FPM group — Engineering and Environmental Science

FPM Group, Ltd.
FPM Engineering Group, P.C.
formerly Fanning, Phillips and Molnar

CORPORATE HEADQUARTERS
909 Marconi Avenue
Ronkonkoma, NY 11779
631/737-6200
Fax 631/737-2410

July 7, 2015

Ms. Alicia Barraza
NYSDEC
Division of Environmental Remediation
625 Broadway
Albany, NY 12233-7016

Re: **Remedial Design Work Plan - final**
Cinderella 248, LLC Site #C224160
248 Flatbush Avenue, Brooklyn, New York
FPM File No. 1104g-15-03

Dear Ms. Barraza:

Enclosed please find one electronic copy on CD of the final Remedial Design Work Plan (RDWP) for the above-referenced site. An electronic copy on CD has also been transmitted to Bridget Boyd at the New York State Department of Health. The RDWP has been revised and finalized in accordance with the comments in your July 3, 2015 approval letter.

We are finalizing the remedial schedule and will transmit it separately by July 22, 2015.

Very truly yours,

Stephanie O. Davis, C.P.G.
Senior Project Manager
Vice President

SOD:tac
Enclosure

cc: Bridget Boyd, NYSDOH w/CD enclosure
Michael Pintchik, w/CD enclosure

U:\Rigano LLC\Cinderella 248 LLC\RAWP\RDWPfinaltransmittal.docx

REMEDIAL DESIGN WORK PLAN

PREPARED FOR

CINDERELLA 248, LLC SITE
248 FLATBUSH AVENUE
BROOKLYN, NEW YORK

NYSDEC BCP SITE NO. C224160

PREPARED BY

FPM group™

909 MARCONI AVENUE
RONKONKOMA, NY 11779

JULY 2015

TABLE OF CONTENTS

Section	Description	Page No.
	Certification	iii
1.0	**Introduction and Purpose**	1-1
2.0	**Site Background and Selected Remedial Measures**	2-1
2.1	Site Description	2-1
2.2	Site Environmental Setting	2-1
2.3	Summary of Impacts and Selected Remedial Measures	2-4
2.4	Remedial Goals	2-6
2.5	Green Remediation Principles	2-8
3.0	**Remedial Actions**	3-1
3.1	Introduction	3-1
3.1.1	General Provisions	3-1
3.1.2	Quality Assurance/Quality Control	3-2
3.2	Descriptions of Remedial Measures	3-3
3.2.1	Sub-Slab Depressurization System	3-3
3.2.2	Institutional Control – Environmental Easement	3-7
3.2.3	Site Management Plan	3-8
3.3	Reporting	3-8
3.4	Remedial Action Schedule	3-10
3.5	Green Remediation Principles and Techniques	3-10
4.0	**References**	4-1

TABLE OF CONTENTS (CONTINUED)

LIST OF FIGURES

Figure No.	Title	Page No.
2.1.1	Site Location Map	2-2
2.1.2	Site and Vicinity Plan	2-3
2.3.1	Groundwater PCE Data and Flow Direction	2-5
2.3.2	Site Plan with Air and Vapor Data for PCE	2-7
3.2.1.1	SSDS Layout	3-4
3.2.1.2	Schematic of SSDS Process Flow	3-6
3.4.1	Schedule for Remedial Activities	3-11

LIST OF APPENDICES

A	Decision Document
B	Health and Safety Plan, including Community Air Monitoring Plan
C	Quality Assurance Project Plan
D	Equipment and Materials Specifications

REMEDIAL ACTION AND DESIGN WORK PLAN

Prepared for

Facility: Cinderella 248, LLC Site
248 Flatbush Avenue
Brooklyn, New York
NYSDEC BCP Site # C224160

FPM File No: 1104g-15-03

CERTIFICATION

I, Kevin F. Loyst, PE, certify that I am currently a NYS registered Professional Engineer and that this Remedial Action and Design Work 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).

NYUS Registered Professional Engineer

Signature

Prepared by

FPM Engineering Group, PC
909 Marconi Avenue
Ronkonkoma, NY 11779
(Tel) 631-737-6200
(Fax) 631-737-2410

SECTION 1.0
INTRODUCTION AND PURPOSE

This Remedial Design Work Plan (RDWP) has been prepared by FPM Engineering Group, PC (FPM) for the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) Site #C224160, identified as Cinderella 248, LLC located at 248 Flatbush Avenue, Kings County (Brooklyn), New York (Site). This RDWP was prepared to describe the remedial actions and provide the associated details necessary for the construction and implementation of the remedial program for the Site. The elements of the selected remedy are documented in the Decision Document (DD) for the Site, a copy of which is included in Appendix A.

The Site occupies approximately 2,310 square feet and is identified by the New York City Tax Map as Borough of Kings, Block 936, and Lot 12. The Site is fully developed with a one-story masonry building and associated basement. The building is presently vacant and was most recently occupied by Cinderella Cleaners, a dry cleaners and shoe repair facility. The building was constructed between 1888 and 1906. Cinderella Cleaners operated at the Site from at least 1985 to 2005. Other prior uses have reportedly included office space, retail stores, and a woodworker.

The Site was initially investigated in 2005 during an environmental site assessment. Additional investigations and remedial actions were performed at the Site in 2005, 2007, and 2011 to further evaluate Site conditions and to address contamination resulting from past dry cleaning operations. A Remedial Investigation/Alternatives Analysis (RI/AA) Report was completed in October 2014. The previous investigations and remedial activities are documented in the RI/AA Report and the remaining impacts are summarized in Section 2 herein.

Detailed descriptions of the selected remedial actions are provided in Section 3. This section also includes information about the remedial action schedule, sampling activities, reporting, site management, and the institutional control (IC).

