19 Patchen Avenue

Kings County

Brooklyn, New York

SITE MANAGEMENT PLAN

NYSDEC Site Number: C224232

Prepared for:

Hudson BEC II LLC &

19 Patchen GP LLC

826 Broadway, 11th Floor

New York, NY 10003

Prepared by:

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Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

DECMBER 2019

CERTIFICATION STATEMENT

I, Matthew M. Carroll, certify that I am currently a NYS registered professional engineer and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

_____ P.E.

12/31/2019
_____DATE

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SITE MANAGEMENT PLAN

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List of Acronyms

AS	Air Sparging
ASP	Analytical Services Protocol
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CAMP	Community Air Monitoring Plan
C/D	Construction and Demolition
CFR	Code of Federal Regulation
CLP	Contract Laboratory Program
COC	Certificate of Completion
CO2	Carbon Dioxide
CP	Commissioner Policy
DER	Division of Environmental Remediation
EC	Engineering Control
ECL	Environmental Conservation Law
ELAP	Environmental Laboratory Approval Program
ERP	Environmental Restoration Program
EWP	Excavation Work Plan
GHG	Green House Gas
GWE&T	Groundwater Extraction and Treatment
HASP	Health and Safety Plan
IC	Institutional Control
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	New York Codes, Rules and Regulations
O&M	Operation and Maintenance
OM&M	Operation, Maintenance and Monitoring
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PID	Photoionization Detector
PRP	Potentially Responsible Party
PRR	Periodic Review Report
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RP	Remedial Party
RSO	Remedial System Optimization
SAC	State Assistance Contract
SCG	Standards, Criteria and Guidelines
SCO	Soil Cleanup Objective

SMP	Site Management Plan
SOP	Standard Operating Procedures
SOW	Statement of Work
SPDES	State Pollutant Discharge Elimination System
SSD	Sub-slab Depressurization
SVE	Soil Vapor Extraction
SVI	Soil Vapor Intrusion
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leachate Procedure
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VCA	Voluntary Cleanup Agreement
VCP	Voluntary Cleanup Program

ES EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance and reporting activities required by this Site Management Plan:

Site Identification: C224232 19 Patchen Avenue – Brooklyn, NY

Institutional Controls:	1. The property may be used for restricted-residential and commercial use;
	2. Environmental Easement;
	3. All ECs must be inspected at a frequency and in a manner defined in the SMP; and
	4. Prohibition on use of groundwater, consistent with New York City code.
Engineering Controls:	1. Active Sub-slab depressurization systems (SSDSs) a. Site (19 Patchen Avenue) b. Off-site property 2. Composite Cover System 3. Vapor Barrier a. Site (19 Patchen Avenue) b. Off-site property

Inspections:	Frequency
1. Active SSDSs (on- and off-site)	Quarterly
2. Cover System	Annually
3. Vapor Barriers	Annually
Monitoring:	
1. Groundwater Monitoring Wells MW-1, MW-2, MW-4 and MW-5	Quarterly
2. Indoor Air On- and Off-Site (Locations to be approved by NYSDEC/NYSDOH)	Annually during heating season

Site Identification: C224232 19 Patchen Avenue – Brooklyn, NY

Maintenance:	
1. Active SSDSs (on- and off-site) 2. Cover System 3. Vapor Barriers 4. Carbon Filters	As needed As needed As needed As needed
Reporting:	
1. Periodic Review Report	Annually

Further descriptions of the above requirements are provided in detail in the latter sections of this Site Management Plan.

1.0 INTRODUCTION

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for 19 Patchen Avenue located in Brooklyn, New York (hereinafter referred to as the "Site"). See Figure 1. The Site is currently in the New York State (NYS) Brownfield Cleanup Program (BCP) Site No. C224232 which is administered by New York State Department of Environmental Conservation (NYSDEC).

19 Patchen Avenue LLC entered into a Brownfield Cleanup Agreement (BCA) on June 20, 2016 with the NYSDEC to remediate the site. In October 2017, 19 Patchen GP LLC and Hudson BEC II LLC were added to the BCA and 19 Patchen LLC was removed from the BCA. A figure showing the site location and boundaries of this site is provided in Figure 2.

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

This SMP was prepared to manage remaining contamination at the site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, which is grounds for revocation of the Certificate of Completion (COC);
- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6NYCRR Part 375 and the BCA (Index #C224232-05-16; Site #C224232) for the site, and thereby subject to applicable penalties.

All reports associated with the site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the site is provided in Appendix 1 of this SMP.

This SMP was prepared by Matthew M. Carroll, PE & Tenen Environmental, LLC, on behalf of 19 Patchen GP LLC and Hudson BEC II LLC, in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated November 2017, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and/or ECs that are required by the Environmental Easement for the site.

1.2 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shut-down of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the site conditions. In accordance with the Environmental Easement for the site, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.3 Notifications

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

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

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

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the Brownfield Cleanup Agreement (BCA),, and all approved work plans and reports, including this SMP.

- Within 15 days after the transfer of all or part of the site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

Table 1 on the following page includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix 1.

Table 1: Notifications*

Name	**Contact Information**
Chris Heller, NYSDEC Project Manager	(518) 402-0163, Chris.Heller@dec.ny.gov
Kelly A. Lewandowski, P.E., Chief, Site Control Section	(518) 402-9543, kelly.lewandowski@dec.ny.gov
Angela Martin, NYSDOH Project Manager	(518) 402-7860, Angela.Martin@health.ny.gov
Matthew M. Carroll, PE, Remedial Engineer	(646) 606-2332, mcarroll@tenen-env.com
Max Zarin, Hudson BEC II LLC	(212) 777-9500, mzarin@hudsoninc.com

* Note: Notifications are subject to change and will be updated as necessary.

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 Site Location and Description

The site is located in Brooklyn, Kings County, New York and is identified as Block 1618 and Lot 8 on the New York City Tax Map (see Figure 1). The site is an approximately 0.0422-acre area and is bounded by residential buildings to the south and east, a vacant lot to the north and a mixed-use residential building with a deli/grocery occupying the ground level to the west. The surrounding area to the north and east is mixed-use commercial (restaurants, grocery stores, nail salons, and stores) and residential. The elevated subway station for the J train is located one block north of the Site. The surrounding properties to the south and west are predominantly residential. (see Figure 2 – Site Layout Map). The owner(s) of the site parcel(s) at the time of issuance of this SMP is/are:

BEC Continuum Housing Development Fund Company Inc.
67 Hanson Place
Brooklyn, New York, 11217

19 Patchen GP LLC
c/o BEC New Communities HDFC, Inc.
67 Hanson Place
Brooklyn, New York, 11217

2.2 Physical Setting

2.2.1 Land Use

The Site consists of the following: a four-story mixed-use commercial and residential building with a basement. The Site is zoned residential and is currently

utilized for commercial use on the ground floor and residential use for the rest of the floors. The commercial space is a grandfathered non-conforming use. Site occupants include a laundry (formerly a dry cleaner) and residential apartments.

The properties adjoining the Site and in the neighborhood surrounding the Site primarily include mixed-use commercial and residential properties. The property immediately south of the Site includes a residential building; the properties immediately north of the Site include a vacant lot and a residential building; the properties immediately east of the Site include residential buildings and a residential garage; and the properties to the west of the Site include mixed-use commercial and residential properties.

2.2.2 Geology

The Site is underlain by historic fill material (sands mixed with cobbles and brick), to depths of up to 5.5 feet below the basement level, followed by native silts and sands to depths of at least 50 feet below sidewalk grade (ft-bg). The native silts and sands extend to approximately 200 ft-bg and are underlain by Gardiners Clay and an unnamed Raritan Formation clay layer. The approximate depth to bedrock is 350 ft-bg.

Site specific boring logs are provided in Appendix 4.

2.2.3 Hydrogeology

Groundwater was encountered at an average depth of approximately 44 ft-bg. Based on the depths to water measured in May 2017, the groundwater flow direction is toward the northwest.

Investigations at the Site have documented groundwater concentrations of contaminants above the NYSDEC drinking water standards. There are no known wellhead protection areas or specifically designated groundwater recharge areas in the vicinity of the Site. Groundwater in this area is not used as a source of potable water.

A groundwater contour map is shown in Figure 3. Groundwater monitoring well construction logs are provided in Appendix 4.

2.3 Investigation and Remedial History

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site.

Several environmental investigations were conducted at the Site and off-site properties, consistent with the status as a Participant.

All investigations are detailed in the approved Remedial Investigation Report (RIR) dated October 2019. The summary of the RIR is as follows:

Site History

- A dry cleaning facility operated at the Site since at least 1960. The former dry cleaner operator was Rodriguez Dry Cleaners (NYSDEC Dry Cleaning Facility #2-6104-01058).

Geology/Hydrogeology

- Shallow historic fill material (sands mixed with cobbles and brick) is present to depths of approximately 13.5 ft-bg. The fill material is underlain by native silts and sands that extend to approximately 200 ft-bg and are underlain by Gardiners Clay and an unnamed Raritan Formation clay layer. A tighter, sandy silt layer was encountered at approximately 100 ft-bg. The approximate depth to bedrock is 350 ft-bg.
- Groundwater was encountered at depths of 43 to 45 ft-bg and flows in a northwesterly direction.

Chlorinated Solvents

- Tetrachloroethene (PCE) was not detected in soil above the Unrestricted Use or Protection of Groundwater soil cleanup objectives (SCOs).
- PCE was detected in all shallow groundwater wells, except the upgradient well 19P-MW-3, at concentrations ranging from 12 to 26 micrograms per liter (ug/L), above the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Class GA Water Quality Standards and Guidance Values (AWQS) of 5 ug/L. PCE was not detected above the AWQS in the deep well. No other chlorinated volatile organic compounds (cVOCs) were detected above the AWQSs.
- Elevated concentrations of PCE were detected on-site in sub-slab soil vapor [max: 1,880 micrograms per cubic meter (ug/m3)] as well as the corresponding indoor air sample (882 ug/m3). The New York State Department of Health (NYSDOH) Decision Matrix action for PCE at the Site is Mitigate.

- The NYSDOH Decision Matrix action for trichloroethene (TCE) and cis-1,2-dichloroethene (cis-1,2-DCE) at the Site is Mitigate. The NYSDOH Decision Matrix Action for carbon tetrachloride is Identify Source(s) and Resample or Mitigate.
- PCE and TCE were both detected in the indoor air sample collected from the on-site cellar above the NYSDOH Air Guideline Values (AGVs).
- Elevated concentrations of PCE were detected at the off-site building in sub-slab soil vapor (max: 38,500 ug/m), indoor air samples (max: 547 ug/m3) and outdoor air samples (max: 336 ug/m3). Elevated concentrations of TCE were also detected at the off-site building in sub-slab soil vapor (max: 666 ug/m3) and indoor air (max: 10.1 ug/m3). The NYSDOH Decision Matrix action for PCE and TCE at the off-site building is Mitigate.
- Off-site sub-slab soil vapor and indoor air sampling was completed at four off-site locations. The NYSDOH Decision Matrices indicated No Further Action is required.
- Elevated concentrations of PCE were detected in on-site indoor air samples (max: 5,400 ug/m3) and in the outdoor air samples (max: 1,550 ug/m3). The detected concentrations in both indoor air and outdoor air are above the NYSDOH AGVs.
- Following shut down of the on-site dry cleaner, on March 27, 2017, based on testing by New York City Department of Health and Mental Hygiene (NYC Health) in September 2017 and by Tenen in December 2017, indoor air and outdoor air concentrations decreased.
- Subsequent post-remedial and post-dry cleaner start-up sampling, in February and March 2019, indicated elevated levels remain in the on-site indoor air.

Historic Fill-Related Impacts

- Polyaromatic hydrocarbons (PAHs) and metals, including barium, lead, mercury and zinc, were detected in shallow fill material above the Unrestricted Use SCOs in samples collected from the rear yard of the Site. These concentrations are delineated to below the Unrestricted Use SCOs at two ft-bg.

Other Organic Impacts

- Bis(2-ethylhexyl)phthalate was detected in a shallow well above the AWQS. 2-Butanone was detected in the deep well above the AWQS. Chloroform, a common laboratory artifact was detected above the AWQS in the upgradient well.

Qualitative Environmental Assessment

- The following potential exposure routes were identified: direct contact with surface soils, inhalation and incidental ingestion, ingestion of groundwater, direct contact with groundwater and inhalation of vapors.
- Potential impacts from these exposure routes can be mitigated through the implementation of a Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) during renovation activities and mitigation of soil vapor intrusion at the Site and the off-site building..
- Elevated indoor impacts from the continued operation of the dry cleaner are still

present following the implementation of the Interim Remedial Measures (IRM) Work Plan and installation of a vapor barrier.

The site was remediated in accordance with the remedy selected by the NYSDEC in the RAWP dated December 27, 2019 and Interim Remedial Measures Work Plan (IRM WP) dated March 2017.

The factors considered during the selection of the remedy are those listed in 6NYCRR 375-1.8. The following are the components of the selected remedy:

1. Construction and maintenance of a soil cover system consisting of concrete slabs to prevent human exposure to remaining contaminated soil/fill remaining at the site;
2. Installation and maintenance of a vapor barrier;
3. Installation and maintenance of active sub-slab depressurization systems (SSDSs) at the Site and off-site building;
4. Execution and recording of an Environmental Easement to restrict land use and prevent future exposure to any contamination remaining at the site;
5. Use of groundwater underlying the Controlled Property is prohibited without treatment rendering it safe for intended purpose;
6. Development and implementation of a Site Management Plan for long term management of remaining contamination as required by the Environmental Easement, which includes plans for: (1) Institutional and Engineering Controls, (2) monitoring, (3) operation and maintenance and (4) reporting; and,
7. Periodic certification of the institutional and engineering controls listed above.

These activities were implemented between October 2016 and March 2019 and are described in the Final Engineering Report and other sections of this SMP.

In October 2019, a carbon filter was installed in one on-site unit. An additional carbon filtration unit will be installed in the former dry cleaner space. While not an Engineering Control, these units will be maintained and additional indoor air sampling of all

apartment units in the building, including the former dry cleaning space, will be completed in accordance with this SMP.

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site as listed in the Decision Document dated December 27, 2019 are as follows:

Groundwater

RAOs for Public Health Protection

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

Soil

RAOs for Public Health Protection

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

RAOs for Environmental Protection

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

Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

2.5 Remaining Contamination

2.5.1 Soil

Soil excavation was completed to allow for the installation of a sub-slab depressurization (SSDS) for vapor mitigation at the Site but not to excavate historic fill-related compounds below the courtyard. Specifically, PAHs and metals are present in the first two feet below the concrete slab.

Table 5 and Figure 4 summarize the results of all soil samples collected that exceed the Unrestricted Use SCOs and the Restricted-Residential Use SCOs at the site after completion of remedial action.

2.5.2 Groundwater

Groundwater sampling was completed to document the condition of the shallow and deep intervals of the aquifer. One non-Site-related compound, 2-butanone, was detected slightly above the AWQS in the deep interval. PCE was detected in the shallow interval at a maximum concentration of 26 ug/L, above the AWQS and consistent with regional impacts. No other non-laboratory-related target compounds were detected above the AWQS. Given the exceedances of the AWQS, long-term groundwater monitoring is included in this SMP.

Table 6 and Figure 5 summarize the results of all samples of groundwater that exceed the SCGs after completion of the remedial action.

2.5.3 Soil Vapor

The concentration of PCE identified during past environmental investigations in soil vapor and indoor air indicated PCE should be mitigated at the Site and the off-site

building based on NYSDOH Decision Matrix. Installation of active SDSSs and vapor barriers at the Site and the off-site building were completed as part of the remedial action.

3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 General

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

This plan provides:

- A description of all IC/ECs on the site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of IC/ECs, such as the implementation of the Excavation Work Plan (EWP) (as provided in Appendix 2) for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the site; and
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the site remedy, as determined by the NYSDEC.

3.2 Institutional Controls

A series of ICs is required by the Decision Document to (1) implement, maintain and monitor the Engineering Controls; (2) prevent future exposure to remaining contamination by controlling disturbances of the subsurface contamination; and, (3) limit the use and development of the site to Restricted-Residential and Commercial uses only.

Adherence to these ICs on the site is required by the Environmental Easement and will be implemented under this SMP. ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement. The IC boundaries are shown on Figure 1. These ICs are:

- The property may be used for: restricted residential and commercial use;
- All ECs must be operated and maintained as specified in this SMP;
- All ECs must be inspected at a frequency and in a manner defined in the SMP.
- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department.
- Groundwater and other environmental or public health monitoring must be performed as defined in this SMP;
- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;
- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP;
- Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to

the property owner to assure compliance with the restrictions identified by the Environmental Easement.

- The potential for vapor intrusion must be evaluated for any buildings developed in the area within the IC boundaries noted on Figure 1, and any potential impacts that are identified must be monitored or mitigated; and,
- Vegetable gardens and farming on the site are prohibited.

The environmental easement for the site was executed by the Department on August 14, 2018, and filed with the Kings County Clerk on August 14, 2018. The County Recording Identifier number for this filing is 2018000408040.

3.3 Engineering Controls

3.3.1 Composite Cover System

Exposure to remaining contamination at the site is prevented by a cover system placed over the site. Figure 6 presents the locations of the composite cover system. This cover system is comprised of a minimum of 2 inches of concrete in the building slab and rear yard slab. Figures 6 presents the location of the cover system. The Excavation Work Plan (EWP) provided in Appendix 2 outlines the procedures required to be implemented in the event the cover system is breached, penetrated or temporarily removed, and any underlying remaining contamination is disturbed. Procedures for the inspection of this cover are provided in the Monitoring and Sampling Plan included in Section 4.0 of this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and associated Community Air Monitoring Plan (CAMP) prepared for the site and provided in Appendix 7.

3.3.2 Vapor Barriers

A vapor barrier was installed at the Site and the off-site building to minimize the potential for soil vapor intrusion to the buildings. The vapor barriers were installed on top of the existing cellar slabs and consistent of a RetroCoat® primer and finish. Figure 7 presents the locations of the vapor barrier at the Site. Procedures for the inspection of this cover are provided in the Monitoring and Sampling Plan included in Section 4.0 of this SMP.

3.3.3 Sub-slab Depressurization Systems

To minimize the potential for vapor intrusion, active SSDSs were installed at the Site and the off-site building. The SSDSs will depressurize below the current building slabs as compared to the building environment.

The SSDSs consists of several suction pits installed beneath the building slab connected to a fan on the roof via cast iron (interior) and PVC (exterior) piping. To create the suction pits, the existing slabs were saw cut and the underlying soil was removed to a depth of at least 18 inches. The void spaces were lined with geotextile fabric and a layer of ¾" clean stone aggregate.

The overall goal of the systems is to create a pressure differential of -0.02 inches per water column (in-wc) between the cellar and sub-slab environments; however, differential pressure readings above -0.004 in-wc are considered acceptable. Alarm systems were installed in each building that will notify the building management if a drop in pressure occurs, which indicates that the system is not operating as designed. The system has been designed in general accordance with the New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006 (NYSDOH Soil Vapor Guidance), including Section 4.2.2, *System-specific recommendations*. The exhaust location is located on the highest point of the building's roof and meets the requirements of the NYSDOH Soil Vapor Guidance, specifically Section 4.2.2 c (6), which reads:

To avoid entry of extracted subsurface vapors into the building, the vent pipe's exhaust is located 13 feet above the roof level and at least 25 feet away from adjoining buildings and HVAC intakes.

Pre-design pilot tests were completed in August 2017 to confirm the radius of influence (ROI) of the pressure field; all measurements were above 0.02 in-wc. A blower test was performed on September 22, 2017 to size the blower.

The SSDS design for the Site was included in Tenen's IRM Work Plan. The SSDS design for one off-site location was included in a New York City Department of Environmental Protection (NYCDEP)-approved Remedial Action Plan (RAP). The suction pits and piping were installed below the cellar slabs and the final SSDS blowers were installed on the roofs. The monitoring point communication test results are shown below in Table 4 and indicate that all soil vapor monitoring points pass the performance criteria approved by NYSDEC and NYSDOH (pressure less than or equal to -0.004 in-wc). Locations of the three on-Site monitoring points are shown on Figure 8.

Table 2: SSDS Monitoring Point Communication Test Results

Monitoring Point	Pressure (in-wc)
Site (19 Patchen Avenue)	
MP-1	-0.04
MP-2	-0.05
MP-3	-0.07
Off-site Location	
MP-1	-0.10
MP-2	-0.02
MP-3	-0.02
MP-4	-0.04
MP-5	-0.07

Procedures for operating and maintaining the SSDSs are documented in the Operation and Maintenance Plan (Section 5.0 of this SMP). Both the Site and the off-site SSDSs are similarly designed. As built drawings, signed and sealed by a professional engineer, are included in Appendix 9 – Operations and Maintenance Manuals.

3.3.4 Carbon Filtration of Indoor Air

While not a required Engineering Control, a carbon filtration unit was installed in Unit 2A at the Site and an additional carbon filtration unit will be installed in the former dry cleaner space at the Site to address potential indoor air impacts. Unit 2A and the former dry cleaner space were selected based on historic indoor air concentrations. The filtration units, Airpura C600-DLX, are sized for the selected spaces and contain 26 pounds of granulated activated carbon (GAC) each. Continued annual indoor air testing of all apartment units within the building, including the former dry cleaner space, will be completed during the heating season.

Procedures for operating and maintaining the carbon filters are documented in the Operation and Maintenance Plan (Section 5.0 of this SMP) and in Appendix 9 – Operations and Maintenance Manuals.

3.3.5 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the remedial action objectives identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10.

3.3.5.1 – Composite Cover System

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

3.3.5.2 – Vapor Barriers

The vapor barriers are a permanent control and the quality and integrity of these barriers will be inspected at defined, regular intervals in accordance with this SMP in perpetuity.

3.3.5.3 – Sub-Slab Depressurization Systems (SSDSs)

The active SSDSs will not be discontinued unless prior written approval is granted by the NYSDEC and the NYSDOH. In the event that monitoring data indicates that the SSDSs may no longer be required, a proposal to discontinue the SSDSs will be submitted by the remedial party to the NYSDEC and NYSDOH.

3.3.5.4 – Carbon Filtration of Indoor Air

Carbon filtration units and continued indoor air monitoring of all apartment units within the building, including the former dry cleaner space, in heating season will not be discontinued unless prior written approval is granted by the NYSDEC and the NYSDOH. In the event that monitoring data indicates that the carbon filtration units may no longer be required, a proposal to discontinue the carbon filtration units will be submitted by the remedial party to the NYSDEC and NYSDOH.

4.0 MONITORING AND SAMPLING PLAN

4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the site are included in the Quality Assurance Project Plan provided in Appendix 6.

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

- Sampling and analysis of all appropriate media (e.g., groundwater, indoor air, soil vapor, soils);
- Assessing compliance with applicable NYSDEC standards, criteria and guidance (SCGs), particularly groundwater standards and Part 375 SCOs for soil; and
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment;

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Sampling locations, protocol and frequency;
- Information on all designed monitoring systems;
- Analytical sampling program requirements;
- Inspection and maintenance requirements for monitoring wells;
- Monitoring well decommissioning procedures; and

- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7.0 of this SMP.

4.2 Site – wide Inspection

Site-wide inspections will be performed at a minimum of once per year. Modification to the frequency or duration of the inspections will require approval from the NYSDEC. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed as provided in Appendix 8 – Site Management Forms. The form will compile sufficient information to assess the following:

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

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

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;

- Achievement of remedial performance criteria; and,
- If site records are complete and up to date.

Reporting requirements are outlined in Section 7.0 of this plan.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the site, verbal notice to the NYSDEC must be given by noon of the following day. In addition, an inspection of the site will be conducted within 5 days of the event to verify the effectiveness of the IC/ECs implemented at the site by a qualified environmental professional, as determined by the NYSDEC. Written confirmation must be provided to the NYSDEC within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

4.3 Treatment System Monitoring and Sampling

4.3.1 Remedial System Monitoring

Monitoring of the composite cover system, SSDSs, vapor barriers and carbon filtration units will be performed on a routine basis, as identified in Table 3 Remedial System Monitoring Requirements and Schedule (see below). Modification to the frequency or sampling requirements will require approval from the NYSDEC. A visual inspection of the complete system will be conducted during each monitoring event. Unscheduled inspections and/or sampling may take place when a suspected failure of the SSDSs has been reported or an emergency occurs that is deemed likely to affect the operation of the system. SSDS components to be monitored include, but are not limited to, the components included in Table 3 below.

Table 3 – Remedial System Monitoring Requirements and Schedule

Remedial System Component	Monitoring Parameter	Operating Range	Monitoring Schedule
Composite Cover	Visual inspection of concrete floors and slabs for perforations, cracking or degradation	N/A	Annually
Vapor Barriers	Visual inspection of vapor barriers at Site and the off-site building for evidence of degradation	N/A	Annually
SSDS Vacuum Blowers	Pressure readings from soil vapor monitoring points at the Site and the off-site building	Design goal of ≤ -0.02 in-wc; ≤ -0.004 in-wc acceptable	Annually
SSDS Piping and Alarms	Visual inspection of the SSDS mechanical and above grade piping components, as well as confirm low-pressure alarms at the Site and the off-site building.	N/A	Quarterly
Carbon Filtration Units	Visual inspection of units and filters	N/A	Annual

A complete list of components to be inspected is provided in the Inspection Checklist, provided in Appendix 8 - Site Management Forms. If any equipment readings are not within their specified operation range, any equipment is observed to be malfunctioning or the system is not performing within specifications; maintenance and repair, as per the Operation and Maintenance Plan, is required immediately.

4.4 Post-Remediation Media Monitoring and Sampling

Groundwater samples shall be collected from the Site groundwater monitoring network on a routine basis. Indoor air samples shall be collected from all on-site units, including the former dry cleaner space, on an annual basis during the heating season. Sampling locations, required analytical parameters and schedule are provided in Table 4 – Remedial System Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Table 4 – Post Remediation Sampling Requirements and Schedule

Sampling Location	Analytical Parameters	Schedule
	VOCs	
Monitoring Wells MW-1, MW-2, MW-4 and MW-5	EPA Method 8260	Quarterly
Indoor Air On- and Off-Site (Locations to be approved by NYSDEC/ NYSDOH)	EPA Method TO-15	Annual during heating season

Detailed sample collection and analytical procedures and protocols are provided in Appendix 6 – Quality Assurance Project Plan.

4.4.1 Groundwater Sampling

Groundwater monitoring will be performed quarterly to assess the performance of the remedy. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

The network of monitoring wells has been installed to monitor downgradient groundwater conditions at the site. The only upgradient well is located over 200 feet from the Site and no-onsite wells were installed due to the configuration of the existing building. The network of on-site and off-site wells has been designed based on the following criteria:

- Site wells are located for appropriate triangulation of the groundwater flow; and,
- Site wells are screened approximately five feet into the groundwater.

Table 5 summarizes the wells identification number, as well as the purpose, location, depths, diameter and screened intervals of the wells. As part of the groundwater monitoring, four downgradient wells are sampled to evaluate the effectiveness of the remedial system.

Table 5 – Monitoring Well Construction Details

Monitoring Well ID	Well Location	Coordinates (Northing/ Easting)	Well Diameter (inches)	Relative Elevation	
				Casing	Screen Top
MW-1	Off-Site Downgradient	2953.30 / 2975.60	2	55.38	13.38
MW-2	Off-Site Downgradient	2923.93 / 2925.80	2	54.77	12.77
MW-4	Off-Site Downgradient	2993.66 / 2930.25	2	55.29	11.29
MW-5	Off-Site Downgradient	2995.67 / 2871.95	2	55.22	13.22

Monitoring well construction logs are included in Appendix 5 of this document.

Site monitoring well locations are illustrated on Figure 5 and were installed and documented in Tenen's Remedial Investigation Report; no new groundwater wells are proposed for installation. Groundwater gauging data indicates the groundwater generally flows to the northwest.

Groundwater samples will be analyzed for the following by an ELAP certified laboratory:

- VOCs (EPA Method 8260)

If biofouling or silt accumulation occurs in the on-site and/or off-site monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced, if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC will be notified prior to any repair or decommissioning of any monitoring well for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent Periodic Review Report. Well decommissioning without replacement will be done only with the prior approval of the NYSDEC. Well abandonment will be performed in accordance with NYSDEC's guidance entitled "CP-43: Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by the NYSDEC.

The sampling frequency may only be modified with the approval of the NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC.

Deliverables for the groundwater monitoring program are specified in Section 7.0 – Reporting Requirements.

4.4.2 Indoor Air Sampling

Indoor air monitoring will be performed annually during heating season to document the indoor air condition at the site in all apartment units within the building, including the former dry cleaner space, and in the off-site building. Additional actions will be taken to address potential exposures based on NYSDEC/NYSDOH recommendations. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Samples will be collected in accordance with the NYSDOH Soil Vapor Guidance. Samples from both units and outdoor air will be analyzed for VOCs by EPA Method TO-15.

4.4.3 Monitoring and Sampling Protocol

All sampling activities will be recorded in a field book and associated sampling log. Other observations (e.g., groundwater monitoring well integrity, etc.) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network. Additional detail regarding monitoring and sampling protocols are provided in the site-specific Quality Assurance Project Plan (QAPP) provided as Appendix 6 of this document.

5.0 OPERATION AND MAINTENANCE PLAN

5.1 General

This Operation and Maintenance Plan provides a brief description of the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the site. This Operation and Maintenance Plan:

- Includes the procedures necessary to allow individuals unfamiliar with the site to operate and maintain the on- and off-site SSDSs, and the on-site carbon filtration units;
- Will be updated periodically to reflect changes in site conditions or the manner in which the on- and off-site SSDSs, or the on-site carbon filtration units are operated and maintained.

Further detail regarding the Operation and Maintenance of the SSDS and the carbon filtration units is provided in Appendix 9 - Operation and Maintenance Manuals. A copy of this Operation and Maintenance Manuals, along with the complete SMP, is to be maintained at the site. This Operation and Maintenance Plan is not to be used as a stand-alone document, but as a component document of this SMP.

5.2 Remedial System (or other Engineering Control) Performance Criteria

The site cover, vapor barrier, SSDS performance and carbon filtration units criteria are specified in Table 3 (Section 4.3.1) of this SMP.

5.3 Operation and Maintenance of Sub-slab Depressurization Systems

The following sections provide a description of the operations and maintenance of the SSDSs. Cut-sheets and as-built drawings for SSDSs are provided in Appendix 9 - Operations and Maintenance Manuals.

5.3.1 System Start-Up and Testing

After the depressurization system was installed, the following was completed:

1. Visual inspection of building slabs for any cracks or holes. If any were identified, they were sealed using caulk.
2. Measurement of the sub-slab pressure at three monitoring points to ensure that the remedial goal of -0.02 in-wc has been achieved; differential pressure readings above -0.004 in-wc are considered acceptable.
3. Verification that the system alarms are functioning.

The system testing described above will be conducted if, in the course of the SSDS lifetimes, the systems go down or significant changes are made to the systems and the systems must be restarted.

5.3.2 Routine System Operation and Maintenance

The long-term operation and maintenance program described below shall continue throughout the life cycle of the SSDSs to ensure a proper working order. The long-term operation and maintenance program for the major SSDS components includes manufacturer's recommendations for the reinstallation of SSDS components if modifications to the existing system need to be made, inspection procedures, an operation schedule, typical routine maintenance activities and schedules, and troubleshooting.

The alarm systems, described below, shall run continuously and only be disconnected for routine maintenance and inspection activities or replacement. The system includes the following:

- vacuum switches, Dwyer BDPA-03-2N
- alarm system, Edwards horn strobes

In case there is a need to relocate a vacuum switch, the new location shall ensure that the vacuum switch remains in close proximity to the riser pipes and is installed correctly. If a vacuum gauge is not indicating a vacuum while the SSDS is on, make sure that the tubing connected to the riser pipe is connected to the low-pressure port. High pressure ports on the vacuum gauge/switch should be vented to atmosphere.

The vacuum switches do not require lubrication or periodic servicing. The vacuum gauges are not field serviceable and should be returned to the manufacturer or supplier if repair is needed. Repairs or alterations made to the vacuum switches by others will void the unit's warranty. The vacuum switches are factory calibrated and cannot be recalibrated in the field. The installation and operating instructions for the vacuum alarm/monitor have been included in Appendix 9.

When testing the vacuum alarms, the tubing that connects the vacuum alarms to the riser pipe shall be disconnected and the low set point raised above the current reading. If the vacuum alarms are powered at the time of disconnecting the tubing from the riser pipe, the alarms will go off. The alarms should go back on-line when the tubing is reconnected to the riser pipe. If the system is in alarm when there is a vacuum present in the riser pipe, inspect the tubing and riser pipe tap to ensure that there are no blockages. If there is a blockage in either the tubing or the riser pipe tap, remove the blockage and retest the vacuum alarm/monitor.

The blowers shall operate continuously and only be turned off for routine maintenance and inspection activities or replacement. The SSDS fans and motors shall not be left on the system piping without electrical power for more than 48 hours due to possible fan failure that could result from this non-operational storage. The SSDS fan units do not require periodic servicing and should be returned to the manufacturer or supplier for service. Repairs or alterations made to the SSDS fan units by others will void the unit's warranty. The installation and operating instructions for the SSDS fan units have been included in Appendix 9.

Inspections of the SSDS components shall include the following:

- Observe visible components (fans, vacuum alarm/monitors, vacuum gauges, tubing, riser pipes, etc.) for physical wear, damage and operational issues, and replace as necessary;
- Remove any blockages in vacuum monitor and gauge tubing and riser pipe taps;
- Verify operation of vacuum monitors by disconnecting tubing from riser pipe and noting if the system goes into alarm mode;
- Verify operation of vacuum gauges by disconnecting tubing from riser pipe and noting if the indicator moves to zero (check high and low pressure ports to see if they are plugged correctly);
- Inspect riser pipe penetrations in concrete slab for proper seal;
- Inspect riser pipe connections at fans for leaks and tightness;
- Inspect condition of mufflers (if installed) at end of outlet pipe; and,
- Inspect power to fan by operating dedicated switches.

A copy of an Operations and Maintenance Manual specific to the SSDS components is provided in Appendix 9, which will provide further detail on the above.

5.3.3 Non-Routine Operation and Maintenance

Common troubleshooting tips that can be followed if the vacuum gauges/switches will not indicate a vacuum or is sluggish include the following:

- The pressure ports (high or low) are not hooked up correctly;
- The fittings or sensing lines are blocked, pinched or leaking;
- The cover is loose;
- The pressure sensor is improperly located;
- The ambient temperature is too low (below 20-degC)

Table 6 provides a summary and schedule of routine maintenance.

5.3.4 System Monitoring Devices and Alarms

The SSDSs have warning devices to indicate that the systems are not operating properly. In the event that a warning device is activated, applicable maintenance and repairs will be conducted, as specified in the Operation and Maintenance Plan, and the SSDS will be restarted. Operational problems will be noted in the Periodic Review Report to be prepared for that reporting period.

5.4 Operation and Maintenance of Carbon Filtration Units

The following sections provide a description of the operations and maintenance of the carbon filtration units. Cut-sheets are provided in Appendix 9 - Operations and Maintenance Manuals.

5.4.1 System Start-Up

The system was installed in Unit 2A and turned on in October 2019. An additional unit will be installed in the former dry cleaner space. The systems are designed to be operated with minimal user interaction.

5.4.2 Routine System Operation and Maintenance

Pre-filters can be vacuumed if dust is observed. The pre-filters and the HEPA filters will be changed annually. The GAC will be changed every two years.

5.4.3 Non-Routine Operation and Maintenance

The systems have few replaceable or maintainable parts. If the systems are not working, they will be replaced.

6.0 PERIODIC ASSESSMENTS/EVALUATIONS

6.1 Climate Change Vulnerability Assessment

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

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

Flood Plain: The Federal Emergency Management Agency (FEMA) flood insurance rate map for the Site (Map Number 3604970242F) indicates that the Site and surrounding area is not located within the 0.2% annual chance floodplain (500-year flood).

Site Drainage and Storm Water Management: The Site occupies less than one acre of land and a permit for storm water discharges is not required.

Erosion: No evidence of erosion has been observed at the Site and the Site cover will not be affected by stormwater.

High Wind: There are no remedial systems susceptible to high wind damage present at the Site.

Electricity: The SSDS would be susceptible to power loss and/or dips/surges in voltage during severe weather events, including lightning strikes, and the associated impact on Site equipment and operations.

Spill/Contaminant Release: The SSDS is not susceptible to a spill or other contaminant release due to storm-related damage caused by flooding, erosion, high winds, loss of power etc.

6.2 Green Remediation Evaluation

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

6.2.1 Timing of Green Remediation Evaluations

For major remedial system components, green remediation evaluations and corresponding modifications will be undertaken as part of a formal Remedial System Optimization (RSO), or at any time that the Project Manager feels appropriate, e.g. during significant maintenance events or in conjunction with storm recovery activities.

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

6.2.2. Remedial Systems

Remedial systems will be operated properly considering the current site conditions to conserve materials and resources to the greatest extent possible. Consideration will be given to operating rates and use of reagents and consumables. Spent materials will be sent for recycling, as appropriate.

6.2.3 Building Operations

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

6.2.4 Frequency of System Checks, Sampling and Other Periodic Activities

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

6.3 Remedial System Optimization

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

- The remedial actions have not met or are not expected to meet RAOs in the time frame estimated in the Decision Document;
- The management and operation of the remedial system is exceeding the estimated costs;
- The remedial system is not performing as expected or as designed;
- Previously unidentified source material may be suspected;
- Plume shift has potentially occurred;

- Site conditions change due to development, change of use, change in groundwater use, etc.;
- There is an anticipated transfer of the site management to another remedial party or agency; and
- A new and applicable remedial technology becomes available.

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

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

7.0 REPORTING REQUIREMENTS

7.1 Site Management Reports

All site management inspection, maintenance and monitoring events will be recorded on the appropriate site management forms provided in Appendix 8. These forms are subject to NYSDEC revision.

All applicable records, including media sampling data and system maintenance reports, generated for the site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of Table 6 and summarized in the Periodic Review Report.

Table 6: Schedule of Monitoring/Inspection Reports

Task/Report	Reporting Frequency*
Periodic Review Report	Annually, or as otherwise determined by the Department

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC.

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

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);
- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air, etc);

- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, etc.);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

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

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

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

- Date of event;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Description of non-routine activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and

- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

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

7.2 Periodic Review Report

A Periodic Review Report (PRR) will be submitted to the Department beginning sixteen (16) months after the Certificate of Completion or equivalent document (e.g., Satisfactory Completion Letter, No Further Action Letter, etc.) is issued. After submittal of the initial Periodic Review Report, the next PRR shall be submitted annually to the Department or at another frequency as may be required by the Department. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the Periodic Review Report. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the site.
- Results of the required annual site inspections and severe condition inspections, if applicable.
- All applicable site management forms and other records generated for the site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.
- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, indoor air, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends.

- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.

- A site evaluation, which includes the following:

  - The compliance of the remedy with the requirements of the site-specific RAWP, ROD or Decision Document;

  - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;

  - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;

  - Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan; and

  - Trends in contaminant levels in the affected media will be evaluated to determine if the remedy continues to be effective in achieving remedial goals as specified by the Decision Document.

  - The overall performance and effectiveness of the remedy.

7.2.1 Certification of Engineering Controls

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

"*For each institutional or engineering control identified for the site, I certify that all of the following statements are true:*

- *The inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;*

- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the site is compliant with the environmental easement;*
- *The engineering control systems are performing as designed and are effective;*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices;*
- *The information presented in this report is accurate and complete; and,*
- *No new information has come to my attention, including groundwater monitoring data from wells located at the site boundary, if any, to indicate that the assumptions made in the qualitative exposure assessment of off-site contamination are no longer valid.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, Matthew M. Carroll, of 1085 Sackett Avenue, Bronx, NY 10461, am certifying as Remedial Party's Designated Site Representative for the site."

For BCP projects, every five years the following certification will be added:

- *The assumptions made in the qualitative exposure assessment remain valid.*

The signed certification will be included in the Periodic Review Report.

The Periodic Review Report will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the site is located and the NYSDOH Bureau of Environmental Exposure Investigation. The Periodic Review Report may need to be submitted in hard-copy format, as requested by the NYSDEC project manager.

7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control, a Corrective Measures Work Plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC.

7.4 Remedial Site Optimization Report

In the event that an RSO is to be performed (see Section 6.3, upon completion of an RSO, an RSO report must be submitted to the Department for approval. A general outline for the RSO report is provided in Appendix 10. The RSO report will document the research/ investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional work plans, design documents, HASPs etc., may still be required to implement the recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required.

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

8.0 REFERENCES

6NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.

NYSDEC DER-10 – "Technical Guidance for Site Investigation and Remediation".

NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).

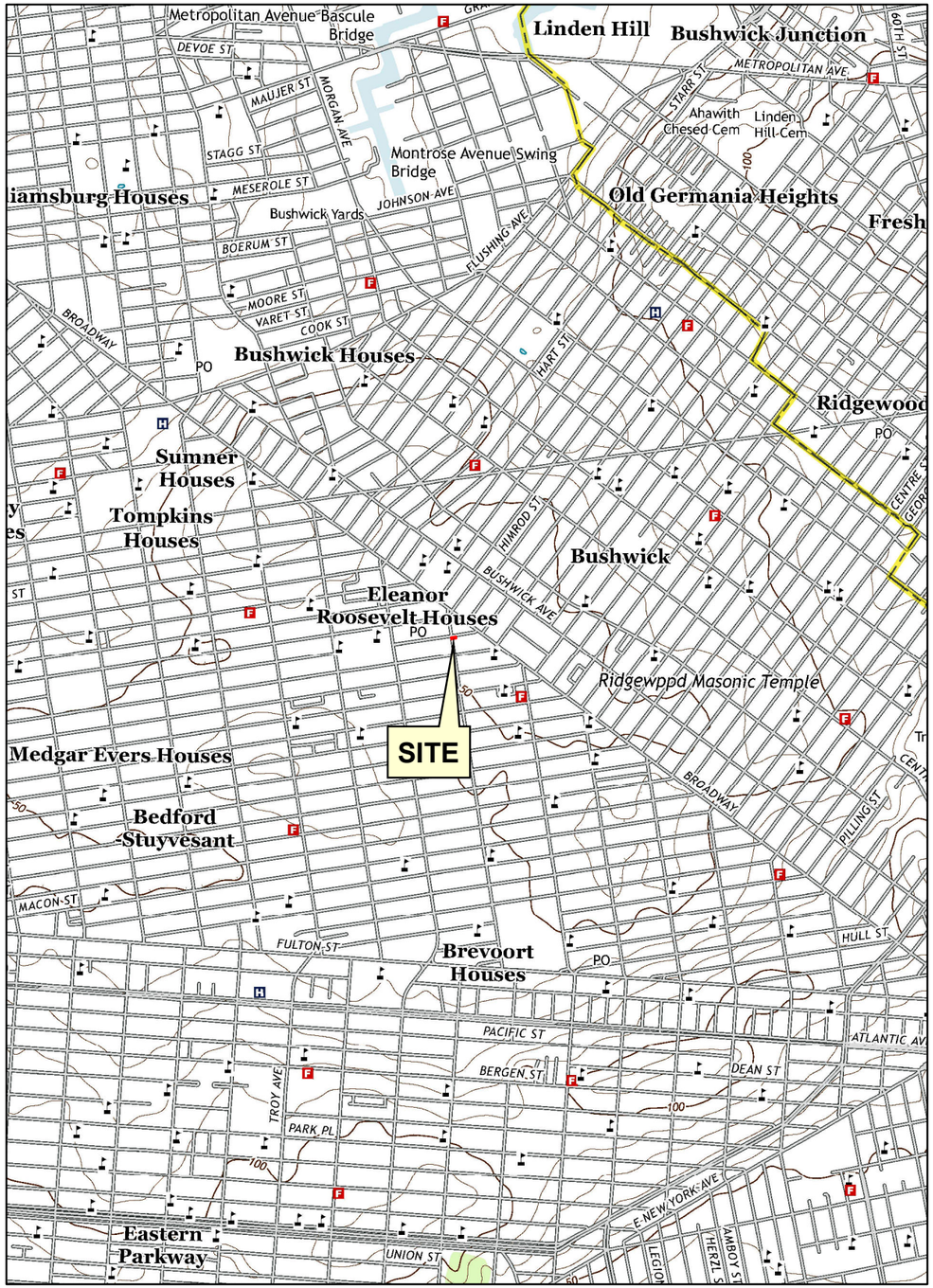
New York State Department of Environmental Conservation, Division of Environmental Remediation. DER Technical Guidance for Site Investigation and Remediation (DER-10). NYSDEC 2010.

