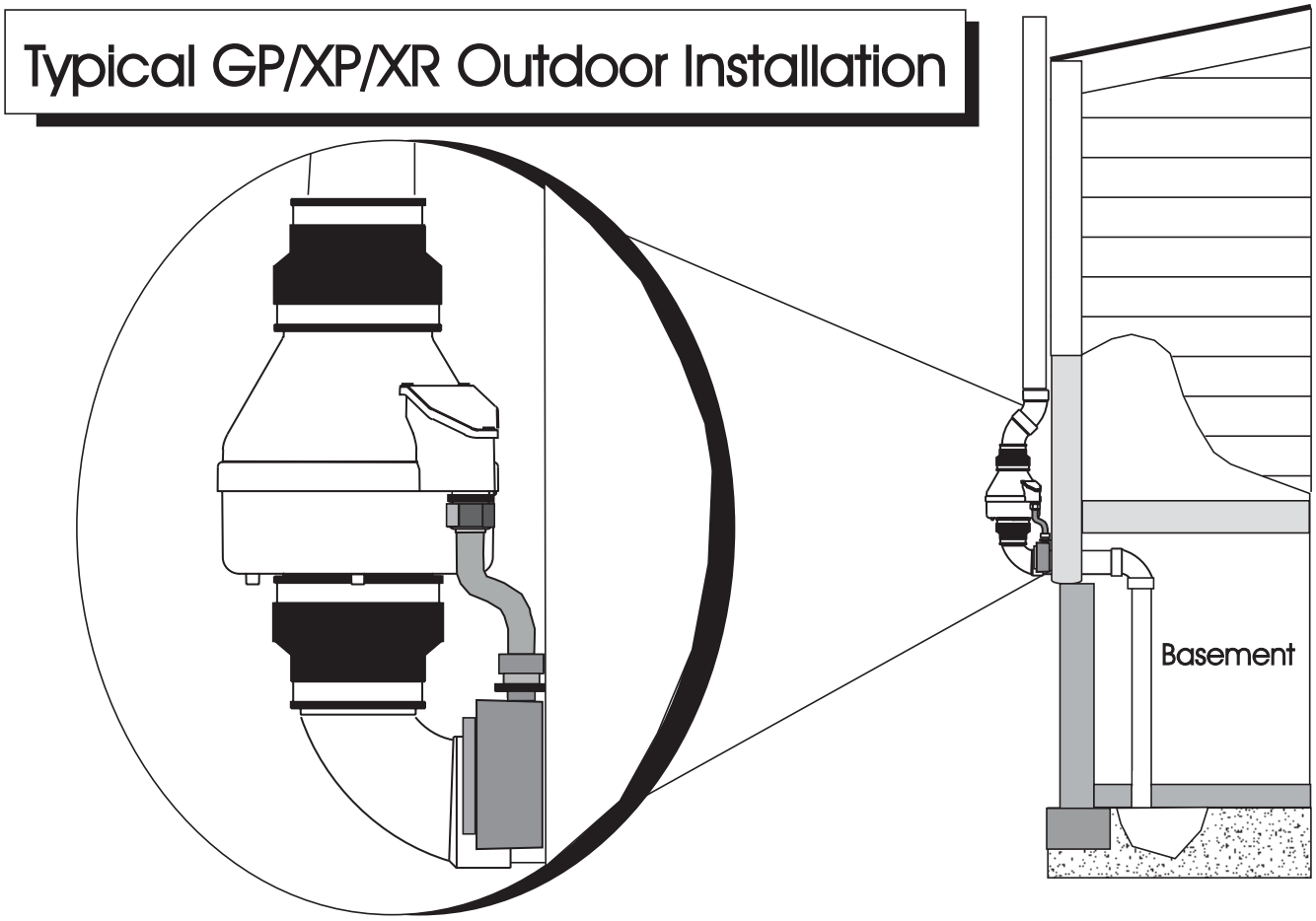
The GP/XP/XR Series Fans operate on standard 120V 60 Hz. AC. All wiring must be performed in accordance with the National Electrical Code and state and local building codes. All electrical work should be performed by a qualified electrician. Outdoor installations require the use of a U.L. listed watertight conduit.

1.9 SPEED CONTROLS

The GP/XP/XR Series Fans are rated for use with electronic speed controls ,however, they are generally not recommended.