Supporting documents are included in the appendices. In addition to the DD (Appendix A), these documents include a Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) in Appendix B, a Quality Assurance Project Plan (QAPP) in Appendix C, and materials and equipment specifications in Appendix D.

SECTION 2.0
SITE BACKGROUND AND SELECTED REMEDIAL MEASURES

The Site description and environmental setting were described in the RI/AA Report and are presented below in summary form for reference. Investigations and remediation previously conducted at the Site were documented in the RI/AA Report. A summary of the remaining impacts, together with the approved remedial measures, is provided below. The Standards, Criteria and Guidance (SCGs) applicable to remedial activities at this Site are also summarized in this section. A summary of green remediation principles applicable to remedial activities at this Site is also presented.

2.1 Site Description

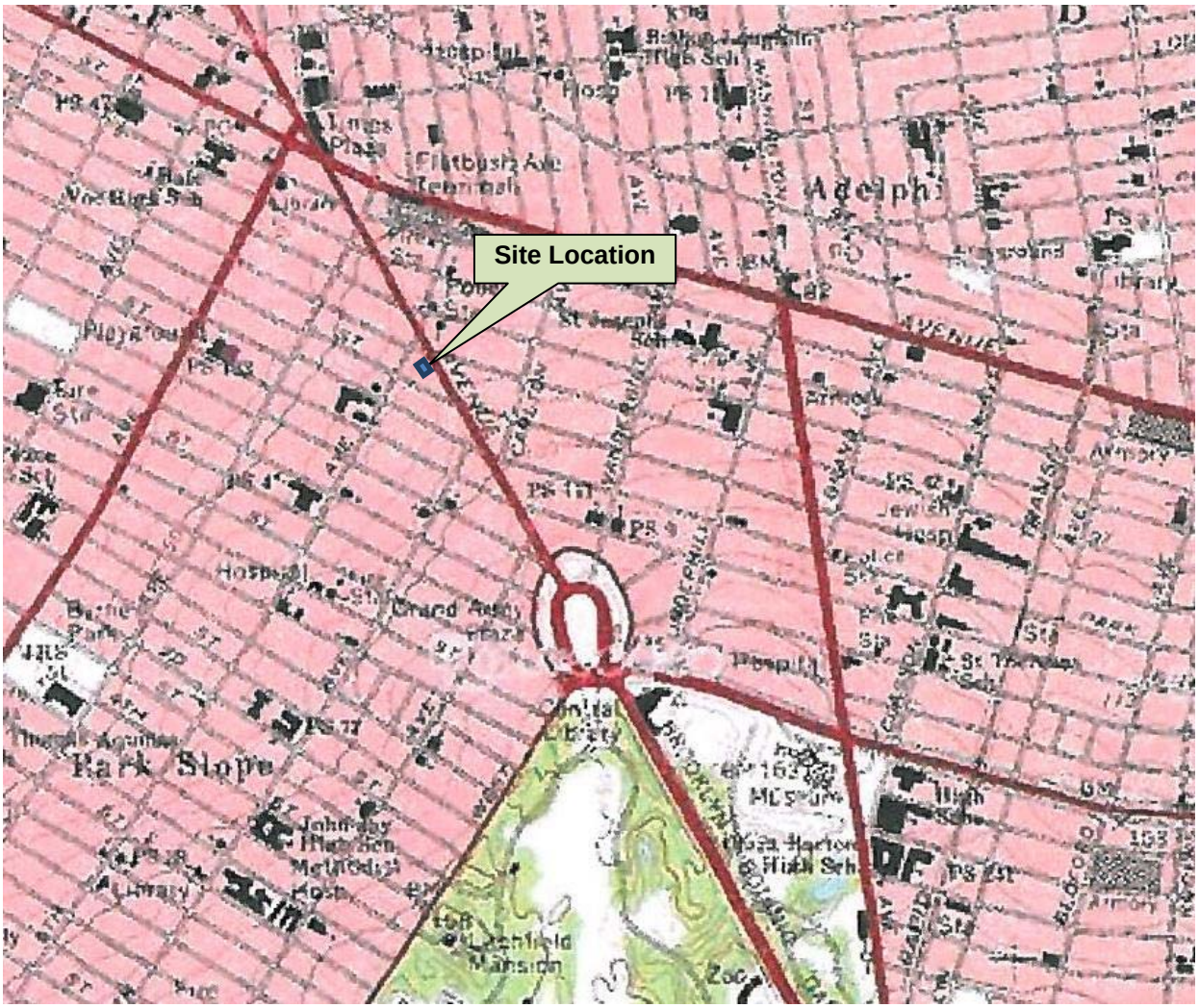
The Site is identified as 248 Cinderella, LLC, is located in Brooklyn, New York (Borough of Kings, Block 936, and Lot 12), and occupies approximately 2,310 square feet. The Site is fully developed with a one-story masonry building and associated basement constructed between 1888 and 1906. The building is presently vacant and was most recently occupied by Cinderella Cleaners, a dry cleaners and shoe repair facility.

The Site location is presented in Figure 2.1.1. A plan of the Site and surrounding properties is included as Figure 2.1.2. The Site is located in an R7A residential zone with a C2-4 commercial overlay; this zoning permits both residential and commercial uses and the Site neighborhood is mixed commercial and residential uses. The Site is bounded to the south by a one-story commercial building with several units; the unit adjoining the Site is occupied by the Eastern Parkway Project's Resident Engineer's Field Office (250 Flatbush Avenue), beyond which are a retail store (252 Flatbush Avenue) and a vacant unit (254 Flatbush Avenue). To the west of the Site is an open unpaved courtyard at the basement level that is utilized by the neighboring properties for outdoor purposes. Further to the west, adjoining Prospect Place and 6th Avenue, are residential buildings. To the north of the Site are Taro Sushi Restaurant (244 Flatbush Avenue), a liquor store (80-82 St. Marks Avenue), and the Flatbush Farm Restaurant at 76 St. Marks Avenue, all of which occupy the first floors and basements of these buildings. Residential apartments occupy the floors above these businesses. Beyond these buildings is St. Marks Avenue. The Site is bounded to the east by Flatbush Avenue, beyond which are multi-story buildings occupied by businesses on the first floor and residential apartments above. A building to the southeast (upgradient) at 287 Flatbush Avenue is occupied by a dry cleaner.