New York State Department of Health. Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York. October 2006. NYSDOH 2006.

Remedial Investigation Report, 19 Patchen Avenue, Brooklyn, NY 11221. Tenen Environmental, LLC. October 2019.

Final Engineering Report, 19 Patchen Avenue, Brooklyn, NY 11221. Tenen Environmental, LLC. December 2019.

FIGURES



Basemap: USGS Brooklyn - NY Quandrangle, 2013
http://www.usgs.gov

Site Location

0 1,000 2,000 4,000 Feet

http://gis.nyc.gov/taxmap/map.htm

Department of Finance Digital Tax Map

0 50 100 200 Feet

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
NYC Department of City Planning, Information Technology Division

Department of City Planning MapPLUTO - 2015

0 50 100 200 Feet

Client

19 Patchen Avenue
Brooklyn, New York
Block 1618, Lot 8

TENEN ENVIRONMENTAL
Tenen Environmental, LLC
121 West 27th Street
Suite 702
New York, NY 10001
O: (646) 606-2332
F: (646) 606-2379

Drawn By	Checked By	Date	Scale
LM	MC	6/1/2016	As Noted

Drawing Title: **Site Location Map**

Drawing No: **Figure 1**

Legend

Land Use

- One &Two Family Buildings
- Multi-Family Walk-Up Buildings
- Multi-Family Elevator Buildings
- Mixed Residential & Commercial Buildings
- Commercial & Office Buildings
- Industrial & Manufacturing
- Transportation & Utility
- Public Facilities & Institutions
- Open Space & Outdoor Recreation
- Parking Facilities
- Vacant Land

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community
NYC Department of City Planning, Information Technology Division

Department of City Planning MapPLUTO - 2018v1

0 50 100 200 Feet

Client

19 Patchen Avenue
Brooklyn, New York

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Drawn By	Checked By	Date	Scale
LM	CZ	November 2018	As Noted

Drawing Title: **Site Layout**

Drawing No: **Figure 2**

N

Legend

- Monitoring Well Location
- Groundwater Flow Direction
- Groundwater Elevation Contour

0 20 40 80 Feet

Basemap Source: Survey by Donald R. Stedge. P.L.S.
19 Patchen Avenue, Brooklyn, New York, 5/17/2017

Groundwater contours interpolated
with the aid of ESRI ArgGIS Spatial Analyst

Client

19 Patchen Avenue
Brooklyn, New York
Block 1618, Lot 8

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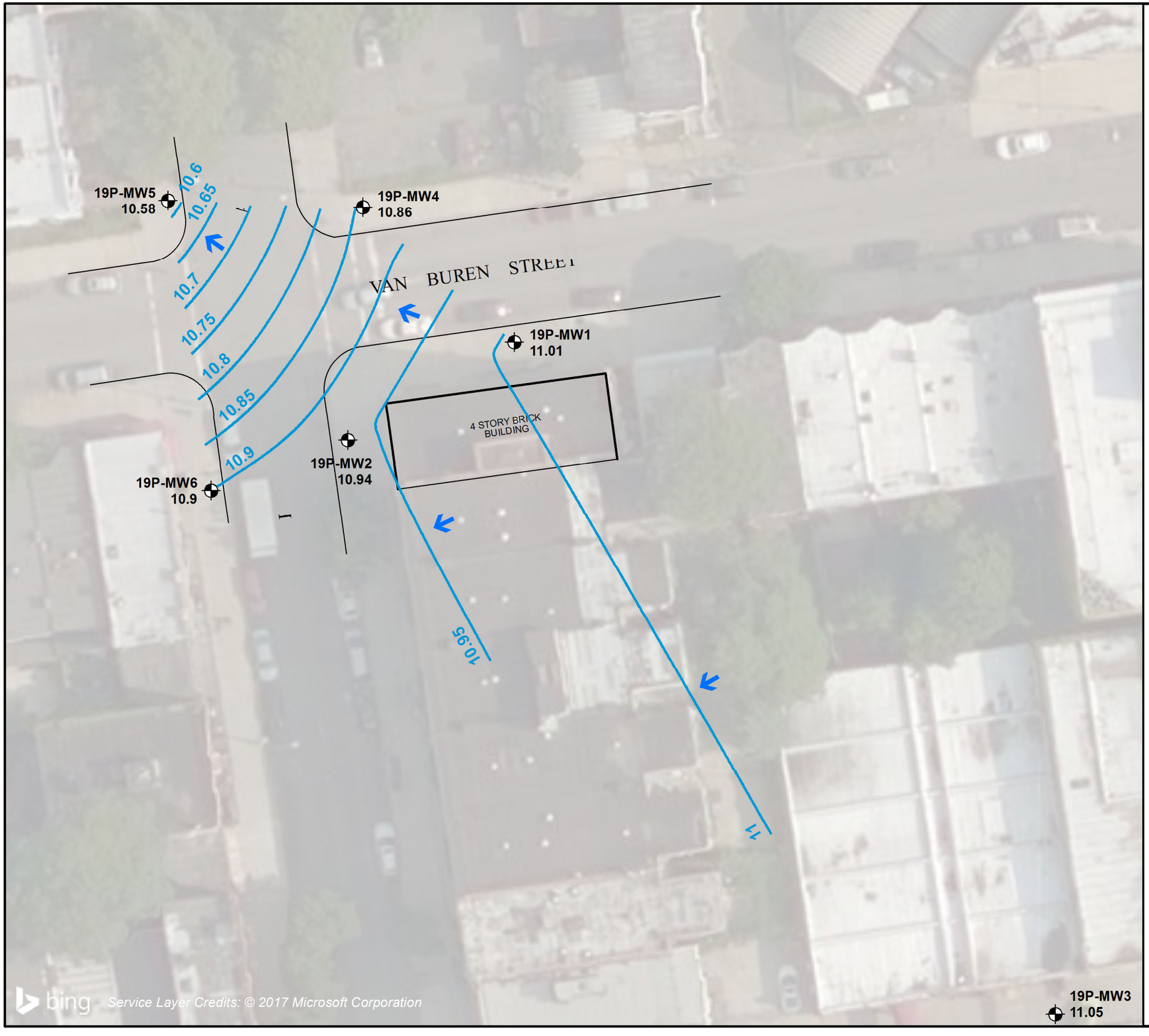
Drawn By	Checked By	Date	Scale
LM	CZ	May 2017	As Noted

Drawing Title: **Groundwater Flow Direction (May 1, 2017)**

Drawing No: **Figure 3A**



Legend

- Monitoring Well Location
- Groundwater Flow Direction
- Groundwater Elevation Contour

Feet
0 20 40 80

Basemap Source: Survey by Donald R. Stedge. P.L.S.
19 Patchen Avenue, Brooklyn, New York, 5/17/2017

Groundwater contours interpolated
with the aid of ESRI ArgGIS Spatial Analyst

Client

19 Patchen Avenue
Brooklyn, New York
Block 1618, Lot 8

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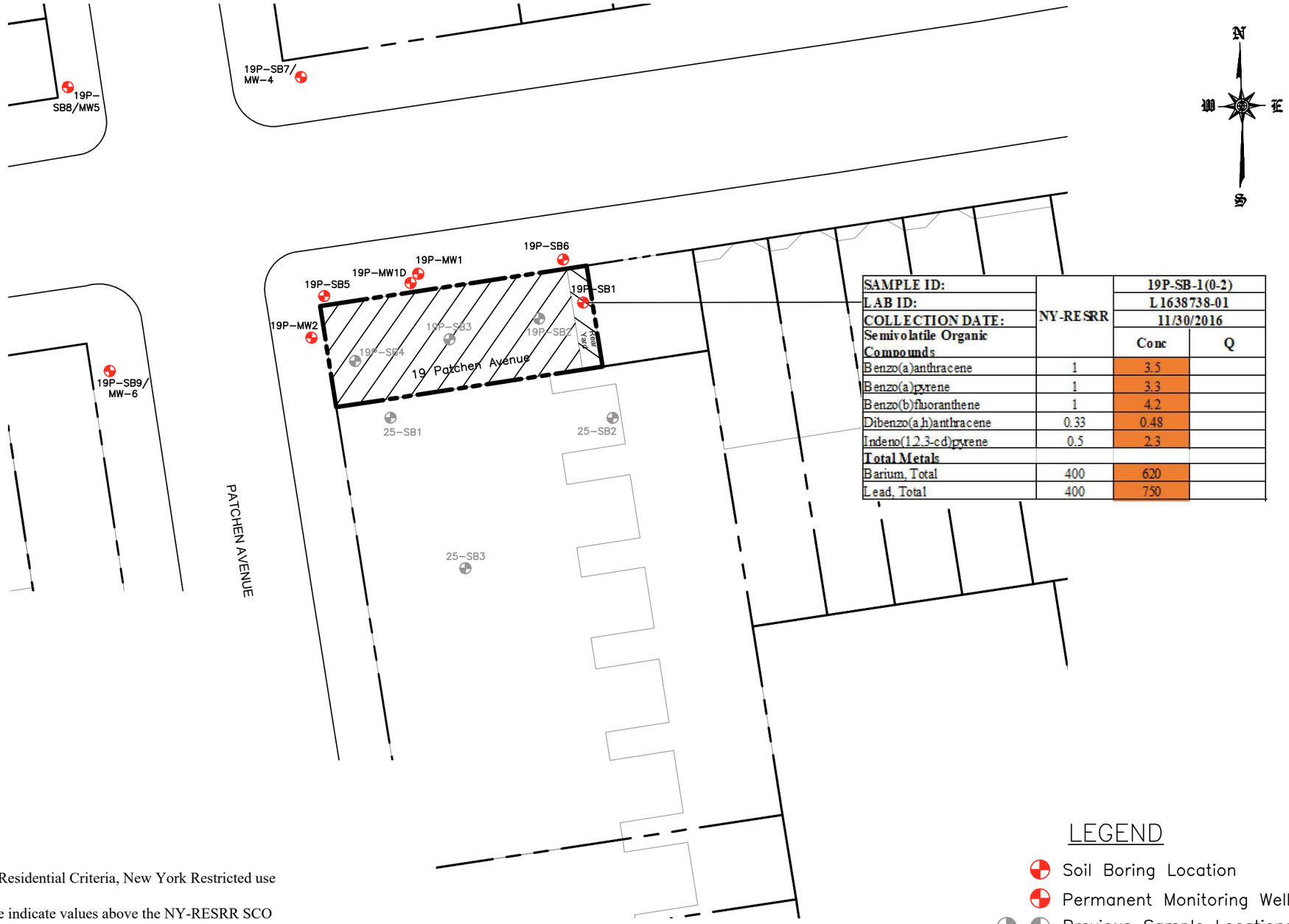
Drawn By	Checked By	Date	Scale
LM	CZ	June 2017	As Noted

Drawing Title: **Groundwater Flow Direction (May 31, 2017)**

Drawing No: **Figure 3B**



SAMPLE ID:	NY-RESRR	19P-SB-1(0-2)	
LAB ID:		L1638738-01	
COLLECTION DATE:		11/30/2016	
Semivolatile Organic Compounds		Conc	Q
Benzo(a)anthracene	1	3.5	
Benzo(a)pyrene	1	3.3	
Benzo(b)fluoranthene	1	4.2	
Dibenzo(a,h)anthracene	0.33	0.48	
Indeno(1,2,3-cd)pyrene	0.5	2.3	
Total Metals			
Barium, Total	400	620	
Lead, Total	400	750	

Notes:
NY-RESRR = Restricted-Residential Criteria, New York Restricted use current as of 5/2007
Cells highlighted in orange indicate values above the NY-RESRR SCO
SCO = Soil Cleanup Objective
Q = Laboratory Data Qualifier
Soil sample depths shown in feet (ft) within sample location

LEGEND

- Soil Boring Location
- Permanent Monitoring Well
- Previous Sample Locations

0 15' 30' 60'
Drawing Scale

Basemap Features Source: New York City Dept. of Finance & NYC Open Data.

CLIENT: 19 Patchen Avenue
Brooklyn, New york

CONSULTANT: TENEN ENVIRONMENTAL

TENEN ENVIRONMENTAL, LLC
121 West 27th Street
Suite 702
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O: 646-606-2332
F: 646-606-2379

DRAWN BY	CHECKED BY	DATE	SCALE:
LM	CZ	August 2019	As Noted

DRAWING TITLE: Remaining Soil Sample Exceedances

DRAWING NO.: Figure 4

SAMPLE ID:	NY-AWQS	MW-4		MW-4		MW-4 DUP	
LAB ID:		L1639548-03		L1837978-04		L1837978-05	
COLLECTION DATE:		12/6/2016		9/21/2018		9/21/2018	
Volatile Organic Compounds Units: ug/l		Conc	Q	Conc	Q	Conc	Q
Chloroform	7	6.4		8.6		7.4	
Tetrachloroethene	5	26		23		19	

SAMPLE ID:	NY-AWQS	MW-1		MW-1	
LAB ID:		L1639693-03		L1837978-02	
COLLECTION DATE:		12/7/2016		9/21/2018	
Volatile Organic Compounds Units: ug/l		Conc	Q	Conc	Q
Tetrachloroethene	5	18		12	

SAMPLE ID:	NY-AWQS	MW-5		MW-5	
LAB ID:		L1639548-02		L1837978-06	
COLLECTION DATE:		12/6/16		9/21/2018	
Volatile Organic Compounds Units: ug/l		Conc	Q	Conc	Q
Tetrachloroethene	5	24		10	

SAMPLE ID:	NY-AWQS	MW-1D		MW-1D-DUP		MW-1-D	
LAB ID:		L1639693-04		L1639693-05		L1837978-01	
COLLECTION DATE:		12/7/2016		12/7/2016		9/21/2018	
Volatile Organic Compounds Units: ug/l		Conc	Q	Conc	Q	Conc	Q
Tetrachloroethene	5	0.4	J	0.3	J	0.18	U
2-Butanone	50	51		49		1.9	U

SAMPLE ID:	NY-AWQS	MW-2		MW-2	
LAB ID:		L1639693-02		L1837978-03	
COLLECTION DATE:		12/7/2016		9/21/2018	
Volatile Organic Compounds Units: ug/l		Conc	Q	Conc	Q
Tetrachloroethene	5	19		12	

SAMPLE ID:	NY-AWQS	MW-6		MW-6	
LAB ID:		L1639548-01		L1837978-07	
COLLECTION DATE:		12/6/2016		9/21/2018	
Volatile Organic Compounds Units: ug/l		Conc	Q	Conc	Q
Tetrachloroethene	5	12		12	

SAMPLE ID:	NY-AWQS	19P-MW-3		MW-3	
LAB ID:		L1714748-01		L1837978-08	
COLLECTION DATE:		5/8/2017		9/21/2018	
Volatile Organic Compounds Units: ug/l		Conc	Q	Conc	Q
Tetrachloroethene	5	0.7	U	72	
2-Butanone	50	13		1.9	U

22 1/2 Patchen Avenue

24 Patchen Avenue

19P-SB8/MW5

19P-SB7/MW-4

PARKING LOT

VAN BUREN STREET

PARKING GARAGE

19P-MW1

19P-MW1D

19P-MW2

19 Patchen Avenue

Rear Yard

542 Van Buren Street

19P-SB9/MW-6

520 Van Buren

25 Patchen Avenue

19P-MW3

N

W E

S

LEGEND

Permanent Monitoring Well

Notes:

*NY-AWQS: New York TOGS 111 Ambient Water Quality Standards criteria reflects all addendum to criteria through June 2004.

Cells highlighted in yellow indicate concentrations above the NY-AWQS

DUP = designation for duplicate sample

MDL = Maximum Detection Limit

Q = Laboratory Data Qualifier

For U qualified entries, the MDL is shown

U = not detected at or above the MDL

Results and MDL values are in micrograms per liter (µg/L)

Basemap Features Source: New York City Dept. of Finance & NYC Open Data.

0 15' 30' 60'

Drawing Scale

CLIENT

19 Patchen Avenue
Brooklyn, New York

CONSULTANT

TENEN ENVIRONMENTAL

TENEN ENVIRONMENTAL, LLC
121 West 27th Street
Suite 702
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O: 646-606-2332
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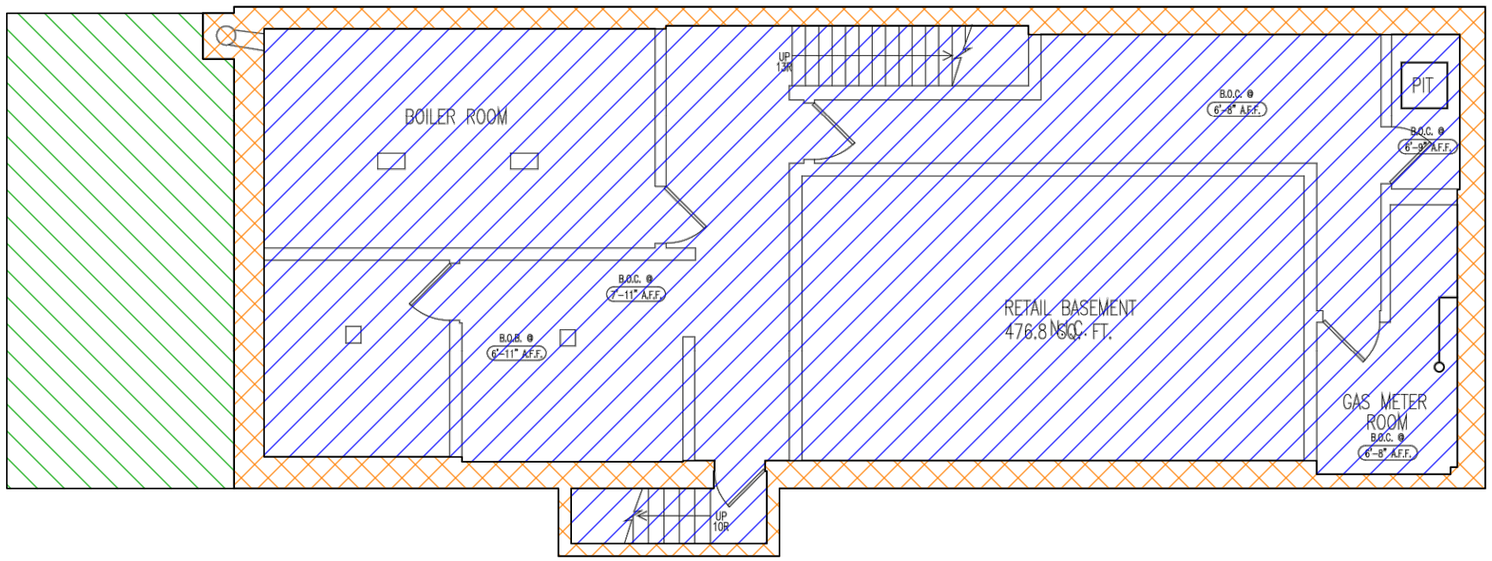
DRAWN BY	CHECKED BY	DATE	SCALE:
LM	CZ	August 2019	As Noted

DRAWING TITLE:
Remaining Groundwater Sample Exceedances

DRAWING NO.
Figure 5



Legend

- 4-6 inch concrete slab on grade
- 4-6 inch concrete slab at 10 feet below grade
- 4-6 inch concrete subgrade walls from 0-10 feet below grade

0 4' 8' 16'

Drawing Scale

Basemap Source:
Aufgang Architects, LLC, Suffern, NY,
Proposed Repair and Rennovation for BEC New Communities HDFC, Inc.,
Proj #1518, Dwg. #A-100.00, 6/28/15

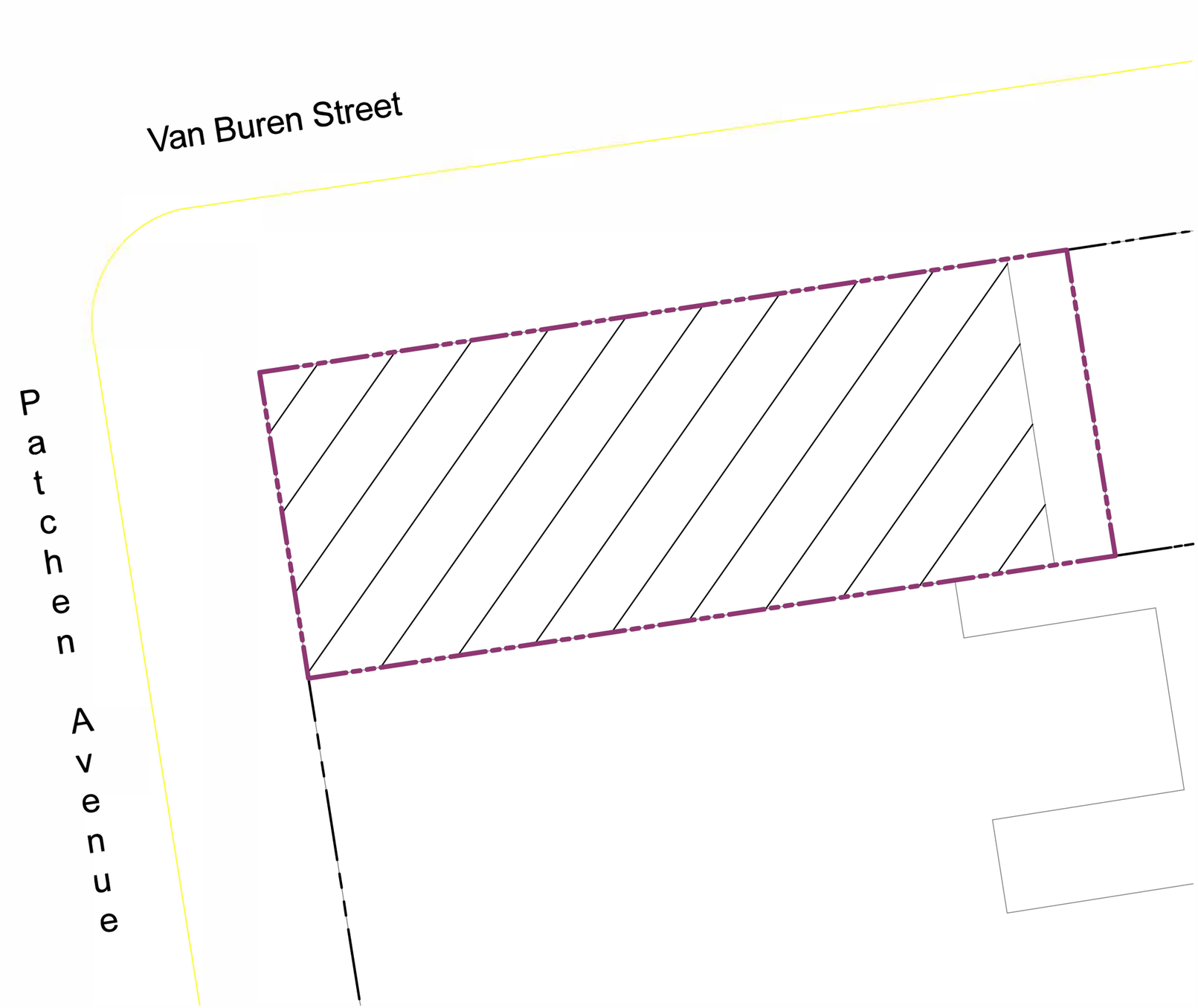
SITE
19 Patchen Avenue
Brooklyn, NY

CONSULTANT
TENEN ENVIRONMENTAL
TENEN ENVIRONMENTAL, LLC
121 West 27th Street
Suite 702
New York, NY 10001
O: 646-606-2332
F: 646-606-2379

DRAWN BY	CHECKED BY	DATE	SCALE:
LM	CZ	12/17/2019	As Noted

DRAWING TITLE.
Engineering Controls Location (Site Cover)

DRAWING NO.
Figure 6



Basemap Features Source: New York City Dept. of Finance & NYC Open Data.

CLIENT

19 PATCHEN AVENUE
BROOKLYN, NEW YORK

CONSULTANT

TENEN ENVIRONMENTAL

TENEN ENVIRONMENTAL, LLC
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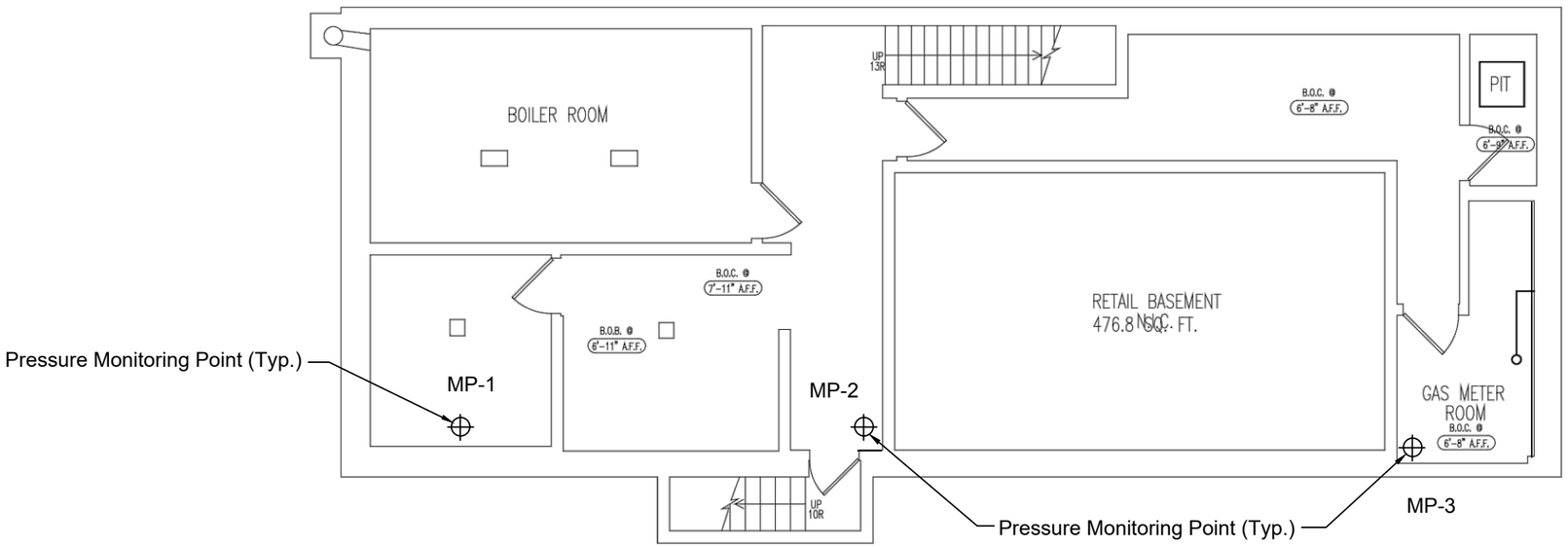
DRAWN BY	CHECKED BY	DATE	SCALE
MC	MM	DECEMBER 2019	AS NOTED

DRAWING TITLE: Engineering Controls Location (Vapor Barrier)

DRAWING NO.: Figure 7



LEGEND

⊕ Pressure Monitoring Point Location

0 4' 8' 16'

Drawing Scale

Basemap Source:
Aufgang Architects, LLC, Suffern, NY,
Proposed Repair and Rennovation for BEC New Communities HDFC, Inc.,
Proj #1518, Dwg. #A-100.00, 6/28/15

CLIENT
19 PATCHEN AVENUE
BROOKLYN, NEW YORK

CONSULTANT
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DRAWN BY	CHECKED BY	DATE	SCALE:
LM	MC	DECEMBER 2019	AS NOTED

DRAWING TITLE: Engineering Controls Location (SSDS Monitoring Points)

DRAWING NO. Figure 8

TABLES

Table 7 - Soils Exceeding Restricted-Residential and Unrestricted Use SCOs After the Remedial Action
19 Patchen Avenue - Brooklyn, NY

SAMPLE ID:	NY-RESRR	NY-UNRES	19P-SB-1(0-2)	
LAB ID:			L1638738-01	
COLLECTION DATE:			11/30/2016	
Semivolatile Organic Compounds Units: mg/kg			Conc	Q
Benzo(a)anthracene	1	1	3.5	
Benzo(a)pyrene	1	1	3.3	
Benzo(b)fluoranthene	1	1	4.2	
Benzo(k)fluoranthene	3.9	0.8	1.6	
Chrysene	3.9	1	3.8	
Dibenzo(a,h)anthracene	0.33	0.33	0.48	
Indeno(1,2,3-cd)pyrene	0.5	0.5	2.3	
Total Metals				
Barium, Total	400	350	620	
Lead, Total	400	63	750	
Mercury, Total	0.81	0.18	0.38	
Zinc, Total	10000	109	700	

Notes:
NY-UNRES = New York Unrestricted use Criteria current as of 5/2007
NY-RESRR = Restricted-Residential Criteria, New York Restricted use current as of 5/2007
Cells highlighted in yellow indicate concentrations above the NY-UNRES SCO value, but below the NY-RESRR SCO
Cells highlighted in orange indicate values above the NY-RESRR SCO
SCO = Soil Cleanup Objective
Q = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = not detected at or above the MDL
Results values are in milligrams per kilogram (mg/kg)
Soil sample depths shown in feet (ft) within sample location

Table 8 – Groundwater Exceeding Class GA AWQS
19 Patchen Avenue - Brooklyn, NY

SAMPLE ID:	NY-AWQS	MW-1		MW-1	
LAB ID:		L1639693-03		L1837978-02	
COLLECTION DATE:		12/7/2016		9/21/2018	
Volatile Organic Compounds Units: ug/l		Conc	Q	Conc	Q
Tetrachloroethene	5	18		12	

SAMPLE ID:	NY-AWQS	MW-1D		MW-1D-DUP		MW-1-D	
LAB ID:		L1639693-04		L1639693-05		L1837978-01	
COLLECTION DATE:		12/7/2016		12/7/2016		9/21/2018	
Volatile Organic Compounds Units: ug/l		Conc	Q	Conc	Q	Conc	Q
Tetrachloroethene	5	0.4	J	0.3	J	0.18	U
2-Butanone	50	51		49		1.9	U

SAMPLE ID:	NY-AWQS	MW-2		MW-2	
LAB ID:		L1639693-02		L1837978-03	
COLLECTION DATE:		12/7/2016		9/21/2018	
Volatile Organic Compounds Units: ug/l		Conc	Q	Conc	Q
Tetrachloroethene	5	19		12	

SAMPLE ID:	NY-AWQS	19P-MW-3		MW-3	
LAB ID:		L1714748-01		L1837978-08	
COLLECTION DATE:		5/8/2017		9/21/2018	
Volatile Organic Compounds Units: ug/l		Conc	Q	Conc	Q
Tetrachloroethene	5	0.7	U	72	
2-Butanone	50	13		1.9	U

SAMPLE ID:	NY-AWQS	MW-4		MW-4		MW-4 DUP	
LAB ID:		L1639548-03		L1837978-04		L1837978-05	
COLLECTION DATE:		12/6/2016		9/21/2018		9/21/2018	
Volatile Organic Compounds Units: ug/l		Conc	Q	Conc	Q	Conc	Q
Chloroform	7	6.4		8.6		7.4	
Tetrachloroethene	5	26		23		19	

SAMPLE ID:	NY-AWQS	MW-5		MW-5	
LAB ID:		L1639548-02		L1837978-06	
COLLECTION DATE:		12/6/16		9/21/2018	
Volatile Organic Compounds Units: ug/l		Conc	Q	Conc	Q
Tetrachloroethene	5	24		10	

SAMPLE ID:	NY-AWQS	MW-6		MW-6	
LAB ID:		L1639548-01		L1837978-07	
COLLECTION DATE:		12/6/2016		9/21/2018	
Volatile Organic Compounds Units: ug/l		Conc	Q	Conc	Q
Tetrachloroethene	5	12		12	

*NY-AWQS: New York TOGS 111 Ambient Water Quality Standards criteria reflects all addendum to criteria through June 2004.
Cells highlighted in yellow indicate concentrations above the NY-AWQS
DUP = designation for duplicate sample
RL = Reporting limit
Q = Laboratory Data Qualifier
For U qualified entries, the MDL is shown
U = not detected at or above the MDL
For J qualified entries, the estimated concentration is shown
J = estimated value, indicating the detected value is below the RL, but above the MDL
Results are in micrograms per liter (µg/L)

APPENDIX 1 – LIST OF SITE CONTACTS

Name	Phone/Email Address
Max Zarin; Hudson BEC II LLC and Off-site Location	(212) 777-9500, mzarin@hudsoninc.com
Matthew Carroll, PE; Remedial Engineer	(646) 606-2332, mcarroll@tenen-env.com
Chris Heller, NYSDEC Project Manager	(518) 402-0163, Chris.Heller@dec.ny.gov
Jane O'Connell; Regional Remediation Engineer	(718) 482-4599, jane.oconnell@dec.ny.gov
Kelly A. Lewandowski, P.E.; Chief, Site Control Section	(518) 402-9543, kelly.lewandowski@dec.ny.gov
Angela Martin, NYSDOH Project Manager	(518) 402-7860, Angela.Martin@health.ny.gov
David Yudelson	(212) 421-2150, dyudelson@sprlaw.com

3.0 APPENDIX 2 – EXCAVATION WORK PLAN (EWP)

2-1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination, the site owner or their representative will notify the NYSDEC. Table 1 includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix 1.

Table 1: Notifications*

Chris Heller, Project Manager	(518) 402-0163, Chris.Heller@dec.ny.gov
Jane O'Connell; Regional Remediation Engineer	(718) 482-4599, jane.oconnell@dec.ny.gov
Kelly A. Lewandowski, P.E.; Chief, Site Control Section	(518) 402-9543, kelly.lewandowski@dec.ny.gov

* Note: Notifications are subject to change and will be updated as necessary.

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated and any work that may impact an engineering control;
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work;

- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120;
- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided in Appendix 7 of this SMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

2-2 SOIL SCREENING METHODS

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

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal and material that requires testing to determine if the material can be reused on-site as soil beneath a cover or if the material can be used as cover soil. Further discussion of off-site disposal of materials and on-site reuse is provided in Section 6 of this Appendix.

2-3 MATERIALS EXCAVATION AND LOAD-OUT

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the site.

Loaded vehicles leaving the site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the site are clean of dirt and other materials derived from the site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials.

2-4 MATERIALS TRANSPORT OFF-SITE

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

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

Truck transport routes are as follows: Trucks removing waste from the Site will be loaded on Van Buren Street. Trucks will make a right on Patchen Avenue, followed by a right on Lafayette Avenue, followed by a left hand turn onto Broadway. Trucks will head northwest on Broadway to the Brooklyn Queens Expressway. All trucks loaded with site materials will exit the vicinity of the site using only these approved truck routes. This is the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c)

prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project site.

Egress points for truck and equipment transport from the site will be kept clean of dirt and other materials during site remediation and development.

Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited.

2-5 MATERIALS DISPOSAL OFF-SITE

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

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

Non-hazardous historic fill and contaminated soils taken off-site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

2-6 MATERIALS REUSE ON-SITE

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

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

2-7 FLUIDS MANAGEMENT

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

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

2-8 COVER SYSTEM RESTORATION

After the completion of soil removal and any other invasive activities the cover system will be restored in a manner that complies with the RAWP. The existing cover system is comprised of a minimum of 2 inches of concrete slabs. If the type of cover system changes from that which exists prior to the excavation (i.e., a soil cover is

replaced by asphalt), this will constitute a modification of the cover element of the remedy and the upper surface of the remaining contamination. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in an updated SMP.

2-9 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP prior to receipt at the site. A Request to Import/Reuse Fill or Soil form, which can be found at http://www.dec.ny.gov/regulations/67386.html, will be prepared and submitted to the NYSDEC project manager allowing a minimum of 5 business days for review.

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

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

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

2-11 STORMWATER POLLUTION PREVENTION

Stormwater pollution prevention practices are not required.

2-12 EXCAVATION CONTINGENCY PLAN

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

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes (TAL metals; TCL volatiles and semi-volatiles, TCL pesticides and PCBs), unless the site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the Periodic Review Report.

2-13 COMMUNITY AIR MONITORING PLAN

Air sampling stations based on generally prevailing wind conditions will be adjusted on a daily or more frequent basis based on actual wind directions to provide an upwind and downwind monitoring stations.

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers.

A summary of the CAMP plan is included in Appendix 11.

2-14 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of nuisance odors off-site and on-site. If nuisance odors are identified at the site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC

and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the remedial party's Remediation Engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

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

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

2-15 DUST CONTROL PLAN

A dust suppression plan that addresses dust management during invasive on-site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved though the use of a dedicated on-site water truck for road wetting.

2-16 OTHER NUISANCES

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

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

APPENDIX 3
RESPONSIBILITIES of
OWNER and REMEDIAL PARTY

Responsibilities

The responsibilities for implementing the Site Management Plan ("SMP") for the 19 Patchen Avenue site (the "site"), number C224232, are divided between the site owner(s) and a Remedial Party, as defined below. The owner(s) is/are currently listed as:
BEC Continuum Housing Development Fund Company Inc. (the "fee owner") and 19 Patchen GP LLC (the "beneficial owner").

Solely for the purposes of this document and based upon the facts related to a particular site and the remedial program being carried out, the term Remedial Party ("RP") refers to any of the following: certificate of completion holder, volunteer, applicant, responsible party, and, in the event the New York State Department of Environmental Conservation ("NYSDEC") is carrying out remediation or site management, the NYSDEC and/or an agent acting on its behalf. The RPs are:
19 Patchen GP LLC and Hudson BEC II LLC.

Nothing on this page shall supersede the provisions of an Environmental Easement, Consent Order, Consent Decree, agreement, or other legally binding document that affects rights and obligations relating to the site.

Site Owner's Responsibilities:

1) The owner shall follow the provisions of the SMP as they relate to future construction and excavation at the site.

2) In accordance with a periodic time frame determined by the NYSDEC, the owner shall periodically certify, in writing, that all Institutional Controls set forth in an Environmental Easement remain in place and continue to be complied with. The owner shall provide a written certification to the RP, upon the RP's request, in order to allow the RP to include the certification in the site's Periodic Review Report (PRR) certification to the NYSDEC.

3) In the event the site is delisted, the owner remains bound by the Environmental Easement and shall submit, upon request by the NYSDEC, a written certification that the Environmental Easement is still in place and has been complied with.

4) The owner shall grant access to the site to the RP and the NYSDEC and its agents for the purposes of performing activities required under the SMP and assuring compliance with the SMP.

5) The owner is responsible for assuring the security of the remedial components located on its property to the best of its ability. In the event that damage to the remedial components or vandalism is evident, the owner shall notify the site's RP and the NYSDEC in accordance with the timeframes indicated in Section 1.3 -Notifications.

6) In the event some action or inaction by the owner adversely impacts the site, the owner must notify the site's RP and the NYSDEC in accordance with the time frame indicated in Section 1.3 - Notifications and (ii) coordinate the performance of necessary corrective actions with the RP.

7) The owner must notify the RP and the NYSDEC of any change in ownership of the site property (identifying the tax map numbers in any correspondence) and provide contact information for the new owner of the site property. 6 NYCRR Part contains notification requirements applicable to any construction or activity changes and changes in ownership. Among the notification requirements is the following: Sixty days prior written notification must be made to the NYSDEC. Notification is to be submitted to the NYSDEC Division of Environmental Remediation's Site Control Section. Notification requirements for a change in use are detailed in Section 2.4 of the SMP. A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html.

8) The owner will maintain the composite cover system, SSDSs and vapor barriers on behalf of the RP. The RP remains ultimately responsible for maintaining the engineering controls.

9) Until such time as the NYSDEC deems the vapor mitigation system unnecessary, the owner shall operate the system, pay for the utilities for the system's operation, and report any maintenance issues to the RP and the NYSDEC.

10) In accordance with the tenant notification law, within 15 days of receipt, the owner must supply a copy of any vapor intrusion data, that is produced with respect to structures and that exceeds NYSDOH or OSHA guidelines on the site, whether produced by the NYSDEC, RP, or owner, to the tenants on the property. The owner must otherwise comply with the tenant and occupant notification provisions of Environmental Conservation Law Article 27, Title 24.

Remedial Party Responsibilities

1) The RP must follow the SMP provisions regarding any construction and/or excavation it undertakes at the site.

2) The RP shall report to the NYSDEC all activities required for remediation, operation, maintenance, monitoring, and reporting. Such reporting includes, but is not limited to, periodic review reports and certifications, electronic data deliverables, corrective action work plans and reports, and updated SMPs.

3) Before accessing the site property to undertake a specific activity, the RP shall provide the owner advance notification that shall include an explanation of the work expected to be completed. The RP shall provide to (i) the owner, upon the owner's request, (ii) the NYSDEC, and (iii) other entities, if required by the SMP, a copy of any data generated during the site visit and/or any final report produced.

4) If the NYSDEC determines that an update of the SMP is necessary, the RP shall update the SMP and obtain final approval from the NYSDEC. Within 5 business days after NYSDEC approval, the RP shall submit a copy of the approved SMP to the owner(s).

5) The RP shall notify the NYSDEC and the owner of any changes in RP ownership and/or control and of any changes in the party/entity responsible for the operation, maintenance, and monitoring of and reporting with respect to any remedial system (Engineering Controls). The RP shall provide contact information for the new party/entity. Such activity constitutes a Change of Use pursuant to 375-1.11(d) and requires 60-days prior notice to the NYSDEC. A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html .

6) The RP shall notify the NYSDEC of any damage to or modification of the systems as required under Section 1.3 - Notifications] of the SMP.

7) The RP is responsible for the proper maintenance of any installed vapor intrusion mitigation systems associated with the site, as required in Appendix 9 (Operation, Monitoring and Maintenance Manual) of the SMP.

8) Prior to a change in use that impacts the remedial system or requirements and/or responsibilities for implementing the SMP, the RP shall submit to the NYSDEC for approval an amended SMP.

9) Any change in use, change in ownership, change in site classification (*e.g.*, delisting), reduction or expansion of remediation, and other significant changes related to the site may result in a change in responsibilities and, therefore, necessitate an update to the SMP and/or updated legal documents. The RP shall contact the Department to discuss the need to update such documents.

Change in RP ownership and/or control and/or site ownership does not affect the RP's obligations with respect to the site unless a legally binding document executed by the NYSDEC releases the RP of its obligations.

Future site owners and RPs and their successors and assigns are required to carry out the activities set forth above.

APPENDIX 4 – ENVIRONMENTAL EASEMENT

NYC DEPARTMENT OF FINANCE
OFFICE OF THE CITY REGISTER

This page is part of the instrument. The City Register will rely on the information provided by you on this page for purposes of indexing this instrument.The information on this page will control for indexing purposes in the event of any conflict with the rest of the document.