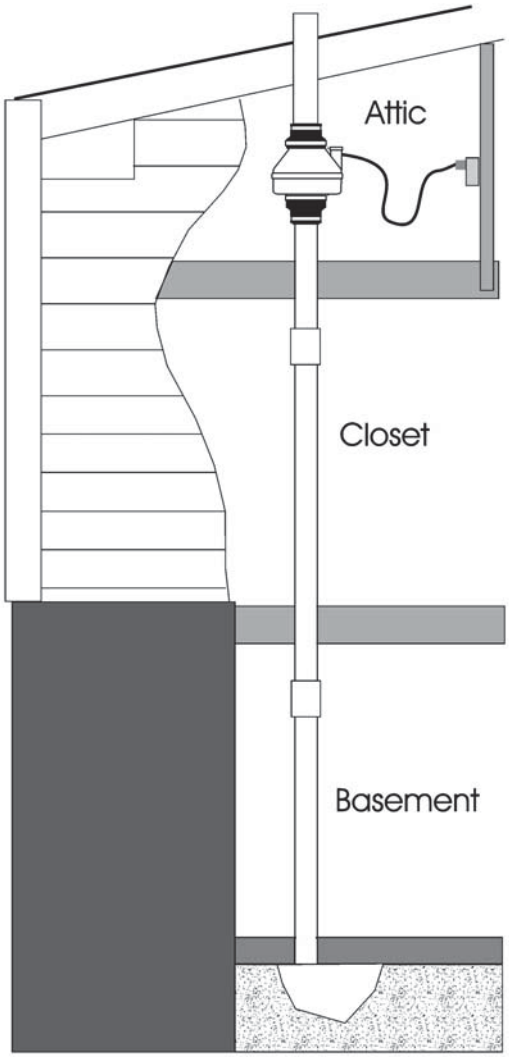
2.0 INSTALLATION

The GP/XP/XR Series Fan can be mounted indoors or outdoors. (It is suggested that EPA recommendations be followed in choosing the fan location.) The GP/XP/XR Series Fan may be mounted directly on the system piping or fastened to a supporting structure by means of optional mounting bracket.



2.1 MOUNTING

Mount the GP/XP/XR Series Fan vertically with outlet up. Insure the unit is plumb and level. When mounting directly on the system piping assure that the fan does not contact any building surface to avoid vibration noise.



2.2 MOUNTING BRACKET (optional)

The GP/XP/XR Series fan may be optionally secured with the integral mounting bracket on the GP Series fan or with RadonAway P/N 25007-2 mounting bracket for an XP/XR Series fan. Foam or rubber grommets may also be used between the bracket and mounting surface for vibration isolation.

2.3 SYSTEM PIPING

Complete piping run, using flexible couplings as means of disconnect for servicing the unit and vibration isolation.

2.4 ELECTRICAL CONNECTION

Connect wiring with wire nuts provided, observing proper connections:

Fan Wire	Connection
Green	Ground
Black	AC Hot
White	AC Common

2.5 VENT MUFFLER (optional)

Install the muffler assembly in the selected location in the outlet ducting. Solvent weld all connections. The muffler is normally installed at the end of the vent pipe.

2.6 OPERATION CHECKS

_____ **Verify** all connections are tight and **leak-free**.

_____ **Insure** the GP/XP/XR Series Fan and all ducting is secure and vibration-free.

_____ **Verify** system vacuum pressure with manometer. **Insure** vacuum pressure is **less than** maximum recommended operating pressure

(Based on sea-level operation, at higher altitudes reduce by about 4% per 1000 Feet.)
(Further reduce Maximum Operating Pressure by 10% for High Temperature environments)
See Product Specifications. If this is exceeded, increase the number of suction points.