Cinderella Cleaners operated at the Site from at least 1985 to 2005. The Site was initially investigated in 2005 and an abandoned fuel oil aboveground storage tank (AST) and a historic dry cleaning machine coolant leak were identified as issues of environmental concern. The dry cleaning machine coolant leak was investigated in April 2005 and soils impacted by tetrachloroethylene (PCE) were reported to be present beneath the former boiler room. In September 2005 the impacted soils were excavated to a depth of five feet below the basement floor and end-point sampling confirmed that the impacted soils had been removed. The AST was emptied, cleaned, and properly abandoned in October 2005.

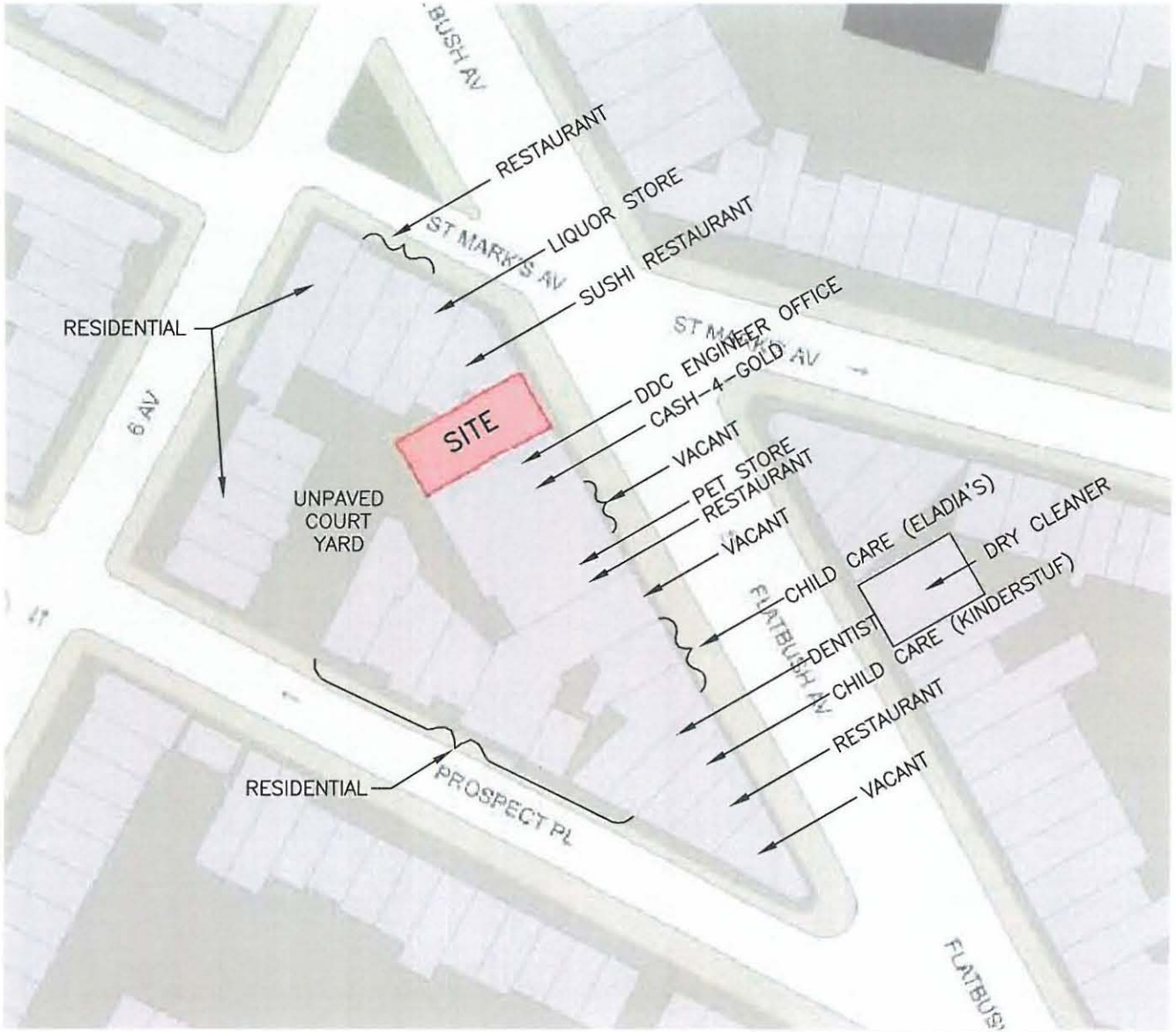
2.2 Site Environmental Setting

The Site is located in an urban area of Brooklyn, New York. The topographic elevation of the Site vicinity is approximately 70 feet above mean sea level (MSL), as shown in Figure 2.1.1. It



Source: US Geological Survey 7.5-Minute Brooklyn Quadrangle

FPM GROUP		
FIGURE 2.1.1 SITE LOCATION MAP CINDERELLA 248 LLC 248 FLATBUSH AVENUE, BROOKLYN, NEW YORK		
Drawn by: BC	Checked By: SOD	Date: 3/11/15



FPM GROUP		
FIGURE 2.1.2 SITE AND VICINITY PLAN 248 FLATBUSH AVENUE BROOKLYN, NY		
Drawn By: H.C.	Checked By: B.C.	Date: 4/13/15

should be noted that the ground surface elevation in the rear (west) of the building is approximately 10 feet lower than at the front, along Flatbush Avenue, and a below-grade open courtyard adjoins the west side of the Site at the basement level.