2018121100560001002E8CEA

RECORDING AND ENDORSEMENT COVER PAGE **PAGE 1 OF 12**

Document ID: 2018121100560001 Document Date: 09-10-2018 Preparation Date: 12-11-2018
Document Type: EASEMENT
Document Page Count: 10

PRESENTER:
ROYAL REGISTERED PROPERTY
REPORTS(182450)MB
125 PARK AVENUE, SUITE 1610
NEW YORK, NY 10017
212-376-0900
MBASALATAN@ROYALABSTRACT.COM

RETURN TO:
ROYAL REGISTERED PROPERTY
REPORTS(182450)MB
125 PARK AVENUE, SUITE 1610
NEW YORK, NY 10017
212-376-0900
MBASALATAN@ROYALABSTRACT.COM

PROPERTY DATA

Borough	Block	Lot	Unit	Address
BROOKLYN	1618	8	Entire Lot	19 PATCHEN AVENUE

Property Type: COMMERCIAL REAL ESTATE Easement

CROSS REFERENCE DATA

CRFN_____ *or* DocumentID_____ *or* _____ Year_____ Reel____ Page_____ *or* File Number_____

PARTIES

GRANTOR/SELLER:
BEC CONTINUUM HOUSING DEVELOPMENT FUND COMPANY INC
67 HANSON PLACE
BROOKLYN, NY 11217

☒ Additional Parties Listed on Continuation Page

GRANTEE/BUYER:
THE PEOPLE OF THE STATE OF NEW YORK
625 BROADWAY
ALBANY, NY 12233

FEES AND TAXES

Mortgage :		
Mortgage Amount:	$	0.00
Taxable Mortgage Amount:	$	0.00
Exemption:		
TAXES: County (Basic):	$	0.00
City (Additional):	$	0.00
Spec (Additional):	$	0.00
TASF:	$	0.00
MTA:	$	0.00
NYCTA:	$	0.00
Additional MRT:	$	0.00
TOTAL:	$	0.00
Recording Fee:	$	EXEMPT
Affidavit Fee:	$	0.00

Filing Fee: $ 0.00
NYC Real Property Transfer Tax: $ 0.00
NYS Real Estate Transfer Tax: $ 0.00

RECORDED OR FILED IN THE OFFICE OF THE CITY REGISTER OF THE CITY OF NEW YORK
Recorded/Filed 12-11-2018 15:21
City Register File No.(CRFN): **2018000408040**

City Register Official Signature

NYC DEPARTMENT OF FINANCE
OFFICE OF THE CITY REGISTER

2018121100560001002C8E6A

RECORDING AND ENDORSEMENT COVER PAGE (CONTINUATION) **PAGE 2 OF 12**

Document ID: 2018121100560001 Document Date: 09-10-2018 Preparation Date: 12-11-2018
Document Type: EASEMENT

PARTIES

GRANTOR/SELLER:
19 PATCHEN GP LCC
67 HANSON PLACE
BROOKLYN, NY 11217

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

THIS INDENTURE made as of this 10th day of September, 2018 between Owner(s) BEC Continuum Housing Development Fund Company, Inc., (the "Grantor Fee Owner") having an office at 67 Hanson Place, Brooklyn, New York 11217, County of Kings, State of New York, and 19 Patchen GP LCC, (the "Grantor Beneficial Owner), having an office at c/o BEC New Communities HDFC, Inc., 67 Hansen Place, Brooklyn, New York 11217, County of Kings, State of New York (collectively, the "Grantor"), and The People of the State of New York (the "Grantee."), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

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

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

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

WHEREAS, Grantor, is the owner of real property located at the address of 19 Patchen Avenue in the City of New York, County of Kings and State of New York, known and designated on the tax map of the New York City Department of Finance as tax map parcel number: Block 1618 Lot 8, being the same as that property conveyed to Grantor by deed dated June 30, 2017 and recorded in the City Register of the City of New York as CRFN # 2017000276596. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 0.0422 +/- acres, and is hereinafter more fully described in the Land Title Survey dated May 18, 2018 prepared by Richard Tom, L.L.S. of Perfect Point Land Surveying RT, which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, Grantor Beneficial Owner, is the owner of the beneficial interest in the Controlled Property being the same as a portion of that beneficial interest conveyed to Grantor Beneficial Owner by means of a Declaration of Interest and Nominee Agreement dated June 30, 2017 and recorded in the recorded in the City Register of the City of New York as CRFN # 2017000276601; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Brownfield Cleanup Agreement Index Number: C224232-05-16 as amended October 30, 2017, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement").

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

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

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

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

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

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

(4) The use of groundwater underlying the property is prohibited without

necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

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

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

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

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

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

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

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

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

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

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

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

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation Law.

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

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

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

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

(i) are in-place;

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

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

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

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

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

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

(7) the information presented is accurate and complete.

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

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

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

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

5. Enforcement

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

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

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

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

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

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

Parties shall address correspondence to: Site Number: C224232
Office of General Counsel

NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to:

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

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

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

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

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

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

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

Remainder of Page Intentionally Left Blank

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

BEC Continuum Housing Development Fund Company, Inc.:

By: Al Libard

Print Name: Al Libard

Title: Board President Date: 8/14/18

Grantor's Acknowledgment

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

On the 14 day of August, in the year 2018, before me, the undersigned, personally appeared Al Libard, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public - State of New York

ELIZABETH SHOY
Notary Public, State of New York
No. 01SH6137760
Qualified in Kings County
Commission Expires December 5, 2021

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

19 Patchen GP LLC:

By: _____

Print Name: Aaron Kaffman

Title: member Date: 8/22/18

Grantor's Acknowledgment

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

On the 22nd day of August, in the year 2018, before me, the undersigned, personally appeared Aaron Kaffman, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public - State of New York

MARLEE BUSCHING
Notary Public, State of New York
No. 01BU6344816
Qualified in Kings County
Commission Expires July 11, 2020

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

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

Grantee's Acknowledgment

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

On the 10th day of September, in the year 2018, before me, the undersigned, personally appeared Michael J. Ryan, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

_____
Notary Public - State of New York

David J. Chiusano
Notary Public, State of New York
No. 01CH5032146
Qualified in Schenectady County
Commission Expires August 22, 2019

SCHEDULE "A" PROPERTY DESCRIPTION

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

BEGINNING at the corner formed by the intersection of the easterly side of Patchen Avenue (70 feet wide) with the southerly side of Van Buren Street (70 feet wide);

RUNNING THENCE easterly along the southerly side of Van Buren Street, 73 feet 6 inches to a point;

THENCE southerly parallel with Patchen Avenue, 25 feet to a point;

THENCE westerly parallel with Van Buren Street and part of a distance through a party wall, 73 feet 6 inches to a point on the easterly side of Patchen Avenue;

THENCE northerly along the easterly side of Patchen Avenue, 25 feet to the southerly side of Van Buren Street at the point or place of BEGINNING.

LOT AREA = 1837.50 sq. ft. = 0.0422 acre

B. 1618
L. 8
County of Kings

182450
Royal Registered Property Reports, Inc.
125 Park Avenue, Suite 1610
New York, N.Y 10017
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Record and Return TO:
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560 Lexington Ave., 15th Floor
New York, NY 10022
Attn: Allison Sloto

APPENDIX 5 – MONITORING WELL BORING AND CONSTRUCTION LOGS

TENEN ENVIRONMENTAL

		Boring No.	**19P-SB-1**
		Sheet 1	**of 1**
Site:	**19 Patchen Ave - Brooklyn, NY**	**Drilling Method:**	420M
Date:	**11/30/16**	**Soil Sampling Method:**	Acetate liners
Weather:	**~mid 60°F, rain**	**Soil Vapor Sampling Method:**	
Observer:	**Claire Zaccheo, Kristen Meisner**	**Driller :**	ADT

Depth (feet)	PID Reading (ppm)	Soil Samples	Soil Description
1	0.0	SB-1(0-2)	0-2: Fill (silt, concrete fragments, brick fragments)
2			
3	0.0	SB-1(2-4)	2-4: Fill (brown silt, medium grain sand, rocks, brick fragments)
4			4: EOB
5			

Legend:
DTW - Depth to Water
EOB - End of Boring
ft-bg - Feet Below Grade
SAA - Same as Above
PID - Photoionization Detector

TENEN ENVIRONMENTAL

		Boring No.	**19P-SB-2**
		Sheet:	**1 OF 1**
Site:	**19 Patchen Avenue, Brooklyn, NY**	**Drilling Method:**	Geoprobe
Weather:	**80F, clear**	**Driller:**	Chris
Date:	**7/2/15**	**Soil Sampling Method:**	Acetate Sampler
Observers:	**Kristen Meisner, Matthew Carroll**		

Depth (feet)	PID Reading (ppm)	Soil Samples	Soil Description
1			0-3: FILL (cobbles, brick, brown coarse grain sand, rock)
2			
3	5.0		3.0-5.5: FILL (SAA)
4	3.5		
5			
6	0.7		5.5-6.0: Brown, coarse grain sand
7	2.3	SB-2 (6-7)	6.0-7.0: Brown and grey medium grain sand
8	0.9		7.0-9.0: Brown coarse grain sand
9			
10			
11		SB-2 (10-11)	10-11.5: SAA
12			EOB at 11.50 ft.

Notes:
DTW - Depth to Water
EOB - End of Boring
ft-bg - Feet Below Grade
SAA - Same as Above
PID - Photoionization Detector

TENEN ENVIRONMENTAL

		Boring No.	**19P-SB-3**
		Sheet:	**1 OF 1**
Site:	**19 Patchen Avenue, Brooklyn, NY**	**Drilling Method:**	Geoprobe
Weather:	**80F, clear**	**Driller:**	Chris
Date:	**7/2/15**	**Soil Sampling Method:**	Acetate Sampler
Observers:	**Kristen Meisner, Matthew Carroll**		

Depth (feet)	PID Reading (ppm)	Soil Samples	Soil Description
1			0-0.5: Concrete
2	0.7		0.5-3.0: Brown coarse grain sand
3			3.0-5.0: SAA
4	0.8		
5			
6			5.0-6.0: SAA
7	1.1		6.0-9.0: SAA with cobbles at 8.0 ft.
8			9.0-10.0: Brown coarse grain sand
9		SB-3 (8-9)	
10			
11	0.7	SB-3 (10-11)	10.0-12.0: SAA
12			EOB at 12.0 ft.

Notes:
DTW - Depth to Water
EOB - End of Boring
ft-bg - Feet Below Grade
SAA - Same as Above
PID - Photoionization Detector

TENEN ENVIRONMENTAL

		Boring No.	**19P-SB-4**
		Sheet:	**1 OF 1**
Site:	**19 Patchen Avenue, Brooklyn, NY**	**Drilling Method:**	Geoprobe
Weather:	**80F, clear**	**Driller:**	Chris
Date:	**7/2/15**	**Soil Sampling Method:**	Acetate Sampler
Observers:	**Kristen Meisner, Matthew Carroll**		

Depth (feet)	PID Reading (ppm)	Soil Samples	Soil Description
1	0.7		0-0.5: Concrete 0.5-3.0: Brown coarse grain sand 3.0-5.0: SAA with dark grey sand
2			
3	2.6		
4		SB-4 (3.5-4.5)	
5			
6	1.3		5.0-9.0: SAA
7			
8			
9			
10			
11	1.0		9.0-11.5: SAA EOB at 11.5 ft.
12		SB-4 (11-12)	

Notes:
DTW - Depth to Water
EOB - End of Boring
ft-bg - Feet Below Grade
SAA - Same as Above
PID - Photoionization Detector

TENEN ENVIRONMENTAL

		Boring No.	**SB-5**
		Sheet 1	**of 1**
Site:	**19 Patchen Ave - Brooklyn, NY**	**Drilling Method:**	Sonic
Date:	**11/28/16**	**Soil Sampling Method:**	Plastic collection bags
Weather:	**~mid 50°F, sunny**	**Soil Vapor Sampling Method:**	
Observer:	**Claire Zaccheo, Kristen Meisner**	**Driller :**	ADT

Depth (feet)	PID Reading (ppm)	Soil Samples	Soil Description
1 2 3 4 5	0.0		0-5: Fill (concrete, asphalt, silt, some cobbles)
6 7 8 9 10	0.1 0.0		5-8: SAA 8-10: Brown silt, some fine to medium grain sand.
11 12 13 14 15	0.0		10-13: SAA 13-15: Brown medium grain sand.
16 17 18 19 20	0.0		15-17: Brown medium grain sand, cobbles. 17-20: Light brown fine to medium grain sand, pebbles.
21 22 23 24 25	0.0		20-22.5: Silt with fine to medium grain sand, pebbles. 22.5-25: Light brown fine grain sand.

TENEN ENVIRONMENTAL

		Boring No.	**SB-5**
		Sheet 1	**of 1**
Site:	**19 Patchen Ave - Brooklyn, NY**	**Drilling Method:**	Sonic
Date:	**11/28/16**	**Soil Sampling Method:**	Plastic collection bags
Weather:	**~mid 50°F, sunny**	**Soil Vapor Sampling Method:**	
Observer:	**Claire Zaccheo, Kristen Meisner**	**Driller :**	ADT

Depth (feet)	PID Reading (ppm)	Soil Samples	Soil Description
26 27 28 29 30	0.0		25-27: Cobbles, some medium to coarse grain sand. 27-30: Coarse grain sand.
31 32 33 34 35	0.0		30-33: Fine grain sand, some silt and cobbles. 33-35: Brown coarse grain sand, pebbles and cobbles.
36 37 38 39 40	0.0		35-40: SAA, some silt.
41 42 43 44 45	0.0	SB-5(43-45)	40-45: Silt some pebbles, coarse grain sand. 45: DTW, Wet
46 47 48 49 50			45-50: SAA

Legend:
DTW - Depth to Water
EOB - End of Boring
ft-bg - Feet Below Grade
SAA - Same as Above
PID - Photoionization Detector

TENEN ENVIRONMENTAL

		Boring No.	**SB-6**
		Sheet 1	**of 1**
Site:	**19 Patchen Ave - Brooklyn, NY**	**Drilling Method:**	Sonic
Date:	**11/28/16**	**Soil Sampling Method:**	Plastic collection bags
Weather:	**~mid 50°F, sunny**	**Soil Vapor Sampling Method:**	
Observer:	**Claire Zaccheo, Kristen Meisner**	**Driller :**	ADT

Depth (feet)	PID Reading (ppm)	Soil Samples	Soil Description
1 2 3 4 5	0.0		0-5: Fill (concrete, asphalt, silt, some fine to medium grain sand and pebbles)
6 7 8 9 10	0.0		5-10: Fill (silt, some medium grain sand)
11 12 13 14 15	0.0		10-15: Coarse grain sand, some silt, some asphalt.
16 17 18 19 20	0.0		15-20: Silt, some fine grain sand, pebbles.
21 22 23 24 25	0.0		20-25: Brown silt, some fine to medium grain sand.

TENEN ENVIRONMENTAL

		Boring No.	**SB-6**
		Sheet 1	**of 1**
Site:	**19 Patchen Ave - Brooklyn, NY**	**Drilling Method:**	Sonic
Date:	**11/28/16**	**Soil Sampling Method:**	Plastic collection bags
Weather:	**~mid 50°F, sunny**	**Soil Vapor Sampling Method:**	
Observer:	**Claire Zaccheo, Kristen Meisner**	**Driller :**	ADT

Depth (feet)	PID Reading (ppm)	Soil Samples	Soil Description
26	0.0		25-27: Fine to medium grain sand, some pebbles.
27			
28			
29	0.0		27-30: Light brown fine grain sand, some pebbles.
30			
31	0.0		30-33: Brown fine to medium grain sand.
32			
33			
34	0.0		33-35: Brown silt with medium grain sand.
35			
36	27.0	SB-6 (35-37)	35-37: Light brown fine grain sand.
37			
38		SB-6 (37-39)	37-40: Fine to medium grain sand, some silt.
39	0.0		
40			
41	0.0		
42			
43			40-45: Coarse grain sand, some silt.
44			44: DTW, Wet
45			
46			45-50: SAA
47			
48			
49			
50			

Legend:
DTW - Depth to Water
EOB - End of Boring
ft-bg - Feet Below Grade
SAA - Same as Above
PID - Photoionization Detector

TENEN ENVIRONMENTAL

		Boring No.	**P19-MW-1**
		Sheet:	**1 OF 1**
Site:	**19 Patchen Avenue**	**Drilling Method:**	Sonic
Weather:	**Breezy, 70F**	**Driller:**	Joey McGill
Date:	**7/17/15**	**Soil Sampling Method:**	5 ft. Plastic Liner
Observers:	**Claire Zaccheo, Alex Kuhn**		

Depth (feet)	PID Reading (ppm)	Soil Samples	GW Monitoring Well Intervals	Soil Description
1			Riser (0-44)	
2				
3				
4				
5				
6	0.0			5-10: Silt with fine brown sand
7		19P-MW-1(7-10)		
8				
9	0.3			
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				

TENEN ENVIRONMENTAL

		Boring No.	**P19-MW-1**
		Sheet:	**2 OF 2**
Site:	**19 Patchen Avenue**	**Drilling Method:**	Sonic
Weather:	**Breezy, 70F**	**Driller:**	Joey McGill
Date:	**7/17/15**	**Soil Sampling Method:**	5 ft. Plastic Liner
Observers:	**Claire Zaccheo, Alex Kuhn**		

Depth (feet)	PID Reading (ppm)	Soil Samples	GW Monitoring Well Intervals	Soil Description
26				25-30: Medium grain sand with pebbles and cobbles
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				40-45: Medium grain sand with pebbles and cobbles.
42				
43	0.0			
44				
45				
46	0.0	MW-1 (45-47)	Screen (44-45)	45-50: SAA.
47				DTW (Wet) at 47 feet.
48				
49				
50				
51				NA
52				
53				
54				
55				

Notes:
DTW - Depth to Water
EOB - End of Boring
ft-bg - Feet Below Grade
SAA - Same as Above
PID - Photoionization Detector
NA - Not Analyzed/Collected

TENEN ENVIRONMENTAL

		Boring No.	**MW-1D**
		Sheet 1	**of 5**
Site:	**19 Patchen Ave - Brooklyn, NY**	**Drilling Method:**	Sonic
Date:	**11/29/16**	**Soil Sampling Method:**	Plastic collection bags
Weather:	**~mid 50°F, rain**	**Soil Vapor Sampling Method:**	
Observer:	**Claire Zaccheo, Kristen Meisner**	**Driller :**	ADT

Depth (feet)	PID Reading (ppm)	Soil Samples	GW Monitoring Well Intervals	Soil Description
1 2 3 4 5			Riser (0-101)	0-5: NA
6 7 8 9 10				5-10: NA
11 12 13 14 15				10-15: NA
16 17 18 19 20				15-20: NA
21 22 23 24 25				20-25: NA

TENEN ENVIRONMENTAL

		Boring No.	**MW-1D**
		Sheet 2	**of 5**
Site:	**19 Patchen Ave - Brooklyn, NY**	**Drilling Method:**	Sonic
Date:	**11/29/16**	**Soil Sampling Method:**	Plastic collection bags
Weather:	**~mid 50°F, rain**	**Soil Vapor Sampling Method:**	
Observer:	**Claire Zaccheo, Kristen Meisner**	**Driller :**	ADT

Depth (feet)	PID Reading (ppm)	Soil Samples	GW Monitoring Well Intervals	Soil Description
26			Riser (0-101)	25-30: NA
31				30-35: NA
36				35-40: NA
41				40-45: NA DTW assumed at 45 feet
46				45-50: NA

TENEN ENVIRONMENTAL

		Boring No.	**MW-1D**
		Sheet 3	**of 5**
Site:	**19 Patchen Ave - Brooklyn, NY**	**Drilling Method:**	Sonic
Date:	**11/29/16**	**Soil Sampling Method:**	Plastic collection bags
Weather:	**~mid 50°F, rain**	**Soil Vapor Sampling Method:**	
Observer:	**Claire Zaccheo, Kristen Meisner**	**Driller :**	ADT

Depth (feet)	PID Reading (ppm)	Soil Samples	GW Monitoring Well Intervals	Soil Description
51			Riser (0-101)	50-55: No recovery
52				
53				
54				
55				
56				55-60: No recovery
57				
58				
59				
60				
61				60-65: No recovery
62				
63				
64				
65				
66				65-70: No recovery
67				
68				
69				
70				
71				70-75: No recovery
72				
73				
74				
75				

TENEN ENVIRONMENTAL

		Boring No.	**MW-1D**
		Sheet 4	**of 5**
Site:	**19 Patchen Ave - Brooklyn, NY**	**Drilling Method:**	Sonic
Date:	**11/29/16**	**Soil Sampling Method:**	Plastic collection bags
Weather:	**~mid 50°F, rain**	**Soil Vapor Sampling Method:**	
Observer:	**Claire Zaccheo, Kristen Meisner**	**Driller :**	ADT

Depth (feet)	PID Reading (ppm)	Soil Samples	GW Monitoring Well Intervals	Soil Description
76 77 78 79 80			Riser (0-101)	75-80: No recovery
81 82 83 84 85	0.0			80-85: Medium to coarse grain sand.
86 87 88 89 90	0.0			85-90: SAA
91 92 93 94 95	0.0			90-95: SAA
96 97 98 99 100	0.0			95-100: Medium to coarse grain sand, sandy silt.

TENEN ENVIRONMENTAL

		Boring No.	**MW-1D**
		Sheet 5	**of 5**
Site:	**19 Patchen Ave - Brooklyn, NY**	**Drilling Method:**	Sonic
Date:	**11/29/16**	**Soil Sampling Method:**	Plastic collection bags
Weather:	**~mid 50°F, rain**	**Soil Vapor Sampling Method:**	
Observer:	**Claire Zaccheo, Kristen Meisner**	**Driller :**	ADT

Depth (feet)	PID Reading (ppm)	Soil Samples	GW Monitoring Well Intervals	Soil Description
101 102 103 104 105	0.0	MW-1D (100-105)	Riser Screen(101-106)	100-105: Sandy silt
106 107 108 109 110	0.0	MW-1D (110)		105-110: SAA

Legend:
DTW - Depth to Water
EOB - End of Boring
ft-bg - Feet Below Grade
SAA - Same as Above
PID - Photoionization Detector
NA - Not Analyzed/Collected

TENEN ENVIRONMENTAL

		Boring No.	**P19-MW-2**
		Sheet:	**1 OF 2**
Site:	**19 Patchen Avenue**	**Drilling Method:**	Sonic
Weather:	**Breezy, 70F**	**Driller:**	Joey McGill
Date:	**7/17/15**	**Soil Sampling Method:**	5 ft. Plastic Liner
Observers:	**Claire Zaccheo, Alex Kuhn**		

Depth (feet)	PID Reading (ppm)	Soil Samples	GW Monitoring Well Intervals	Soil Description
1			Riser (0-44)	NA
2				
3				
4				
5				
6	0.4	MW-2(5-8)		5-10: Brown silth with some fine grain sand and cobbles
7				
8				
9	0.0			
10				
11				NA
12				
13				
14				
15				
16				NA
17				
18				
19				
20				
21				NA
22				
23				
24				
25				

TENEN ENVIRONMENTAL

		Boring No.	**P19-MW-2**
		Sheet:	**2 OF 2**
Site:	**19 Patchen Avenue**	**Drilling Method:**	Sonic
Weather:	**Breezy, 70F**	**Driller:**	Joey McGill
Date:	**7/17/15**	**Soil Sampling Method:**	5 ft. Plastic Liner
Observers:	**Claire Zaccheo, Alex Kuhn**		

Depth (feet)	PID Reading (ppm)	Soil Samples	GW Monitoring Well Intervals	Soil Description
26	0			25-30: Brown medium to coarse sand with cobbles
27				
28				
29				
30				
31				NA
32				
33				
34				
35				
36				NA
37				
38				
39				
40				
41	0			40-45: Medium to coarse grain sand with cobbles
42				
43				
44				
45			Screen (44-45)	
46	0.0	MW-1 (45-47)		45-50: SAA.
47				DTW (Wet) at 47 feet.
48				
49				
50				
51				NA
52				
53				
54				
55				

Notes:
DTW - Depth to Water
EOB - End of Boring
ft-bg - Feet Below Grade
SAA - Same as Above
PID - Photoionization Detector
NA - Not Analyzed/Collected

TENEN ENVIRONMENTAL

		Boring No.	**19PMW-3**
		Sheet:	**1 OF 2**
Site:	**BEC Tranche I/19 Patchen Ave**	**Drilling Method:**	Geoprobe
Weather:	**55°F, cloudy**	**Driller:**	ADT
Date:	**5/1/17**	**Soil Sampling Method:**	Acetate Liner
Observers:	**C. Zaccheo, K. Malnati**		

Depth (feet)	PID Reading (ppm)	Soil Samples	GW Monitoring Well Intervals	Soil Description
1 2 3 4 5	0.0		Riser (0-38)	0'-5': Fill (silt and cobble)
6 7 8 9 10	15.0 51.2	 MW-3 (7-10)		5'-7': Fill (silt) 7'-10': Medium grain sand, reddish brown, native
11 12 13 14 15	1.2 3.4			10'-12': Silts with some fine sand 12'-15': Clay, brown
16 17 18 19 20	4.7 2.5 15.4 48.4			15'-20': Reddish brown silt with pebbles and cobbles, dry
21 22 23 24 25	35.6 110			20'-25': Medium to coarse grain sand, dry

TENEN ENVIRONMENTAL

		Boring No.	**19PMW-3**
		Sheet:	**2 OF 2**
Site:	**BEC Tranche I/19 Patchen Ave**	**Drilling Method:**	Geoprobe
Weather:	**55°F, cloudy**	**Driller:**	ADT
Date:	**5/1/17**	**Soil Sampling Method:**	Acetate Liner
Observers:	**C. Zaccheo, K. Malnati**		

Depth (feet)	PID Reading (ppm)	Soil Samples	GW Monitoring Well Intervals	Soil Description
26 27 28 29 30	127.0	MW-3 (25-30)	Riser (0-38)	25'-30': SAA, dry
31 32 33 34 35	101.0			30'-35': Medium to coarse grain sand, cobbles, dry
36 37 38 39 40	10.1			35'-40': Fine to medium grain sand, wet at bottom 40': DTW (Wet)
41 42 43 44 45	4.5	MW-3 (40-42)	Screen (38-48)	40'-45': Coarse grain sand, wet
46 47 48 49 50				NA

Notes:
DTW - Depth to Water
EOB - End of Boring
ft-bg - Feet Below Grade
SAA - Same as Above
PID - Photoionization Detector
NA - Not Analyzed/Collected

TENEN ENVIRONMENTAL

		Boring No.	**19P-SB-7/MW-4**
		Sheet 1	**of 2**
Site:	**19 Patchen Ave - Brooklyn, NY**	**Drilling Method:**	Sonic
Date:	**11/21/16**	**Soil Sampling Method:**	Plastic collection bags
Weather:	**~mid 40°F, windy**	**Soil Vapor Sampling Method:**	
Observer:	**Claire Zaccheo**	**Driller :**	ADT

Depth (feet)	PID Reading (ppm)	Soil Samples	GW Monitoring Well Intervals	Soil Description
1 2 3 4 5	0.0		Riser (0-44)	0-5: NA
6 7 8 9 10	0.0			5-10: Brown silt, some medium grain sand and cobbles
11 12 13 14 15	0.0			10-15: Brown coarse grain sand, some cobbles.
16 17 18 19 20	0.0			15-20: Brown coarse grain sand, some silt, pebbles.
21 22 23 24 25	0.0			20-25: Brown medium to coarse grain sand

TENEN ENVIRONMENTAL

		Boring No.	**19P-SB-7/MW-4**
		Sheet 2	**of 2**
Site:	**19 Patchen Ave - Brooklyn, NY**	**Drilling Method:**	Sonic
Date:	**11/21/16**	**Soil Sampling Method:**	Plastic collection bags
Weather:	**~mid 40°F, windy**	**Soil Vapor Sampling Method:**	
Observer:	**Claire Zaccheo**	**Driller :**	ADT

Depth (feet)	PID Reading (ppm)	Soil Samples	GW Monitoring Well Intervals	Soil Description
26 27 28 29 30	0.0		Riser (0-44)	25-30: Brown medium to coarse grain sand with silt.
31 32 33 34 35				30-35: Brown medium to coarse grain sandy silt to coarse grain sand.
36 37 38 39 40	0.0			35-40: SAA
41 42 43 44 45	0.0			40-45: Coarse grain sand.
46 47		SB-7/MW-4 (45-47)	Screen (44-54)	45: DTW, Wet
48 49 50				45-50: Coarse grain sand, wet.
51 52 53 54 55				

Legend:
DTW - Depth to Water
EOB - End of Boring
ft-bg - Feet Below Grade
SAA - Same as Above
PID - Photoionization Detector

TENEN ENVIRONMENTAL

		Boring No.	**SB-8/MW-5**
		Sheet 1	**of 2**
Site:	**19 Patchen Ave - Brooklyn, NY**	**Drilling Method:**	Sonic
Date:	**11/23/16**	**Soil Sampling Method:**	Plastic collection bags
Weather:	**~mid 40°F, sunny**	**Soil Vapor Sampling Method:**	
Observer:	**Claire Zaccheo, Kristen Meisner**	**Driller :**	ADT

Depth (feet)	PID Reading (ppm)	Soil Samples	GW Monitoring Well Intervals	Soil Description
1 2 3 4 5	0.0		Riser (0-42)	0-5: NA
6 7 8 9 10	0.0			5-10: Reddish brown fine to medium grain sand, silt.
11 12 13 14 15	0.0			10-15: Fine to medium to coarse grain sand, some silt, cobbles.
16 17 18 19 20	0.0			15-20: Coarse grain sand, cobbles.
21 22 23 24 25	0.0			20-25: Light brown, medium to coarse grain sand.

TENEN ENVIRONMENTAL

		Boring No.	**SB-8/MW-5**
		Sheet 2	**of 2**
Site:	**19 Patchen Ave - Brooklyn, NY**	**Drilling Method:**	Sonic
Date:	**11/23/16**	**Soil Sampling Method:**	Plastic collection bags
Weather:	**~mid 40°F, sunny**	**Soil Vapor Sampling Method:**	
Observer:	**Claire Zaccheo, Kristen Meisner**	**Driller :**	ADT

26 27 28 29 30	0.1		Riser (0-42)	25-30: Brown coarse grain sand with cobbles.
31 32 33 34 35	0.0 0.0 0.0 0.8 0.8	19P-SB-8/ MW-5 (33-35)		30-35: Medium to coarse grain sand, some silt, cobbles and pebbles.
36 37 38 39 40	0.0	19P-SB-8/ MW-5 (35-37)		35-40: Coarse grain sand, pebbles.
41 42 43 44 45	0.0			40-45: Brown coarse grain sand, wet. DTW at 44 feet.
46 47 48 49 50			Screen (42-52)	45-50: SAA
51 52 53 54 55				

Legend:
DTW - Depth to Water
EOB - End of Boring
ft-bg - Feet Below Grade
SAA - Same as Above
PID - Photoionization Detector

TENEN ENVIRONMENTAL

		Boring No.	**SB-9/MW-6**
		Sheet 1	**of** 2
Site:	**19 Patchen Ave - Brooklyn, NY**	**Drilling Method:**	Sonic
Date:	**11/22/16**	**Soil Sampling Method:**	Plastic collection bags
Weather:	**~mid 40°F, windy**	**Soil Vapor Sampling Method:**	
Observer:	**Claire Zaccheo, Kristen Meisner**	**Driller :**	ADT

Depth (feet)	PID Reading (ppm)	Soil Samples	GW Monitoring Well Intervals	Soil Description
1 2 3 4 5	0.0		Riser (0-42)	0-5: NA
6 7 8 9 10	0.0			5-10: Brown sandy silt, some pebbles.
11 12 13 14 15	0.0			10-15: Brown fine to medium grain sand, some silt.
16 17 18 19 20	0.0			15-20: SAA, some cobbles and pebbles.
21 22 23 24 25	0.0			20-25: Fine to medium grain sand, some silt.

TENEN ENVIRONMENTAL

		Boring No.	**SB-9/MW-6**
		Sheet 2	**of 2**
Site:	**19 Patchen Ave - Brooklyn, NY**	**Drilling Method:**	Sonic
Date:	**11/22/16**	**Soil Sampling Method:**	Plastic collection bags
Weather:	**~mid 40°F, windy**	**Soil Vapor Sampling Method:**	
Observer:	**Claire Zaccheo, Kristen Meisner**	**Driller :**	ADT

Depth (feet)	PID Reading (ppm)	Soil Samples	GW Monitoring Well Intervals	Soil Description
26	0.1		Riser (0-42)	25-30: SAA
27				
28				
29				
30				
31	0.3			30-35: Silt with coarse grain sand and cobbles.
32				
33	0.7			
34	1.7	SB-9/MW-6 (33-35)		
35				
36		SB-9/MW-6 (35-37)		35-40: SAA
37	0.0			
38				
39				
40				
41				40-45: NA, no recovery.
42	0.0			
43				
44				DTW assumed at 45 feet.
45				
46			Screen (42-52)	45-50: Coarse grain sand, wet.
47				
48				
49				
50				
51				
52				
53				
54				
55				

Legend:
DTW - Depth to Water
EOB - End of Boring
ft-bg - Feet Below Grade
SAA - Same as Above
PID - Photoionization Detector

APPENDIX 6 – QUALITY ASSURANCE PROJECT PLAN

Quality Assurance Project Plan

for
19 Patchen Avenue
Site Management Plan

19 Patchen Avenue – Brooklyn, NY
Block 1618, Lot 8
BCP Site # C224232

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau A
625 Broadway, 12th Floor
Albany, NY 12233-7016

Prepared for:
Hudson BEC II LLC &
19 Patchen GP LLC
826 Broadway, 11th Floor
New York, NY 10003

Prepared by:
TENEN ENVIRONMENTAL
121 West 27th Street, Suite 1004
New York, NY 10001

December 2019

TABLE OF CONTENTS

Appendices

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been developed for the Site Management Plan (SMP) prepared for the 19 Patchen Avenue property (the Site).

The Site, located at 19 Patchen Avenue, is a rectangular parcel of land located at the corner of Patchen Avenue and Van Buren Street in the Bedford Stuyvesant area of Brooklyn.

The Site area is 1,838 square feet (0.0422 acre) with 25 feet of frontage along Patchen Avenue. The Site is occupied by a four-story mixed-use commercial and residential building with a basement. A dry cleaner formerly occupied the ground floor commercial space. The Site is located in Brooklyn Community Board 3 and is generally identified on New York City tax maps as Kings County Block 1618, Lot 8.

1.1 Project Scope and QAPP Objective

The proposed scope of work includes the following:

- collection of groundwater, indoor air and outdoor air samples from soil borings, permanent and temporary monitoring wells and temporary soil vapor points.

The objective of the QAPP is to detail the policies, organization, objectives, functional activities and specific quality assurance/quality control activities designed to achieve the data quality goals or objectives of the SMP. This QAPP addresses how the acquisition and handling of samples and the review and reporting of data will be documented for quality control (QC) purposes. Specifically, this QAPP addresses the following:

- The procedures to be used to collect, preserve, package, and transport samples;
- Field data collection and record keeping;
- Data management;
- Chain-of-custody procedures; and,
- Determination of precision, accuracy, completeness, representativeness, decision rules, comparability and level of quality control effort.

2.0 PROJECT ORGANIZATION

The personnel detailed are responsible for the implementation of the QAPP. Tenen Environmental, LLC (Tenen) will implement the SMP on behalf of Hudson BEC II LLC and 19 Patchen GP LLC (the Participants) once it has been approved by the New York State Department of Environmental Conservation (NYSDEC).

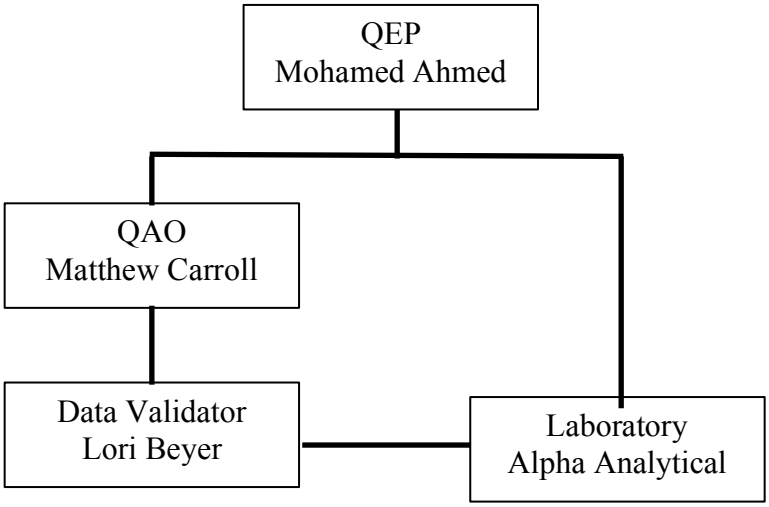
The Project Manager and Qualified Environmental Professional (QEP) will be Mohamed Ahmed, Ph.D., CPG, principal at Tenen. Dr. Ahmed is a certified professional geologist with over 20 years of experience in the New York City metropolitan area. He has designed and implemented subsurface investigations and is proficient in groundwater modeling, design of groundwater treatment systems, and soil remediation. He has managed numerous projects focused on compliance with the requirements of the New York State Brownfield Cleanup Program and spills programs and the New York City E-designation program. Dr. Ahmed also has extensive experience in conducting regulatory negotiations with the New York State Department of Environmental Conservation, the New York City Department of Environmental Protection, the NYC Office of Housing Preservation and Development, and the Mayor's Office of Environmental Remediation. Dr. Ahmed holds advanced degrees in geology and Earth and Environmental Sciences from Brooklyn College and the Graduate Center of the City University of New York; his resume is included in Appendix A.

The Quality Assurance Officer will be Mr. Matthew Carroll, P.E., principal at Tenen. Mr. Carroll is an environmental engineer experienced in all aspects of site assessment and development and implementation of remedial strategies. His experience involves projects from inception through investigation, remediation and closure. His expertise includes soil, soil vapor and groundwater remediation; remedial selection and design; field/health and safety oversight and preparation of work plans and reports to satisfy the requirements of various regulatory agencies. Mr. Carroll received his Bachelor of Engineering from Stevens Institute of Technology and Bachelor of Science in Chemistry from New York University and is a New York State professional engineer; his resume is included in Appendix A.

In addition, Tenen will utilize subcontractors for laboratory services (Alpha Analytical of Westborough, MA) and data validation (L.A.B. Validation Corp. of East Northport, NY). The resume for the DUSR preparer, Ms. Lori Beyer, is included in Appendix A.

Contact Information
Remedial Party (Hudson BEC II LLC and 19 Patchen GP LLC), Max Zarin, 212.777.9500
Tenen Environmental, Mohamed Ahmed or Matthew Carroll, 646.606.2332

An organization chart for the implementation of the Site Characterization Work Plan and QAPP is below.



3.0 SAMPLING AND DECONTAMINATION PROCEDURES

A detailed description of the procedures to be used during this program for collection of the indoor air, outdoor air and groundwater air samples is provided below. Sample locations are described in the SMP. An Analytical Methods/Quality Assurance Summary is provided in Table 1, included in Section 3.9.

3.1 Level of Effort for QC Samples

Field blank, trip blank, field duplicate and matrix spike (MS) / matrix spike duplicate (MSD) samples will be analyzed to assess the quality of the data resulting from the field sampling and analytical programs. Each type of QC sample is discussed below.

- Field and trip blanks consisting of distilled water will be submitted to the analytical laboratories to provide the means to assess the quality of the data resulting from the field-sampling program. Field (equipment) blank samples are analyzed to check for procedural chemical constituents that may cause sample contamination. Trip blanks are used to assess the potential for contamination of samples due to contaminant migration during sample shipment and storage.

- Duplicate samples are analyzed to check for sampling and analytical reproducibility.

- MS/MSD samples provide information about the effect of the sample matrix on the digestion and measurement methodology.

The general level of QC effort will be one field duplicate and one field blank (when non-dedicated equipment is used) for every 20 or fewer investigative samples of a given matrix. Additional sample volume will also be provided to the laboratory to allow one site-specific MS/MSD for every 20 or fewer investigative samples of a given matrix. One trip blank will be included along with each sample delivery group of volatile organic compound (VOC) samples.

The analytical laboratory, Alpha Analytical, is certified under the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) as LabIDs 11148 and 11627. NYSDEC Analytical Services Protocol (ASP) Category B deliverables will be prepared by the laboratory.

3.2 Sample Handling

Samples will either be picked up by the laboratory, delivered to the laboratory in person by the sampler, or transported to the laboratory by overnight courier. All samples will be shipped to the laboratory to arrive within 48 hours after collection, and the laboratory will adhere to the analytical holding times for these analyses, as listed in the current version of the New York State ASP.

3.3 Custody Procedures

Sample custody will be controlled and maintained through the chain-of-custody procedures. The chain of custody is the means by which the possession and handling of samples is tracked from the site to the laboratory. Sample containers will be cleaned and preserved at the laboratory before shipment to the Site. The following sections (Sections 3.4 and 3.5) describe procedures for maintaining sample custody from the time samples are collected to the time they are received by the analytical laboratory.

3.4 Sample Storage

Samples will be stored in secure limited-access areas. Walk-in coolers or refrigerators will be maintained at 4°C, ± 2°C, or as required by the applicable regulatory program. The temperatures of all refrigerated storage areas are monitored and recorded a minimum of once per day. Deviations of temperature from the applicable range require corrective action, including moving samples to another storage location, if necessary.

3.5 Sample Custody

Sample custody is defined by this QAPP as the following:

- The sample is in someone's actual possession;
- The sample is in someone's view after being in his or her physical possession;
- The sample was in someone's possession and then locked, sealed, or secured in a manner that prevents unsuspected tampering; or,
- The sample is placed in a designated and secured area.

Samples will be removed from storage areas by the sample custodian or laboratory personnel and transported to secure laboratory areas for analysis. Access to the laboratory and sample storage areas is restricted to laboratory personnel and escorted visitors only; all areas of the laboratory are therefore considered secure.

Laboratory documentation used to establish chain of custody and sample identification may include the following:

- Field chains of custody or other paperwork that arrives with the sample;
- Laboratory chain of custody;
- Sample labels or tags attached to each sample container;
- Sample custody seals;
- Sample preparation logs (i.e., extraction and digestion information) recorded in hardbound laboratory books, filled out in legible handwriting, and signed and dated by the chemist;
- Sample analysis logs (e.g., metals, GC/MS, etc.) information recorded in hardbound laboratory books that are filled out in legible handwriting, and signed and dated by the chemist;

- Sample storage log (same as the laboratory chain of custody); and,
- Sample disposition log, which documents sample disposal by a contracted waste disposal company.

3.6 Sample Tracking

All samples will be maintained in the appropriate coolers prior to and after analysis. Laboratory analysts will remove and return their samples, as needed. Samples that require internal chain of custody procedures will be relinquished to the analysts by the sample custodians. The analyst and sample custodian will sign the original chain of custody relinquishing custody of the samples from the sample custodian to the analyst. When the samples are returned, the analyst will sign the original chain of custody returning sample custody to the sample custodian. Sample extracts will be relinquished to the instrumentation analysts by the preparatory analysts. Each preparation department will track internal chain of custody through their logbooks/spreadsheets.

Any change in the sample during the time of custody will be noted on the chain of custody (e.g., sample breakage or depletion).

3.7 Groundwater Sampling

Prior to sample collection, static water levels will be measured and recorded from monitoring wells MW-1, MW-2, MW-4 and MW-5. Monitoring wells will also be gauged for the presence of non-aqueous phase liquid (NAPL). In the event that NAPL is detected, Tenen will record the thickness and will not collect a sample. If NAPL is not detected, Tenen will purge and sample monitoring wells using low-flow/minimal drawdown purge and sample collection procedures (bladder pump system). Prior to sample collection, groundwater will be evacuated from each well at a low-flow rate (typically less than 0.1 L/min). Field measurements for pH, temperature, turbidity, dissolved oxygen, specific conductance, oxidation-reduction potential and water level, as well as visual and olfactory field observations, will be periodically recorded and monitored for stabilization. Purging will be considered complete when pH, specific conductivity, dissolved oxygen and temperature stabilize and when turbidity measurements fall below 50 Nephelometric Turbidity Units (NTU) or become stable above 50 NTU.

Stability is defined as variation between field measurements of 10 percent or less and no overall upward or downward trend in the measurements. Upon stabilization of field parameters, groundwater samples will be collected and analyzed as discussed below.

Wells will be purged and sampled using dedicated pump tubing following low-flow/minimal drawdown purge and sample collection procedures, as described above. The pump and bladder will be decontaminated between samples.

Groundwater samples will be collected for VOC analysis through dedicated tubing. Prior to, and immediately following collection of groundwater samples, field measurements for pH, specific conductance, temperature, dissolved oxygen, turbidity and depth-to-water, as well as visual and olfactory field observations will be recorded. All collected groundwater samples will be placed

in pre-cleaned, pre-preserved laboratory provided sample bottles, cooled to 4°C in the field, and transported under chain-of-custody command to the designated laboratory for analysis.

All groundwater samples will be analyzed for Target Compound List (TCL) volatile organic compounds (VOCs). A Category B data package will be provided.

3.8 Indoor Air and Outdoor Air Sampling

Indoor air and outdoor air samples will be collected in accordance with the NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, dated October 2006. Indoor air samples will be collected from all residential units and the former dry cleaner space.

A sample log sheet will be maintained summarizing sample identification, date and time of sample collection, sampling depth, identity of samplers, sampling methods and devices, soil vapor purge volumes, volume of the soil vapor extracted, vacuum of canisters before and after the samples are collected, apparent moisture content of the sampling zone and chain of custody

Indoor air samples will be collected in laboratory-supplied six-liter Summa canisters using 24-hour regulators. One outdoor air sample will be collected in laboratory-supplied six-liter canisters using 24-hour regulators during soil vapor sample collection. All indoor air and outdoor air samples will be analyzed for VOCs using EPA Method TO-15.

3.9 Analytical Methods/Quality Assurance Summary Table

A summary of the analytical methods and quality assurance methods are included in Table 1, below.