_____ **Verify Radon levels by testing to EPA protocol.**

GP SERIES PRODUCT SPECIFICATIONS

The following chart shows fan performance for the GPx01 Series Fan:

Typical CFM Vs Static Suction "WC	1.0"	1.5"	2.0"	2.5"	3.0"	3.5"	4.0"
GP501	95	87	80	70	57	30	5
GP401	93	82	60	38	12	-	-
GP301	92	77	45	10	-	-	-
GP201	82	58	5	-	-	-	-

Maximum Recommended Operating Pressure*		
GP501	3.8" W.C.	(Sea Level Operation)**
GP401	3.0" W.C.	(Sea Level Operation)**
GP301	2.4" W.C.	(Sea Level Operation)**
GP201	1.8" W.C.	(Sea Level Operation)**

**Reduce by 10% for High Temperature Operation*
***Reduce by 4% per 1000 feet of altitude*

Power Consumption @ 120 VAC	
GP501	70 - 140 watts
GP401	60 - 110 watts
GP301	55 - 90 watts
GP201	40 - 60 watts

Inlet/Outlet: 3.5" OD (3.0" PVC Sched 40 size compatible)

Mounting: Fan may be mounted on the duct pipe or with integral flanges.

Weight: 12 lbs.

Size: 13H" x 12.5" x 12.5"

Recommended ducting: 3″ or 4" Schedule 20/40 PVC Pipe

Storage temperature range: 32 - 100 degrees F.

Normal operating temperature range: -20 - 120 degrees F.

Maximum inlet air temperature: 80 degrees F.

Continuous Duty

Class B Insulation

3000 RPM

Thermally protected

Rated for Indoor or Outdoor Use

GP301C / GP501C Rated for Commercial Use

LISTED
Electric Fan
77728
Tested to
UL
Std. 507

IMPORTANT INSTRUCTIONS TO INSTALLER

Inspect the GPx01/XP/XR Series Fan for shipping damage within 15 days of receipt. Notify RadonAway of any damages immediately. Radonaway is not responsible for damages incurred during shipping. However, for your benefit, Radonaway does insure shipments.

There are no user serviceable parts inside the fan. **Do not attempt to open.** Return unit to factory for service.

Install the GPx01/XP/XR Series Fan in accordance with all EPA standard practices, and state and local building codes and state regulations.

WARRANTY

Subject to any applicable consumer protection legislation, RadonAway warrants that the GPX01/XP/XR/RP Series Fan (the "Fan") will be free from defects in materials and workmanship for a period of 90 days from the date of purchase (the "Warranty Term").

RadonAway will replace any Fan which fails due to defects in materials or workmanship. The Fan must be returned (at Owner's cost) to the RadonAway factory. Any Fan returned to the factory will be discarded unless the Owner provides specific instructions along with the Fan when it is returned regardless of whether or not the Fan is actually replaced under this warranty. Proof of purchase must be supplied upon request for service under this Warranty.

This Warranty is contingent on installation of the Fan in accordance with the instructions provided. This Warranty does not apply where any repairs or alterations have been made or attempted by others, or if the unit has been abused or misused. Warranty does not cover damage in shipment unless the damage is due to the negligence of RadonAway.

5 YEAR EXTENDED WARRANTY WITH PROFESSIONAL INSTALLATION.

RadonAway will extend the Warranty Term of the fan to 5 years from date of manufacture if the Fan is installed in a professionally designed and professionally installed radon system or installed as a replacement fan in a professionally designed and professionally installed radon system. Proof of purchase and/or proof of professional installation may be required for service under this warranty. Outside the Continental United States and Canada the extended Warranty Term is limited to one (1) year from the date of manufacture.

RadonAway is not responsible for installation, removal or delivery costs associated with this Warranty.

EXCEPT AS STATED ABOVE, THE GPx01/XP/XR/RP SERIES FANS ARE PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT SHALL RADONAWAY BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR RELATING TO, THE FAN OR THE PERFORMANCE THEREOF. RADONAWAY'S AGGREGATE LIABILITY HEREUNDER SHALL NOT IN ANY EVENT EXCEED THE AMOUNT OF THE PURCHASE PRICE OF SAID PRODUCT. THE SOLE AND EXCLUSIVE REMEDY UNDER THIS WARRANTY SHALL BE THE REPAIR OR REPLACEMENT OF THE PRODUCT, TO THE EXTENT THE SAME DOES NOT MEET WITH RADONAWAY'S WARRANTY AS PROVIDED ABOVE.

For service under this Warranty, contact RadonAway for a Return Material Authorization (RMA) number and shipping information. No returns can be accepted without an RMA. If factory return is required, the customer assumes all shipping cost to and from factory.

RadonAway
3 Saber Way
Ward Hill, MA 01835
TEL. (978) 521-3703
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