The Site is generally underlain by fill material from immediately below the building slab to a depth of approximately five feet below the slab. The fill generally consists of silty sand with minor amounts of brick, wood, glass, and/or angular gravel. No visual indications suggestive of potential contamination were noted during the RI. Minor amounts of brick and concrete fragments were noted in a few borings, but no debris, ash, or other indications suggestive of contaminated historic fill were observed.

Native soil is present from below the base of the fill to the maximum depth penetrated by any of the borings. These soils generally consisted of silty sand with varying amounts of gravel. No visual indications suggestive of potential contamination were noted during the RI.

The depth to groundwater beneath the Site is approximately 52 feet below the basement floor, and the site-specific groundwater flow is to the north-northwest, which is generally consistent with previous investigation data. No dense non-aqueous-phase liquid (DNAPL) was detected during the RI or previous investigations and none of the data suggests that DNAPL is associated with this Site.

The closest surface water body is the Gowanus Canal, which is located approximately 0.67 miles west-northwest of the Site. The Gowanus Canal is a federal National Priorities List (NPL, or Superfund) site and has been impacted by discharges from the surrounding industrial activities, as well as the New York City sewer system. Based on the relatively low levels of contaminants in the Site groundwater, as discussed in Section 2.3, and the distance from the Site to the Gowanus Canal, it is highly unlikely that there are potential impacts to the Gowanus Canal from the Site.

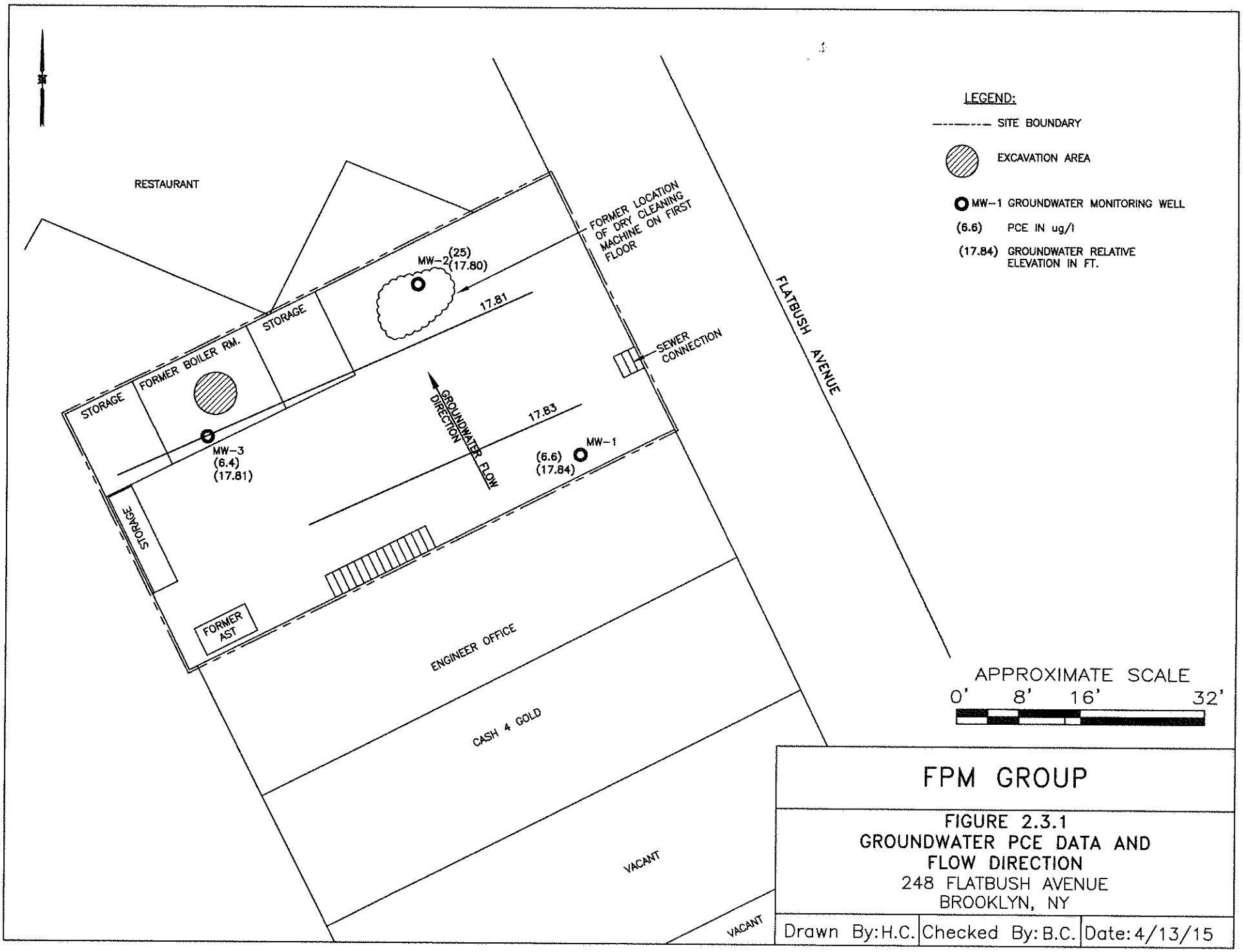
2.3 Summary of Impacts and Selected Remedial Measures

Subsurface investigations were performed at the Site on several occasions and remediation has been performed in the former boiler room area. The investigations and remediation have been fully documented elsewhere, including the RI/AA Report where the nature and extent of remaining impacts were defined such that potential remedial measures could be evaluated.