Table 1
Analytical Methods/Quality Assurance Summary

Matrix	Proposed Samples	QA/QC Samples				Total # Samples	Analytical Parameter	Method	Preservative	Holding Time	Container
		TB	FB	DUP	MS/MSD						
Groundwater	5	1	1	1	2	10	VOCs	8260	Cool to 4°C, pH<2 with HCl	14 days	(3) 40 mL clear glass vials
Indoor Air	9	No QA/QC samples				9	VOCs	TO-15	None	30 days	6 L Summa
Outdoor Air	1					1			None		6 L Summa

TB – Trip Blank
FB – Field Blank
DUP – Duplicate
°C – degrees Celsius
mL – milliliter
L – liter

3.10 Decontamination

Where possible, samples will be collected using new, dedicated sampling equipment so that decontamination is not required. All non-dedicated sampling equipment will also have a final rinse with deionized water. Decontamination water will be collected and disposed as investigation-derived waste (IDW).

3.11 Data Review and Reporting

The NYSDEC ASP Category B data package will be validated by an independent data validation subconsultant and a DUSR summarizing the results of the data validation process will be prepared. All reported analytical results will be qualified as necessary by the data validation and will be reviewed and compared against background concentrations and/or applicable New York State criteria:

Groundwater – Class GA groundwater standards and guidance values for groundwater as listed in NYSDEC Technical and Operations Guidance Series (TOGS) 1.1.1; and,
Indoor Air – NYSDOH Air Guidance Values (AGVs), as applicable, and ambient air sample results.

A Periodic Review Report documenting the sampling will be prepared, and will describe Site conditions and document applicable observations made during the sample collection. In addition, the report will include a description of the sampling procedures, tabulated sample results and an assessment of the data and conclusions. The laboratory data packages, DUSR and field notes will be included in the report as appendices. All data will also be submitted electronically to NYSDEC via the Environmental Information Management System (EIMS) in EqUIS format.

Appendix A

Resumes

Matthew Carroll, P.E.
Environmental Engineer/Principal

Experience Summary

Matthew Carroll is an environmental engineer experienced in all aspects of site assessment and development and implementation of remedial strategies. He has managed projects from inception through investigation, remediation and closure. His expertise includes soil, soil gas, and groundwater remediation, preparation of cost estimates, remedial alternative selection and design, soil characterization for disposal, field safety oversight, and preparation of work plans and reports to satisfy New York and New Jersey state requirements, and New York City "e" designation and restrictive declarations. Mr. Carroll's project management experience includes past management of a New York City School Construction Authority hazardous materials contract. He is responsible for all engineering work performed by Tenen and is currently the project manager and remedial engineer for several New York State Brownfield Cleanup Program sites.

Selected Project Experience

470 Kent Avenue, Brooklyn
As project manager, supported the client in due diligence and transactional activities, including a Phase I ESA, preliminary site investigation, and remedial cost estimate; preparation of BCP application and remedial investigation work plan. The former manufactured gas plant, sugar refinery and lumberyard will be developed as a mixed-use project with market rate and affordable housing and public waterfront access. As remedial engineer, will be responsible for development of remedial alternatives and oversight and certification of all remedial activities.

500 Exterior Street, Bronx
Designed and implemented the investigation of this former lumberyard and auto repair shop that will be redeveloped as mixed use development with an affordable housing component; prepared BCP application and subsequent work plans and reports. Designed a remedial strategy incorporating both interim remedial measures (IRMs) and remediation during the development phase.

Gateway Elton I and II, Brooklyn
Conducted soil disposal characterization, prepared Remedial Action Work Plans and designed methane mitigation systems for two phases of a nine-building residential development and commercial space; prepared and oversaw implementation of a Stormwater Pollution Prevention Plan during construction and prepared and certified the remedial closure reports for the project.

Affordable Housing Development, Rye, NY
Consultant to the City of Rye on environmental issues pertaining to a county-owned development site slated for an afford senior housing; reviewed environmental documentation for the project and prepared summary memorandum for City Council review; recommended engineering controls to address potential exposure to petroleum constituents, presented report findings at public meetings and currently providing ongoing environmental support during project implementation.

Queens West Development BCP Site, Long Island City, New York
Assistant Project Manager for two developers involved in the site.

- Responsible for oversight of remediation under the New York State Brownfield Cleanup Program
- Technical review of work plans and reports and coordination of the Applicant's investigation and oversight efforts
- Provided input for mass calculations and well placement for an in-situ oxidation remedy implemented on a proposed development parcel and within a City street
- Conducted technical review of work pertaining to a former refinery. Documents reviewed included work plans for characterization and contaminant delineation; pilot test (chemical oxidation); remediation (excavation and groundwater treatment). Managed field personnel conducting full time oversight and prepared progress summaries for distribution to project team
- Following implementation of remedial action, implemented the Site Management Plan and installation/design of engineering controls (SSDS, vapor barrier/concrete slab, NAPL recovery). Also responsible for coordination with NYSDEC

Brownfield Cleanup Program Redevelopment Sites – West Side, New York City
Managed remediation of a development consisting of four parcels being addressed under one or more State and city regulatory programs (NYS Brownfield Cleanup Program, NYS Spills, and NYC "e" designation program). Remediation includes soil removal, screening and disposal; treatment of groundwater during construction dewatering and implementation of a worker health and safety plan and community air monitoring plan (HASP/CAMP)

Managed an additional BCP site, supported the Applicant in coordination with MTA to create station access for the planned No. 7 subway extension; also provided support the client in coordination with Amtrak to obtain access for remedial activities on the portion of the site that is within an Amtrak easement. The site will eventually be used for construction of a mixed-use high-rise building.

BCP Site, Downtown Brooklyn, New York
Performed investigation on off-site properties and designed an SSDS for an adjacent building, retrofitting the system within the constraints of the existing structure; coordinated the installation of the indoor HVAC controls and vapor barrier; provided input to the design of a SVE system to address soil vapor issues on the site.

West Chelsea Brownfield Cleanup Program Site
Designed an in-situ remediation program and sub-slab depressurization system to address contamination remaining under the High Line Viaduct; SSDS design included specification of sub-grade components, fan modeling and selection, identifying exhaust location within building constraints and performance modeling; prepared the Operations Maintenance and Monitoring Plan and Site Management Plan sections pertaining to the SSDS.

Historic Creosote Spill Remediation – Queens, New York – New York State Voluntary Cleanup Program
Modeled contamination volume and extent and prepared mass estimates of historic fill constituents and creosote-related contamination; designed a soil vapor extraction (SVE) and dewatering system to address historic creosote release both above and below static

water table; coordinated with the Metropolitan Transit Authority and prepared drawings to secure approval to drill in the area of MTA subway tunnels.

NYSDEC Spill Site– Far West Side, Manhattan
Provided support to client during negotiations with a major oil company regarding allocation of remedial costs. Worked with client's attorney to develop a regulatory strategy to address the client's obligations under the NYSDEC Spills Program and the New York City "e" designation requirements.

Affordable Housing Site, Brooklyn, New York
Modified prior work plans for soil, soil vapor and groundwater investigation to address requirements for site entry into the New York City Brownfield Cleanup Program. Prepared technical basis for use of prior data previously disallowed by OER. Currently conducting site investigation.

New York City School Construction Authority Hazardous Materials Contract
Provided work scopes and cost estimates, managed and implemented concurrent projects, including Phase I site assessments, Phase II soil, groundwater and soil gas investigations, review of contractor bid documents, preparation of SEQR documents, specifications and field oversight for above- and underground storage tank removal, and emergency response and spill control.

Former Manufacturing Facility, Hoboken, New Jersey
Evaluated site investigation data to support a revision of the current property use to unrestricted; modified the John & Ettinger vapor intrusion model to apply the model to a site-specific, mixed use commercial/residential development; implemented a Remedial Action Work Plan that included the characterization, removal and separation of 9,500 cubic yards of historic fill; designed and implemented a groundwater characterization/delineation program using a real-time Triad approach; designed and implemented an innovative chemical oxidation technology for the property.

F**ormer Varnish Manufacturer – Newark, New Jersey**
Prepared a Phase I environmental site assessment; implemented soil and groundwater sampling to assess presence of petroleum and chlorinated compounds; prepared alternate cost remediation scenarios for settlement purposes and implemented a groundwater investigation plan, including pump tests and piezometer installation to assess the effect of subsurface utilities and unique drainage pathways upon contaminant transport.

Education and Certifications

Professional Engineer, New York
Bachelor of Engineering, Environmental; Stevens Institute of Technology, 2002
Bachelor of Science, Chemistry, New York University, 2002
Technical and Regulatory Training in Underground Storage Tanks, Cook College, Rutgers University, 2006

Mohamed Ahmed, Ph.D., C.P.G.
Sr. Geologist/Principal

Experience Summary

Mohamed Ahmed is a certified professional geologist with nearly 23 years of experience in the New York City metropolitan area. He has designed and implemented subsurface investigations and is proficient in groundwater modeling, design of groundwater treatment systems and soil remediation. He has managed numerous projects focused on compliance with the New York State Brownfield Cleanup and Spills programs and the New York City "e" designation program. Dr. Ahmed also has extensive experience in conducting regulatory negotiations with the New York State Department of Environmental Conservation, the NYC Office of Housing Preservation and Development, and the Mayor's Office of Environmental Remediation.

Selected Project Experience

Willoughby Square, Downtown Brooklyn
As Project Manager, directs all regulatory interaction and investigation on this joint public-private sector redevelopment that will include a public park and four-level underground parking garage. Prepared the remedial investigation work plan and remedial action work plan, conducted investigation activities and waste characterization, and negotiated with the NYC Department of Environmental Protection and the Mayor's Office of Environmental Remediation to transition the site into the NYC Voluntary Cleanup Program.

School Facility, Borough Park, Brooklyn
Managed all regulatory agency coordination, work plan and report preparation and remedial oversight; worked with OER to determine measures to retroactively address the hazardous materials and air quality E-designations on a previously constructed school building and prepared supporting documentation to justify the use of electrical units rather than natural gas.

LGA Hotel Site, East Elmhurst, Queens
Project manager for all work conducted at this former gasoline service station which is being remediated under the NYS Brownfield Cleanup Program; technical oversight of work plans, reports, and design and implementation of field and soil disposal characterization.

436 10th Avenue, Manhattan
As project manager and technical lead, assisted client in developing remedial cost estimates used for property transaction, developed regulatory strategy to address NYS Spills and NYC E-designation requirements, and currently overseeing remedial activities which include removal and disposal of petroleum-contaminated bedrock and dewatering and disposal of impacted groundwater.

Brownfield Cleanup Program Site, Downtown Brooklyn
Managed investigation and remediation under the BCP program for a proposed mixed-use development; designed the remedial investigation and prepared the remedial action work plan which includes an SVE system monitored natural attenuation. Prepared remedial cost

estimates for several scenarios. The project will include a 53-story mixed-use structure and parking garage.

Queens West Development, Long Island City
Directed project team and subcontractors for soil investigation/remediation studies on multiple properties; provided technical support for negotiations with NYSDEC during investigation and remediation.

Former Creosote Site, Long Island City
Designed and implemented a complex investigation to assess the nature and extent of historic creosote contamination at this former industrial site; conducted studies to optimize recovery of LNAPL and DNAPL and developed strategies using bioremediation and natural attenuation in conjunction with conventional remedial approaches. Performed pilot tests for soil vapor extraction system design and coordinated with NYSDEC and NYSDOH to implement sub-slab soil vapor sampling.

NYSDEC Spill Site – Far West Side, Manhattan
Developed a detailed remedial cost estimate for to support client negotiations with a major oil company. The estimate included costs pertaining to: chipping, removal and disposal of petroleum-impacted bedrock; removal/disposal of recycled concrete; costs for dewatering and disposal of impacted groundwater during construction; and design and installation of a vapor barrier below the redevelopment.

Active Industrial Facility, Newburgh, New York
Designed remedial investigation of soil and groundwater contaminated with trichloroethane; performed soil vapor pilot test and pump test to aid in design of soil and groundwater remediation alternatives; conducted sub-slab vapor sampling in accordance with NYSDOH guidance.

Former Dry Cleaning Facility, New York City
Conducted soil and groundwater investigations, designed and installed a soil vapor extraction system and performed extensive testing of indoor air. Negotiated the scope of the RI and IRM with NYSDEC.

Waterfront Redevelopment, Yonkers, NY
Designed and performed geophysics survey of six parcels to determine locations of subsurface features; supervised test pit excavation to confirm geophysics results and evaluate and classify soil conditions prior to development activities.

Prince's Point, Staten Island, New York
Performed soil, groundwater and sediment sampling to delineate the extent of contamination; used field-screening techniques to control analytical costs and supervised soil excavation and disposal.

Apartment Complex, New York City, New York
Coordinated with Con Edison, the owner of the adjacent property and NYSDEC to determine oil recovery protocol; assessed hydrogeological conditions and conducted pilot tests to design cost-effective recovery system; designed and supervised installation of recovery system.

Publications

"Impact of Toxic Waste Dumping on the Submarine Environment: A Case Study from the New York Bight". Northeastern Geology and Environmental Sciences, V. 21, No. 12, p. 102-120. (With G. Friedman)

Metals Fluxes Across the Water/Sediment Interface and the Influence of pH. Northeastern Geology and Environmental Sciences, in press. (With G. Friedman)

"Water and Organic Waste Near Dumping Ground in the New York Bight". International Journal of Coal Geology, volume 43. (With G. Friedman)

Education and Certifications

Ph.D., Earth and Environmental Sciences, Graduate Center of the City of New York (2001)
M.Ph., Earth and Environmental Sciences, City University of New York (1998)
M.A. Geology, Brooklyn College (1993)
B.S. Geology, Alexandria University, Egypt (1982)

American Institute of Professional Geologists, Certified Professional Geologist, 1997-2015

L.A.B. Validation Corp., 14 West Point Drive, East Northport, New York 11731

Lori A. Beyer

SUMMARY: General Manager/Laboratory Director with a solid technical background combined with Management experience in environmental testing industry. Outstanding organizational, leadership, communication and technical skills. Customer focused, quality oriented professional with consistently high marks in customer/employee satisfaction.

EXPERIENCE:

1998-Present L.A.B. Validation Corporation, 14 West Point Drive, East Northport, NY
President
- Perform Data Validation activities relating to laboratory generated Organic and Inorganic Environmental Data.

1998-Present American Analytical Laboratories, LLC. 56 Toledo Street, Farmingdale, NY
Laboratory Director/Technical Director
- Plan, direct and control the operation, development and implementation of programs for the entire laboratory in order to meet AAL's financial and operational performance standards.
- Ensures that all operations are in compliance with AAL's QA manual and other appropriate regulatory requirements.
- Actively maintains a safe and healthy working environmental that is demanded by local laws/regulations.
- Monitors and manages group's performance with respect to data quality, on time delivery, safety, analyst development/goal achievement and any other key performance indices.
- Reviews work for accuracy and completeness prior to release of results to customers.

1996-1998 Nytest Environmental, Inc. (NEI) Port Washington, New York
General Manager
- Responsible for controlling the operation of an 18,000 square foot facility to meet NEI's financial and operational performance standards.
- Management of 65 FTEs including Sales and Operations
- Ensure that all operations are in compliance with NEI's QA procedures
- Ensures that productivity indicators, staffing levels and other cost factors are held within established guidelines
- Maintains a quantified model of laboratory's capacity and uses this model as the basis for controlling the flow of work into and through the lab so as to ensure that customer requirements and lab's revenue and contribution targets are achieved.

1994-1996 Nytest Environmental, Inc. (NEI) Port Washington, New York
Technical Project Manager
- Responsible for the coordination and implementation of environmental testing programs requirements between NEI and their customers
- Supervise Customer Service Department
- Assist in the development of major proposals
- Complete management of all Federal and State Contracts and assigned commercial contracts
- Provide technical assistance to the customer, including data validation and interpretation
- Review and Implement Project specific QAPP's.

1995-1996 Nytest Environmental, Inc. (NEI) Port Washington, New York
Corporate QA/QC Officer
- Responsible for the implementation of QA practices as required in the NJDEP and EPA Contracts
- Primary contact for NJDEP QA/QC issues including SOP preparation, review and approval
- Responsible for review, verification and adherence to the Contract requirements and NEI QA Plan

1992-1994 Nytest Environmental, Inc. (NEI) Port Washington, New York
Data Review Manager
- Responsible for the accurate compilation, review and delivery of analytical data to the company's customers. Directly and effectively supervised a department of 22 personnel.
- Managed activities of the data processing software including method development, form creation, and production
- Implement new protocol requirements for report and data management formats
- Maintained control of data storage/archival areas as EPA/CLP document control officer

1987-1991 Nytest Environmental, Inc. (NEI) Port Washington, New York
Data Review Specialist
- Responsible for the review of GC, GC/MS, Metals and Wet Chemistry data in accordance with regulatory requirements
- Proficient with USEPA, NYSDEC, NJDEP and NEESA requirements
- Review data generated in accordance with SW846, NYSDEC ASP, EPA/CLP and 40 CFR Methodologies

1986-1987 Nytest Environmental, Inc (NEI) Port Washington, New York
GC/MS VOA Analyst

EDUCATION:

1982-1985 State University of New York at Stony Brook, New York; BS Biology/Biochemistry
1981-1982 University of Delaware; Biology/Chemistry
5/91 Rutgers University; Mass Spectral Data Interpretation Course, GC/MS Training
8/92 Westchester Community College; Organic Data Validation Course
9/93 Westchester Community College; Inorganic Data Validation Course

Westchester Community College

Professional Development Center

Awards this Certificate of Achievement To

LORI BEYER

for Successfully Completing

ORGANIC DATA VALIDATION COURSE (35 HOURS)

Dr. John Samuelian

Date AUGUST 1992

Assistant Dean
Professional Development Center

President

The Professional Development Center

SUNY
WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York 10595

Westchester Community College
Professional Development Center

Awards this Certificate of Achievement To

LORI BEYER

for Successfully Completing

INORGANIC DATA VALIDATION

Instructor: Dale Boshart

Date MARCH 1993

Assistant Dean
Professional Development Center

President

The Professional Development Center

SUNY
WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York 10595

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

Thomas C. Jorling
Commissioner

July 8, 1992

Ms. Elaine Sall
Program Coordinator
Westchester Community College
Valhalla, NY 10595-1698

Dear Elaine,

Thank you for your letter of June 29, 1992. I have reviewed the course outline for organic data validation, qualifications for teachers and qualifications for students. The course that you propose to offer would be deemed equivalent to that which is offered by EPA. The individuals who successfully complete the course and pass the final written exam would be acceptable to perform the task of organic data validation for the Department of Environmental Conservation, Division of Hazardous Waste Remediation.

As we have discussed in our conversation of July 7, 1992, you will forward to me prior to the August course deadline, the differences between the EPA SOW/90 and the NYSDEC ASP 12/91. You stated these differences will be compiled by Mr. John Samulian.

I strongly encourage you to offer an inorganic data validation course. I anticipate the same list of candidates would be interested in an inorganic validation course as well, since most of the data to be validated consists of both organic and inorganic data.

Thank you for you efforts and please contact me if I can be of any further assistance.

Sincerely,

Maureen P. Serafini

Maureen P. Serafini
Environmental Chemist II
Division of Hazardous Waste
Remediation

The Professional
Development Center
AT
WESTCHESTER COMMUNITY COLLEGE

914 285-6619

October 2, 1992

Ms. Lori Beyer
3 sparkill Drive
East Northport, NY 11731

Dear Ms. Beyer:

Congratulations upon successful completion of the Organic Data Validation course held August 17 - 21, 1992, through Westchester Community College, Professional Development Center. This course has been deemed by New York State Department of Environmental Conservation as equivalent to EPA's Organic Data Validation Course.

Enclosed is your Certificate. Holders of this Certificate are deemed competent to perform organic data validation for the New York State DEC Division of Hazardous Waste Remediation.

The Professional Development Center at Westchester Community College plans to continue to offer courses and seminars which will be valuable to environmental engineers, chemists and related personnel. Current plans include a TCLP seminar on November 17th and a conference on Environmental Monitoring Regulations on November 18th.

We look forward to seeing you again soon at another environmental program or event. Again, congratulations.

Very truly yours,

Passing Grade is 70%
Your Grade is 99%

Elaine Sall
Program Coordinator

ES/bf

SUNY
WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York 10595

The Professional
Development Center
AT
WESTCHESTER COMMUNITY COLLEGE

914 285-6619

June 21, 1993

Dear Ms. Beyer:

Enclosed is your graded final examination in the Inorganic Data Validation course you completed this past March. A score of 70% was required in order to receive a certificate of satisfactory completion. Persons holding this certificate are deemed acceptable to perform Inorganic Data Validation for the New York State Department of Environmental Conservation, Division of Hazardous Waste Remediation.

I am also enclosing a course evaluation for you to complete if you have not already done so. The information you provide will greatly aid us in structuring further courses. We wish to make these course offerings as relevant, targeted and comprehensive as possible. Your evaluation is vital to that end.

Congratulations on your achievement. I look forward to seeing you again at another professional conference or course. We will be co-sponsoring an environmental monitoring conference on October 21, 1993 with the New York Water Pollution Control Association, Lower Hudson Chapter, at IBM's Yorktown Heights, NY site. Information regarding this event will be going out in August.

Very truly yours,

Elaine Sall

Elaine Sall
Program Coordinator

ES/bf

Enclosures

SUNY
WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York 10595

APPENDIX 7 – HEALTH AND SAFETY PLAN

Health and Safety Plan

for
19 Patchen Avenue
Site Management Plan

19 Patchen Avenue,
Brooklyn, New York 11221
BCP Site # C224232

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau A
625 Broadway, 12th Floor
Albany, NY 12233-7016

Prepared for:
Hudson BEC II LLC &
19 Patchen GP LLC
826 Broadway, 11th Floor
New York, NY 10003

Prepared by:
TENEN ENVIRONMENTAL
121 West 27th Street, Suite 702
New York, NY 10001

December 2019

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1.0 INTRODUCTION

This Health and Safety Plan (HASP) has been prepared in conformance with the Occupational Safety and Health Administration (OSHA) standards and guidance that govern site investigation activities, other applicable regulations, and Tenen Environmental LLC (Tenen) health and safety policies and procedures. The purpose of this HASP is the protection of Tenen field personnel and others during the implementation of the Site Management Plan (SMP).

The Site, located at 19 Patchen Avenue, is a rectangular parcel of land located at the corner of Patchen Avenue and Van Buren Street in the Bedford Stuyvesant area of Brooklyn.

The Site area is 1,838 square feet (0.0422 acre) with 25 feet of frontage along Patchen Avenue. The Site is occupied by a four-story mixed-use commercial and residential building with a basement. An active dry cleaner occupies the ground floor commercial space. The current operator is Rodriguez Dry Cleaners (NYSDEC Dry Cleaning Facility #2-6104-01058). The Site is located in Brooklyn Community Board 3 and is generally identified on New York City tax maps as Kings County Block 1618, Lot 8.

1.1 Scope of HASP

This HASP includes safety procedures to be used by Tenen staff during the following activities:

- Collection of groundwater samples;
- Collection of indoor air and outdoor air samples.

Subcontractors will ensure that performance of the work is in compliance with this HASP and applicable laws and regulations.

2.0 PROJECT SAFETY AUTHORITY

The following personnel are responsible for project health and safety under this HASP.

- Project Manager, Matthew Carroll
- Health and Safety Officer (HSO), Mohamed Ahmed

In addition, each individual working at the Site will be responsible for compliance with this HASP and general safe working practices. All Site workers will have the authority to stop work if a potentially hazardous situation or event is observed.

2.1 Designated Personnel

The Project Manager is responsible for the overall operation of the project, including compliance with the HASP and general safe work practices. The Project Manager may also act as the Health and Safety Officer (HSO) for this project.

Tenen will appoint one of its on-site personnel as the on-site HSO. This individual will be responsible for the implementation of the HASP. The HSO will have a 4-year college degree in occupational safety or a related science/engineering field, and at least two (2) years of experience in implementation of air monitoring and hazardous materials sampling programs. The HSO will have completed a 40-hour training course that meets OSHA requirements of 29 CFR Part 1910, Occupational Safety and Health Standards.

The HSO will be present on-site during all field operations involving drilling or other subsurface disturbance, and will be responsible for all health and safety activities and the delegation of duties to the field crew. The HSO has stop-work authorization, which he/she will execute on his/her determination of an imminent safety hazard, emergency situation, or other potentially dangerous situation. If the HSO must be absent from the field, a replacement who is familiar with the Construction Health and Safety Plan, air monitoring and personnel protective equipment (PPE) will be designated.

3.0 HAZARD ASSESSMENT AND CONTROL MEASURES

Known previous and current uses of the site include operations that used chlorinated solvents.

A Remedial Investigation Report (RIR) dated October 2019, was prepared by Tenen Environmental LLC (Tenen).

The investigation consisted of installation of soil borings and collection of soil samples, installation and sampling of groundwater monitoring wells, installation and sampling of soil vapor points and sampling of indoor and ambient air. Based on the results of the RI and previous investigations, the following summary has been prepared:

Site History

- A dry cleaning facility operated at the Site since at least 1960. The current operator is Rodriguez Dry Cleaners (NYSDEC Dry Cleaning Facility #2-6104-01058).

Geology/Hydrogeology

- Shallow historic fill material (sands mixed with cobbles and brick) is present to depths of approximately 13.5 feet below grade (ft-bg). The fill material is underlain by native silts and sands that extend to approximately 200 ft-bg and are underlain by Gardiners Clay and an unnamed Raritan Formation clay layer. A tighter, sandy silt layer was encountered at approximately 100 ft-bg. The approximate depth to bedrock is 350 ft-bg.
- Groundwater was encountered at depths of 43 to 45 ft-bg and flows in a northwesterly direction.

Chlorinated Solvents

- Tetrachloroethene (PCE) was not detected in soil above the Unrestricted Use soil cleanup objectives (SCOs).
- PCE was detected in all shallow groundwater wells, at concentrations ranging from 12 to 26 micrograms per liter (ug/L), above the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Class GA Ambient Water Quality Standards and Guidance Values (AWQS) of 5 ug/L. PCE was not detected above the AWQS in the deep well. No other chlorinated volatile organic compounds (cVOCs) were detected above the AWQSs.
- Elevated concentrations of PCE were detected on-site in sub-slab soil vapor [max: 1,880 micrograms per cubic meter (ug/m3)] and in the corresponding indoor air sample (882 ug/m3). The New York State Department of Health (NYSDOH) Decision Matrix action for PCE at the Site is Mitigate.
- PCE and trichloroethene (TCE) were both detected in the indoor air sample collected from the basement at concentrations above the NYSDOH Air Guidance Values (AGVs).
- The NYSDOH Decision Matrix action for TCE and cis-1,2-dichloroethene (cis-1,2-DCE) is Monitor.
- PCE (max: 557 ug/m3) and TCE (max: 14.6 ug/m3) were detected in off-site soil vapor locations.
- Elevated concentrations of PCE were detected in on-site indoor air samples (max: 5,400 ug/m3) and in the ambient air samples (max: 1,550 ug/m3). The detected concentrations in both indoor air and ambient air are above the NYSDOH AGVs.

Historic Fill-Related Impacts

- Polyaromatic hydrocarbons (PAHs) and metals, including barium, lead, mercury and zinc, were detected in shallow fill material above the Unrestricted Use SCOs in samples collected from the rear yard of the Site. These concentrations are delineated to below the Unrestricted Use SCOs at two ft-bg.

Other Organic Impacts

- Bis(2-ethylhexyl)phthalate was detected in a shallow well above the AWQS. 2-Butanone was detected in the deep well above the AWQS.

3.1 Human Exposure Pathways

The media of concern at the Site include potentially-impacted soil, groundwater indoor air and soil vapor. Potential exposure pathways include dermal contact, incidental ingestion and inhalation of vapors. The risk of dermal contact and incidental ingestion will be minimized through general safe work practices, a personal hygiene program and the use of PPE. The risk of inhalation will be minimized through the use of an air monitoring program for VOCs and particulates.

3.2 Chemical Hazards

Based on historic uses, the following contaminants of concern are present in media that will be encountered during the implementation of the SMP:

Chlorinated Solvents

- Tetrachloroethylene (PCE)
- Trichloroethene (TCE)
- Cis-1,2-Dichloroehtene (cis-1,2-DCE)

Material Safety Data Sheets (MSDSs) for each contaminant of concern are included in Appendix C. All personnel are required to review the MSDSs included in this HASP.

3.3 Physical Hazards

The physical hazards associated with the field activities likely present a greater risk of injury than the chemical constituents at the Site. Activities within the scope of this project shall comply with New York State and Federal OSHA construction safety standards.

Head Trauma

To minimize the potential for head injuries, field personnel will be required to wear National Institutes of Occupational Safety and Health (NIOSH)-approved hard hats during field activities. Hats must be worn properly and not altered in any way that would decrease the degree of protection provided.

Foot Trauma

To avoid foot injuries, field personnel will be required to wear steel-toed safety shoes while field activities are being performed. To afford maximum protection, all safety shoes must meet

American National Standards Institute (ANSI) standards.

Eye Trauma
Field personnel will be required to wear eye protection (safety glasses with side shields) while field activities are being performed to prevent eye injuries caused by contact with chemical or physical agents.

Noise Exposure
Field personnel will be required to wear hearing protection (ear plugs or muffs) in high noise areas (noise from heavy equipment) while field activities are being performed.

Buried Utilities and Overhead Power Lines
Boring locations will be cleared by an underground utility locator service. In addition, prior to intrusive activities, the drilling subcontractor will contact the One Call Center to arrange for a utility mark-out, in accordance with New York State requirements. Protection from overhead power lines will be accomplished by maintaining safe distances of at least 15 feet at all times.

Thermal Stress
The effects of ambient temperature can cause physical discomfort, personal injury, and increase the probability of accidents. In addition, heat stress due to lack of body ventilation caused by protective clothing is an important consideration. Heat-related illnesses commonly consist of heat stroke and heat exhaustion.

The symptoms of heat stroke include: sudden onset; change in behavior; confusion; dry, hot and flushed skin; dilated pupils; fast pulse rate; body temperature reaching 105° or more; and/or, deep breathing later followed by shallow breathing.

The symptoms of heat exhaustion include: weak pulse; general weakness and fatigue; rapid shallow breathing; cold, pale and clammy skin; nausea or headache; profuse perspiration; unconsciousness; and/or, appearance of having fainted.

Heat-stress monitoring will be conducted if air temperatures exceed 70 degrees Fahrenheit. The initial work period will be set at 2 hours. Each worker will check his/her pulse at the wrist for 30 seconds early in each rest period. If the pulse rate exceeds 110 beats per minute, the next work period will be shortened by one-third.

One or more of the following precautions will reduce the risk of heat stress on the Site:

- Provide plenty of liquids to replace lost body fluids; water, electrolytic drinks, or both will be made available to minimize the risk of dehydration and heat stress
- Establish a work schedule that will provide appropriate rest periods
- Establish work regimens consistent with the American Conference of Governmental Industrial Hygienists (ACGIH) guidelines
- Provide adequate employee training on the causes of heat stress and preventive measures

In the highly unlikely event of extreme low temperatures, reasonable precautions will be made to avoid risks associated with low temperature exposure.

Traffic

Field activities will occur near public roadways. As a result, vehicular traffic will be a potential hazard during these activities and control of these areas will be established using barricades or traffic cones. Additional staff will be assigned, as warranted, for the sole purpose of coordinating traffic. Personnel will also be required to wear high-visibility traffic vests while working in the vicinity of the public roadways and local requirements for lane closure will be observed as needed. All work in public rights-of-way will be coordinated with local authorities and will adhere to their requirements for working in traffic zones.

Hazardous Weather Conditions

All Site workers will be made aware of hazardous weather conditions, specifically including extreme heat, and will be requested to take the precautions described herein to avoid adverse health risks. All workers are encouraged to take reasonable, common sense precautions to avoid potential injury associated with possible rain or high wind, sleet, snow or freezing.

Slip, Trip and Fall

Areas at the Site may be slippery from mud or water. Care should be taken by all Site workers to avoid slip, trip, and fall hazards. Workers shall not enter areas that do not have adequate lighting. Additional portable lighting will be provided at the discretion of the HSO.

Biological Hazards

Drugs and alcohol are prohibited from the Site. Any on-site personnel violating this requirement will be immediately expelled from the site.

Any worker or oversight personnel with a medical condition that may require attention must inform the HSO of such condition. The HSO will describe appropriate measures to be taken if the individual should become symptomatic.

Due to the Site location in an urban area, it is highly unlikely that poisonous snakes, spiders, plants and insects will be encountered. However, other animals (dogs, cats, etc.) may be encountered and care should be taken to avoid contact.

4.0 PERSONAL PROTECTIVE EQUIPMENT

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

Tenen field personnel and other site personnel will wear Level D personal protective equipment. During activities such as drilling, well installation, or sampling, where there is a chance of contact with contaminated materials, modified Level D equipment will be worn. The protection will be upgraded to Level C if warranted by the results of the air monitoring. A description of the personnel protective equipment for Levels D and C is provided below.

Level D
Respiratory Protection: None
Protective Clothing: Hard hat, steel-toed shoes, long pants, nitrile gloves

Modified Level D
Respiratory Protection: None
Protective Clothing: Hard hat, steel-toed shoes, coveralls/tyvek, nitrile gloves

Level C
Respiratory Protection: Air purifying respirator with organic vapor cartridges and filters.
Protective Clothing: Same as modified Level D

5.0 EXPOSURE MONITORING

Selective monitoring of workers in the exclusion area may be conducted, as determined by the HSO, if sources of hazardous materials are identified. Personal monitoring may be conducted in the breathing zone at the discretion of the Project Manager or HSO and, if workers are wearing respiratory protective equipment, outside the face-piece.

6.0 SITE ACCESS

Access to the Site during the investigation will be controlled by the Project Manager or HSO. Unauthorized personnel will not be allowed access to the sampling areas.

7.0 WORK AREAS

During any activities involving subsurface disturbance, the work area must be divided into various zones to prevent the spread of contamination, clarify the type of protective equipment needed, and provide an area for decontamination.

The Exclusion Zone is defined as the area where potentially contaminated materials are generated as the result of sampling, or similar activities. The Contamination Reduction Zone (CRZ) is the area where decontamination procedures take place and is located adjacent to the Exclusion Zone. The Support Zone is the area where support facilities such as vehicles, a field phone, fire extinguisher and/or first aid supplies are located. The emergency staging area (part of the Support Zone) is the area where all Site workers will assemble in the event of an emergency. These zones shall be designated daily, depending on that day's activities. All field personnel will be informed of the location of these zones before work begins.

Control measures such as "Caution" tape and traffic cones will be placed around the perimeter of the work area when work is being done in the areas of concern (i.e., areas with exposed soil) to prevent unnecessary access.

8.0 DECONTAMINATION PROCEDURES

Personnel Decontamination
Personnel decontamination (decon), if deemed necessary by the HSO, will take place in the designated decontamination area delineated for each sampling location. Personnel decontamination will consist of the following steps:

- Soap and potable water wash and potable water rinse of gloves;
- Tyvek removal;
- Glove removal;
- Disposable clothing removal; and
- Field wash of hands and face.

Equipment Decontamination
Sampling equipment, such as split-spoons and bailers, will be decontaminated in accordance with U.S. Environmental Protection Agency methodologies, as described in the work plan.

Disposal of Materials
Purged well water, water used to decontaminate any equipment and well cuttings will be containerized and disposed off-site in accordance with federal, state and local regulations.

9.0 GENERAL SAFE WORK PRACTICES

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

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited, except in designated areas on the site. These areas will be designated by the HSO.
- Workers must wash their hands and face thoroughly on leaving the work area and before eating, drinking, or any other such activity. The workers should shower as soon as possible after leaving the site.
- Removal of potential contamination from PPE and equipment by blowing, shaking or any means that may disperse materials into the air is prohibited.
- Contact with contaminated or suspected surfaces should be avoided.
- The buddy system should always be used; each buddy should watch for signs of fatigue, exposure, and heat stress.
- Personnel will be cautioned to inform each other of symptoms of chemical exposure such as headache, dizziness, nausea, and irritation of the respiratory tract and heat stress.
- No excessive facial hair that interferes with a satisfactory fit of the face-piece of the respirator to the face will be allowed on personnel required to wear respiratory protective equipment.
- On-site personnel will be thoroughly briefed about the anticipated hazards, equipment requirements, safety practices, emergency procedures, and communications methods.

10.0 EMERGENCY PROCEDURES

The field crew will be equipped with emergency equipment, such as a first aid kit and disposable eye washes. In the case of a medical emergency, the HSO will determine the nature of the emergency and will have someone call for an ambulance, if needed. If the nature of the injury is not serious—i.e., the person can be moved without expert emergency medical personnel—onsite personnel should drive him to a hospital. **The nearest emergency room is located at NYC Health + Hospitals Woodhull located at 760 Broadway in Brooklyn, NY 11206. The emergency room entrance is on Flushing Avenue. The phone number is (718) 963-8000.** The route to the hospital is shown and detailed on the next page.

10.1 Route to Hospital

Driving directions to **NYC Health + Hospitals Woodhull** from **19 Patchen Avenue, Brooklyn, New York.**

Driving Directions

1. Head north on Patchen Avenue toward Van Buren Street
2. Turn left onto Broadway
3. Proceed for 0.9 miles
4. Turn left on Flushing Avenue. The emergency room entrance is on the left.

10.2 Emergency Contacts

There will be an on-site field phone. Emergency and contact telephone numbers are listed below:

Table 1 – Emergency Contacts

Ambulance	911
Emergency Room	(718) 963-8000
NYSDEC Spill Hotline	(800) 457-7362
NYSDEC Manager, Chris Heller	(518) 402-0163
NYSDOH Manager, Angela Martin	(518) 402-7860
Tenen QEP, Mohamed Ahmed	(917) 612-6018
Tenen Representative, Matthew Carroll	(646) 606-2332
Client representative, Max Zarin	(212) 777-9500

11.0 TRAINING

All personnel performing the field activities involving hazardous waste, as determined by 40 CFR 262.11 and ECL 27-0903 or a "source area," as determined by DER-10 1.3(b)70, will have received the initial safety training required by 29 CFR, 1910.120. Current refresher training status also will be required for all personnel engaged in field activities.

All those who enter the work area while intrusive activities are being performed must recognize and understand the potential hazards to health and safety. All field personnel must attend a training program covering the following areas:

- potential hazards that may be encountered;
- the knowledge and skills necessary for them to perform the work with minimal risk to health and safety;
- the purpose and limitations of safety equipment; and
- protocols to enable field personnel to safely avoid or escape from emergencies.

Each member of the field crew will be instructed in the above objectives before he/she goes onto the site. The HSO will be responsible for conducting the training program.

12.0 MEDICAL SURVEILLANCE

All Tenen and subcontractor personnel performing field work involving subsurface disturbance involving hazardous waste, as determined by 40 CFR 262.11 and ECL 27-0903 or a "source area," as determined by DER-10 1.3(b)70, at the site are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120 (f). The medical examination for Tenen employees will, at a minimum, be provided annually and upon termination of hazardous waste site work.

Appendix A

Acknowledgement of HASP

ACKNOWLEDGMENT OF HASP

Below is an affidavit that must be signed by all Tenen Environmental employees who enter the site. A copy of the HASP must be on-site at all times and will be kept by the HSO.

AFFIDAVIT

I have read the Health and Safety Plan (HASP) for the 19 Patchen Avenue site Brooklyn, NY. I agree to conduct all on-site work in accordance with the requirements set forth in this HASP and understand that failure to comply with this HASP could lead to my removal from the site.

Signature: _____ Date: _____
Signature: _____ Date: _____
Signature: _____ Date: _____
Signature: _____ Date: _____
Signature: _____ Date: _____

Appendix B

Injury Reporting Form (OSHA Form 300)

OSHA's Form 300 (Rev. 01/2004)

Log of Work-Related Injuries and Illnesses

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Year 20__ __

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

You must record information about every work-related death and about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR Part 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an Injury and Illness Incident Report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Establishment name ______________________

City ______________________ State ______________

Identify the person | **Describe the case** | **Classify the case** — CHECK ONLY ONE box for each case based on the most serious outcome for that case: | Enter the number of days the injured or ill worker was: | Check the "Injury" column or choose one type of illness:

(A) Case no.	(B) Employee's name	(C) Job title (*e.g., Welder*)	(D) Date of injury or onset of illness	(E) Where the event occurred (*e.g., Loading dock north end*)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (*e.g., Second degree burns on right forearm from acetylene torch*)	(G) Death	(H) Days away from work	(I) Remained at Work: Job transfer or restriction	(J) Remained at Work: Other record-able cases	(K) Away from work	(L) On job transfer or restriction	(M)(1) Injury	(2) Skin disorder	(3) Respiratory condition	(4) Poisoning	(5) Hearing loss	(6) All other illnesses
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Page totals ➤						___	___	___	___	___	___	___ Injury (1)	___ Skin disorder (2)	___ Respiratory condition (3)	___ Poisoning (4)	___ Hearing loss (5)	___ All other illnesses (6)

Be sure to transfer these totals to the Summary page (Form 300A) before you post it.

Public reporting burden for this collection of information is estimated to average 14 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

Appendix C

Material Safety Data Sheets (MSDS)

21 VOC

Material Safety Data Sheet
Tetrachloroethylene

ACC# 22900

Section 1 - Chemical Product and Company Identification

MSDS Name: Tetrachloroethylene
Catalog Numbers: C182 20, C182 4, C182-20, C182-4, C18220, C1824, O4586 4, O4586-4, O45864
Synonyms: Ethylene tetrachloride; Tetrachlorethylene; Perchloroethylene; Perchlorethylene
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
127-18-4	Tetrachloroethylene	99.0+	204-825-9

Hazard Symbols: XN N
Risk Phrases: 40 51/53

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid. Irritant. May cause severe eye and skin irritation with possible burns. May cause central nervous system depression. May cause liver and kidney damage. May cause reproductive and fetal effects. May cause cancer based on animal studies. **Caution!** May cause respiratory tract irritation.
Target Organs: Kidneys, central nervous system, liver.

Potential Health Effects
Eye: Contact with eyes may cause severe irritation, and possible eye burns.
Skin: May cause severe irritation and possible burns.
Ingestion: May cause central nervous system depression, kidney damage, and liver damage. Symptoms may include: headache, excitement, fatigue, nausea, vomiting, stupor, and coma. May cause gastrointestinal irritation with nausea, vomiting and diarrhea.
Inhalation: Inhalation of vapor may cause respiratory tract irritation. May cause central nervous system effects including vertigo, anxiety, depression, muscle incoordination, and emotional instability.
Chronic: Possible cancer hazard based on tests with laboratory animals. Prolonged or repeated skin contact may cause defatting and dermatitis. May cause respiratory tract cancer. May cause

adverse nervous system effects including muscle tremors and incoordination. May cause liver and kidney damage. May cause reproductive and fetal effects.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid if irritation develops or persists. Wash clothing before reuse. Flush skin with plenty of soap and water.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Containers may explode in the heat of a fire. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas.
Extinguishing Media: Substance is noncombustible; use agent most appropriate to extinguish surrounding fire. For small fires, use dry chemical, carbon dioxide, or water spray. For large fires, use dry chemical, carbon dioxide, alcohol-resistant foam, or water spray. Cool containers with flooding quantities of water until well after fire is out.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 2; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Flush down the spill with a large amount of water. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Do not reuse this container. Avoid breathing vapors from heated material. Avoid contact with skin and eyes. Keep container tightly closed. Keep away from flames

and other sources of high temperatures that may cause material to form vapors or mists.
Storage: Keep away from heat and flame. Store in a cool, dry place. Keep containers tightly closed.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Tetrachloroethylene	25 ppm TWA; 100 ppm STEL	150 ppm IDLH	100 ppm TWA; 200 ppm Ceiling

OSHA Vacated PELs: Tetrachloroethylene: 25 ppm TWA; 170 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: sweetish odor
pH: Not available.
Vapor Pressure: 15.8 mm Hg
Vapor Density: 5.2
Evaporation Rate:9 (ether=100)
Viscosity: 0.89 mPa s 20 deg C
Boiling Point: 121 deg C
Freezing/Melting Point:-22.3 deg C
Decomposition Temperature:150 deg C
Solubility: Nearly insoluble in water.
Specific Gravity/Density:1.623
Molecular Formula:C2Cl4
Molecular Weight:165.812

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, excess heat.
Incompatibilities with Other Materials: Strong bases, metals, liquid oxygen, dinitrogen tetroxide.

Hazardous Decomposition Products: Hydrogen chloride, phosgene, carbon monoxide, carbon dioxide.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 127-18-4: KX3850000
LD50/LC50:
CAS# 127-18-4:
Draize test, rabbit, eye: 162 mg Mild;
Draize test, rabbit, eye: 500 mg/24H Mild;
Draize test, rabbit, skin: 810 mg/24H Severe;
Draize test, rabbit, skin: 500 mg/24H Mild;
Inhalation, mouse: LC50 = 5200 ppm/4H;
Inhalation, rat: LC50 = 34200 mg/m3/8H;
Oral, mouse: LD50 = 8100 mg/kg;
Oral, rat: LD50 = 2629 mg/kg;
Carcinogenicity:
CAS# 127-18-4:
ACGIH: A3 - Animal Carcinogen
California: carcinogen; initial date 4/1/88
NIOSH: potential occupational carcinogen
NTP: Suspect carcinogen
OSHA: Possible Select carcinogen
IARC: Group 2A carcinogen
Epidemiology: Epidemiologic studies have given inconsistent results. Studi es have shown that tetrachloroethylene has not caused canc er in exposed workers. The studies have serious weakne sses such as mixed exposures. In tests with rats and mice, i t appeared that tissue destruction or peroxisome prolifera tion rather than genetic mechanisms were the cause of the observed increases in normally occurring cancers. The oral mouse TDLo that was tumorigenic was 195 gm/kg/50W-I.
Teratogenicity: Has caused musculoskeletal abnormalities. Has caused morphological transformation at a dose of 97mol/L in a study using rat embryos.
Reproductive Effects: Has caused behavioral, biochemical, and metabolic effects on newborn rats when the mother was exposed to the TCLo of 900 ppm/7H at 7-13 days after conception. A dose of 300 ppm/7H 6-15 days after conception caused post-implantation mortality.
Neurotoxicity: No information available.
Mutagenicity: Not mutagenic in Escherichia coli. No mutagenic effects were seen in rat liver after exposure at 200 ppm for 10 weeks. No chromosome changes were seen in the bone marrow cells of exposed mice.
Other Studies: A case of 'obstructive jaundice' in a 6-week old infant has been attributed to tetrachloroethylene in breast milk.

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 5.28 mg/L; 96 Hr.; Static Condition, 12 degrees C Fathead Minnow: LC50 = 18.4 mg/L; 96 Hr.; Flow-through condition Bluegill/Sunfish: LC50 = 12.9 mg/L; 96 Hr.; Static Condition ria: Phytobacterium phosphoreum: EC50 = 120.0 mg/L; 30 minutes; Microtox test No data available.

Environmental: In soil, substance will rapidly evaporate. In water, it will evaporate. In air, it can be expected to exist in the vapor phase.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 127-18-4: waste number U210.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	TETRACHLOROETHYLENE				TETRACHLOROETHYLENE
Hazard Class:	6.1				6.1
UN Number:	UN1897				UN1897
Packing Group:	III				III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 127-18-4 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 127-18-4: Effective Date: 6/1/87; Sunset Date: 6/1/97
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

CERCLA Hazardous Substances and corresponding RQs
CAS# 127-18-4: 100 lb final RQ; 45.4 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 127-18-4: acute.
Section 313
This material contains Tetrachloroethylene (CAS# 127-18-4, 99 0%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:
CAS# 127-18-4 is listed as a hazardous air pollutant (HAP). This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA. CAS# 127-18-4 is listed as a Priority Pollutant under the Clean Water Act. CAS# 127-18-4 is listed as a Toxic Pollutant under the Clean Water Act.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 127-18-4 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act: WARNING: This product contains Tetrachloroethylene, a chemical known to the state of California to cause cancer. California No Significant Risk Level: CAS# 127-18-4: 14 ug/day NSRL

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
XN N
Risk Phrases:
R 40 Limited evidence of a carcinogenic effect.
R 51/53 Toxic to aquatic organisms; may cause long-term adverse effects in the aquatic environment.

Safety Phrases:
S 23 Do not inhale gas/fumes/vapour/spray.
S 36/37 Wear suitable protective clothing and gloves.
S 61 Avoid release to the environment. Refer to special instructions/Safety data sheets.

WGK (Water Danger/Protection)
CAS# 127-18-4: 3
Canada - DSL/NDSL
CAS# 127-18-4 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of D1B, D2A.
Canadian Ingredient Disclosure List
CAS# 127-18-4 is listed on the Canadian Ingredient Disclosure List.
Exposure Limits
CAS# 127-18-4: OEL-ARAB Republic of Egypt:TWA 5 ppm (35 mg/m3);Skin OEL-AUSTRALIA:TWA 50 ppm (335 mg/m3);STEL 150 ppm;CAR OEL-BELGIUM:TWA 50 ppm (339 mg/m3);STEL 200 ppm (1368 mg/m3) OEL-CZECHOSLOVAKIA:TWA 250 mg/m3;STEL 1250 mg/m3 OEL-DENMARK:TWA 30 ppm (200 mg/m3);Skin OEL-FINLAND:TWA 50 ppm (335 mg/m3);STEL 75 ppm (520 mg/m3);Skin OEL-FRANCE:TWA 50 ppm (335 mg/m3) OEL-GERMANY:TWA 50 ppm (345 mg/m3);Carcinogen OEL-HUNGARY:STEL 50 mg/m3;Skin;Carcinogen OEL-JAPAN:TWA 50 ppm (340 mg/m3) OEL-THE NETHERLANDS:TWA 35 ppm (240 mg/m3);Skin OEL-THE PHILIPPINES:TWA 100 ppm (670 mg/m3) OEL-POLAND:TWA 60 mg/m3 OEL-RUSSIA:TWA 50 ppm;STEL 10 mg/m3 OEL-SWEDEN:TWA 10 ppm (70 mg/m3);STEL 25 ppm (170 mg/m3) OEL-SWITZERLAND:TWA 50 ppm (345 mg/m3);STEL 100 ppm;Skin OEL-THAILAND:TWA 100 ppm;STEL 200 ppm OEL-UNITED KINGDOM:TWA 50 ppm (335 mg/m3);STEL 15 ppm OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA

check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

Section 16 - Additional Information

MSDS Creation Date: 6/17/1999
Revision #3 Date: 3/18/2003

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

2D

VOC

Material Safety Data Sheet
Trichloroethylene

ACC# 23850

Section 1 - Chemical Product and Company Identification

MSDS Name: Trichloroethylene
Catalog Numbers: S80232, S80327ACS-1, S80327ACS-2, NC932384B, NC9494003, NC9494591, NC9981849, S80237ACS-1, S80237ACS-2, T340-4, T341-20, T341-4, T341-500, T341J4, T403-4, XXT341SK4LIX48
Synonyms: Ethylene trichloride; triclene; trichloroethene; benzinol cecolene
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
79-01-6	Trichloroethylene	99.5	201-167-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid.
Warning! Causes eye and skin irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. May cause central nervous system depression. May cause cancer based on animal studies. Potential cancer hazard. May cause liver damage.
Target Organs: Central nervous system, liver, eyes, skin.

Potential Health Effects
Eye: Causes moderate eye irritation. May result in corneal injury. Contact produces irritation, tearing, and burning pain.
Skin: Causes mild skin irritation. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis. May cause peripheral nervous system function impairment including persistent neuritis, and temporary loss of touch. Damage to the liver and other organs has been observed in workers who have been overexposed.
Ingestion: Aspiration hazard. May cause irritation of the digestive tract. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.
Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. May cause respiratory tract irritation. May cause liver abnormalities. May cause peripheral nervous system effects.
Chronic: Possible cancer hazard based on tests with laboratory animals. Chronic inhalation may

cause effects similar to those of acute inhalation. Prolonged or repeated skin contact may cause defatting and dermatitis. May cause peripheral nervous system function impairment including persistent neuritis, and temporary loss of touch. Damage to the liver and other organs has been observed in workers who have been overexposed.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid imme diately.
Skin: Get medical aid if irritation develops or persists. Flush skin with plenty of soap and water.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Possible aspiration hazard. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors can travel to a source of ignition and flash back. Combustion generates toxic fumes. Containers may explode in the heat of a fire.
Extinguishing Media: Use water spray to cool fire-exposed containers. Use water spray, dry chemical, carbon dioxide, or chemical foam.
Flash Point: Not applicable.
Autoignition Temperature: 778 deg F (414.44 deg C)
Explosion Limits, Lower:12.5
Upper: 90.0
NFPA Rating: (estimated) Health: 2; Flammability: 1; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Remove all sources of ignition. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use only in a well-ventilated area. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from sources of ignition. Store in a tightly closed container. Keep from

contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Trichloroethylene	50 ppm TWA; 100 ppm STEL	1000 ppm IDLH	100 ppm TWA; 200 ppm Ceiling

OSHA Vacated PELs: Trichloroethylene: 50 ppm TWA; 270 mg/m3 TWA

Personal Protective Equipment

Eyes: Wear chemical splash goggles.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance: clear, colorless

Odor: sweetish odor - chloroform-like

pH: Not available.

Vapor Pressure: 58 mm Hg @20C

Vapor Density: 4.53

Evaporation Rate:0.69 (CCl4=1)

Viscosity: 0.0055 poise

Boiling Point: 189 deg F

Freezing/Melting Point:-121 deg F

Decomposition Temperature: Not available.

Solubility: Insoluble in water.

Specific Gravity/Density:1.47 (water=1)

Molecular Formula:C2HCl3

Molecular Weight:131.366

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: Incompatible materials, ignition sources, oxidizers.

Incompatibilities with Other Materials: Alkalis (sodium hydroxide), chemically active metals (aluminum, beryllium, lithium, magnesium), epoxies and oxidants. Can react violently with aluminum, barium, lithium, magnesium, liquid oxygen, ozone, potassium hydroxide, potassium nitrate, sodium, sodium hydroxide, titanium, and nitrogen dioxide. Reacts with water under heat

and pressure to form hydrogen chloride gas.
Hazardous Decomposition Products: Hydrogen chloride, carbon dioxide, chloride fumes.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 79-01-6: KX4550000
LD50/LC50:
CAS# 79-01-6:
Draize test, rabbit, eye: 20 mg/24H Moderate;
Draize test, rabbit, skin: 2 mg/24H Severe;
Inhalation, mouse: LC50 = 8450 ppm/4H;
Inhalation, mouse: LC50 = 220000 mg/m3/20M;
Inhalation, mouse: LC50 = 262000 mg/m3/30M;
Inhalation, mouse: LC50 = 40000 mg/m3/4H;
Inhalation, rat: LC50 = 140700 mg/m3/1H;
Oral, mouse: LD50 = 2402 mg/kg;
Oral, mouse: LD50 = 2400 mg/kg;
Oral, rat: LD50 = 4920 mg/kg;
Skin, rabbit: LD50 = >20 gm/kg;
Skin, rabbit: LD50 = 20 mL/kg;
Carcinogenicity:
CAS# 79-01-6:

- **ACGIH:** Not listed.
- **California:** carcinogen, initial date 4/1/88
- **NTP:** Suspect carcinogen
- **IARC:** Group 2A carcinogen

Epidemiology: Suspected carcinogen with experimental carcinogenic, tumorigenic, and teratogenic data.
Teratogenicity: No information available.
Reproductive Effects: Experimental reproductive effects have been observed.
Mutagenicity: Human mutation data has been reported. IARC and the National Toxicology Program (NTP) stated that variability in the mutagencity test results with trichloroethylene may be due to the presence of various stabilizers used in TCEwhich are mutagens (e.g.epoxybutane, epichlorohydrin).See actual entry in RTECS for complete infomation.R68 Mutagen Category 3 (CHIP 2002, UK).
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. Bluegill sunfish, LD50= 44,700 ug/L/96Hr. Fathead minnow, LC50=40.7 mg/L/96Hr.
Environmental: In air, substance is photooxidized and is reported to form phosgene, dichloroacetyl chloride, and formyl chloride. In water, it evaporates rapidly.
Physical: No information available.

Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 79-01-6: waste number U228.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	TRICHLOROETHYLENE	TRICHLOROETHYLENE
Hazard Class:	6.1	6.1(9.2)
UN Number:	UN1710	UN1710
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 79-01-6 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 79-01-6: 100 lb final RQ; 45.4 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 79-01-6: acute, chronic, reactive.
Section 313
This material contains Trichloroethylene (CAS# 79-01-6, 99.5%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR
Clean Air Act:
CAS# 79-01-6 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 79-01-6 is listed as a Hazardous Substance under the CWA. CAS# 79-01-6 is listed as a Priority Pollutant under the Clean Water Act. CAS# 79-01-6 is listed as a Toxic Pollutant under

the Clean Water Act.

OSHA:

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

STATE

CAS# 79-01-6 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Trichloroethylene, a chemical known to the state of California to cause cancer.

California No Significant Risk Level: CAS# 79-01-6: 50 æg/day NSRL (oral); 80 æg/day NSRL (inhalation)

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T

Risk Phrases:

R 36/38 Irritating to eyes and skin.
R 45 May cause cancer.
R 52/53 Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R 67 Vapours may cause drowsiness and dizziness.
R 68 Possible risk of irreversible effects.

Safety Phrases:

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 53 Avoid exposure - obtain special instructions before use.
S 61 Avoid release to the environment. Refer to special instructions/safety data sheets.

WGK (Water Danger/Protection)

CAS# 79-01-6: 3

Canada - DSL/NDSL

CAS# 79-01-6 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D1B, D2B.

Canadian Ingredient Disclosure List

CAS# 79-01-6 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 2/01/1999
Revision #5 Date: 5/31/2005

SAFETY DATA SHEET

Creation Date 22-Sep-2009 **Revision Date** 10-Feb-2015 **Revision Number** 1

1. Identification

Product Name **cis-1,2-Dichloroethylene**

Cat No. : **AC113380000; AC113380025; AC113380100; AC113380500**

Synonyms cis-Acetylene dichloride.

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Entity / Business Name
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 2
Acute oral toxicity	Category 4
Acute Inhalation Toxicity - Vapors	Category 4
Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Danger

Hazard Statements
Highly flammable liquid and vapor
Harmful if swallowed
Harmful if inhaled
Causes serious eye irritation
Causes skin irritation
May cause respiratory irritation

Precautionary Statements
Prevention
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Avoid breathing dust/fume/gas/mist/vapors/spray
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Take precautionary measures against static discharge
Do not eat, drink or smoke when using this product
Response
Call a POISON CENTER or doctor/physician if you feel unwell
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
Skin
IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation occurs: Get medical advice/attention
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Ingestion
Rinse mouth
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Fire
Explosion risk in case of fire
Fight fire with normal precautions from a reasonable distance
Evacuate area
Storage
Store in a well-ventilated place. Keep cool
Store in a closed container
Store locked up
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

3. Composition / information on ingredients

Component	CAS-No	Weight %
cis-1,2-Dichloroethylene	156-59-2	97

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention.

Ingestion Do not induce vomiting. Obtain medical attention.

Most important symptoms/effects Breathing difficulties. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Water spray. Carbon dioxide (CO_2). Dry chemical. Use water spray to cool unopened containers. chemical foam.

Unsuitable Extinguishing Media No information available

Flash Point 6 °C / 42.8 °F
Method - No information available

Autoignition Temperature 440 °C / 824 °F

Explosion Limits
Upper 12.80%
Lower 9.70%
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Flammable. Vapors may travel to source of ignition and flash back.

Hazardous Combustion Products
Hydrogen chloride gas Carbon monoxide (CO) Carbon dioxide (CO_2)
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	3	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment. Remove all sources of ignition. Take precautionary measures against static discharges. Avoid contact with skin, eyes and clothing.

Environmental Precautions See Section 12 for additional ecological information.

Methods for Containment and Clean Up Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling Ensure adequate ventilation. Wear personal protective equipment. Use explosion-proof equipment. Use only non-sparking tools. Avoid contact with skin, eyes and clothing. Avoid breathing dust/fume/gas/mist/vapours/spray. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharges.

Storage Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Keep away from heat and sources of ignition. Flammables area.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
cis-1,2-Dichloroethylene	TWA: 200 ppm		

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
cis-1,2-Dichloroethylene			TWA: 200 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

Engineering Measures Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

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

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	aromatic
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-80 °C / -112 °F
Boiling Point/Range	60 °C / 140 °F @ 760 mmHg
Flash Point	6 °C / 42.8 °F
Evaporation Rate	No information available
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	12.80%
Lower	9.70%
Vapor Pressure	201 mmHg @ 25 °C
Vapor Density	3.34 (Air = 1.0)
Relative Density	1.280
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	440 °C / 824 °F
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C2 H2 Cl2
Molecular Weight	96.94

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Keep away from open flames, hot surfaces and sources of ignition. Exposure to air. Exposure to light. Incompatible products. Exposure to moist air or water.

Incompatible Materials Bases

Hazardous Decomposition Products Hydrogen chloride gas, Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information No acute toxicity information is available for this product

Component Information

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes, respiratory system and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
cis-1,2-Dichloroethylene	156-59-2	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity

Do not empty into drains. Do not flush into surface water or sanitary sewer system.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
cis-1,2-Dichloroethylene	Not listed	Not listed	EC50 = 721 mg/L 5 min EC50 = 905 mg/L 30 min	Not listed

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility No information available.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No	UN1150
Proper Shipping Name	1,2-DICHLOROETHYLENE
Hazard Class	3
Packing Group	II

TDG

UN-No	UN1150
Proper Shipping Name	1,2-DICHLOROETHYLENE
Hazard Class	3
Packing Group	II

IATA

UN-No	1150
Proper Shipping Name	1,2-DICHLOROETHYLENE
Hazard Class	3
Packing Group	II

IMDG/IMO

UN-No	1150
Proper Shipping Name	1,2-DICHLOROETHYLENE
Hazard Class	3
Packing Group	II

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
cis-1,2-Dichloroethylene	X	-	X	205-859-7	-		-	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313 Not applicable

SARA 311/312 Hazardous Categorization

Acute Health Hazard	Yes
Chronic Health Hazard	No
Fire Hazard	Yes

Sudden Release of Pressure Hazard No
Reactive Hazard No

Clean Water Act Not applicable

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA

Component	Hazardous Substances RQs	CERCLA EHS RQs
cis-1,2-Dichloroethylene	1000 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals

State Right-to-Know

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
cis-1,2-Dichloroethylene	X	-	X	-	-

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class B2 Flammable liquid
D1B Toxic materials
D2B Toxic materials

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 22-Sep-2009
Revision Date 10-Feb-2015
Print Date 10-Feb-2015
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally

Harmonized System of Classification and Labeling of Chemicals (GHS)

Disclaimer

The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of SDS

APPENDIX 8 – SITE MANAGEMENT FORMS

Project Name: 19 Patchen Avenue – Brooklyn, NY

Project Number: C224232

Site Management Reporting Period:

Inspection Date:

Inspector and Certifier:

Site Inspection Report

1.0 ENGINEERING CONTROLS

Engineering Controls were employed in the Remedial Action to assure permanent protection of public health by eliminating human exposure to residual materials remaining at the site. The Site has the following Engineering Control Systems. Engineering Controls for this property are:

Composite Cover System;

Vapor Barrier System (at Site and One Off-Site Property);

Active Sub-Slab Depressurization System (at Site and one Off-Site Property); and

Carbon Filtration in Unit 2A and Former Dry Cleaner Space.

2.0 INSTITUTIONAL CONTROLS

A series of Institutional Controls are required under the Remedial Action to assure permanent protection of public health by eliminating human exposure to residual materials remaining at the site. Those Institutional Controls that can be observed at the Site are:

The property may be used for restricted-residential and commercial use; and

Prohibition on use of groundwater, consistent with New York City code.

3.0 INSPECTION NARRATIVE

The site inspection was performed by name(s). The date of the inspection was date. See attached Site Inspection Forms and Photographs.

Provide comprehensive narrative description of the site inspection performed by the party preparing this report and the results of that inspection. The Site inspection must be performed by the P.E. or Qualified Environmental Professional (QEP) certifying this report. The narrative should be comprehensive and should include:

- Description of the inspection activities performed on each Engineering and Institutional Control;
- Description of the performance of each Engineering and Institutional Control;
- Description of findings, conclusions, or recommendations;
- Narrative that refers liberally to an addendum with photos of inspection;
- Description of any deficiencies that were identified during the inspection and how they were (or will be) corrected;
- Copy of any periodic maintenance inspection forms prepared by the building staff.

4.0 STATUS OF ENGINEERING AND INSTITUTIONAL CONTROLS

- Are the Engineering Controls and Institutional Controls employed at the Site continuing to perform as designed and continuing to be protective of human health and the environment?
  Response:
- Has anything occurred that impairs the ability of the Engineering Controls or Institutional Controls to protect public health and the environment?
  Response:
- Are any changes needed to the remedial systems or controls?
  Response:
- Has compliance with this SMP been maintained during this reporting period?
  Response:
- Are site records complete and up to date?
  Response:

Active SSDS (19 Patchen Avenue and Off-Site Property):

- Have monthly SSDS inspections by building superintendents been performed, certified on inspection checklists, and maintained on file on site?
  Response:

5.0 NEXT INSPECTION

The next Site Management Inspection will be performed [year].

QEP Name

QEP Signature

Date

Annual Inspection Form

19 Patchen Avenue and Off-Site Property – Brooklyn, NY
BCP Site #C224232

Inspector's Name:	Weather Conditions:
Inspection Date:	Air Temperature (°F):
Inspection Time:	
Comments:	

A. SSDS SYSTEM INSPECTION (19 Patchen Avenue and Off-Site Property)

1. Walk the entire SSDS of each building (Cellar, Rear Wall, Roof).

* Inspect vent pipe for visible damage
* Inspect roof surrounding the vent pipe for damage.
* Inspect the vent piping for debris or obstruction.
* Confirm alarm system is working.
* Confirm flow at roof exhaust.
* Measure pressure field below slab.
* Comments:

B. VAPOR BARRIER AND COVER SYSTEM - CELLAR FLOOR INSPECTION (19 Patchen Avenue and Off-Site Property)

1. Walk all of the cellar floors

* Any visible cracks or depressions in the cellar floors?
* Any other visible openings (unintended) in the cellar floors?
* Draw approximate location, length, width of floor cracks/openings on site map if observed.
* Comments:

C. COVER SYSTEM - REAR YARD INSPECTION

1. Walk the entire perimeter of the Site.

2. Walk all of the paved areas (concrete) of the Site.

* Are there any signs of significant cracks, settlement, or deterioration of the paved areas?
* Has any of the pavement material been removed?
* Are there any signs of intrusive activities (drilling, digging, trenching, grading, excavating, etc.)?
* Comments:

D. CARBON FILTRATION INSPECTION

1. Observe the carbon filtration systems in Unit 2A and the Former Dry Cleaner Space, if operational.

* Are the systems operational?
* Inspect unit for damage.
* Change pre-filter and HEPA filters every year.
* Change GAC every two years.

E. COMMENTS

Summarize needed/completed repairs to Engineering Controls:

Active Sub Slab Depressurization System (SSDS) Monthly Inspection Building Superintendent Form
19 Patchen Avenue – Brooklyn, NY

This system protects public safety and must be operating properly to ensure the safety of occupants of the building. If you identify any problems with this system, contact the SSDS maintenance team at Tenen Environmental at (646) 606-2332.

Question	No	Yes	Directions	Comments
Is the system alarm operational? (Turn off fan and confirm alarm received)			If "No," call number above.	
Is the system blower operating? (Roof)			If "No," call number above.	
Is air being discharged from the system vent? (Roof)			If "No," call number above.	
Are clamps in system piping properly fastened and seals near the blower intact and properly sealed? (Roof)			If "No," call number above.	
Are there any holes, cracks, or other physical deficiencies in SSDS piping? (Basement, Rear Wall, Roof)			If "Yes," call number above.	
Are there any blockages in SSDS piping? (Basement, Rear Wall, Roof)			If "Yes," call number above.	

This form must be signed, kept on file at the building location and be available on inspection.

Name of Building Superintendent Performing Inspection: _____

Signature of Building Superintendent Performing Inspection: _____

Date of Inspection: _____

Active Sub Slab Depressurization System (SSDS) Monthly Inspection Building Superintendent Form
19 Patchen Avenue (Off-site Property) – Brooklyn, NY

This system protects public safety and must be operating properly to ensure the safety of occupants of the building. If you identify any problems with this system, contact the SSDS maintenance team at Tenen Environmental at (646) 606-2332.

Question	No	Yes	Directions	Comments
Is the system alarm operational? (Turn off fan and confirm alarm received)			If "No," call number above.	
Is the system blower operating? (Roof)			If "No," call number above.	
Is air being discharged from the system vent? (Roof)			If "No," call number above.	
Are clamps in system piping properly fastened and seals near the blower intact and properly sealed? (Roof)			If "No," call number above.	
Are there any holes, cracks, or other physical deficiencies in SSDS piping? (Basement, Rear Wall, Roof)			If "Yes," call number above.	
Are there any blockages in SSDS piping? (Basement, Rear Wall, Roof)			If "Yes," call number above.	

This form must be signed, kept on file at the building location and be available on inspection.

Name of Building Superintendent Performing Inspection: _____

Signature of Building Superintendent Performing Inspection: _____

Date of Inspection: _____

APPENDIX 9 – O&M MANUALS

OPERATIONS, MAINTENANCE & MONITORING (OM&M) PLAN

SUB-SLAB DEPRESSURIZATION SYSTEM (SSDS), COMPOSITE COVER SYSTEM, VAPOR SEALANT, AND CARBON FILTRATION SYSTEMS for 19 Patchen Avenue BCP Site #C224232

19 Patchen Avenue
Brooklyn, New York 11221

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau A
625 Broadway, 12th Floor
Albany, NY 12233-7016

Prepared for:
Hudson BEC II LLC &
19 Patchen GP LLC
826 Broadway, 11th Floor
New York, NY 10003

Prepared by:
TENEN ENVIRONMENTAL
121 West 27th Street, Suite 702
New York, NY 10001

December 2019

OPERATIONS, MAINTENANCE AND MONITORING (OM&M) PLAN

TABLE OF CONTENTS

APPENDICES

OPERATIONS, MAINTENANCE AND MONITORING (OM&M) PLAN

1.0 Introduction

This Operations, Maintenance and Monitoring (OM&M) Plan has been developed to detail the engineering controls (ECs) implemented as part of the Remedial Action Work Plan (RAWP) prepared for 19 Patchen Avenue (the Site).

The Site, located at 19 Patchen Avenue, is a rectangular parcel of land located at the corner of Patchen Avenue and Van Buren Street in the Bedford Stuyvesant area of Brooklyn.

This Operation and Maintenance Plan is not to be used as a stand-alone document, but as a component document of the December 2019 Site Management Plan (SMP).

1.1 Background

Environmental investigations at the 19 Patchen Avenue property have documented elevated concentrations of chlorinated solvents in the sub-slab soil vapor. There is the potential for an indoor air intrusion condition. In addition, elevated concentrations of chlorinated solvents have historically been detected in indoor air.

In order to address the potential for indoor air quality impacts from the sub-slab soil vapor, an active sub-slab depressurization system (SSDS) has been designed and incorporated into the current building plan. In addition, while not an Engineering Control, carbon filtration units have been installed in select units.

1.2 Summary of Engineering Controls (ECs)

Engineering Controls (ECs) to address residual contamination through physical protective measures have been incorporated to ensure that the off-site property remains protective of public health and the environment.

A vapor sealant was applied to mitigate the potential for vapor intrusion to the Site building. The vapor seal was applied atop the concrete slab in the basement of the Site building.

A sub-slab depressurization system (SSDS) was installed below the current slab in the basement of the building. The principal components of the SSDS are suction pits, solid-construction piping from the suction pit to an exterior suction fan on the roof and pressure monitoring points through the basement slab. The performance goal of the sub-slab vapor mitigation system is to depressurize below the slab to at least -0.02 inches of water gauge (in-wc); however, differential pressure readings above -0.004 in-wc are considered to be acceptable. A visual and audible alarm was installed in the basement to notify the building management if the pressure at the suction fan has dropped below 50% of the start-up pressure. The system was designed in general accordance with NYSDOH's Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006 (NYSDOH Soil Vapor Guidance).

While not a required Engineering Control, carbon filtration units were installed in Unit 2A and in the dry cleaner space at the Site to address potential indoor air impacts. Unit 2A and the dry cleaner space were selected based on historic indoor air concentrations. The filtration units, Airpura C600-DLX, are sized for the selected spaces and contain 26 pounds of granulated activated carbon (GAC) each.

2.0 Engineering Control Operations

The active sub-slab depressurization system (SSDS) is a permanent EC incorporated into the building to address potential soil vapor intrusion at the Site. The composite cover system and vapor barrier are permanent ECs to address residual fill and potential soil vapor intrusion. The carbon filtration units are not ECs but will be maintained until indoor air concentrations decrease.

General design drawings and specifications are included in the Appendices.

2.1 Sub-Slab Depressurization System (SSDS)

The SSDS will reduce the potential for soil vapor migration into the building. The SSDS will be inspected at specific intervals as defined in this OM&M. SSDS documentation is included in Appendix A.

2.2 Composite Cover System and Vapor Sealant

The composite cover system and vapor sealant will reduce exposure to residual soil/fill contaminants and, in combination with the SSDS, reduce the potential for soil vapor migration into the building. Vapor barrier documentation is included in Appendix B. The composite cover system is the existing basement slab and walls and the existing slab in the rear yard.

2.3 Carbon Filtration Units

The carbon filtration units will address residual indoor air concentrations. Carbon filtration unit documentation is included in Appendix A.

3.0 Routine Maintenance and Monitoring

Routine EC inspections will be performed by a person knowledgeable with the mechanical systems present in the building and familiar with the property and may include a building or property superintendent. Annual inspections will be completed by a Qualified Environmental Professional (QEP), as defined by the New York State Department of Environmental Conservation (NYSDEC).

3.1 EC Inspection Frequency

Site inspection and certification for performance of the active SSDS, composite cover system and carbon filtration units will be performed on a schedule detailed in the SMP and reported in a Periodic Review Report (PRR).

3.2 EC Inspection Components

The EC inspections will evaluate the following:

- continued performance of ECs as designed;
- compliance with the SMP;
- continued achievement of remedial performance criteria;
- accuracy and completeness of Site records;
- necessity for any changes to the remedial systems; and
- general Site conditions at the time of inspection.

In the event of an emergency, such as a natural disaster or an unforeseen failure of any of the ECs, an inspection of the ECs will be conducted by Professional Engineer.

3.3 EC Inspections

3.3.1 Sub-Slab Depressurization System (SSDS)

EC inspections of the SSDS components shall include the following:

- Observe visible components (fan, vacuum alarm/monitor, vacuum gauge, tubing, riser pipe, etc.) for physical wear, damage and operational issues, and replace as necessary;
- Remove any blockages in vacuum monitor and gauge tubing and riser pipe taps;
- Verify operation of vacuum monitor by disconnecting tubing from riser pipe and noting if the building notification system goes into alarm mode;
- Verify operation of vacuum gauge by disconnecting tubing from riser pipe and noting if the indicator moves to zero (check high and low pressure ports to see if they are plugged correctly);
- Inspect riser pipe penetrations in concrete slab for proper seal;
- Inspect riser pipe connections at fan for leaks and tightness; and
- Inspect power to fan by operating dedicated switch.

3.3.2 Composite Cover

EC inspections of the composite cover shall include observations of the conditions of the concrete building slab and concrete slab in the rear yard. The composite cover will be inspected for cracks, holes or other openings that will provide access to the soil/fill below the cover. If any cracks, holes or other openings are observed in the composite cover during the EC inspection, the inspector will make a recommendation that such cracks, holes or openings be immediately filled and/or sealed as necessary.

3.3.3 Vapor Sealant

Visual EC inspections of the vapor sealant will be made. EC vapor sealant inspections will consist of 1) observations of the vapor sealant atop the concrete slab for visible cracks and gaps; and 2) inspection of any exposed sections of the concrete slab. Additional vapor sealant will be recommended to repair holes in the vapor sealant if the concrete slab is observed. If repair of the vapor seal is required, additional sealant will be applied.

3.3.4 Carbon Filtration Units

Visual inspections of the carbon filtration units will be made. The inspections will consist of 1) observations of the damage to the units; and 2) inspection of all filters. New units will be obtained if they are damaged. All filters will be vacuumed or replaced as necessary.

3.4 Inspection Reporting

Routine EC inspections will be performed by a person with knowledge of the mechanical systems present in the building and familiar with the property. Annual inspections will be completed by a QEP. Inspection results will be reported to NYSDEC in a PRR.

3.5 Certifications

The results of the EC inspections will be certified at the time of the inspection and the signed certifications included in the PRR.

The Inspection Certification will certify whether:

- on-site ECs are unchanged from the previous certification;
- on-site ECs remain in-place and effective;
- on-site ECs are performing as designed; and
- anything has occurred that would impair the ability of the controls to protect public health and the environment.

4.0 Emergency Contact Numbers

In the event of any emergency condition pertaining to any EC, the current Owner's representative should contact the appropriate parties from the contact list below. Prompt contact should also be made to a Qualified Environmental Professional (QEP), as defined by NYSDEC. These emergency contact lists must be maintained in an easily accessible location at the Site.

Emergency Contact Numbers

Contact	Number
Medical, Fire and Police:	911
One Call Center:	(800) 272-4480 (3 day notice required for utility markout)
Poison Control Center:	(800) 222-1222
Pollution Toxic Chemical Oil Spills:	(800) 424-8802
NYSDEC Spills Hotline	(800) 457-7362

Project Contact Information

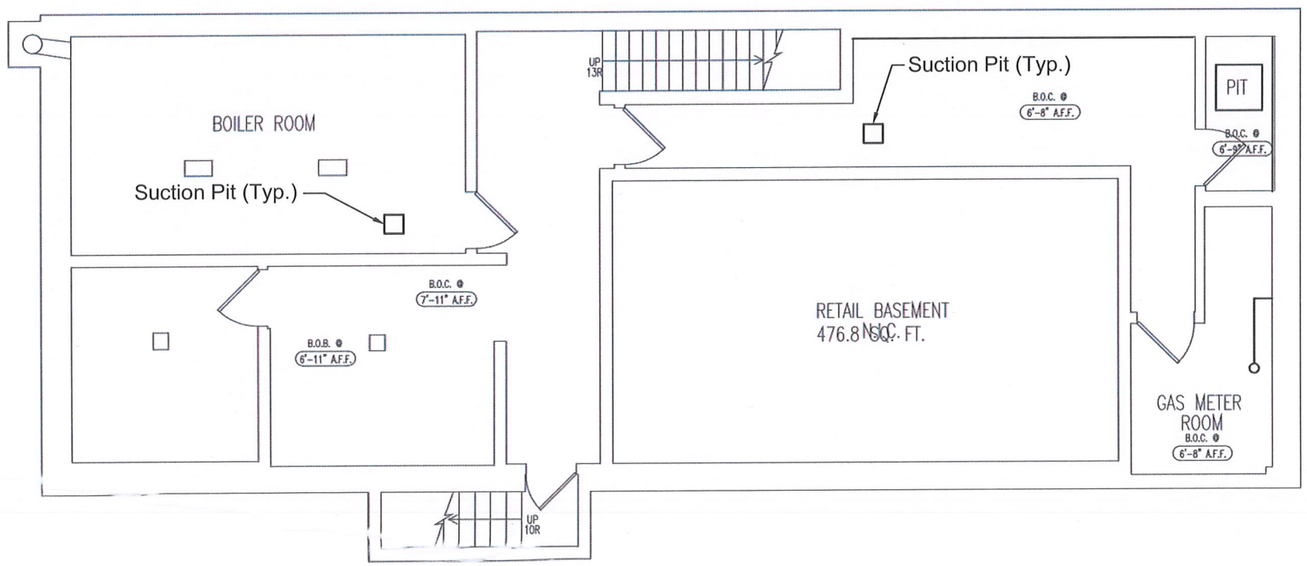
Contact	Number
Matthew Carroll, Tenen Environmental	(646) 606-2332, mcarroll@tenen-env.com
Chris Heller, NYSDEC Project Manager	(518) 402-0163, Chris.Heller@dec.ny.gov
Angela Martin, NYSDOH Project Manager	(518) 402-7860, Angela.Martin@health.ny.gov

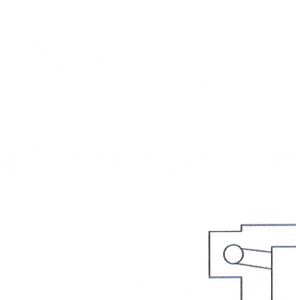
Appendix A

Sub-Slab Depressurization System

Appendix A-1

SSDS Design – As-Built





LEGEND

☐ Suction Pit Location

Basemap Source:
Aufgang Architects, LLC, Suffern, NY,
Proposed Repair and Rennovation for BEC New Communities HDFC, Inc.,
Proj #1518, Dwg. #A-100.00, 6/28/15

0 4' 8' 16'
Drawing Scale

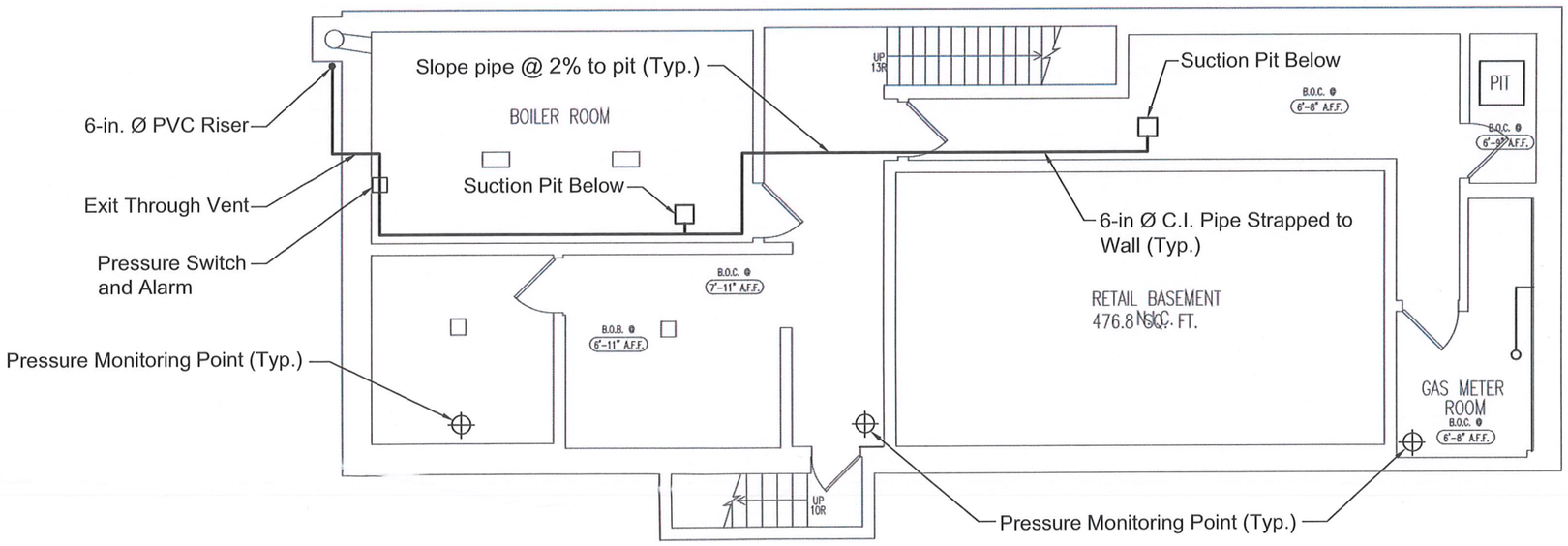
CLIENT
19 PATCHEN AVENUE
BROOKLYN, NEW YORK

CONSULTANT
TENEN ENVIRONMENTAL
TENEN ENVIRONMENTAL, LLC
121 West 27th Street
Suite 702
New York, NY 10001
O: 646-606-2332
F: 646-606-2379

DRAWN BY	CHECKED BY	DATE	SCALE:
LM	MC	FEBRUARY 2017	AS NOTED

DRAWING TITLE: X-100.00

DRAWING NO.: SSDS SUBGRADE LAYOUT



LEGEND

- Suction Pit Location
- Pressure Monitoring Point Location

0 4' 8' 16'

Drawing Scale

Basemap Source:
Aufgang Architects, LLC, Suffern, NY,
Proposed Repair and Rennovation for BEC New Communities HDFC, Inc.,
Proj #1518, Dwg. #A-100.00, 6/28/15

CLIENT

19 PATCHEN AVENUE
BROOKLYN, NEW YORK

CONSULTANT

TENEN ENVIRONMENTAL

TENEN ENVIRONMENTAL, LLC
121 West 27th Street
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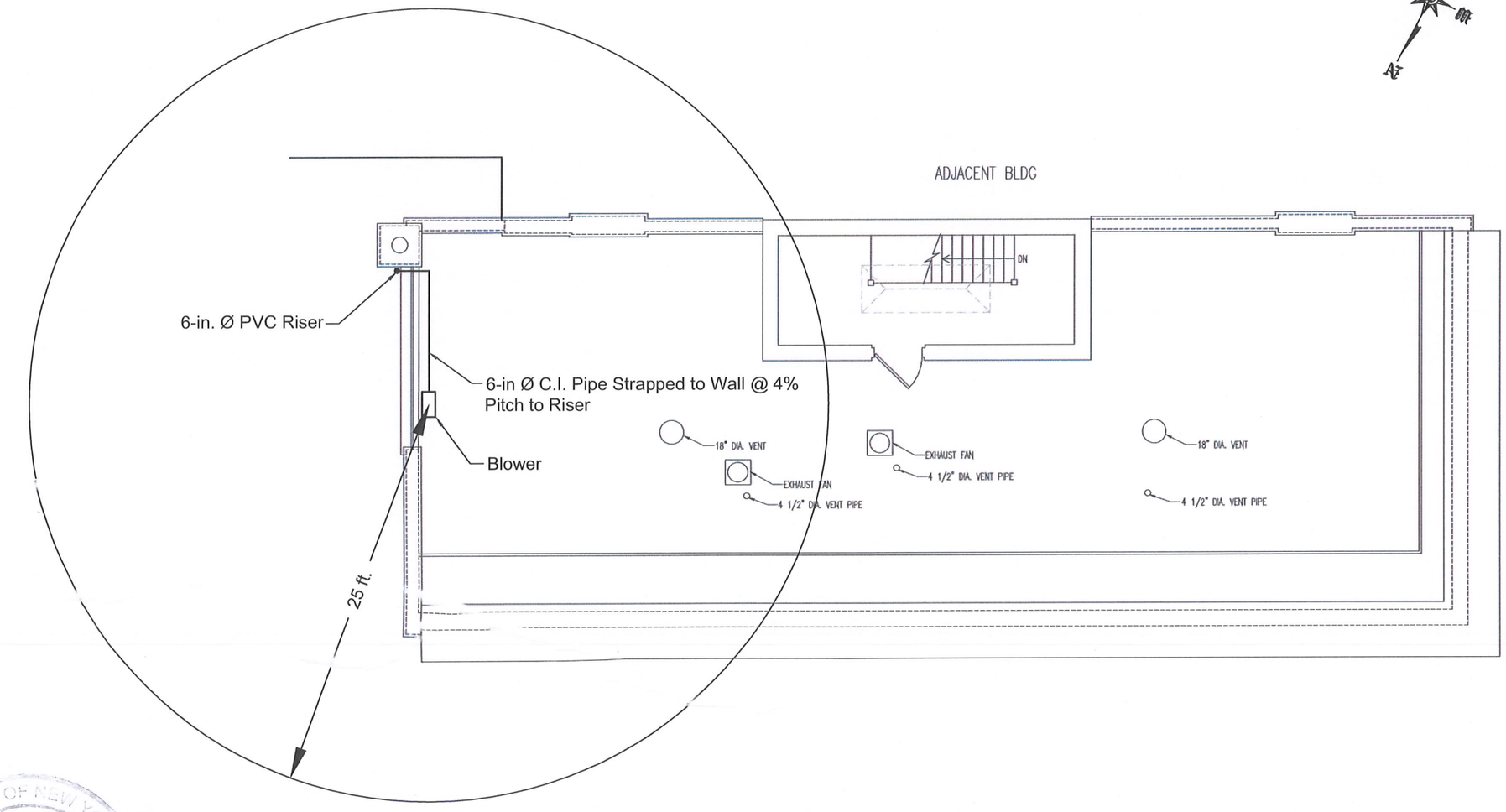
New York, NY 10001
O: 646-606-2332
F: 646-606-2379

DRAWN BY	CHECKED BY	DATE	SCALE:
LM	MC	FEBRUARY 2017	AS NOTED

DRAWING TITLE: X-101.00

DRAWING NO.: SSDS CELLAR LAYOUT



Basemap Source:
Aufgang Architects, LLC, Suffern, NY,
Proposed Repair and Rennovation for BEC New Communities HDFC, Inc.,
Proj #1518, Dwg. #A-103.00, 6/28/15

0 4' 8' 16'
Drawing Scale

CLIENT

19 PATCHEN AVENUE
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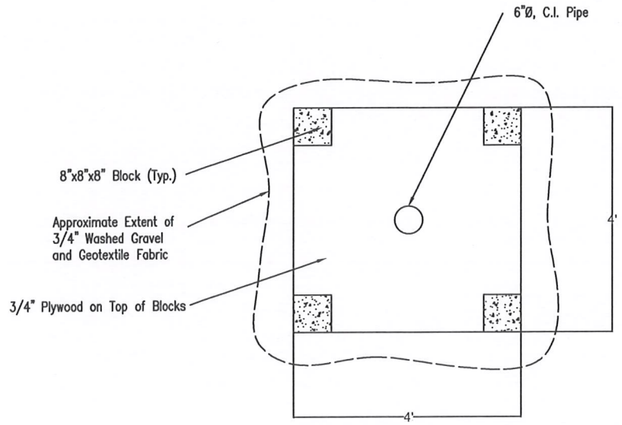
DRAWN BY	CHECKED BY	DATE	SCALE:
LM	MC	FEBRUARY 2017	AS NOTED

DRAWING TITLE: X-102.00

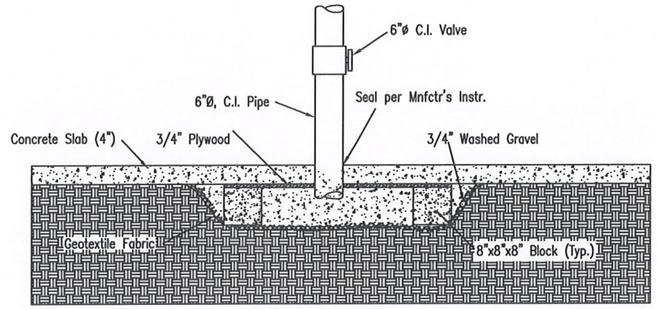
DRAWING NO.: SSDS ROOF LAYOUT

1



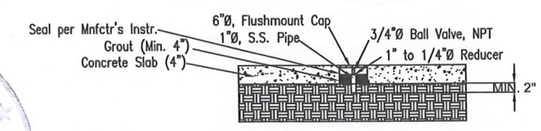
Suction Pit – Plan View

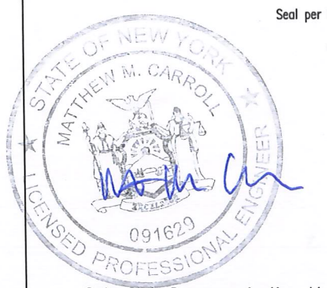
2



Suction Pit – Section View

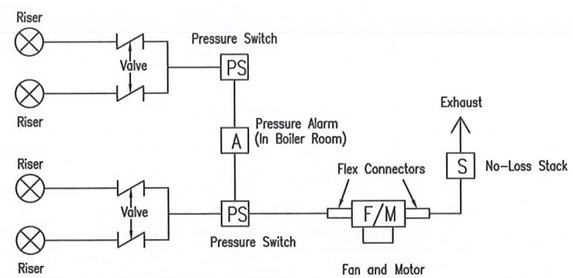
3





Sub-Slab Depressurization Monitoring Point – Side View

4



Sub-Slab Depressurization System – Schematic from Riser to Exhaust Location

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SCALE:	AS NOTED
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DRAWING NO.	X-103.00

Appendix A-2

SSDS Operation – Routine Operating Procedures

Sub-Slab Depressurization System (SSDS)

Routine Operating Procedures

The long-term operation and maintenance program described below shall continue throughout the life cycle of the sub-slab depressurization system (SSDS) to ensure a proper working order. The long-term operation and maintenance program for the major SSDS components includes manufacturer's recommendations for the reinstallation of SSDS components if modifications to the existing system need to be made, inspection procedures, an operation schedule, typical routine maintenance activities and schedules, and troubleshooting. Refer to Section 3.3.3 for an overall inspection procedure of the SSDS.