The contaminant of concern identified for the Site is PCE, which exceeds the applicable standards, criteria and guidance (SCGs) in groundwater and for soil vapor intrusion. The following summarizes the nature and extent of contamination and the environmental media requiring remedial action, as articulated in the DD.

- <u>Groundwater</u>

Groundwater impacted with PCE is present beneath Site, with concentrations ranging from 6.4 to 25 micrograms per liter (ug/l) in 2014, as shown on Figure 2.3.1. The PCE levels have decreased since prior investigations performed in 2005 and 2011, when PCE was noted to range up to 285 ug/l. These data are consistent with the soil data, which show no PCE exceeding SCGs in soil. Petroleum-related VOCs are found in groundwater at one location at the Site at concentrations slightly exceeding their respective NYSDEC Standards. These detections do not appear to be Site-related.



FPM GROUP

FIGURE 2.3.1
GROUNDWATER PCE DATA AND FLOW DIRECTION
248 FLATBUSH AVENUE
BROOKLYN, NY

Drawn By: H.C.	Checked By: B.C.	Date: 4/13/15

Z:\CINDERELLA 248\REMEDIAL ACTION\GROUNDWATER PCE DATA.dwg, 4/13/2015 10:13:09 AM, BW Minolta

Groundwater is found at an approximate depth of 52 feet below the basement floor at the Site and no onsite water supply well is present. Therefore, there is no reasonable potential for exposure to impacted groundwater during residential or commercial use of the Site or during ordinary construction activities at the Site. No public water or other supply wells were identified within one-half mile of the Site.

The remedial measures include a provision to restrict the use of groundwater at the Site unless it is treated to render it suitable for the proposed use. This restriction will be implemented via the environmental easement and compliance will be confirmed through periodic inspection and reporting under the Site Management Plan (SMP).

- Soil Vapor

Soil vapor impacted by PCE at levels for which mitigation is indicated is present beneath the building slabs of the Site building and buildings in close proximity to the Site, as shown in Figure 2.3.2. The extent of the area for which mitigation is indicated has been delineated.

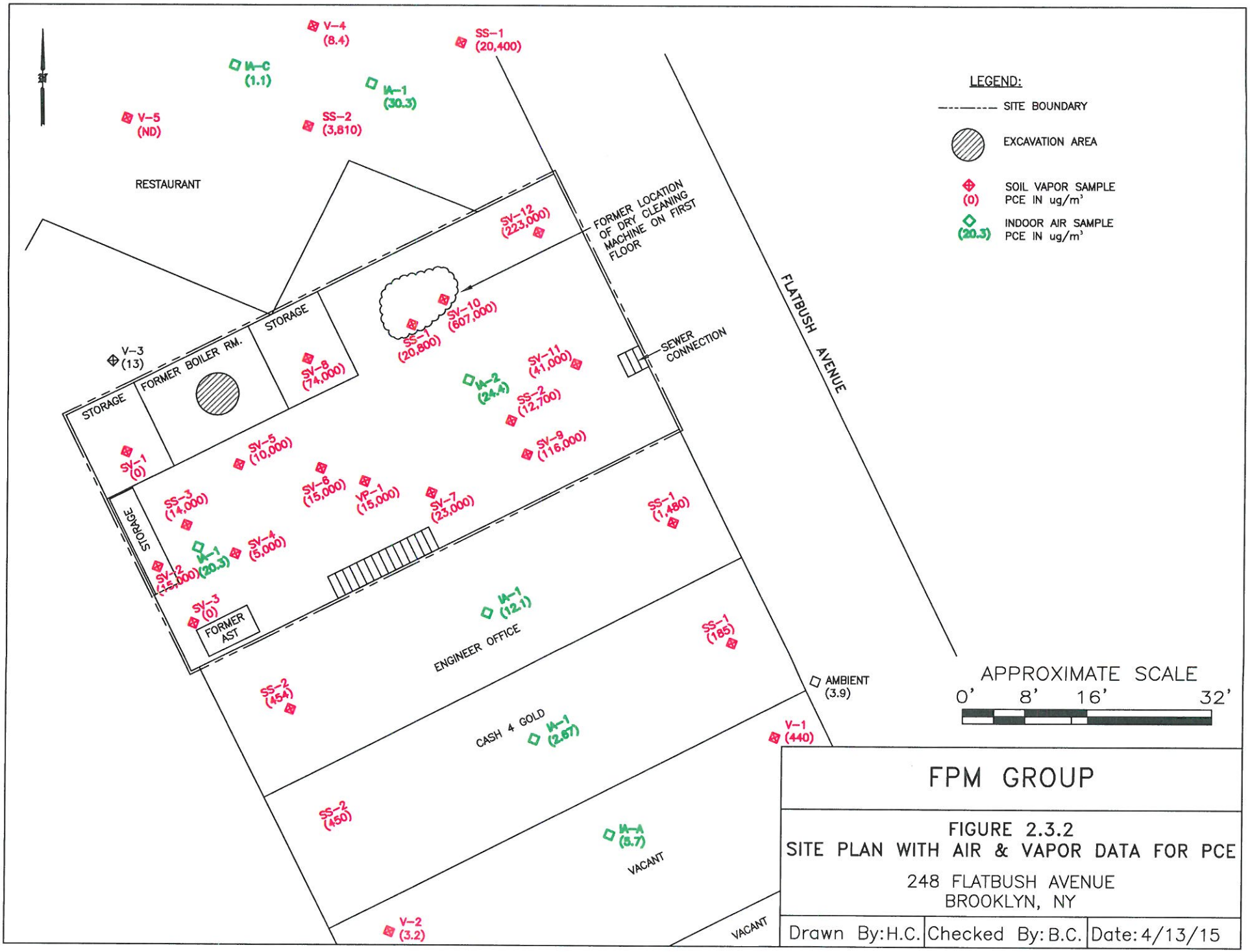
There is the potential for exposure to Site-related PCE in soil vapor during residential or commercial use of the Site and nearby areas. Therefore, the remedial measures include provisions to mitigate the potential for soil vapor intrusion (SVI) in the affected areas. The remedial measures include installation and operation of a sub-slab depressurization system (SSDS) beneath the Site to minimize the potential for SVI at the Site and for nearby buildings at 244, 250, 252 and 254 Flatbush Avenue and 82 St. Marks Avenue. Periodic SVI monitoring will also be performed under the SMP, which will also contain provisions for operation, monitoring, and maintenance (OM&M) of the SSDS, and inspection and certification of the SSDS. Compliance with the SMP will be required through imposition of an IC in the form of an environmental easement.