The alarm system, described below, shall run continuously and only be disconnected for routine maintenance and inspection activities or replacement. The system includes the following:

- vacuum gauge/switch, Dwyer Instruments Series ADPS/EDPS Differential Pressure Switch, model ADPS-05-2-N
- building alarm system, Edwards Signaling Electronic Horn/Strobe 860 Series, model 867STRC

In case there is a need to relocate the vacuum gauge/switch, the new location shall ensure that the vacuum gauge/switch remains in close proximity to the riser pipe and is installed correctly. If the vacuum gauge is not indicating a vacuum while the SSDS is on, make sure that the tubing connected to the riser pipe is connected to the low pressure port. High pressure ports on the vacuum gauge/switch should be vented to atmosphere.

The vacuum gauge/switch does not require lubrication or periodic servicing. The vacuum gauge is not field serviceable and should be returned to the manufacturer or supplier if repair is needed. Repairs or alterations made to the vacuum gauge/switch by others will void the unit's warranty. The vacuum gauge/switch is factory calibrated and cannot be recalibrated in the field. The installation and operating instructions for the vacuum alarm/monitor have been included in Appendix A-3.

When testing the vacuum alarm/monitor, the tubing that connects the vacuum alarm/monitor to the riser pipe shall be disconnected and the low set point raised above the current reading. If the vacuum alarm/monitor is powered at the time of disconnecting the tubing from the riser pipe, the building system will go into alarm. The building system should go back on-line when the tubing is reconnected to the riser pipe. If the building system is in alarm when there is a vacuum present in the riser pipe, inspect the tubing and riser pipe tap to ensure that there are no blockages. If there is a blockage in either the tubing or the riser pipe tap, remove the blockage and retest the vacuum alarm/monitor.

Common troubleshooting tips that can be followed if the vacuum gauge/switch will not indicate a vacuum or is sluggish include the following:

- The pressure ports (high or low) are not hooked up correctly;

- The fittings or sensing lines are blocked, pinched or leaking;
- The cover is loose;
- The pressure sensor is improperly located;
- The ambient temperature is too low (below 20ºC).

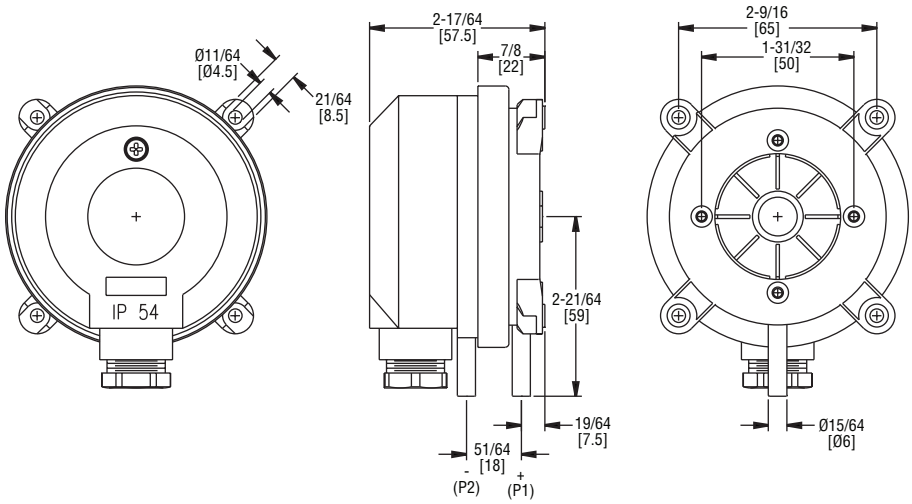
The RadonAway HS2000 Radon Fan shall operate continuously and only be turned off for routine maintenance and inspection activities or replacement. The SSDS fan and motor shall not be left on the system piping without electrical power for more than 48 hours due to possible fan failure that could result from this non-operational storage. The SSDS fan unit does not require periodic servicing and should be returned to the manufacturer or supplier for service. Repairs or alterations made to the SSDS fan unit by others will void the unit's warranty. The installation and operating instructions for the SSDS fan unit have been included in Appendix A-4.

Appendix A-3

SSDS Vacuum Gauge and Switch – Installation and Operating Instructions

Series ADPS Differential Pressure Switch

Specifications - Installation and Operating Instructions



The Series ADPS Adjustable Differential Pressure Switch is designed for overpressure, vacuum, and differential pressure applications. The scaled adjustment knob allows changes to the switching pressure to be made without a pressure gage. The ADPS is available with settings from 0.08″ w.c. (20 Pa) to 20″ w.c. (5000 Pa). The silicone diaphragm and PA 6.6 body make the Series ADPS perfect for use with air and other noncombustible gases. The Series ADPS can be used in monitoring air filters, ventilators, and industrial cooling-air circuits along with controlling air and fire-protection flaps and many other applications.

Use only with mediums such as air, or other noncombustible or non-aggressive gases. Otherwise operating faults or accidents may occur.

Mounting Switch

First check the pressure switch to ascertain whether any damage is visible on the housing. If the housing is leaky because of damage, the pressure switch must not be used.

Switching pressure specifications apply to vertical installation which is also the recommended position with pressure connections pointing downwards.

Only if there is no potential for condensate forming can you mount the pressure switch horizontally. In this case, however, the switching values are approximately 0.08 in w.c. (20 Pa) higher as indicated on the scale. In the horizontal position, the pressure switch should be mounted 'lying down' only (that is to say with the electrical connections pointing upwards). Do not mount the pressure switch in a hanging position (that is to say, not 'overhead' with the electrical connections pointing downwards). Otherwise the device will function inaccurately.

a) Mounting with screws or brackets

1. To mount the pressure switch, L-shaped A-288 and S-shaped A-289 mounting brackets can be ordered separately. To secure the device on the rear side of the housing, only use the sheet metal screws (3.5 x 8 mm) which are supplied together with the mounting brackets. Under no circumstances must you use longer screws. Otherwise, the base of the housing could be punctured resulting in the pressure switch leaking.

2. You can also mount the pressure switch directly on a wall. To do this use screws with a maximum diameter of 0.315″ (8.0 mm), if you use the outer mounting lugs to screw the device in place. Do not tighten the screws so much that the base of the device is deformed. Otherwise, the pressure switch can be shifted out of position, or leak.

SPECIFICATIONS

Service: Air and noncombustible, compatible gases.
Wetted Materials: Diaphragm material: Silicone; Housing material & switch body: POM and PA 6.6; Cover: Polystyrene.
Temperature Limits: Process ambient temperature from -4 to 185˚F (-20 to 85˚C).
Pressure Limits: Max. Operating Pressure: 40" W.C. (10 kPa) for all pressure ranges.
Switch Type: Single-pole double-throw (SPDT).
Repeatability: ±15% FS.
Electrical Rating: Standard: Max., 1.5A/250 VAC, max. switching rate: 6 cycles/min.; Gold Contact Option: 0.1 A/ 24 VDC.
Electrical Connections: Push-on screw terminals. M20x1.5 with cable strain relief or optional 1/2″ NPT connection.
Process Connections: 5/16″ (7.94 mm) outside diameter tubing, 1/4″ (6.0 mm) inside diameter tubing.
Mounting Orientation: Vertically, with pressure connections pointing downwards.
Mechanical Working Life: Over 10^6 switching operations.
Weight: 5.6 oz (160 g).
Enclosure Rating: IP54.
Agency Approvals: CE, RoHS.

Installing Hoses

Important: Pressure tubing cannot be kinked. Pay particular attention to this point if you run hoses over an edge. It is better to form a loop. If the hoses are kinked, the device cannot function accurately.

a) For connection to the pressure switch two fittings inherent in the housing are provided for hoses with an internal diameter of 1/4″ (6.0 mm).

1. Connect a hose with the higher pressure to socket P1 which is located on the lower section of the housing.

2. Connect a hose with the lower pressure to socket P2 which is located on the middle section of the housing.

After you have installed the hoses, it is absolutely essential to check them for tightness of fit at the connection points and to make sure that they run without any kinks.

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Electrical Connection
Work on electrical installations must only be carried out by electricians who are specifically trained for this purpose.

⚠CAUTION First make sure that there is no voltage on the connecting cable while you are working on the electrical connections. Otherwise, a possible electric shock may result and the connected equipment may be damaged. The connecting cable can be run to the pressure switch from three sides, according to choice. The screw cable connection has a plug-in design for this purpose. Rotate protective cover accordingly.

For cable gland models, the seal in the screw cable connection is designed for cables with alternative sheath diameters of 0.275″ (7 mm) or 0.393″ (10 mm). Only use these sizes – otherwise the screw cable connection cannot seal adequately.

1. If using a 0.275″ (7 mm) connecting cable, you can line up the press nut, the plain washer and the sealing ring directly on the cable.

2. If using a 0.393″ (10 mm) connecting cable, you must first break the inner rubber ring out of the sealing ring directly on the cable. Then line up the press nut, the plain washer and the sealing ring on the cable.

Wiring
The switching device in this pressure switch is designed as a change-over contact as can be seen from the wiring diagram (Figure 1). The rest position is shown in Figure 1 (pressure below the activation switch point on dial).

1. In the instance where pole 3 (COM) closes to Pole 2, the pressure is increasing (NO).

2. In the instance where pole 3 (COM) closes to Pole 1, the pressure is decreasing (NC).

Protect the feed line (to pole 3) by fuse, either in control system or along the line, and do so with:

1. Max. 1.5 A / 250 VAC, if you are loading the contact with an resistive load;

2. Max 0.4 A / 250 VAC, if you are loading the contact with an inductive load (such as relay);

3. Max. 0.1 A / 24 VDC, if you are using the pressure switch in the weak current version with gold-plated contacts.

The connections are intended for crimp-type sockets, 0.25 in (6.3 mm).

1. Make sure the crimp connection is perfect, and that the cable lugs fit properly on to the connections.

2. If you do not have any crimp-type sockets available, you can also use the cable lugs which are supplied with mounted screw terminals. However, these are only intended for rigid copper wire.

3. On flex, it is either necessary to crimp on strand end sleeves – and then you can also screw the strands on – or to crimp cable lugs on directly as previously described.

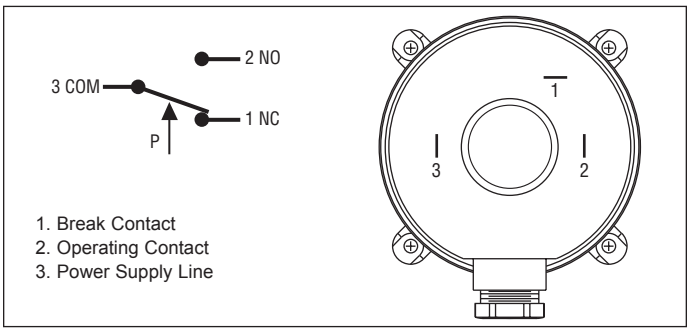

Figure 1

Setting the Pressure Range
Make absolutely certain that there is no voltage on the electrical connections before you carry out any setting on the pressure switch. Otherwise, it could be fatal if you accidentally touch the electrical connections or the metal adjusting screw while you are performing the settings.

a) Use the adjustment dial to set the pressure which should trip the switch on an increase of pressure.

1. The indications on the dial are only correct for the vertical mounting position.

2. When the pressure falls, the switch returns to its resting position as soon as the pressure falls below the dead band.

Attaching Cover
a) Insert the screw cable connection into the recess provided for this purpose on the housing.

b) Then place the housing cover in position and screw it down evenly on to the pressure switch.

Testing the Setting
Do not operate the system until the housing is closed. Otherwise there is the possibility of an electric shock if you accidentally touch live parts.
Check the trip and reset pressures by slowly increasing the pressure and then allowing it to fall again.

IMPORTANT: Observe the maximum permissible operating pressure of 40″ w.c. (10 kPa) which is indicated in the data sheet. Otherwise the pressure switch may be damaged.

MAINTENANCE
Upon final installation of the Series ADPS Adjustable Differential Pressure Switch, no routine maintenance is required. A periodic check of system operation is recommended. The Series ADPS is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

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Electronic Horn/Strobe Signal Appliance Installation Sheet

Description

The horn/strobes are high quality signals intended for use in cUL general signaling applications. The strobes flash at 1 fps across their full operating voltage range. See Table 1 for model numbers and “Specifications” for details.

Table 1: Models

Number	Description
867STR(*)-**	Horn/Strobe, Surface Mount Indoor, Gray
868STR(*)-**	Horn/Strobe, Surface Mount Outdoor, Gray
869STR(*)-**	Horn/Strobe, Flush or Panel Mount Indoor, Gray

* Insert lens color: C = Clear, R = Red, G = Green, B = Blue, A = Amber.

** The horns are available in two voltages. Insert suffix as required: N5 = 120 VAC, AQ = 24 V AC/DC

Installation

Install and wire this device in accordance with applicable national and local codes, ordinances, and regulations, and in a manner acceptable to the local authority having jurisdiction.

WARNINGS

- To reduce the risk of shock, do not connect AC or battery power to the horn until directed in these instructions.
- To reduce the risk of shock, do not tamper with this device when the signal circuit is energized. Disconnect all power and wait 5 minutes for stored energy to dissipate before handling.

1. Select a mounting method as detailed in Figure 1 and install the electrical box using suitable hardware.

   For outdoor applications, install the weatherproof box using four #10 × 1-1/4 (32 mm) screws and caplugs provided in the enclosed parts bag. Carefully adhere the gasket, part number P-007549-0082 (provided in the enclosed parts bag) to the box as shown in Figure 1.

   Notes

   - Be sure that the hook flange is facing outward as shown in Figure 1 (item 10).
   - The designation "TOP" on boxes denotes orientation of box after installation.

2. Attach the mounting plate using two #8-32 screws provided with the surface box or four #8-32 screws provided with weatherproof box. The flush box uses two #8-32 screws (not provided).
3. Bring the signaling circuit field wiring into the electrical box.
4. Connect signaling circuit field wires to terminals on horn/strobe assembly (Figure 2 through Figure 4).
5. Ground in accordance with national and local electrical codes. A green ground screw is provided with both the indoor and outdoor surface boxes.
6. Mount the horn/strobe on the mounting plate (Figure 1).
   a. The inside of the top of the grille has hinges that pass through cutouts and engage with tabs on the mounting plate. With the bottom of the grille lifted out slightly, place the grille over the mounting plate so that the hinges of the grille are in the mounting cutouts.
   b. Properly seat the grille by pressing the bottom in.
   c. Fasten the bottom of the grille to the mounting plate by installing the captive combination drive screw.
7. Apply power and activate the horn/strobe unit to verify that it is operating properly.

Maintenance

Caution: Should the unit fail to operate properly, do not attempt repair. Contact the supplier for replacement.

Perform a visual inspection and an operational test twice a year.

Specifications

	N5 model	AQ model	
Operating voltage*	120 VAC 50/60 Hz	24 VAC 50/60 Hz	24 VDC
Operating current, horn**	33 mA	72 mA	22 mA
Operating current, strobe**	115 mA	390 mA	390 mA
Flash rate (per second)	Approximately 1 fps		
Sound level output at 10 ft. (3.05 m) anechoic chamber	90 dBA nominal		
Operating environment	Indoor: 93% at 90°F (32°C) relative humidity; 32 to 120°F (0 to 49°C) variable ambient temperature Outdoor: 98% at 104°F (40°C) relative humidity; −31 to 150°F (−35°F to 66°C) variable ambient temperature		

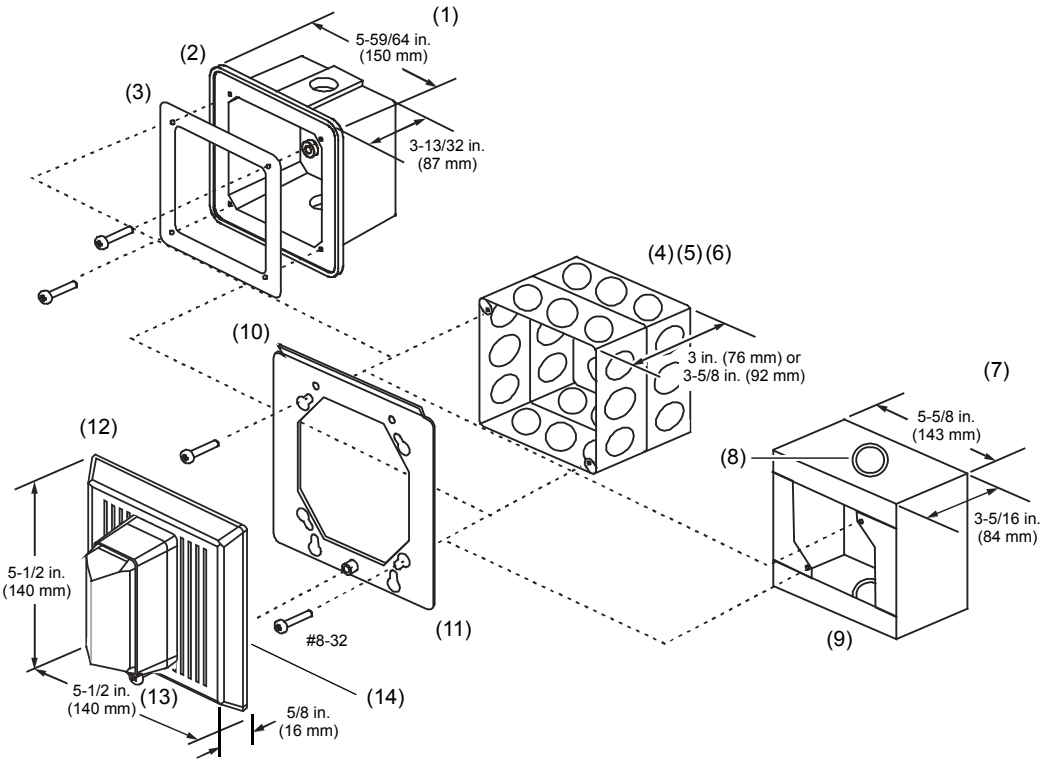
* The operating voltage to the horn may be continuous or coded such as march time or a temporal pattern meeting ISO8201 (ANSI S3.41) Audible Emergency Evacuation Signal.

** Horn and strobe currents are additive when connected in parallel.

Models 867STR(*)-AQ, 868STR(*)-AQ and 869STR(*)-AQ potentially generate timing signals or pulses above 9 kHz and therefore have been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

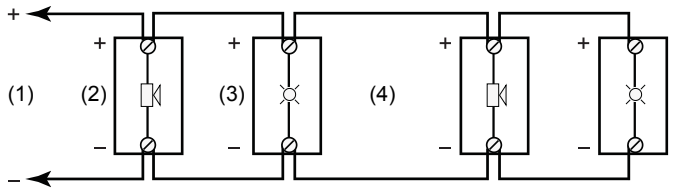
Caution: Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Figure 1: Detailed view



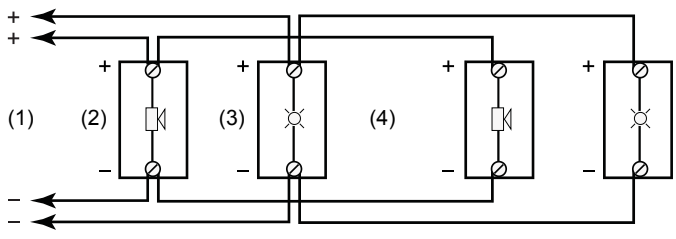
(1) Surface (outdoor)
(2) Weatherproof box
(3) Gasket
(4) Flush/Panel
(5) Standard North American 4 in. sq. × 1-1/2 in. deep electrical box (Universal #52171) with 1-1/2 in. (38 mm) deep extension ring (Universal #53151 or equivalent)
(6) CAUTION CANADA: If using Iberville (Commander) extension ring, use standard North American box with 2-1/8 in. (54 mm) deep extension ring (Universal #53171)
(7) Surface (indoor)
(8) Knockouts for 1/2 in. (13 mm) or 3/4 in. (19 mm) conduit; top, bottom, back
(9) Surface box
(10) Hook flange
(11) Mounting plate (supplied)
(12) Electronic horn/strobe
(13) Captive combination drive screw
(14) Terminal block (see Figure 4)

Figure 2: Wiring the horn and strobe on the same circuit



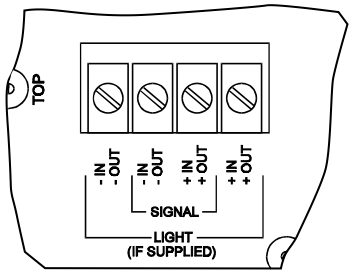
(1) Applicable voltage source
(2) Horn
(3) Strobe
(4) Polarity must be observed for units operating on VDC

Figure 3: Wiring the horn and strobe on different circuits



(1) Applicable voltage source
(2) Horn
(3) Strobe
(4) Polarity must be observed for units operating on VDC

Figure 4: Terminals



Regulatory information

Ratings	CAN/CSA C22.2 No. 205 UL 464

Contact information

For contact information, see www.edwardsfiresafety.com

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Appendix A-4

SSDS Fan and Motor – Installation and Operating Instructions

RadonAway
The world's leading radon fan manufacturer

HS Series

Radon Mitigation Fan

HS fans offer a proven solution for tough radon mitigation jobs, providing up to 25 times the suction of inline tube fans to deal with sand, tight soil or clay sub-slab material.

Features

- Internal condensate bypass
- Brackets for vertical mounting indoors and outdoors
- Inlet: 3.0" PVC / Outlet: 2.0" PVC
- Weight: 18 lbs.
- Size: 15.5"W x 13.3"H x 8.2"D
- Warranty: 1 year (3-year option available)

MODEL	WATTS	SOUND RATING (dBA)			RECOM. MAX. OP. PRESSURE "WC	TYPICAL CFM* vs. STATIC PRESSURE WC					
		OPEN	1/2	CLOSED		0"	10"	15"	20"	25"	35"
HS2000 with cord	174-307	56.5	56.2	51.9	14	63	37	12	-	-	-
HS3000 with cord	120-250	47.9	48.0	46.2	21	39	30	25	19	-	-
HS5000 with cord	223-385	56.0	55.3	53.1	35	44	37	33	29	25	16
HS2000E with switch box	174-307	56.5	56.2	51.9	14	63	37	12	-	-	-
HS3000E with switch box	120-250	47.9	48.0	46.2	21	39	30	25	19	-	-
HS5000E with switch box	223-385	56.0	55.3	53.1	35	44	37	33	29	25	16

* Made in the USA with U.S. and imported parts.

* CFM measured through suction.

For Further Information, Contact Your Radon Professional:

Rev C 0517
P/N 02002

RadonAway®

The world's leading radon fan manufacturer

HS Series Installation & Operating 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 or flammable materials.

2. **WARNING!** Check voltage at the fan to ensure it corresponds with nameplate. See Vapor Intrusion Application Note #AN001 for important information on VI Applications. RadonAway.com/vapor-intrusion

3. **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.

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

5. All wiring must be performed in accordance with the National Fire Protection Association's (NFPA) "National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician.

6. **WARNING!** In the event that the fan is immersed in water, return unit to factory for service before operating.

7. **WARNING!** Do not twist or torque fan inlet or outlet piping as leakage may result.

8. **WARNING!** Do not leave fan unit installed on system piping without electrical power for more than 48 hours. Fan failure could result from this non-operational storage.

9. **WARNING!** TO REDUCE THE RISK OF FIRE, ELECTRIC SHOCK, OR INJURY TO PERSONS, OBSERVE THE FOLLOWING:

   a) Use this unit only in the manner intended by the manufacturer. If you have questions, contact the manufacturer.

   b) Before servicing or cleaning unit, switch power off at service panel and lock the service disconnecting means to prevent power from being switched on accidentally. When the service disconnecting means cannot be locked, securely fasten a prominent warning device, such as a tag, to the service panel.

1.0 SYSTEM DESIGN CONSIDERATIONS

1.1 INTRODUCTION

The HS Series Fan is intended for use by trained, certified/licensed, professional radon mitigators. The purpose of this instruction is to provide additional guidance for the most effective use of the HS Series Fan. This instruction should be considered as a supplement to EPA/Radon Industry 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 HS Series Fan is 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 HS Series Fan should be stored in an area where the temperature is always greater than 32°F or less than 100°F. The HS Series Fan is thermally protected such that it will shut off when the internal temperature is above 194°F +/- 9°F (90°C +/- 5°C). If the HS Series Fan is idle in an area where the ambient temperature exceeds this shut off, it will not restart until the internal temperature falls below 104°F.

1.3 ACOUSTICS

The HS Series Fan, when installed properly, operates with little or no noticeable noise to the building occupants. Recommended system design and installation considerations to minimize noise: When installing the HS Series Fan above sleeping areas, select a location for mounting at the farthest possible distance. Avoid mounting near doors, fold-down stairs or other uninsulated structures which may transmit sound. Ensure a solid mounting for the HS Series Fan to avoid structure-borne vibration or noise.

The velocity of the outgoing air must also be considered in the overall system design. With small diameter piping, the “rushing” sound of the outlet air can be disturbing. The system design should incorporate a means to slow and quiet the outlet air. The use of the RadonAway Exhaust Muffler, p/n 24002, is strongly recommended.

1.4 GROUND WATER

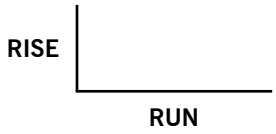
Under no circumstances should water be allowed to be drawn into the inlet of the HS Series Fan as this may result in damage to the unit. The HS Series Fan should be mounted at least 5 feet above the slab penetration to minimize the risk of filling the HS Series Fan with water in installations with occasional high water tables.

In the event that a temporary high water table results in water at or above slab level, water will be drawn into the riser pipes thus blocking air flow to the HS Series Fan. The lack of cooling air will result in the HS Series Fan cycling on and off as the internal temperature rises above the thermal cutoff and falls upon shutoff. Should this condition arise, power down and disconnect the HS Series Fan until the water recedes allowing for return to normal operation; then reconnect and power on to turn the fan back on.

1.5 CONDENSATION & DRAINAGE

WARNING!: Failure to provide adequate drainage for condensation can result in system failure and damage the HS Series Fan.
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 use of small diameter piping in a system increases the speed at which the air moves. The speed of the air can pull water uphill and, at sufficient velocity, it can actually move water vertically up the side walls of the pipe. This has the potential of creating a problem in the negative pressure (inlet) side piping. For HS Series Fan inlet piping, the following table provides the minimum recommended pipe diameters as well as minimum pitch under several system conditions. Use this chart to size piping for a system.



Pipe Diameter	Minimum Rise per 1 Foot of Run*		
	@ 25 CFM	@ 50 CFM	@ 100 CFM
4”	1/32”	3/32”	3/8”
3”	1/8”	3/8”	1 1/2”

*Typical operational flow rates:

HS2000 12 - 63 CFM
HS3000 19 - 39 CFM
HS5000 16 - 44 CFM

All exhaust piping should be 2” PVC.

1.6 SYSTEM MONITOR & LABEL

A properly designed system should incorporate a “System On” indicator for affirmation of system operation. A Magnehelic pressure gauge is recommended for this purpose. The indicator should be mounted at least 5 feet above the slab penetration to minimize the risk of filling the gauge with water in installations with occasional high water tables. A System Label (P/N 15022) with instructions for contacting the installing contractor for service and also identifying the necessity for regular radon tests to be conducted by the building occupants, must be conspicuously placed where the occupants frequent and can see the label.

1.7 SLAB COVERAGE

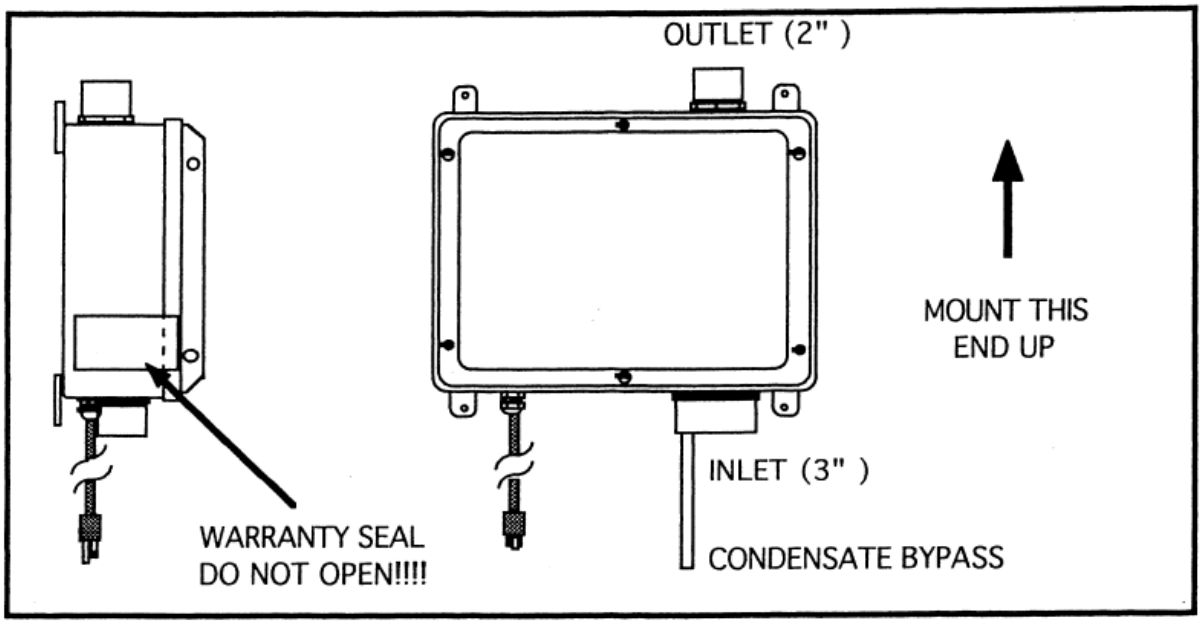
The HS Series Fan can provide coverage of well over 1000 sq. ft. per slab penetration. This will, of course, depend on the sub-slab aggregate in any particular installation and the diagnostic results. In general, sand and gravel are much looser aggregates than dirt and clay. Additional suction points can be added as required. It is recommended that a small pit (5 to 10 gallons in size; larger as needed) be created below the slab at each suction hole. When fine sand or dirt is present it is recommended that the pit be lined with a material such as clean gravel, size 4, 5, 56, or 6 as classified (ASTM C33).

1.8 ELECTRICAL WIRING

For models with a cord, the HS Series Fan plugs into a standard 120V outlet. The switch box models are hardwired. All wiring must be performed in accordance with the National Fire Protection Association’s (NFPA)”National Electrical Code, Standard #70”-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician. Outdoor installations require the use of a UL listed watertight conduit. Ensure that all exterior electrical boxes are outdoor rated and properly caulked to prevent water penetration into the box. A means, such as a weep hole, is recommended to drain the box.

1.9 SPEED CONTROLS

Electronic speed controls can **NOT** be used on HS Series units.



2.0 INSTALLATION

2.1 MOUNTING

Mount the HS Series Fan to the wall studs, or similar structure, in the selected location with (4) 1/4" x 1 1/2" lag screws (not provided). Ensure the HS Series Fan is both plumb and level.

2.2 DUCTING CONNECTIONS

Make final ducting connection to HS Series Fan with flexible couplings. Ensure all connections are tight. Do not twist or torque inlet and outlet piping on HS Series Fan or leaks may result.

NOTE: Do NOT solvent weld fittings to unit hubs.

2.3 VENT MUFFLER INSTALLATION

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

2.4 OPERATION CHECKS & ANNUAL SYSTEM MAINTENANCE

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

_____ **Ensure** the HS Series Fan and all ducting is secure and vibration-free.

_____ **Verify** system vacuum pressure with Magnehelic. **Ensure** vacuum pressure is within normal operating range and **less than** the maximum recommended as shown below:

HS2000 14" WC
HS3000 21" WC
HS5000 35" WC

(Above are based on sea-level operation, at higher altitudes reduce above by about 4% per 1000 Feet.)
If these are exceeded, increase number of suction points.

_____ **Verify Radon levels** by testing to EPA Protocol and applicable testing standards.

Addendum

Product Specifications

Model	Maximum Static Suction	Recommended Maximum Static Suction	Typical CFM vs Static Suction WC (Recommended Operating Range)						Power* Watts @ 115VAC
			0"	10"	15"	20"	25"	35"	
HS2000	16"	14"	62	40	23	-	-	-	153-314
HS3000	24"	21"	39	30	25	19	-	-	120-250
HS5000	41"	35"	43	35	32	28	24	18	349-381
HS2000E	16"	14"	62	40	23	-	-	-	153-314
HS3000E	24"	21"	39	30	25	19	-	-	120-250
HS5000E	41"	35"	43	35	32	28	24	18	349-381

**Power consumption varies with actual load conditions*

Inlet: 3.0" PVC

Outlet: 2.0" PVC

Mounting: Brackets for vertical mount

Weight: Approximately 18 lbs

Size: Approximately 15"W x 13"H x 8"D

Minimum recommended inlet ducting (greater diameter may always be used):

HS3000, HS5000 --- 2.0" PVC Pipe

HS2000 --- Main feeder line of 3.0" or greater PVC Pipe

Branch lines (if 3 or more) may be 2.0" PVC Pipe

Outlet ducting: 2.0" PVC

Storage Temperature Range: 32°F-100°F

Thermal Cutout: 194°F +/- 9°F (90°C +/- 5°C)

Locked rotor protection

Internal condensate bypass

IMPORTANT INSTRUCTIONS TO INSTALLER

Inspect the RadonAway® HS 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.

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

Install the HS Series Fan in accordance with all EPA standard practices, and state and local building codes and state regulations.

Provide a copy of this instruction or comparable radon system and testing information to the building occupants after completing system installation.

Warranty

RadonAway® warrants that the HS 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 repair or replace any Fan which fails due to defects in materials or workmanship during the Warranty Term. 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®.

1 YEAR EXTENDED WARRANTY WITH PROFESSIONAL INSTALLATION

RadonAway® will extend the Warranty Term of the fan to twelve (12) months from date of installation or fifteen (15) months from the date of manufacture, whichever is sooner, if the Fan is installed in a professionally designed and professionally installed active soil depressurization system or installed as a replacement fan in a professionally designed and professionally installed active soil depressurization system. Proof of purchase and/or proof of professional installation may be required for service under this warranty. RadonAway® is not responsible for installation, removal or delivery costs associated with this Warranty.

EXCEPT AS STATED ABOVE, THE HS SERIES FAN IS 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 costs to and from factory.

RadonAway®
3 Saber Way
Ward Hill, MA 01835 USA
TEL (978) 521-3703
FAX (978) 521-3964
Email to: Returns@RadonAway.com

Record the following information for your records:

Serial No. _____

Purchase Date: _____

Appendix B

Vapor Sealant

Vapor Intrusion Coating System for Existing Structures

Product Description

The **Retro-Coat™ (patent pending)** Vapor Intrusion Coating System is a complete product line that consists of chemically resistant materials to properly protect existing structures from the threat of contaminant vapor intrusion without the need for additional concrete protection. Developed by the R&D team of Land Science Technologies™, the Retro-Coat system has been subjected to rigorous testing procedures to prove its ability to combat the most aggressive chemical vapors. The main component of the Retro-Coat system is the **Retro-Coat** coating which is a two part, odorless, no VOC, 100% solids coating.

Retro-Coat finishes to a high gloss, easy-to-clean surface that is impervious to vapor and moisture transmission. Available in a variety of colors, **Retro-Coat** can be applied on damp as well as dry concrete, concrete masonry units, tile, brick and metal. For enhanced slip resistance, a suitable aggregate can be added. In addition, other additives or materials can be utilized to achieve a desired performance or aesthetic look.

Typical Application

Retro-Coat is suitable as a barrier to block contaminated vapors from entering existing structures. Particular uses include coating the horizontal surfaces of existing structures where contamination under, or adjacent to, a structure can potentially migrate inside the structure and create a vapor encroachment condition. This condition is most commonly found when the existing structure was operated as a dry cleaner, gas station, manufacturing facility or located in close proximity to any structure where carcinogenic chemicals were utilized.

A typical application consists of a minimum 20 mil thick system; consisting of two 10 mil coats of **Retro-Coat** at 160 SF/gallon per coat and is recommended along with a 6 mil coat of **Retro-Coat PRIMER.** The typical 20 mil application can withstand forklift traffic, other machinery and even act as secondary containment. However, if **Retro-Coat** may be exposed to more harsh conditions over a longer period of time, thicker applications ranging from 60 mil to ¼ -inch may be more suitable.

In either application, **Retro-Coat** is a traffic bearing surface and does not need a protective course placed over it.

Retro-Coat Advantages

- ***Our R&D team developed all of the Retro-Coat system components specifically for vapor intrusion protection in existing structures***
- ***Retro-Coat is resistant to both TCE and PCE, the vast majority of coatings cringe at such aggressive chemicals***
- ***Retro-Coat is a wearing surface, meaning no additional concrete protection is necessary***
- ***No odor and fast cure time reduce building downtime***
- ***Carpet, tile, linoleum or other floor coverings can be applied directly over Retro-Coat, if desired***
- ***Eliminates the need to remove the existing slab and when combined with in-situ treatment, lowers overall remediation cost***
- ***Retro-Coat can increase the performance of an existing active sub-slab depressurization system***
- ***Retro-Coat can aid in the retiring of existing active systems***
- ***Available and installed by Land Science Technologies certified contractors***

Completed surface preparation consisting of shot blasting, Retro-Coat PREP to fill joints and cracks and a 6 mil application of Retro-Coat PRIMER

Application of Retro-Coat SEALANT to a 20 mil total thickness

Installation

Particular care must be taken to follow those instructions precisely to assure proper installation. These instructions pertain to a standard 20 mil application; please contact us if the desired application is different.

1. New concrete should be allowed to cure a minimum of 28 days and/or be checked with a rubber mat or plastic sheet to ensure adequate curing time has occurred.
2. All surfaces to be covered should be power washed, shot blasted, acid etched, scarified or sanded to present a clean, sound substrate to which to bond to. The prepared surface should have a ph of 7.
3. Any bugholes and cracks wider than 1/8" should be filled with **Retro-Coat PREP** and allowed to dry before coating. More severely damaged concrete or other special conditions will require the proper **Retro-Coat** product.
4. When installing the standard 20 mil application of **Retro-Coat**, apply a 6 mil coat of **Retro-Coat PRIMER** and allow to dry prior to applying the initial coat of **Retro-Coat**. Priming may not be necessary when **Retro-Coat** is applied to a thickness greater than 20 mils. On new concrete or old concrete with an open porosity and on wood surfaces apply **Retro-Coat PRIMER** and allow to dry.
5. The two **Retro-Coat** ingredients should be mixed in the prescribed ratios, using a low speed "jiffy-style" mixer, (maximum 750 rpm). Mix Part A for about 1 minute then, add Part B and mix until uniform in color and consistency (at least one additional minute.)
6. Do not mix less than the prescribed amount of any ingredient or add any solvent to the mix.
7. Apply the mixed **Retro-Coat** material with a short nap roller, a squeegee or a brush. Apply approximately 160 SF per gallon per coat to achieve 10 mils of coating.
8. Apply a second coat while the first coat is still tacky if using spike shoes or dry enough to walk on, but before 7 hours at 75^{o}F. If the first coat has set and is no longer tacky then the first coat should be sanded before recoating.
9. A suitable aggregate may be broadcast onto the surface after backrolling to provide more anti-slip profile to the finished surface. It is advisable to test various types and sizes of aggregate to achieve the desired finished profile.

Product Specification

The specified area shall receive an application of **Retro-Coat** as manufactured by **Land Science Technologies, San Clemente, California.** The material shall be installed by precisely following the manufacturer's published recommendations pertaining to surface preparation, mixing and application. The material shall be a low odor, two part, solvent free 100% solids, high gloss flexibilized system with good resilience to resist thermal and mechanical shock. It should be able to be roller applied at a minimum of 10 mils thickness per coat on vertical surfaces without sagging (at ambient conditions). The system must adhere to damp as well as dry concrete, wood, metal tile, terrazzo and sound existing epoxy and urethane coatings. It shall have tensile elongation of at least 6.0% when tested under ASTM-638. Its bond strength to quarry tile shall exceed 1000 psi when tested with an Elcometer pull test. Its hardness shall not exceed 83, as measured on the Shore D scale. The system shall be unaffected by oils and greases and shall withstand chemical attack for at least 72 hours against 98% sulfuric, 50% hydrofluoric acid, glacial acetic acid and acrylonitrile.

Precautions

1. **This is a fast reacting product; immediately pour onto floor after mixing and spread with notched squeegee. Recoat window without sanding at 70°F: 8 hours**
2. **A severe skin and eye irritant; check MSDS before use**
3. **Do not apply below 50°F**

Note: Failure to follow the above instruction, unless expressly authorized by a Land Science Technologies Representative, will void our material warranty.

Chemical Resistance

Retro-Coat™ is considered chemically resistant to neat concentrated acids, caustics and solvents. For permeation or diffusion coefficients please contact Land Science Technologies.

Physical Properties

Tensile Strength	(ASTM D-638)	: 9800 psi	Bond Strength to Quarry Tile	: >1000 psi
Tensile Elongation	(D-638)	: 6.0%	Vapor Transmission Rate (E-96)	: .027 perms
Flexural Strength	(D-790)	: 7035 psi	Water Absorption (D-570)	: 0.2% in 24hrs.
Hardness, Shore D	(D-2240)	: 83	Taber Abrasion (D-1044)	: 86 mg loss.
Gardner Impact Strength	(D-2794)	: 80 in. lbs.	60° Gloss	: 100

Physical Characteristics

Density, lbs/gal.
Pt. A : 11.0
Pt. B : 8.9
A&B Mixed : 9.3

Viscosity @ 77°F, cps
Pt. A : 18,400
Pt. B : 500
A&B Mixed : 4800

Mixing Ratios — **By Volume** — **By Weight**
Pt. A : Pt. B — **2:1** — **2.3:1**

Curing Times @	**50° F**	**77°F**	**90°F**
Pot Life	35 min.	30 min.	20 min.
Working Times	20 min.	20 min.	15 min.
Hard, Foot Traffic	14 hrs.	7 hrs.	3 ½ hrs.

Maximum hardness and chemical resistance are achieved after 7 days at 77°F

Color Availability

Standard colors: beige, black, blue, dark gray, green, gray, red, white, yellow

Shelf Life: 1 Year at 77°F in unopened containers

Packaging and Coverage Rates *(for 20 mil coverage)*

4 Gallon Kit	:	320 SF
20 Gallon Kit	:	1600 SF
100 Gallon Kit	:	8,000 SF

Land Science Technologies
Specifications for Retro-Coat™
Version 1.0

Part 1 – Scope

1.1 Product and Application

This specification describes the application of the Retro-Coat™ System. The minimum thickness of the system is between 25-30 mils, including a 20 mil minimum application of Retro-Coat.

1.2 Acceptable Manufacturers

A. Retro-Coat as manufactured by Land Science Technologies San Clemente, CA.

1.3 Performance Criteria

A. Retro-Coat as manufactured by Land Science Technologies San Clemente, CA.

1. Diffusion Coefficient (Columbia Labs)
   PCE: 7.6×10^{-14} m^2/s
   TCE: 8.2×10^{-14} m^2/s

2. Tensile Elongation (ASTM D-638)
   Minimum: 6000 psi

3. Tensile Elongation (ASTM D-638)
   Minimum: 6 %

4. Flexural Strength (ASTM D-790)
   Minimum: 7000 psi

5. Hardness, Shore D (ASTM D-2240)
   Maximum: 85

6. Gardner Impact (ASTM D-2794)
   Minimum: 80 inch-pounds

7. Bond Strength to Quarry Tile
   Minimum: 1000 psi

8. Vapor Transmission Rate (ASTM E-96)
   Maximum: .07 perms

9. Water Absorption (ASTM D-570)
   Maximum: .02% in 24 hours

10. 60° Gloss
    Minimum: 100.

1.4 Materials

A. Retro-Coat “A” shall be a modified epoxy containing special flexibilizers and specially formulated resins for superior chemical resistance and enhanced resilience. No solvents are allowed.

B. Retro-Coat “B” shall be customized blend of hardeners specifically formulated to maximize chemical resistance. No solvents are allowed.

1.5 Applicator

A. Applicator must be a certified contractor of Land Science Technologies.

Part 2 – Application

2.1 Surface Preparation

A. All existing surfaces that will be covered with the systems specified herein should be mechanically ground, shot blasted or sand blasted to yield a minimum 60 grit surface texture. All loosely adhered coatings will be removed. Any grease and other contaminants found on the concrete must also be removed.

B. All open cracks 1/2" and greater should be v-notched to a 3/4" width by 1/2" depth and cleaned of any debris. Such cracks should be filled with Retro-Coat Gel and struck off flush with the surrounding surface.

C. Cut back and/or remove any expansion joint backing or filler strips to a minimum of 1 ½" deep. Insert disposable filler in the joints to prevent filling with the overlayment materials and to allow for accurate location of final saw cuts in the overlayment.

2.2 Material Application

A. Retro-Coat CAULK

1. Apply Retro-Coat CAULK around the base of all pipe penetrations making sure to fill any gap between the penetration and concrete slab

2. Apply Retro-Coat CAULK to the joint created between horizontal and vertical transitions. The caulking material should be applied and pressed into the joint filling any gaps that might be present.

B. Retro-Coat PRIMER

1. Apply Retro-Coat PRIMER to all areas at a thickness of 6 mil and allow to dry tack free. In areas where the concrete surface is in need of slight repair or needs to be leveled, a slurry form of Retro-Coat PRIMER called Retro-Coat PRIMER-S can be applied with a flat squeegee. Retro-Coat PRIMER-S is self priming and does not need to be primed again.

C. Retro-Coat

1. Mix Retro-Coat, Part A with a low-speed (<750 rpm) jiffy-style mixer for about 30 seconds, or until uniform in color, then mix in Retro-Coat Coating, Part B for another 30-60 seconds.

2. Dump contents onto floor in a ribbon pattern, squeegee, and then back roll at a coverage rate of 160 SF/gallon to achieve a film thickness of 10 mils.

3. Apply second coat 10 mil coat to achieve a total thickness of 20 mils. Repeat as necessary to achieve specified thickness.

4. If a flooring material will be placed over Retro-Coat after it is applied, or appearance is not a priority, (1) 20 mil coat can be applied.

2.3 Protection of Finished Work

A. Prohibit foot traffic on floor for 24 hours after laying (at 70ºF). At 50ºF,this time should be extended to 48 hours.

B. Rinse off any chemicals that may come in contact within 7 days of installation with the freshly laid floor immediately.

2.4 Cleanup

A. Properly dispose of all unused and waste materials.

B. Tools can be washed in warm, soapy water when wet, but after drying, can only be cleaned by grinding or with a paint stripper.

C. Unused resin can be set off with proper amount of hardener and disposed of in regular trash bins.

Part 3 – Quality Control

3.1 Warranty

A. Installer shall provide a one year warranty against delamination, chemical attack and normal wear and tear.

B. Manufacturer will provide a one year material warranty.

3.2 Quality Control

A. Installer shall use a notched squeegee to apply Retro-Coat to the specified mil thickness and calculations shall be done to determine if the correct amount of material has been applied. Retro-Coat contains 100% solids at the time of application; therefore no material shrinkage will occur during the curing process. One gallon will cover 80 square feet.

B. A wet mil film gauge can be used to spot check the Retro-Coat thickness to make certain the minimum 20 mil thickness has been applied, though some discretion should be used because high points or low points on the underlying surface can adversely affect the thickness measurements.

3.3 Floor Care

A. The standard smooth surface of Retro-Coat should be cleaned on a regular basis by damp mopping the floor with conventional commercial cleaners. It is important to first remove any grease or oils by a suitable cleaner, preferably a citrus based cleaner. Rinse with clear water to help eliminate film buildup and then allow to dry. Never use abrasive powder cleaners like Ajax or Comet as they tend to scratch the floor.

B. Additional steps can also be taken to prolong the look and life of a seamless floor:

1. Protect the floor during transference of heavy equipment
2. Educate the drivers inside the building the importance of avoiding “jack-rabbit” starts and stops, as well as keeping the metal forks lifted
3. Regular cleaning should take place as to not allow the buildup of abrasive material, such as sand or dirt, on the coating
4. Eliminate all metal wheels
5. Change over to light-colored polyurethane wheels
6. Do not slide heavy metal totes, drums or bins across the floor
7. Immediately hose down chemical spills, especially on newly laid floors.

Appendix C

Carbon Filtration Units

Airpura
AIR PURIFIERS

C600-DLX

SPECIFIC CHEMICALS - VOCS

REMOVE SPECIFIC AIRBORNE CHEMICALS INCLUDING VOLATILE ORGANIC COMPOUNDS

THE AIRPURA C600
Available in White / Black / Cream

THE AIRPURA LIMITED WARRANTY
5 years parts / 10 years labor

THE AIRPURA C600-DLX CHEMICAL ABATEMENT UNIT OFFERS YOU:

- **26 LB ENHANCED IMPREGNATED ACTIVATED CARBON BED** Adsorbs airborne chemicals including volatile organic compounds (VOCs)
- **HEPA-BARRIER POST FILTER** Traps particles after the carbon bed.
- **560 CFM INTEGRATED FAN / MOTOR** Largest CFM available in a portable unit.
- **VARIABLE SPEED MOTOR** Gives you flexible air flow options.
- **PROPER CONTACT TIMES FOR EFFECTIVE FILTRATION** Correctly calibrated air flow / bed depth for efficient adsorbtion.
- **PRESSURE SEALED FILTER CHAMBER** Unique pressure seal on the filter chamber ensures all contaminants are filtered and non escape.
- **CALL OUR AIR QUALITY EXPERTS** For the solution to your air pollution problem.

OVER 4000 CHEMICALS CAN BE REMOVED

Carbon blends are available to deal with over 4000 airborne chemicals including:

Ammonias
Nitrous dioxide
Nitrous trioxide
Monoethylamine
CHydrogen Sulfide
Mercury vapors
Chlorine dioxide
Hydrogen Bromide
Sulfur dioxide
Hydrogen fluoride
Hydrogen chloride
Benzene
Methylene Chloride
Radioactive Iodine
Toulene
Napthene
Pesticides
Chlorine
Mold Mycotoxins

FILTER LIFE

Carbon filters should be changed as needed in heavy applications and at least every 24 months in normal use. Airpura carbon canisters are refillable to save costs.

Hepa filters should be changed every 12 months

Pre-filters can be vacuumed from the exterior of the unit and should be changed every 12 months depending on use the exterior of the unit and should be changed every 12 months depending on use.

PROTECT YOURSELF WITH AIRPURA HIGH EFFICIENCY AIR PURIFICATION

Airpura AIR PURIFIERS

C600-DLX

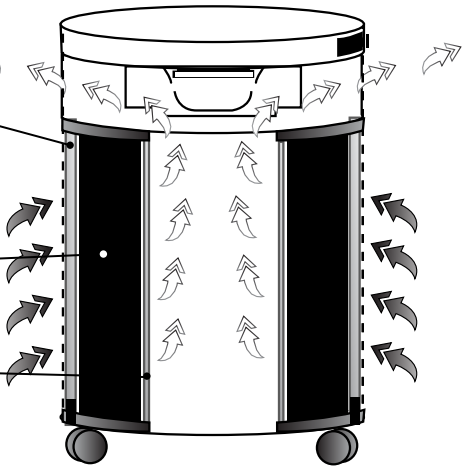
AIRBORNE CHEMICALS & VOCS

FILTRATION SYSTEM

Cleanable pre-filter
Vacuum through grill and change every 12 months

26 lb Enhanced Impregnated Carbon filter
Enhanced carbon to capture VOCs more efficiently

HEPA-Barrier post filter
Traps carbon dust and particles



UNIQUE FEATURES

- **ALL METAL HOUSING** ensures no plastic vapors are emitted.
- **MOTOR OUT OF THE AIR FLOW.** Most air purifiers blow the clean air over the motor and pick up impurities.
- **ELECTRICAL PARTS IN A SEALED CHAMBER** out of the airflow. Increases safety and prevents off-gassing.
- **PRESSURE SEALED FILTER CHAMBER** prevents leakage of polluted air around filters.
- **FELT GASKETS SEAL THE FILTER CHAMBER.** Maximize filtration with no rubber off-gassing found with other filters.
- **CLEAN MODERN APPEARANCE** fits in any decor.
- **LOW NOISE LEVEL** (at 6 feet) 28.1db on low 62.3db on high (560 cfm).

SPECIALLY DESIGNED TO REMOVE SPECIFIC AIRBORNE CHEMICALS AND VOCS

DWELL TIME

For best results the correct dwell time of the pollutants over the carbon bed is vital. The 560 CFM impeller/motor combined with the variable speed control and unimpeded airflow of the Airpura 600 series allows you to set the airflow precisely and achieve the results you need.

EXPERTISE YOU CAN CALL ON

Airpura air quality experts can offer you a solution to most airborne chemical problems. Contact your Airpura dealer or call us directly to discuss your needs.

TECHNICAL SPECIFICATIONS

ODOR, AIRBORNE CHEMICAL AND VOC CONTROL
26 lbs super enhanced impregnated activated carbon 13" x 13" x 7.5"

CARBON BED
3" deep x 570 sq" surface

AIR FLOW 560 CFM
More cfm than any other portable unit available

PRE-FILTER
570 sq in x 1 in

POST PARTICLE FILTER
306 sq in

SIZE
23" x 15"

WEIGHT
49 lbs total

VOLTAGE OPTIONS
115 or 220 volts

WATTS
120 on high / 40 on low

SOUND LEVEL
28.1 db on low (at 6 feet)
62.3 db on high (560 cfm)
(Room level 25.1 db)

ETL CERTIFIED
Conforms to CSA C22.2 no 113 ANSI / UL 507

YOUR AIRPURA™ DEALER

SAFE EFFECTIVE AIR FILTRATION FOR YOUR BETTER HEALTH

OPERATIONS, MAINTENANCE & MONITORING (OM&M) PLAN

SUB-SLAB DEPRESSURIZATION SYSTEM (SSDS), COMPOSITE COVER SYSTEM, AND VAPOR SEALANT
for
19 Patchen Avenue (Off-Site Property)
BCP Site #C224232

19 Patchen Avenue
Brooklyn, New York 11221

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau A
625 Broadway, 12th Floor
Albany, NY 12233-7016

Prepared for:
Hudson BEC II LLC &
19 Patchen GP LLC
826 Broadway, 11th Floor
New York, NY 10003

Prepared by:
TENEN ENVIRONMENTAL
121 West 27th Street, Suite 702
New York, NY 10001

December 2019

OPERATIONS, MAINTENANCE AND MONITORING (OM&M) PLAN

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APPENDICES

OPERATIONS, MAINTENANCE AND MONITORING (OM&M) PLAN

1.0 Introduction

This Operations, Maintenance and Monitoring (OM&M) Plan has been developed to detail the engineering controls (ECs) implemented as part of the Remedial Action Work Plan (RAWP) prepared for 19 Patchen Avenue (the Site). This OM&M is for the Off-Site Property #5.

The BCP Site, located at 19 Patchen Avenue, is a rectangular parcel of land located at the corner of Patchen Avenue and Van Buren Street in the Bedford Stuyvesant area of Brooklyn. This OM&M is for an off-site property.

This Operation and Maintenance Plan is not to be used as a stand-alone document, but as a component document of the December 2019 Site Management Plan (SMP).

1.1 Background

Environmental investigations at the off-site property have documented elevated concentrations of chlorinated solvents in the sub-slab soil vapor. There is the potential for an indoor air intrusion condition.

In order to address the potential for indoor air quality impacts from the sub-slab soil vapor, an active sub-slab depressurization system (SSDS) has been designed and incorporated into the current building plan.

1.2 Summary of Engineering Controls (ECs)

Engineering Controls (ECs) to address residual contamination through physical protective measures have been incorporated to ensure that the off-site property remains protective of public health and the environment.

A vapor sealant was applied to mitigate the potential for vapor intrusion to the Site building. The vapor seal was applied atop the concrete slab in the basement of the Site building.

A sub-slab depressurization system (SSDS) was installed below the current slab in the basement of the building. The principal components of the SSDS are suction pits, solid-construction piping from the suction pit to an exterior suction fan on the roof and pressure monitoring points through the basement slab. The performance goal of the sub-slab vapor mitigation system is to depressurize below the slab to at least -0.02 inches of water gauge (in-wc); however, differential pressure readings above -0.004 in-wc are considered to be acceptable. A visual and audible alarm was installed in the basement to notify the building management if the pressure at the suction fan has dropped below 50% of the start-up pressure. The system was designed in general accordance with NYSDOH's Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006 (NYSDOH Soil Vapor Guidance).

2.0 Engineering Control Operations

The active sub-slab depressurization system (SSDS) is a permanent EC incorporated into the building to address potential soil vapor intrusion at the Site. The composite cover system and vapor barrier are permanent ECs to address residual fill and potential soil vapor intrusion.

General design drawings and specifications are included in the Appendices.

2.1 Sub-Slab Depressurization System (SSDS)

The SSDS will reduce the potential for soil vapor migration into the building. The SSDS will be inspected at specific intervals as defined in this OM&M. SSDS documentation is included in Appendix A.

2.2 Composite Cover System and Vapor Sealant

The composite cover system and vapor sealant will reduce exposure to residual soil/fill contaminants and, in combination with the SSDS, reduce the potential for soil vapor migration into the building. Vapor barrier documentation is included in Appendix B. The composite cover system is the existing basement slab and walls and the existing slab in the rear yard.

3.0 Routine Maintenance and Monitoring

Routine EC inspections will be performed by a person knowledgeable with the mechanical systems present in the building and familiar with the property and may include a building or property superintendent. Annual inspections will be completed by a Qualified Environmental Professional (QEP), as defined by the New York State Department of Environmental Conservation (NYSDEC).

3.1 EC Inspection Frequency

Site inspection and certification for performance of the active SSDS, composite cover system and carbon filtration units will be performed on a schedule detailed in the SMP and reported in a Periodic Review Report (PRR).

3.2 EC Inspection Components

The EC inspections will evaluate the following:

- continued performance of ECs as designed;
- compliance with the SMP;
- continued achievement of remedial performance criteria;
- accuracy and completeness of Site records;
- necessity for any changes to the remedial systems; and
- general Site conditions at the time of inspection.

In the event of an emergency, such as a natural disaster or an unforeseen failure of any of the ECs, an inspection of the ECs will be conducted by Professional Engineer.

3.3 EC Inspections

3.3.1 Sub-Slab Depressurization System (SSDS)

EC inspections of the SSDS components shall include the following:

- Observe visible components (fan, vacuum alarm/monitor, vacuum gauge, tubing, riser pipe, etc.) for physical wear, damage and operational issues, and replace as necessary;
- Remove any blockages in vacuum monitor and gauge tubing and riser pipe taps;
- Verify operation of vacuum monitor by disconnecting tubing from riser pipe and noting if the building notification system goes into alarm mode;
- Verify operation of vacuum gauge by disconnecting tubing from riser pipe and noting if the indicator moves to zero (check high and low pressure ports to see if they are plugged correctly);
- Inspect riser pipe penetrations in concrete slab for proper seal;
- Inspect riser pipe connections at fan for leaks and tightness; and
- Inspect power to fan by operating dedicated switch.

3.3.2 Composite Cover

EC inspections of the composite cover shall include observations of the conditions of the concrete building slab and concrete slab in the rear yard. The composite cover will be inspected for cracks, holes or other openings that will provide access to the soil/fill below the cover. If any cracks, holes or other openings are observed in the composite cover during the EC inspection, the inspector will make a recommendation that such cracks, holes or openings be immediately filled and/or sealed as necessary.

3.3.3 Vapor Sealant

Visual EC inspections of the vapor sealant will be made. EC vapor sealant inspections will consist of 1) observations of the vapor sealant atop the concrete slab for visible cracks and gaps; and 2) inspection of any exposed sections of the concrete slab. Additional vapor sealant will be recommended to repair holes in the vapor sealant if the concrete slab is observed. If repair of the vapor seal is required, additional sealant will be applied.

3.4 Inspection Reporting

Routine EC inspections will be performed by a person with knowledge of the mechanical systems present in the building and familiar with the property. Annual inspections will be completed by a QEP. Inspection results will be reported to NYSDEC in a PRR.

3.5 Certifications

The results of the EC inspections will be certified at the time of the inspection and the signed certifications included in the PRR.

The Inspection Certification will certify whether:

- on-site ECs are unchanged from the previous certification;
- on-site ECs remain in-place and effective;
- on-site ECs are performing as designed; and
- anything has occurred that would impair the ability of the controls to protect public health and the environment.

4.0 Emergency Contact Numbers

In the event of any emergency condition pertaining to any EC, the current Owner's representative should contact the appropriate parties from the contact list below. Prompt contact should also be made to a Qualified Environmental Professional (QEP), as defined by NYSDEC. These emergency contact lists must be maintained in an easily accessible location at the Site.

Emergency Contact Numbers

Contact	Number
Medical, Fire and Police:	911
One Call Center:	(800) 272-4480 (3 day notice required for utility markout)
Poison Control Center:	(800) 222-1222
Pollution Toxic Chemical Oil Spills:	(800) 424-8802
NYSDEC Spills Hotline	(800) 457-7362

Project Contact Information

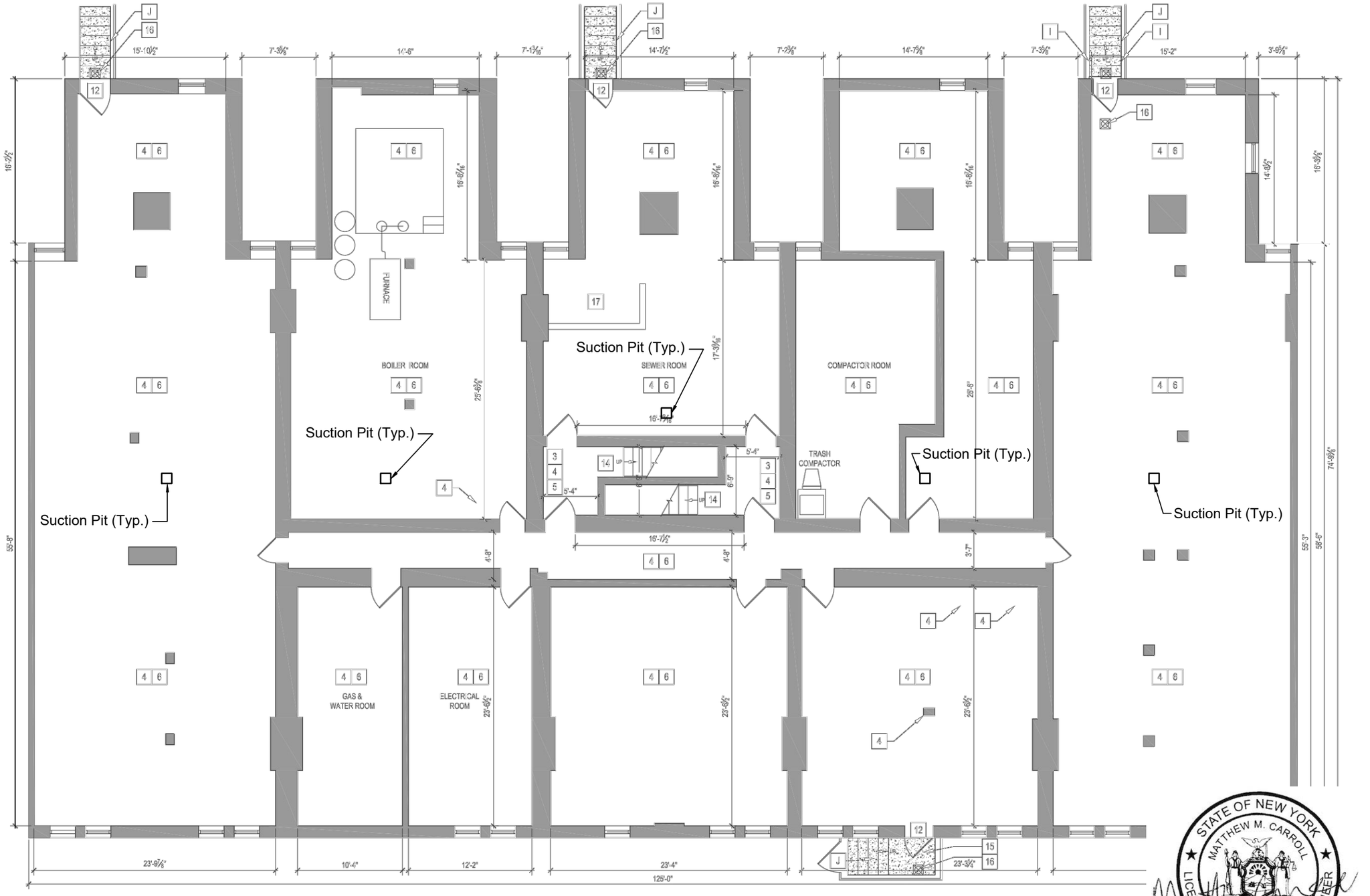
Contact	Number
Matthew Carroll, Tenen Environmental	(646) 606-2332, mcarroll@tenen-env.com
Chris Heller, NYSDEC Project Manager	(518) 402-0163, Chris.Heller@dec.ny.gov
Angela Martin, NYSDOH Project Manager	(518) 402-7860, Angela.Martin@health.ny.gov

Appendix A

Sub-Slab Depressurization System

Appendix A-1

SSDS Design – As-Built



Basefile: Heritage Architecture, New york, NY, Apartment Building Renovations, [redacted]., Brooklyn, NY, Project # 1482, Proposed Cellar Plan, A-101.00, 10/06/15

LEGEND

☐ Suction Pit Location

0 5' 10' 20'

Drawing Scale

STATE OF NEW YORK
MATTHEW M. CARROLL
LICENSED PROFESSIONAL ENGINEER
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CLIENT

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DRAWN BY	CHECKED BY	DATE	SCALE:
LM	MC	FEBRUARY 2017	AS NOTED

DRAWING TITLE: X-100.00

DRAWING NO. SSDS SUBGRADE LAYOUT

6-in. Ø PVC Riser

Pressure Monitoring Point (Typ.)

6-in Ø C.I. Pipe Strapped to Wall (Typ.)

Suction Pit Below

BOILER ROOM

FURNACE

SEWER ROOM

COMPACTOR ROOM

TRASH COMPACTOR

GAS & WATER ROOM

ELECTRICAL ROOM

Basefile: Heritage Architecture, New york, NY, Apartment Building Renovations, [redacted]., Brooklyn, NY, Project # 1482, Proposed Cellar Plan, A-101.00, 10/06/15

LEGEND

- Suction Pit Location
- Pressure Monitoring Point Location

0 5' 10' 20'

Drawing Scale

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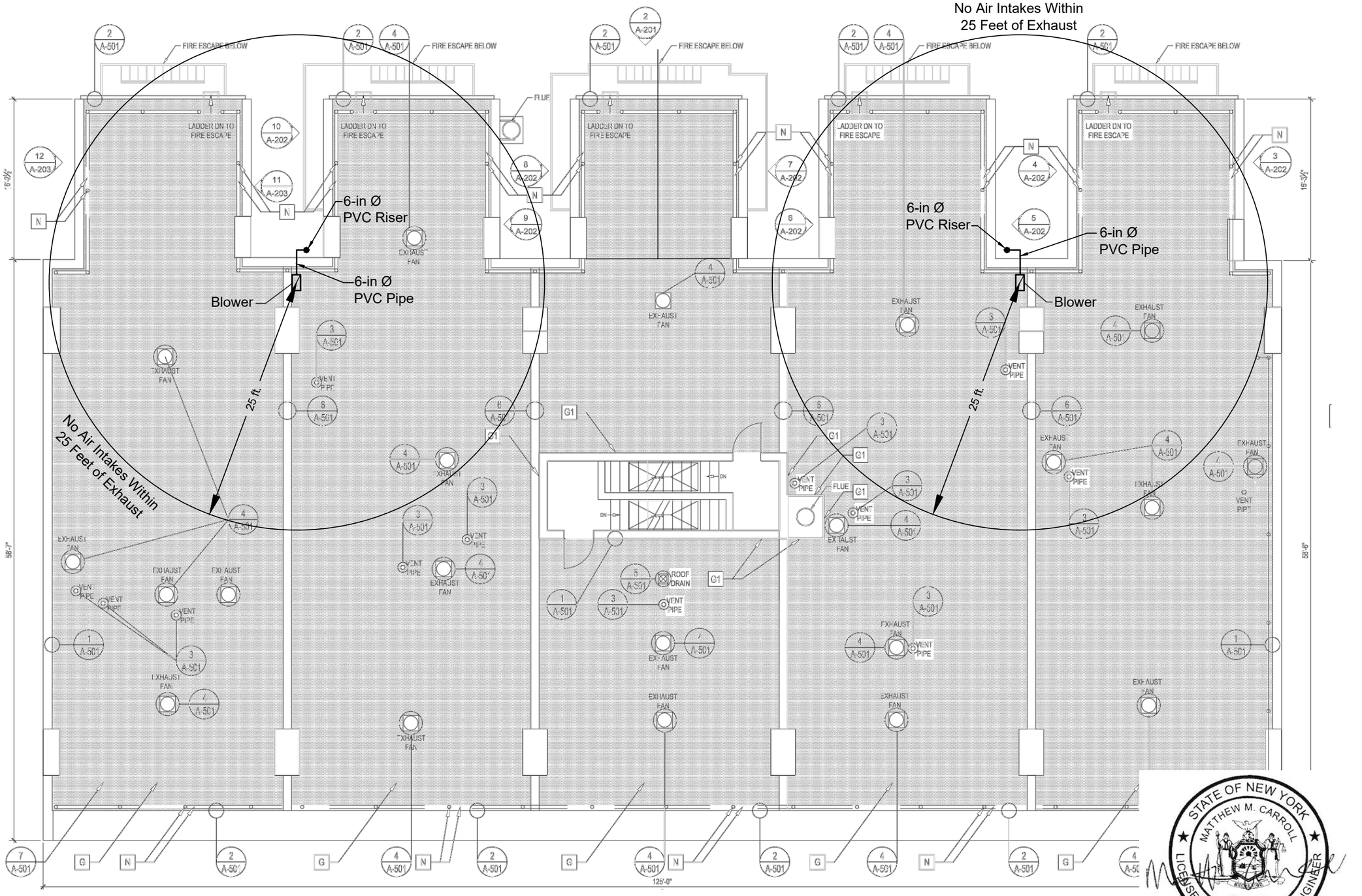
DRAWING TITLE: X-101.00

DRAWING NO. SSDS CELLAR LAYOUT



Basefile: Heritage Architecture, New york, NY, Apartment Building Renovations, [redacted]., Brooklyn, NY, Project # 1482, Proposed Roof Plan, A-106.00, 10/06/15

0 5' 10' 20'

Drawing Scale

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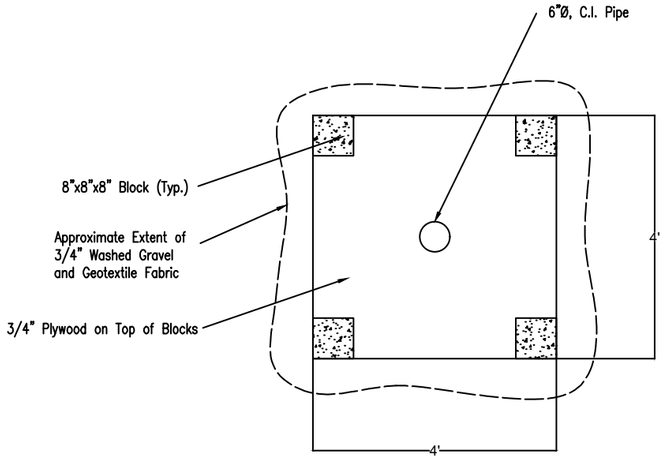
LM	MC	JANUARY 2018	AS NOTED

DRAWING TITLE: X-102.00

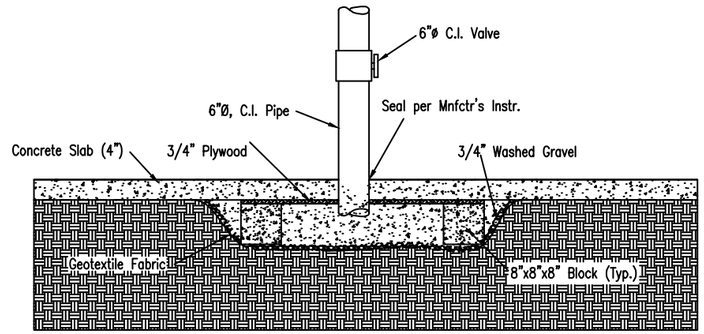
DRAWING NO.: SSDS ROOF LAYOUT

1



Suction Pit – Plan View

2



Suction Pit – Section View

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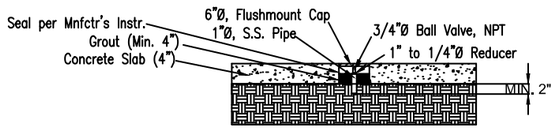
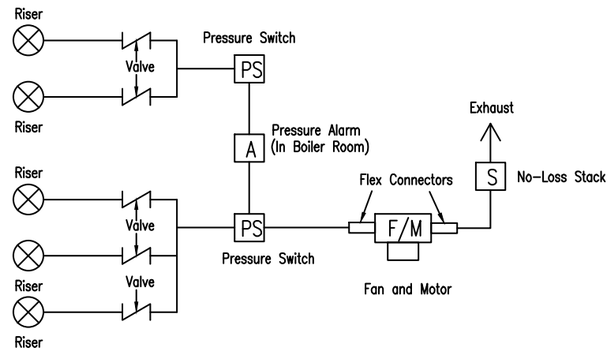


Sub-Slab Depressurization Monitoring Point – Side View

4



Sub-Slab Depressurization System – Schematic from Riser to Exhaust Location

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DRAWING TITLE: X-103.00

DRAWING NO.: SSDS DETAILS

Appendix A-2

SSDS Operation – Routine Operating Procedures

Sub-Slab Depressurization System (SSDS)

Routine Operating Procedures

The long-term operation and maintenance program described below shall continue throughout the life cycle of the sub-slab depressurization system (SSDS) to ensure a proper working order. The long-term operation and maintenance program for the major SSDS components includes manufacturer's recommendations for the reinstallation of SSDS components if modifications to the existing system need to be made, inspection procedures, an operation schedule, typical routine maintenance activities and schedules, and troubleshooting. Refer to Section 3.3.3 for an overall inspection procedure of the SSDS.

The alarm system, described below, shall run continuously and only be disconnected for routine maintenance and inspection activities or replacement. The system includes the following:

- vacuum gauge/switch (Dwyer Instruments Series ADPS/EDPS Differential Pressure Switch, model ADPS-07-2-N)
- alarm system (Edwards Signaling Electronic Horn/Strobe 860 Series, model 867STRC)

In case there is a need to relocate the vacuum gauge/switch, the new location shall ensure that the vacuum gauge/switch remains in close proximity to the riser pipe and is installed correctly. If the vacuum gauge is not indicating a vacuum while the SSDS is on, make sure that the tubing connected to the riser pipe is connected to the low pressure port. High pressure ports on the vacuum gauge/switch should be vented to atmosphere.

The vacuum gauge/switch does not require lubrication or periodic servicing. The vacuum gauge is not field serviceable and should be returned to the manufacturer or supplier if repair is needed. Repairs or alterations made to the vacuum gauge/switch by others will void the unit's warranty. The vacuum gauge/switch is factory calibrated and cannot be recalibrated in the field. The installation and operating instructions for the vacuum alarm/monitor have been included in Appendix A-3.

When testing the vacuum alarm/monitor, the tubing that connects the vacuum alarm/monitor to the riser pipe shall be disconnected and the low set point raised above the current reading. If the vacuum alarm/monitor is powered at the time of disconnecting the tubing from the riser pipe, the building system will go into alarm. The building system should go back on-line when the tubing is reconnected to the riser pipe. If the building system is in alarm when there is a vacuum present in the riser pipe, inspect the tubing and riser pipe tap to ensure that there are no blockages. If there is a blockage in either the tubing or the riser pipe tap, remove the blockage and retest the vacuum alarm/monitor.

Common troubleshooting tips that can be followed if the vacuum gauge/switch will not indicate a vacuum or is sluggish include the following:

- The pressure ports (high or low) are not hooked up correctly;

- The fittings or sensing lines are blocked, pinched or leaking;
- The cover is loose;
- The pressure sensor is improperly located;
- The ambient temperature is too low (below 20ºC).

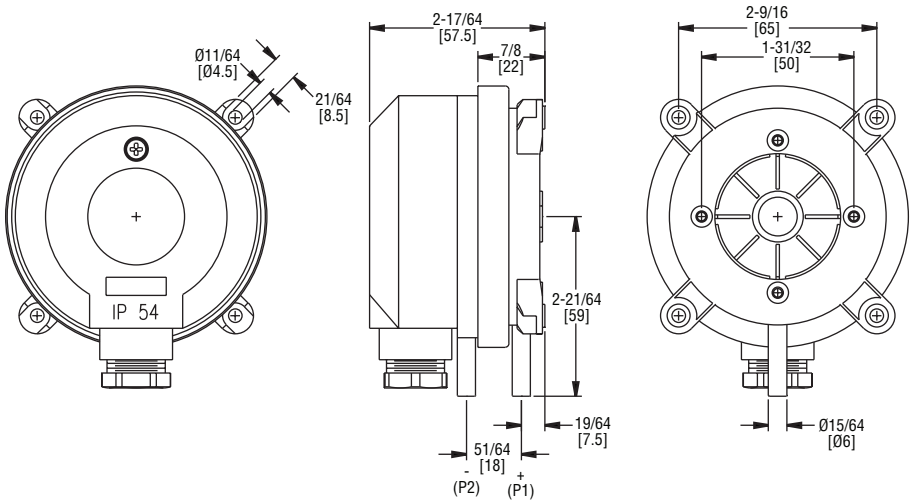
Two Fuji Electric Regenerative Blowers (both Model VFD41S) shall operate continuously and only be turned off for routine maintenance and inspection activities or replacement. The SSDS fan and motor shall not be left on the system piping without electrical power for more than 48 hours due to possible fan failure that could result from this non-operational storage. The SSDS fan unit does not require periodic servicing and should be returned to the manufacturer or supplier for service. Repairs or alterations made to the SSDS fan unit by others will void the unit's warranty. The installation and operating instructions for the SSDS fan unit have been included in Appendix A-4.

Appendix A-3

SSDS Vacuum Gauge and Switch – Installation and Operating Instructions

Series ADPS Differential Pressure Switch

Specifications - Installation and Operating Instructions



The Series ADPS Adjustable Differential Pressure Switch is designed for overpressure, vacuum, and differential pressure applications. The scaled adjustment knob allows changes to the switching pressure to be made without a pressure gage. The ADPS is available with settings from 0.08″ w.c. (20 Pa) to 20″ w.c. (5000 Pa). The silicone diaphragm and PA 6.6 body make the Series ADPS perfect for use with air and other noncombustible gases. The Series ADPS can be used in monitoring air filters, ventilators, and industrial cooling-air circuits along with controlling air and fire-protection flaps and many other applications.

Use only with mediums such as air, or other noncombustible or non-aggressive gases. Otherwise operating faults or accidents may occur.

Mounting Switch

First check the pressure switch to ascertain whether any damage is visible on the housing. If the housing is leaky because of damage, the pressure switch must not be used.

Switching pressure specifications apply to vertical installation which is also the recommended position with pressure connections pointing downwards.

Only if there is no potential for condensate forming can you mount the pressure switch horizontally. In this case, however, the switching values are approximately 0.08 in w.c. (20 Pa) higher as indicated on the scale. In the horizontal position, the pressure switch should be mounted 'lying down' only (that is to say with the electrical connections pointing upwards). Do not mount the pressure switch in a hanging position (that is to say, not 'overhead' with the electrical connections pointing downwards). Otherwise the device will function inaccurately.

a) Mounting with screws or brackets

1. To mount the pressure switch, L-shaped A-288 and S-shaped A-289 mounting brackets can be ordered separately. To secure the device on the rear side of the housing, only use the sheet metal screws (3.5 x 8 mm) which are supplied together with the mounting brackets. Under no circumstances must you use longer screws. Otherwise, the base of the housing could be punctured resulting in the pressure switch leaking.

2. You can also mount the pressure switch directly on a wall. To do this use screws with a maximum diameter of 0.315″ (8.0 mm), if you use the outer mounting lugs to screw the device in place. Do not tighten the screws so much that the base of the device is deformed. Otherwise, the pressure switch can be shifted out of position, or leak.

SPECIFICATIONS

Service: Air and noncombustible, compatible gases.
Wetted Materials: Diaphragm material: Silicone; Housing material & switch body: POM and PA 6.6; Cover: Polystyrene.
Temperature Limits: Process ambient temperature from -4 to 185˚F (-20 to 85˚C).
Pressure Limits: Max. Operating Pressure: 40" W.C. (10 kPa) for all pressure ranges.
Switch Type: Single-pole double-throw (SPDT).
Repeatability: ±15% FS.
Electrical Rating: Standard: Max., 1.5A/250 VAC, max. switching rate: 6 cycles/min.; Gold Contact Option: 0.1 A/ 24 VDC.
Electrical Connections: Push-on screw terminals. M20x1.5 with cable strain relief or optional 1/2″ NPT connection.
Process Connections: 5/16″ (7.94 mm) outside diameter tubing, 1/4″ (6.0 mm) inside diameter tubing.
Mounting Orientation: Vertically, with pressure connections pointing downwards.
Mechanical Working Life: Over 10^6 switching operations.
Weight: 5.6 oz (160 g).
Enclosure Rating: IP54.
Agency Approvals: CE, RoHS.

Installing Hoses

Important: Pressure tubing cannot be kinked. Pay particular attention to this point if you run hoses over an edge. It is better to form a loop. If the hoses are kinked, the device cannot function accurately.

a) For connection to the pressure switch two fittings inherent in the housing are provided for hoses with an internal diameter of 1/4″ (6.0 mm).

1. Connect a hose with the higher pressure to socket P1 which is located on the lower section of the housing.

2. Connect a hose with the lower pressure to socket P2 which is located on the middle section of the housing.

After you have installed the hoses, it is absolutely essential to check them for tightness of fit at the connection points and to make sure that they run without any kinks.

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Electrical Connection
Work on electrical installations must only be carried out by electricians who are specifically trained for this purpose.

⚠CAUTION First make sure that there is no voltage on the connecting cable while you are working on the electrical connections. Otherwise, a possible electric shock may result and the connected equipment may be damaged. The connecting cable can be run to the pressure switch from three sides, according to choice. The screw cable connection has a plug-in design for this purpose. Rotate protective cover accordingly.

For cable gland models, the seal in the screw cable connection is designed for cables with alternative sheath diameters of 0.275″ (7 mm) or 0.393″ (10 mm). Only use these sizes – otherwise the screw cable connection cannot seal adequately.

1. If using a 0.275″ (7 mm) connecting cable, you can line up the press nut, the plain washer and the sealing ring directly on the cable.

2. If using a 0.393″ (10 mm) connecting cable, you must first break the inner rubber ring out of the sealing ring directly on the cable. Then line up the press nut, the plain washer and the sealing ring on the cable.

Wiring
The switching device in this pressure switch is designed as a change-over contact as can be seen from the wiring diagram (Figure 1). The rest position is shown in Figure 1 (pressure below the activation switch point on dial).

1. In the instance where pole 3 (COM) closes to Pole 2, the pressure is increasing (NO).

2. In the instance where pole 3 (COM) closes to Pole 1, the pressure is decreasing (NC).

Protect the feed line (to pole 3) by fuse, either in control system or along the line, and do so with:

1. Max. 1.5 A / 250 VAC, if you are loading the contact with an resistive load;

2. Max 0.4 A / 250 VAC, if you are loading the contact with an inductive load (such as relay);

3. Max. 0.1 A / 24 VDC, if you are using the pressure switch in the weak current version with gold-plated contacts.

The connections are intended for crimp-type sockets, 0.25 in (6.3 mm).

1. Make sure the crimp connection is perfect, and that the cable lugs fit properly on to the connections.

2. If you do not have any crimp-type sockets available, you can also use the cable lugs which are supplied with mounted screw terminals. However, these are only intended for rigid copper wire.

3. On flex, it is either necessary to crimp on strand end sleeves – and then you can also screw the strands on – or to crimp cable lugs on directly as previously described.