2.4 Remedial Goals

Chemical-specific remediation goals have been developed to define the area and volume of the impacted media to be addressed to meet the Remedial Action Objectives (RAOs) as documented in the Decision Document (Appendix A) for the Site. These remediation goals are based on the evaluation of SCGs, which are standards and criteria that are generally applicable, consistently applied, and officially promulgated. SCGs incorporate both the CERCLA concept of "applicable or relevant and appropriate requirements" (ARARs) and the EPA's "to be considered" category of non-enforceable criteria and guidance. The term "ARARs" refers to a promulgated and legally enforceable rule or regulation. "Criteria and guidelines" refer to policy documents that are not promulgated and not legally enforceable. However, "criteria and guidelines" become enforceable if they are incorporated into an accepted decision document for the Site. The NYSDEC term "SGCs" is used in this RDWP and the SCGs evaluations are used to determine contaminant levels that will not endanger human health or the environment.

The following chemical-specific SCGs have been identified for groundwater at the Site:

- NYSDEC Water Quality Regulations for Surface Waters and Groundwaters (6NYCRR Parts 700-705, revised January 17, 2008), established water quality standards for surface waters, groundwater, and effluent discharges.



FPM GROUP

FIGURE 2.3.2
SITE PLAN WITH AIR & VAPOR DATA FOR PCE

248 FLATBUSH AVENUE
BROOKLYN, NY

Drawn By: H.C.	Checked By: B.C.	Date: 4/13/15

The following chemical-specific guidelines have been identified for soil vapor/indoor air at the Site:

- The NYSDOH Guidance Document for Evaluating Soil Vapor Intrusion in the State of New York (October 2006) provides guidance concerning remediation levels for various contaminants that may be present in indoor air and soil vapor at the Site; and

- The NYSDEC's DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants establishes criteria used to evaluate air emissions that may be associated with mitigation or remedial systems to be installed at the Site.

Remedial Action Objectives (RAOs) are media-specific goals for protecting human health and the environment. RAOs provide overall remedial goals for addressing the Site-related contamination within the context of the contemplated use of the Site and potential impacts to the surrounding community and environment. The RAOs were developed based on the anticipated redevelopment of the site with commercial and residential uses and on potential impacts to the surrounding community and environment as evaluated during the exposure assessment included in the RI/AA Report. The RAOs are as follows:

Groundwater – RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards; and

- Prevent contact with or inhalation of volatiles, from contaminated groundwater.

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 the Site and in proximity to the Site.

It should be recognized that it may be economically and technically impractical to actively remediate the media of concern to the levels dictated by the SCGs. Because of the Site's location in an urban area, the location of the impacted materials beneath a building slab and/or at depths where no human contact during normal occupancy is reasonably anticipated, and the lack of use of the groundwater in proximity of the Site for water supply purposes, remediation to levels proscribed by the SCGs is not practicable. Therefore, implementation of ECs and ICs is part of the remedy for this Site.

2.5 Green Remediation Principles

The NYSDEC has adopted an approach to remediating sites in the context of the larger environment; this approach is articulated in the NYSDEC's DER-31 program policy. This green remediation policy is defined as "the practice of considering all environmental effects of remedy implementation and incorporating options to minimize the environmental footprint of cleanup actions". The major green remediation principles articulated in DER-31 include:

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;

- Reducing direct and indirect greenhouse gasses and other emissions;
- Increasing energy efficiency and minimizing the use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling, and increasing reuse of materials that would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes that balance ecological, economic, and social goals; and
- Integrating the remedy with the end use where possible and encouraging green and sustainable redevelopment.

As per the DD for this Site, green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy. Green remediation techniques to be applied at this Site are described in the following section. Cost concerns will be respected and implementing a remedy that is protective of public health and the environment will remain the primary remedial priority.

SECTION 3.0
REMEDIAL ACTIONS

3.1 Introduction

The following sections present the detailed descriptions of the remedial actions and technologies to be implemented at the Site. Information is also provided regarding the remedial action schedule, confirmation sampling, short-term monitoring during the SSDS startup period, reporting, the SMP, and the IC (environmental easement). It should be noted that the SMP to be submitted with the Final Engineering Report (FER) will include detailed information regarding long-term OM&M of the implemented remedy; this information is not included herein.

3.1.1 General Provisions

All onsite remedial work will be overseen by a qualified environmental professional (QEP), as defined in DER-10, and will be supervised by a New York State licensed professional engineer (PE). Field decisions will be made by the QEP, who may consult with the PE, as needed. During remedial activities the QEP will be onsite to observe and direct the activities, to collect samples, to interface with agency representatives, and to conduct monitoring.

All onsite remedial activities will be conducted in accordance with a site-specific HASP. All onsite intrusive activities will be conducted in accordance with a CAMP. The HASP and CAMP for this remedial program are included in Appendix B. Citizen participation activities will be undertaken in accordance with the CPP previously established for this Site.

All media sampling and chemical analyses will be performed in accordance with the site-specific QAPP, a copy of which is included in Appendix C. All analyses will be performed by NYSDOH ELAP-certified laboratories. All data will be reported in a suitable format for uploading to the NYSDEC's Electronic Information Management System (EIMS) as electronic data deliverables (EDDs).

Prior to any onsite intrusive activities, a utility markout will be performed on the adjoining public streets to identify all subsurface utilities that enter the Site. In addition, Site documents regarding the locations of onsite utilities will also be reviewed. If necessary, an onsite utility markout will be performed to confirm the absence of utilities in the areas where intrusive remedial activities will be performed.

Three groundwater monitoring wells are located in the basement of the Site building. As groundwater remediation or monitoring is not required for this Site and the Site is to be redeveloped, these wells will be abandoned in accordance with NYSDEC requirements (NYSDEC CP-43 Groundwater Monitoring Well Decommissioning Policy) prior to initiating intrusive activities. The wells will be abandoned by grouting in place using a standard grout mixture. The grout will be placed from bottom to top in each well using a tremie pipe. Grout will be placed such that the finished level is nearly flush with the existing building slab. Well abandonment will be observed and documented by the QEP.

The Site building is vacant and will be redeveloped for commercial and residential purposes. The Site building is occasionally accessed by a limited number of property owner

representatives for maintenance purposes. There are no ongoing onsite uses or activities for the public. Site remedial activities will be coordinated such that any redevelopment activities may continue during remedial activities.

The Site building is secured. All Site access is anticipated to be via the existing Site entrance door on Flatbush Avenue. Existing security measures will remain in place during remedial activities and additional temporary security measures will be used to secure work areas and/or open excavations, as needed. Fencing or other appropriate devices will be used to protect remedial/monitoring components in proximity to remedial work areas.

In the event that dust suppression becomes necessary during remedial construction, suppression will be accomplished by spraying potable water onto the affected areas, limiting the areas of open excavations, and/or limiting equipment speeds and movement as feasible to reduce the potential for dust generation.

Odors are not anticipated to present a significant concern during remedial construction since the soil to be exposed during construction was not noted to be odorous during the RI and previous sampling events. Odor control measures will be implemented if necessary to control emissions of nuisance odors to offsite. If nuisance odors are identified that have the potential to impact offsite, then the work will be halted and the source of the odor will be identified and corrected. Work will not resume until the nuisance odors have been abated. Odor control measures may include limiting the area of open excavations, shrouding open excavations with covers, and/or use of foam to cover odorous soils. The NYSDEC will be notified of all odor events and odor complaints.

The designated NYSDEC representative will be notified at least 7 calendar days in advance of any onsite remedial activities and the NYSDEC will be provided with access to the Site throughout the remedial process.

3.1.2 Quality Assurance/Quality Control

QA/QC procedures will be implemented throughout the remedial activities and will include visual observations by the QEP and field screening for organic vapors using a calibrated PID. In the event that sampling is conducted then QA/QC procedures may also include decontamination of non-disposable sampling equipment, use of dedicated disposable sampling equipment when feasible, use of chains of custody to document the sequence of sample possession, and collection and analysis of QA/QC samples. Field-collected QA/QC samples may include blind duplicate samples, trip blank samples, equipment blank samples, and/or matrix spike/matrix spike duplicate (MS/MSD) samples, as necessary and as described in the QAPP. In addition, the selected analytical laboratory will use internal QA/QC procedures and samples (including laboratory control samples or LCSs, method blanks or MBs, surrogates, and MS/MSDs) to confirm that the laboratory data are of sufficient accuracy and precision. QA/QC procedures are detailed in the QAPP.

Following receipt of chemical analytical data for in-situ media samples, the data packages and associated QA/QC sample results will be evaluated and a Data Usability Summary Report (DUSR) will be prepared for each data package. The DUSRs will be included in the FER.

3.2 Descriptions of Remedial Measures

3.2.1 Sub-Slab Depressurization System

An SSDS will be implemented to prevent impacts to indoor air quality at the Site and select nearby properties and prevent further migration of sub-slab soil vapors. The SSDS is likely to reduce VOC concentrations in the sub-slab soil vapor and also reduce the potential for SVI. The SSDS will be constructed by a remediation construction contractor firm that is familiar with SSDS construction in the local area. Contractor selection will be conducted following NYSDEC approval of this RDWP. SSDS construction will be observed by an FPM QEP and supervised by an FPM PE.