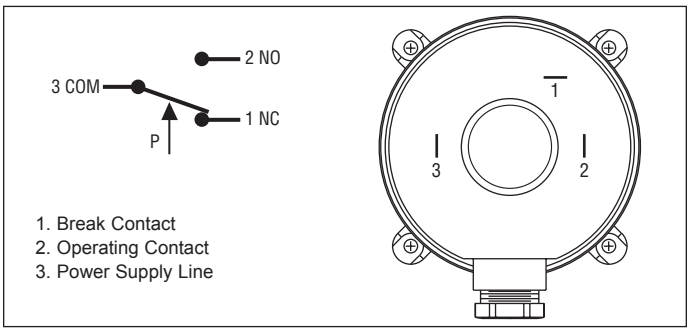

Figure 1

Setting the Pressure Range
Make absolutely certain that there is no voltage on the electrical connections before you carry out any setting on the pressure switch. Otherwise, it could be fatal if you accidentally touch the electrical connections or the metal adjusting screw while you are performing the settings.

a) Use the adjustment dial to set the pressure which should trip the switch on an increase of pressure.

1. The indications on the dial are only correct for the vertical mounting position.

2. When the pressure falls, the switch returns to its resting position as soon as the pressure falls below the dead band.

Attaching Cover
a) Insert the screw cable connection into the recess provided for this purpose on the housing.

b) Then place the housing cover in position and screw it down evenly on to the pressure switch.

Testing the Setting
Do not operate the system until the housing is closed. Otherwise there is the possibility of an electric shock if you accidentally touch live parts.
Check the trip and reset pressures by slowly increasing the pressure and then allowing it to fall again.

IMPORTANT: Observe the maximum permissible operating pressure of 40″ w.c. (10 kPa) which is indicated in the data sheet. Otherwise the pressure switch may be damaged.

MAINTENANCE
Upon final installation of the Series ADPS Adjustable Differential Pressure Switch, no routine maintenance is required. A periodic check of system operation is recommended. The Series ADPS is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

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Electronic Horn/Strobe Signal Appliance Installation Sheet

Description

The horn/strobes are high quality signals intended for use in cUL general signaling applications. The strobes flash at 1 fps across their full operating voltage range. See Table 1 for model numbers and “Specifications” for details.

Table 1: Models

Number	Description
867STR(*)-**	Horn/Strobe, Surface Mount Indoor, Gray
868STR(*)-**	Horn/Strobe, Surface Mount Outdoor, Gray
869STR(*)-**	Horn/Strobe, Flush or Panel Mount Indoor, Gray

* Insert lens color: C = Clear, R = Red, G = Green, B = Blue, A = Amber.

** The horns are available in two voltages. Insert suffix as required: N5 = 120 VAC, AQ = 24 V AC/DC

Installation

Install and wire this device in accordance with applicable national and local codes, ordinances, and regulations, and in a manner acceptable to the local authority having jurisdiction.

WARNINGS

- To reduce the risk of shock, do not connect AC or battery power to the horn until directed in these instructions.
- To reduce the risk of shock, do not tamper with this device when the signal circuit is energized. Disconnect all power and wait 5 minutes for stored energy to dissipate before handling.

1. Select a mounting method as detailed in Figure 1 and install the electrical box using suitable hardware.

   For outdoor applications, install the weatherproof box using four #10 × 1-1/4 (32 mm) screws and caplugs provided in the enclosed parts bag. Carefully adhere the gasket, part number P-007549-0082 (provided in the enclosed parts bag) to the box as shown in Figure 1.

   Notes

   - Be sure that the hook flange is facing outward as shown in Figure 1 (item 10).
   - The designation "TOP" on boxes denotes orientation of box after installation.

2. Attach the mounting plate using two #8-32 screws provided with the surface box or four #8-32 screws provided with weatherproof box. The flush box uses two #8-32 screws (not provided).
3. Bring the signaling circuit field wiring into the electrical box.
4. Connect signaling circuit field wires to terminals on horn/strobe assembly (Figure 2 through Figure 4).
5. Ground in accordance with national and local electrical codes. A green ground screw is provided with both the indoor and outdoor surface boxes.
6. Mount the horn/strobe on the mounting plate (Figure 1).
   a. The inside of the top of the grille has hinges that pass through cutouts and engage with tabs on the mounting plate. With the bottom of the grille lifted out slightly, place the grille over the mounting plate so that the hinges of the grille are in the mounting cutouts.
   b. Properly seat the grille by pressing the bottom in.
   c. Fasten the bottom of the grille to the mounting plate by installing the captive combination drive screw.
7. Apply power and activate the horn/strobe unit to verify that it is operating properly.

Maintenance

Caution: Should the unit fail to operate properly, do not attempt repair. Contact the supplier for replacement.

Perform a visual inspection and an operational test twice a year.

Specifications

	N5 model	AQ model	
Operating voltage*	120 VAC 50/60 Hz	24 VAC 50/60 Hz	24 VDC
Operating current, horn**	33 mA	72 mA	22 mA
Operating current, strobe**	115 mA	390 mA	390 mA
Flash rate (per second)	Approximately 1 fps		
Sound level output at 10 ft. (3.05 m) anechoic chamber	90 dBA nominal		
Operating environment	Indoor: 93% at 90°F (32°C) relative humidity; 32 to 120°F (0 to 49°C) variable ambient temperature Outdoor: 98% at 104°F (40°C) relative humidity; −31 to 150°F (−35°F to 66°C) variable ambient temperature		

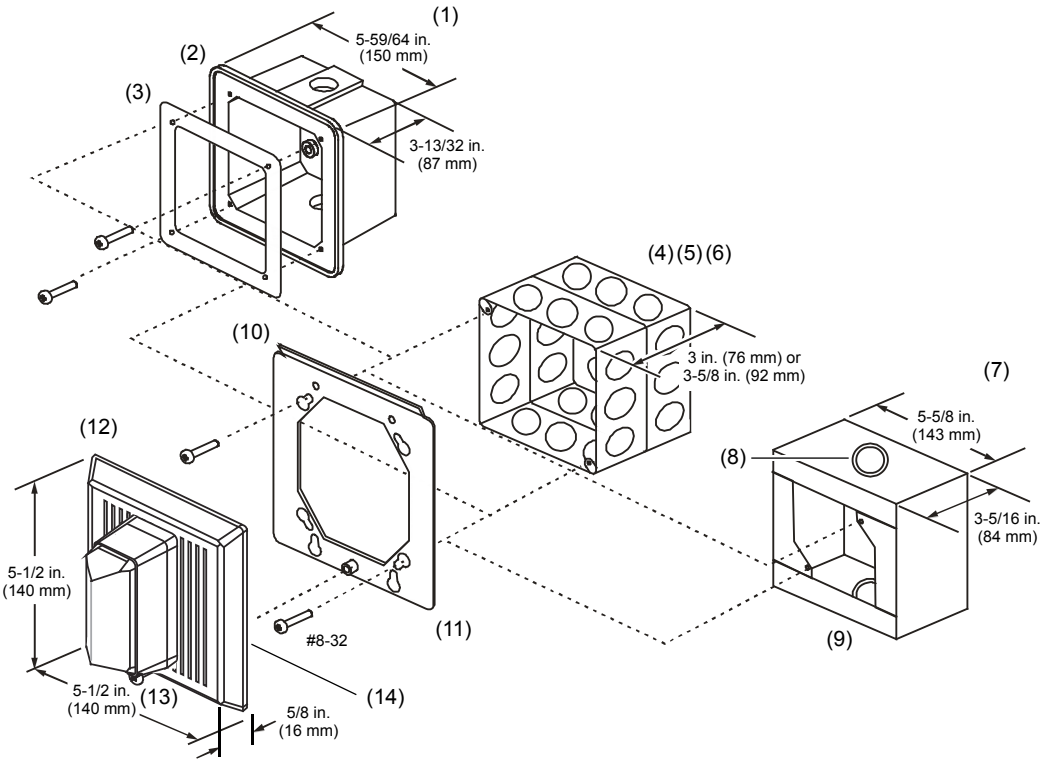
* The operating voltage to the horn may be continuous or coded such as march time or a temporal pattern meeting ISO8201 (ANSI S3.41) Audible Emergency Evacuation Signal.

** Horn and strobe currents are additive when connected in parallel.

Models 867STR(*)-AQ, 868STR(*)-AQ and 869STR(*)-AQ potentially generate timing signals or pulses above 9 kHz and therefore have been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

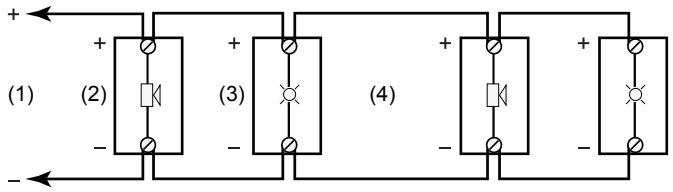
Caution: Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Figure 1: Detailed view



(1) Surface (outdoor)
(2) Weatherproof box
(3) Gasket
(4) Flush/Panel
(5) Standard North American 4 in. sq. × 1-1/2 in. deep electrical box (Universal #52171) with 1-1/2 in. (38 mm) deep extension ring (Universal #53151 or equivalent)
(6) CAUTION CANADA: If using Iberville (Commander) extension ring, use standard North American box with 2-1/8 in. (54 mm) deep extension ring (Universal #53171)
(7) Surface (indoor)
(8) Knockouts for 1/2 in. (13 mm) or 3/4 in. (19 mm) conduit; top, bottom, back
(9) Surface box
(10) Hook flange
(11) Mounting plate (supplied)
(12) Electronic horn/strobe
(13) Captive combination drive screw
(14) Terminal block (see Figure 4)

Figure 2: Wiring the horn and strobe on the same circuit



(1) Applicable voltage source
(2) Horn
(3) Strobe
(4) Polarity must be observed for units operating on VDC

Figure 3: Wiring the horn and strobe on different circuits

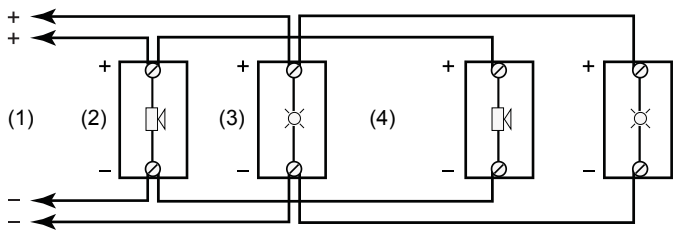


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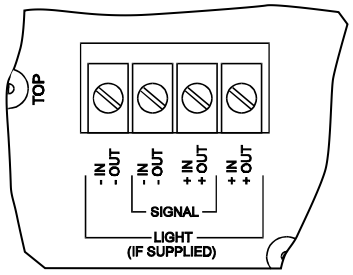
Figure 4: Terminals



Regulatory information

Ratings	CAN/CSA C22.2 No. 205 UL 464

Contact information

For contact information, see www.edwardsfiresafety.com

P/N P-047550-1786-EN • REV 07 • ISS 08OCT15

Electronic Horn/Strobe Signal Appliance Installation Sheet

Description

The horn/strobes are high quality signals intended for use in cUL general signaling applications. The strobes flash at 1 fps across their full operating voltage range. See Table 1 for model numbers and “Specifications” for details.

Table 1: Models

Number	Description
867STR(*)-**	Horn/Strobe, Surface Mount Indoor, Gray
868STR(*)-**	Horn/Strobe, Surface Mount Outdoor, Gray
869STR(*)-**	Horn/Strobe, Flush or Panel Mount Indoor, Gray

* Insert lens color: C = Clear, R = Red, G = Green, B = Blue, A = Amber.

** The horns are available in two voltages. Insert suffix as required: N5 = 120 VAC, AQ = 24 V AC/DC

Installation

Install and wire this device in accordance with applicable national and local codes, ordinances, and regulations, and in a manner acceptable to the local authority having jurisdiction.

WARNINGS

- To reduce the risk of shock, do not connect AC or battery power to the horn until directed in these instructions.
- To reduce the risk of shock, do not tamper with this device when the signal circuit is energized. Disconnect all power and wait 5 minutes for stored energy to dissipate before handling.

1. Select a mounting method as detailed in Figure 1 and install the electrical box using suitable hardware.

   For outdoor applications, install the weatherproof box using four #10 × 1-1/4 (32 mm) screws and caplugs provided in the enclosed parts bag. Carefully adhere the gasket, part number P-007549-0082 (provided in the enclosed parts bag) to the box as shown in Figure 1.

   Notes

   - Be sure that the hook flange is facing outward as shown in Figure 1 (item 10).
   - The designation "TOP" on boxes denotes orientation of box after installation.

2. Attach the mounting plate using two #8-32 screws provided with the surface box or four #8-32 screws provided with weatherproof box. The flush box uses two #8-32 screws (not provided).
3. Bring the signaling circuit field wiring into the electrical box.
4. Connect signaling circuit field wires to terminals on horn/strobe assembly (Figure 2 through Figure 4).
5. Ground in accordance with national and local electrical codes. A green ground screw is provided with both the indoor and outdoor surface boxes.
6. Mount the horn/strobe on the mounting plate (Figure 1).
   a. The inside of the top of the grille has hinges that pass through cutouts and engage with tabs on the mounting plate. With the bottom of the grille lifted out slightly, place the grille over the mounting plate so that the hinges of the grille are in the mounting cutouts.
   b. Properly seat the grille by pressing the bottom in.
   c. Fasten the bottom of the grille to the mounting plate by installing the captive combination drive screw.
7. Apply power and activate the horn/strobe unit to verify that it is operating properly.

Maintenance

Caution: Should the unit fail to operate properly, do not attempt repair. Contact the supplier for replacement.

Perform a visual inspection and an operational test twice a year.

Specifications

	N5 model	AQ model	
Operating voltage*	120 VAC 50/60 Hz	24 VAC 50/60 Hz	24 VDC
Operating current, horn**	33 mA	72 mA	22 mA
Operating current, strobe**	115 mA	390 mA	390 mA
Flash rate (per second)	Approximately 1 fps		
Sound level output at 10 ft. (3.05 m) anechoic chamber	90 dBA nominal		
Operating environment	Indoor: 93% at 90°F (32°C) relative humidity; 32 to 120°F (0 to 49°C) variable ambient temperature Outdoor: 98% at 104°F (40°C) relative humidity; −31 to 150°F (−35°F to 66°C) variable ambient temperature		

* The operating voltage to the horn may be continuous or coded such as march time or a temporal pattern meeting ISO8201 (ANSI S3.41) Audible Emergency Evacuation Signal.

** Horn and strobe currents are additive when connected in parallel.

Models 867STR(*)-AQ, 868STR(*)-AQ and 869STR(*)-AQ potentially generate timing signals or pulses above 9 kHz and therefore have been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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Figure 1: Detailed view

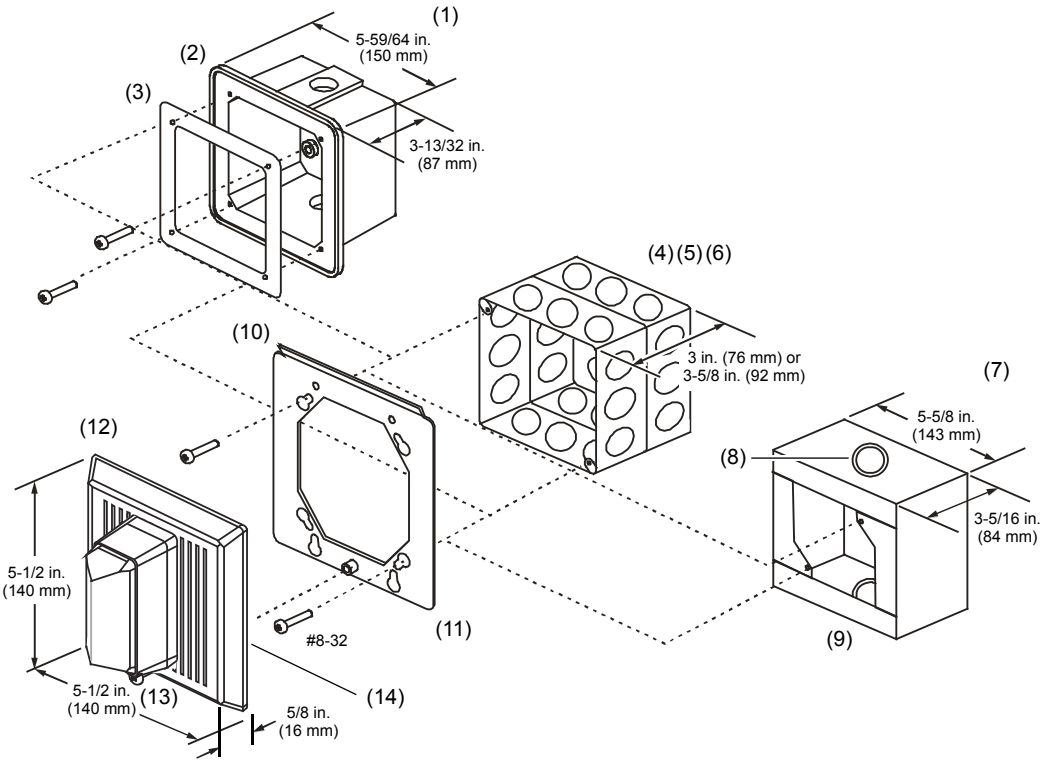

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Figure 2: Wiring the horn and strobe on the same circuit

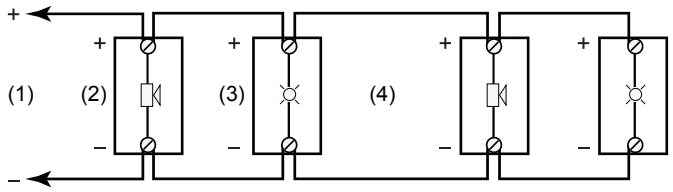

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Figure 3: Wiring the horn and strobe on different circuits

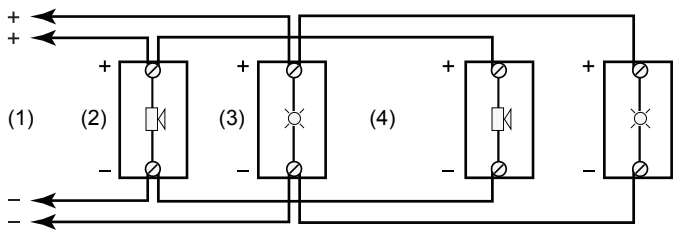

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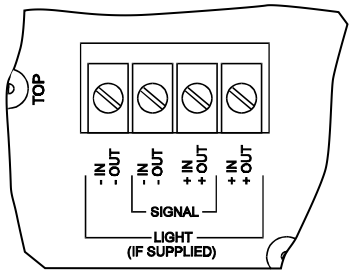
Figure 4: Terminals



Regulatory information

Ratings	CAN/CSA C22.2 No. 205 UL 464

Contact information

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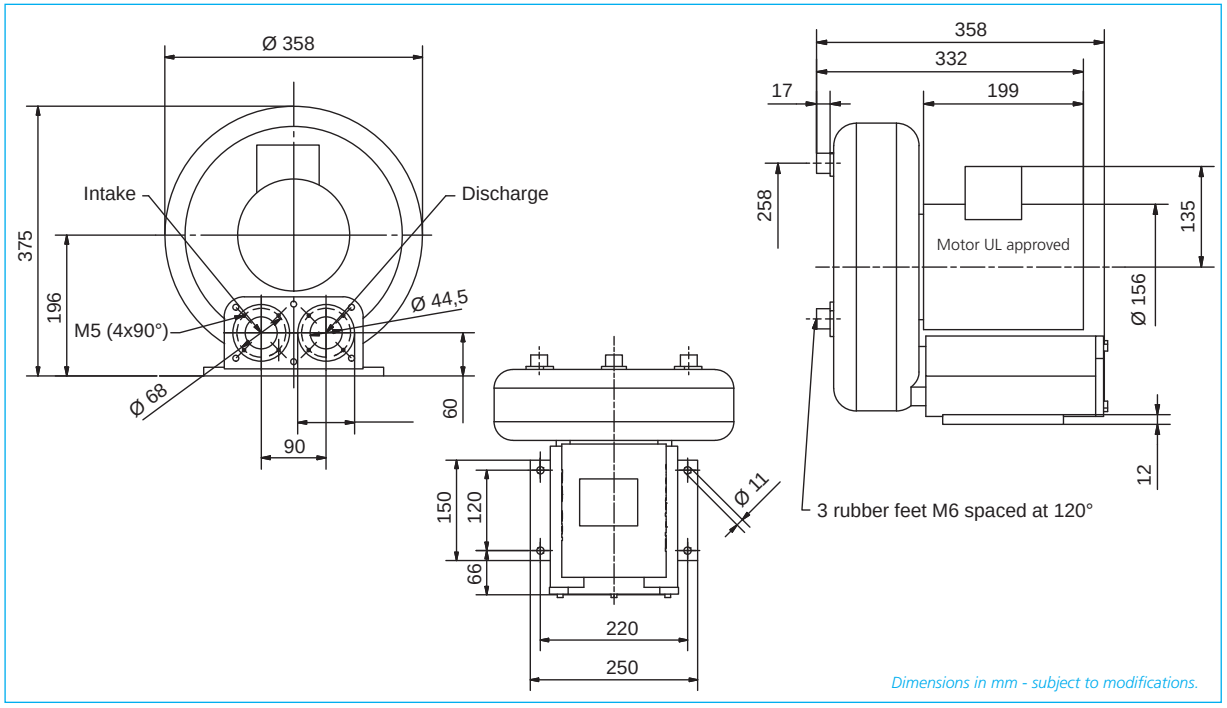
Appendix A-4

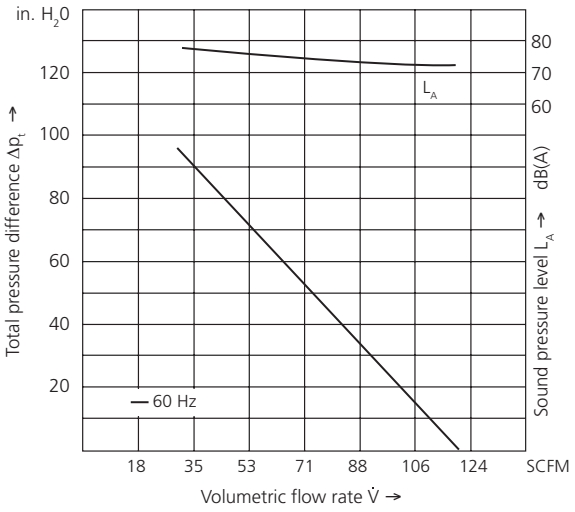
SSDS Fan and Motor – Installation and Operating Instructions



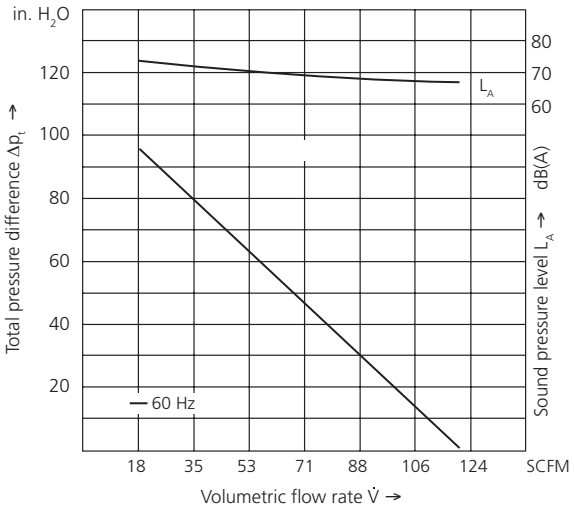
Delivery includes inlet and outlet flanges NPT 1½".

Type	Frequency	Maximum performance when used as blower		Maximum performance when used as extractor		Motor ratings				Capacitor	Weight (approx.)
		$\dot{V}$ max.	Δp_t max.	$\dot{V}$ max.	Δp_t max.	Rated output	Voltage	Current	RPM	230 V	
	Hz	SCFM	in. H_2O	SCFM	in. H_2O	hp	V	A	min^{-1}	µF/V	lb
SE 4n **VFD 41S**	60	120	96	120	96	2,0	230	10,0	3300	40/450	46

Pressure



Vacuum



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Fuji Electric

Innovating Energy Technology

Ring Compressors

Specifications

PRODUCT MODEL	Max. Pressure in. H2O	Max. Vacuum in. H2O	Max. Flow: SCFM	HP	Voltage	Phase	Weight: lbs. (kg)
VFC080P-5T	19.5	18.7	19.5	0.10	115/230	1	13.3 (6.0)
VFC080A-2T	19.5	18.7	19.5	0.10	230	3	13.3 (6.0)
VFC080A-4W	19.5	18.7	19.5	0.10	460	3	13.3 (6.0)
VFC100A-7W	26.5	25	27	0.17	230/460	3	19 (8.6)
VFC100P-5T	27.5	26	27	0.17	115/230	1	19 (8.6)
VFC200A-7W	37	34	42	0.33	230/460	3	22 (10)
VFC200P-5T	34	33	42	0.33	115/230	1	22 (10)
VFC300A-5W	50	45	55	0.50	575	3	25.5 (11.5)
VFC300A-7W	50	45	55	0.50	230/460	3	25.5 (11.5)
VFC300P-5T	49	45	56	0.50	115/230	1	27 (12.3)
VFC400P-5T	54.5	50	98	1.00	115/230	1	51 (23)
VFZ401A-5W	58	52	89	1.40	575	3	46 (20.1)
VFZ401A-7W	58	52	89	1.40	230/460	3	46 (20.1)
VFB175P-5T	72	65	105	1.75	115/230	1	40 (18.1)
VFC508P-2T	80	70	154	2.50	200/230	1	97.5 (44)
VFZ501A-5W	80	80	135	2.70	575	3	77 (35)
VFZ501A-7W	80	78	135	2.70	230/460	3	77 (35)
VFZ601A-5W	134	95	173	5.00	575	3	108 (49)
VFZ601A-7W	134	95	173	5.00	230/460	3	108 (49)
VFZ701A-5W	105	99	217	6.70	575	3	134 (60.8)
VFZ701A-7W	105	99	217	6.70	230/460	3	134 (60.8)
VFZ801A-5W	115	108	379	10.70	575	3	211 (95.7)
VFZ801A-7W	115	108	379	10.70	230/460	3	211 (95.7)
VFZ901A-5W	100	85	574	14.70	575	3	259 (117.5)
VFZ901A-7W	100	85	574	14.70	230/460	3	259 (117.5)
VFB2000-7W	90	115	755	20.00	230/460	3	143 (65)
2VFB30-1.2-5T	100	100	57	1.20	115/230	1	36 (16.6)
2VFB30-1.2-7W	125	110	56	1.20	230/460	3	36 (16.6)
2VFB40-3.42-7W	172	140	106	3.42	230/460	3	64 (29)
2VFB50-6.16-7W	189	165	158	6.16	230/460	3	106 (48.2)
2VFB60-11.5-7W	245	185	222	11.50	230/460	3	177 (80.5)
2VFB60-8.4-5W	200	177	222	8.40	575	3	170 (77.3)
2VFB60-8.4-7W	200	177	222	8.40	230/460	3	170 (77.3)
VFD2-L	84	72	54	0.88	230	3	33 (15)
VFD2-H	84	72	54	0.88	460	3	33 (15)
VFD2S	84	72	54	1.00	115	1	33 (15)
VFD41-L	72	76	120	2.20	230	3	48 (21.8)
VFD41-H	72	76	120	2.20	460	3	48 (21.8)
VFD41S	96	96	120	2.20	230	1	46 (20.9)
VFD42-L	100	104	120	2.60	230	3	51 (23.2)
VFD42-H	100	104	120	2.60	460	3	51 (23.2)
VFD5-L	137	120	148	4.00	230	3	78 (35.5)
VFD5-H	137	120	148	4.00	460	3	78 (35.5)
VFD6-L	90	85	198	4.80	230	3	77 (35)
VFD6-H	90	85	198	4.80	460	3	77 (35)

Applications

Pneumatic Conveying

Fuji Electric Ring Compressors are the "engines" for these critical pneumatic tube systems for the medical industry.

Wastewater Treatment

Fuji Electric Blowers provide clean, dry air for aeration in wastewater treatment systems.

Aquaculture

Fuji Electric blowers provide aeration for shrimp and fish farming applications.

Concrete Aeration

Fuji Electric blowers provide aeration for dry concrete batch plants.

Air Monitoring

Fuji Electric blowers are used in both pressure and vacuum systems to monitor air quality.

Features

Integrated Suction and Discharge Silencers reduce blower noise levels. Dynamically balanced Die cast impellers allows for vibration free operation. Shielded Shaft bearings and seals provide grease retention and protect bearings for longer life. Multi-voltage Fuji Electric Blower Motors are manufactured to minimize OEM inventory requirements. Removable Threaded Flanges allow for ease of maintenance or replacement and Built-in Thermal switches protect motors from overheating.

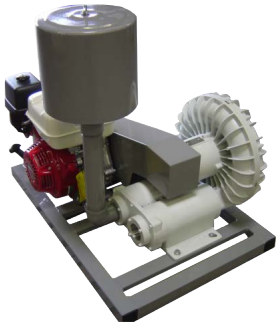
Principles of Operation

Fuji Electric Ring Compressors are high volume, low pressure devices used for pressure or vacuum applications. The unit consists of an impeller mounted directly to the motor shaft rotating at a speed of 3450 RPM. As the impeller spins and the blades pass the inlet port, a low-pressure area is created drawing air into the inlet port of the blower. The impeller blades impart motion to the air, throwing it outward and forward. The air follows the contour of the impeller housing and this is repeated as the impeller turns. This action causes the regeneration process and the air increases in pressure as it reaches the outlet port. Fuji Electric Ring Compressors are capable of pressures up to 245 inches of water and Air flow rates up to 755 cubic feet per minute. These devices compress air in such a way that there is no lubrication needed; the discharge air is free from any oil.

Construction

Fuji Electric Ring Compressors are designed to meet the most critical application requirements. Each unit features an impeller, mounting base and housing manufactured of Aluminum Alloy for maximum strength, reduced weight and increased corrosion resistance. The units are designed for mechanical simplicity and maximum structural integrity. All motors are TEFC (TENV on models less than 1/10 HP). The devices are UL Recognized, CSA Certified and CE Compliant. Each unit contains a built-in pilot duty thermal protector.

Optional Products



Accessories

Fuji Electric provides a wide variety of Blower accessories to complete your installation. Accessories include Pressure and Vacuum Relief Valves, Inlet and Vacuum Filters, Aspirators, Silencers and Vacuum Boosters.

Air Knives

Fuji Electric provides engineered air knives and air knife systems. We can provide individual components or turn-key systems

Systems

Fuji Electric provides engineered systems incorporating Fuji Electric Ring Compressors. Engineered Designs include Industrial Vacuum Systems, Engine-Driven Blower Systems for remote operations and Aspirator Systems.

Fuji Electric
Fuji Electric Corp. of America
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www.americas.fujielectric.com

Premium Efficiency

RoHS Compliant

FEA-RC-BR-100
8-2017

Appendix B

Vapor Sealant

Vapor Intrusion Coating System for Existing Structures

Product Description

The **Retro-Coat™ (patent pending)** Vapor Intrusion Coating System is a complete product line that consists of chemically resistant materials to properly protect existing structures from the threat of contaminant vapor intrusion without the need for additional concrete protection. Developed by the R&D team of Land Science Technologies™, the Retro-Coat system has been subjected to rigorous testing procedures to prove its ability to combat the most aggressive chemical vapors. The main component of the Retro-Coat system is the **Retro-Coat** coating which is a two part, odorless, no VOC, 100% solids coating.

Retro-Coat finishes to a high gloss, easy-to-clean surface that is impervious to vapor and moisture transmission. Available in a variety of colors, **Retro-Coat** can be applied on damp as well as dry concrete, concrete masonry units, tile, brick and metal. For enhanced slip resistance, a suitable aggregate can be added. In addition, other additives or materials can be utilized to achieve a desired performance or aesthetic look.

Typical Application

Retro-Coat is suitable as a barrier to block contaminated vapors from entering existing structures. Particular uses include coating the horizontal surfaces of existing structures where contamination under, or adjacent to, a structure can potentially migrate inside the structure and create a vapor encroachment condition. This condition is most commonly found when the existing structure was operated as a dry cleaner, gas station, manufacturing facility or located in close proximity to any structure where carcinogenic chemicals were utilized.

A typical application consists of a minimum 20 mil thick system; consisting of two 10 mil coats of **Retro-Coat** at 160 SF/gallon per coat and is recommended along with a 6 mil coat of **Retro-Coat PRIMER.** The typical 20 mil application can withstand forklift traffic, other machinery and even act as secondary containment. However, if **Retro-Coat** may be exposed to more harsh conditions over a longer period of time, thicker applications ranging from 60 mil to ¼ -inch may be more suitable.

In either application, **Retro-Coat** is a traffic bearing surface and does not need a protective course placed over it.

Retro-Coat Advantages

- ***Our R&D team developed all of the Retro-Coat system components specifically for vapor intrusion protection in existing structures***
- ***Retro-Coat is resistant to both TCE and PCE, the vast majority of coatings cringe at such aggressive chemicals***
- ***Retro-Coat is a wearing surface, meaning no additional concrete protection is necessary***
- ***No odor and fast cure time reduce building downtime***
- ***Carpet, tile, linoleum or other floor coverings can be applied directly over Retro-Coat, if desired***
- ***Eliminates the need to remove the existing slab and when combined with in-situ treatment, lowers overall remediation cost***
- ***Retro-Coat can increase the performance of an existing active sub-slab depressurization system***
- ***Retro-Coat can aid in the retiring of existing active systems***
- ***Available and installed by Land Science Technologies certified contractors***

Completed surface preparation consisting of shot blasting, Retro-Coat PREP to fill joints and cracks and a 6 mil application of Retro-Coat PRIMER

Application of Retro-Coat SEALANT to a 20 mil total thickness

Installation

Particular care must be taken to follow those instructions precisely to assure proper installation. These instructions pertain to a standard 20 mil application; please contact us if the desired application is different.

1. New concrete should be allowed to cure a minimum of 28 days and/or be checked with a rubber mat or plastic sheet to ensure adequate curing time has occurred.
2. All surfaces to be covered should be power washed, shot blasted, acid etched, scarified or sanded to present a clean, sound substrate to which to bond to. The prepared surface should have a ph of 7.
3. Any bugholes and cracks wider than 1/8" should be filled with **Retro-Coat PREP** and allowed to dry before coating. More severely damaged concrete or other special conditions will require the proper **Retro-Coat** product.
4. When installing the standard 20 mil application of **Retro-Coat**, apply a 6 mil coat of **Retro-Coat PRIMER** and allow to dry prior to applying the initial coat of **Retro-Coat**. Priming may not be necessary when **Retro-Coat** is applied to a thickness greater than 20 mils. On new concrete or old concrete with an open porosity and on wood surfaces apply **Retro-Coat PRIMER** and allow to dry.
5. The two **Retro-Coat** ingredients should be mixed in the prescribed ratios, using a low speed "jiffy-style" mixer, (maximum 750 rpm). Mix Part A for about 1 minute then, add Part B and mix until uniform in color and consistency (at least one additional minute.)
6. Do not mix less than the prescribed amount of any ingredient or add any solvent to the mix.
7. Apply the mixed **Retro-Coat** material with a short nap roller, a squeegee or a brush. Apply approximately 160 SF per gallon per coat to achieve 10 mils of coating.
8. Apply a second coat while the first coat is still tacky if using spike shoes or dry enough to walk on, but before 7 hours at 75^{o}F. If the first coat has set and is no longer tacky then the first coat should be sanded before recoating.
9. A suitable aggregate may be broadcast onto the surface after backrolling to provide more anti-slip profile to the finished surface. It is advisable to test various types and sizes of aggregate to achieve the desired finished profile.

Product Specification

The specified area shall receive an application of **Retro-Coat** as manufactured by **Land Science Technologies, San Clemente, California.** The material shall be installed by precisely following the manufacturer's published recommendations pertaining to surface preparation, mixing and application. The material shall be a low odor, two part, solvent free 100% solids, high gloss flexibilized system with good resilience to resist thermal and mechanical shock. It should be able to be roller applied at a minimum of 10 mils thickness per coat on vertical surfaces without sagging (at ambient conditions). The system must adhere to damp as well as dry concrete, wood, metal tile, terrazzo and sound existing epoxy and urethane coatings. It shall have tensile elongation of at least 6.0% when tested under ASTM-638. Its bond strength to quarry tile shall exceed 1000 psi when tested with an Elcometer pull test. Its hardness shall not exceed 83, as measured on the Shore D scale. The system shall be unaffected by oils and greases and shall withstand chemical attack for at least 72 hours against 98% sulfuric, 50% hydrofluoric acid, glacial acetic acid and acrylonitrile.

Precautions

1. **This is a fast reacting product; immediately pour onto floor after mixing and spread with notched squeegee. Recoat window without sanding at 70°F: 8 hours**
2. **A severe skin and eye irritant; check MSDS before use**
3. **Do not apply below 50°F**

Note: Failure to follow the above instruction, unless expressly authorized by a Land Science Technologies Representative, will void our material warranty.

Chemical Resistance

Retro-Coat™ is considered chemically resistant to neat concentrated acids, caustics and solvents. For permeation or diffusion coefficients please contact Land Science Technologies.

Physical Properties

Tensile Strength	(ASTM D-638)	: 9800 psi	Bond Strength to Quarry Tile	: >1000 psi
Tensile Elongation	(D-638)	: 6.0%	Vapor Transmission Rate (E-96)	: .027 perms
Flexural Strength	(D-790)	: 7035 psi	Water Absorption (D-570)	: 0.2% in 24hrs.
Hardness, Shore D	(D-2240)	: 83	Taber Abrasion (D-1044)	: 86 mg loss.
Gardner Impact Strength	(D-2794)	: 80 in. lbs.	60° Gloss	: 100

Physical Characteristics

Density, lbs/gal.
Pt. A : 11.0
Pt. B : 8.9
A&B Mixed : 9.3

Viscosity @ 77°F, cps
Pt. A : 18,400
Pt. B : 500
A&B Mixed : 4800

Mixing Ratios — **By Volume** — **By Weight**
Pt. A : Pt. B — **2:1** — **2.3:1**

Curing Times @	**50° F**	**77°F**	**90°F**
Pot Life	35 min.	30 min.	20 min.
Working Times	20 min.	20 min.	15 min.
Hard, Foot Traffic	14 hrs.	7 hrs.	3 ½ hrs.

Maximum hardness and chemical resistance are achieved after 7 days at 77°F

Color Availability

Standard colors: beige, black, blue, dark gray, green, gray, red, white, yellow

Shelf Life: 1 Year at 77°F in unopened containers

Packaging and Coverage Rates *(for 20 mil coverage)*

4 Gallon Kit	:	320 SF
20 Gallon Kit	:	1600 SF
100 Gallon Kit	:	8,000 SF

Land Science Technologies
Specifications for Retro-Coat™
Version 1.0

Part 1 – Scope

1.1 Product and Application

This specification describes the application of the Retro-Coat™ System. The minimum thickness of the system is between 25-30 mils, including a 20 mil minimum application of Retro-Coat.

1.2 Acceptable Manufacturers

A. Retro-Coat as manufactured by Land Science Technologies San Clemente, CA.

1.3 Performance Criteria

A. Retro-Coat as manufactured by Land Science Technologies San Clemente, CA.

1. Diffusion Coefficient (Columbia Labs)
   PCE: 7.6×10^{-14} m^2/s
   TCE: 8.2×10^{-14} m^2/s

2. Tensile Elongation (ASTM D-638)
   Minimum: 6000 psi

3. Tensile Elongation (ASTM D-638)
   Minimum: 6 %

4. Flexural Strength (ASTM D-790)
   Minimum: 7000 psi

5. Hardness, Shore D (ASTM D-2240)
   Maximum: 85

6. Gardner Impact (ASTM D-2794)
   Minimum: 80 inch-pounds

7. Bond Strength to Quarry Tile
   Minimum: 1000 psi

8. Vapor Transmission Rate (ASTM E-96)
   Maximum: .07 perms

9. Water Absorption (ASTM D-570)
   Maximum: .02% in 24 hours

10. 60° Gloss
    Minimum: 100.

1.4 Materials

A. Retro-Coat “A” shall be a modified epoxy containing special flexibilizers and specially formulated resins for superior chemical resistance and enhanced resilience. No solvents are allowed.

B. Retro-Coat “B” shall be customized blend of hardeners specifically formulated to maximize chemical resistance. No solvents are allowed.

1.5 Applicator

A. Applicator must be a certified contractor of Land Science Technologies.

Part 2 – Application

2.1 Surface Preparation

A. All existing surfaces that will be covered with the systems specified herein should be mechanically ground, shot blasted or sand blasted to yield a minimum 60 grit surface texture. All loosely adhered coatings will be removed. Any grease and other contaminants found on the concrete must also be removed.

B. All open cracks 1/2" and greater should be v-notched to a 3/4" width by 1/2" depth and cleaned of any debris. Such cracks should be filled with Retro-Coat Gel and struck off flush with the surrounding surface.

C. Cut back and/or remove any expansion joint backing or filler strips to a minimum of 1 ½" deep. Insert disposable filler in the joints to prevent filling with the overlayment materials and to allow for accurate location of final saw cuts in the overlayment.

2.2 Material Application

A. Retro-Coat CAULK

1. Apply Retro-Coat CAULK around the base of all pipe penetrations making sure to fill any gap between the penetration and concrete slab

2. Apply Retro-Coat CAULK to the joint created between horizontal and vertical transitions. The caulking material should be applied and pressed into the joint filling any gaps that might be present.

B. Retro-Coat PRIMER

1. Apply Retro-Coat PRIMER to all areas at a thickness of 6 mil and allow to dry tack free. In areas where the concrete surface is in need of slight repair or needs to be leveled, a slurry form of Retro-Coat PRIMER called Retro-Coat PRIMER-S can be applied with a flat squeegee. Retro-Coat PRIMER-S is self priming and does not need to be primed again.

C. Retro-Coat

1. Mix Retro-Coat, Part A with a low-speed (<750 rpm) jiffy-style mixer for about 30 seconds, or until uniform in color, then mix in Retro-Coat Coating, Part B for another 30-60 seconds.

2. Dump contents onto floor in a ribbon pattern, squeegee, and then back roll at a coverage rate of 160 SF/gallon to achieve a film thickness of 10 mils.

3. Apply second coat 10 mil coat to achieve a total thickness of 20 mils. Repeat as necessary to achieve specified thickness.

4. If a flooring material will be placed over Retro-Coat after it is applied, or appearance is not a priority, (1) 20 mil coat can be applied.

2.3 Protection of Finished Work

A. Prohibit foot traffic on floor for 24 hours after laying (at 70ºF). At 50ºF,this time should be extended to 48 hours.

B. Rinse off any chemicals that may come in contact within 7 days of installation with the freshly laid floor immediately.

2.4 Cleanup

A. Properly dispose of all unused and waste materials.

B. Tools can be washed in warm, soapy water when wet, but after drying, can only be cleaned by grinding or with a paint stripper.

C. Unused resin can be set off with proper amount of hardener and disposed of in regular trash bins.

Part 3 – Quality Control

3.1 Warranty

A. Installer shall provide a one year warranty against delamination, chemical attack and normal wear and tear.

B. Manufacturer will provide a one year material warranty.

3.2 Quality Control

A. Installer shall use a notched squeegee to apply Retro-Coat to the specified mil thickness and calculations shall be done to determine if the correct amount of material has been applied. Retro-Coat contains 100% solids at the time of application; therefore no material shrinkage will occur during the curing process. One gallon will cover 80 square feet.

B. A wet mil film gauge can be used to spot check the Retro-Coat thickness to make certain the minimum 20 mil thickness has been applied, though some discretion should be used because high points or low points on the underlying surface can adversely affect the thickness measurements.

3.3 Floor Care

A. The standard smooth surface of Retro-Coat should be cleaned on a regular basis by damp mopping the floor with conventional commercial cleaners. It is important to first remove any grease or oils by a suitable cleaner, preferably a citrus based cleaner. Rinse with clear water to help eliminate film buildup and then allow to dry. Never use abrasive powder cleaners like Ajax or Comet as they tend to scratch the floor.

B. Additional steps can also be taken to prolong the look and life of a seamless floor:

1. Protect the floor during transference of heavy equipment
2. Educate the drivers inside the building the importance of avoiding “jack-rabbit” starts and stops, as well as keeping the metal forks lifted
3. Regular cleaning should take place as to not allow the buildup of abrasive material, such as sand or dirt, on the coating
4. Eliminate all metal wheels
5. Change over to light-colored polyurethane wheels
6. Do not slide heavy metal totes, drums or bins across the floor
7. Immediately hose down chemical spills, especially on newly laid floors.

APPENDIX 10 – REMEDIAL SYSTEM OPTIMIZATION TABLE OF CONTENTS

REMEDIAL SYSTEM OPTIMIZATION FOR 19 Patchen Avenue

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