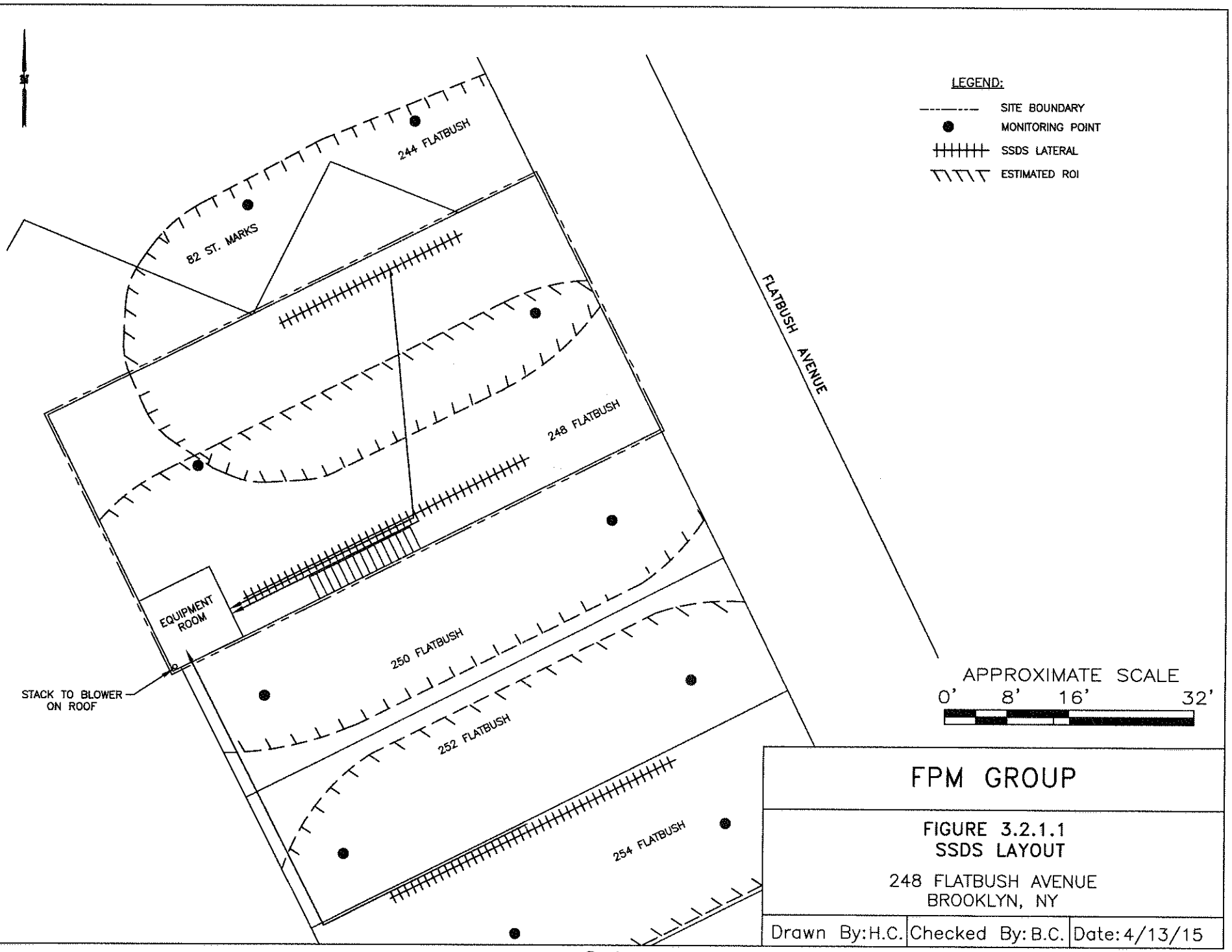
SSDS construction will include installation of lateral piping beneath the concrete slab of the Site building. SSDS lateral piping will also be installed beneath an offsite property to the southeast (254 Flatbush Avenue) to provide for mitigation of offsite impacts in this area. Radius of influence (ROI) testing performed during the RI demonstrated that a 20-foot ROI is achievable with an applied vacuum of 30" of water column (WC). The proposed layout of the SSDS laterals based on the ROI test results is shown on Figure 3.2.1.1. This layout is anticipated to provide mitigation for SVI over the affected area, including the Site, 244, 250, 252 and 254 Flatbush Avenue, and 82 St. Marks Avenue.

The SSDS lateral piping will be installed by cutting a trench through the existing concrete slab at the offsite 254 Flatbush Avenue building. The Site building is being redeveloped with a fitness facility (gym) that will include locker rooms, a storage room and a manager's office in the basement. Redevelopment is anticipated to begin in late 2015 and to be completed in 2016. To facilitate construction of the basement plumbing the existing slab will be removed. The SSDS lateral piping will be installed by excavating trenches into the exposed soil at the Site once the existing slab has been removed during redevelopment. Each trench will be approximately 2 feet deep and 1 foot wide.

The SSDS lateral piping will be four-inch-diameter perforated Schedule 40 PVC pipe with solid slip-on end caps. T-connections will be placed near the center of each lateral for connection to solid piping to be extended to the remedial equipment compound. The lateral piping will be placed into the excavated trenches with backfill placed completely around each lateral.

Backfill around the lateral piping will consist of uniform gradation gravel-size base material for the concrete slab to be restored above the laterals. Following lateral piping placement, each trench will be backfilled with the base material, with backfill placed below, to the sides, and above each lateral pipe. The backfill will be field-compacted in a manner to reduce the potential for settlement while not damaging the installed lateral piping.

The backfill at the top of each trench will be covered with a vapor barrier. A vapor barrier will also be placed below each portion of the existing Site slab that is replaced during redevelopment. The vapor barriers will be installed beneath the final finished slab and above the sub-slab SSDS components and will be constructed of a 20-mil-thick VOC-resistant barrier material (Vaporblock Plus, or approved equivalent, specifications in Appendix D) meeting or exceeding the ASTM E-1745 Class A Standard for vapor barriers used in contact with soil under concrete slabs. A geotextile fabric will be used above the sub-slab base material and below the vapor barrier to protect the barrier from possible damage from the base material. Sealing tape will be used to seal joins between sheets of vapor barrier and any pipe penetrations will also be



FPM GROUP

FIGURE 3.2.1.1
SSDS LAYOUT

248 FLATBUSH AVENUE
BROOKLYN, NY

Drawn By: H.C.	Checked By: B.C.	Date: 4/13/15

Z:\CINDERELLA 248\REMEDIAL ACTION\SSDS LAYOUT.dwg, 4/28/2015 9:05:22 AM, BW Minolta

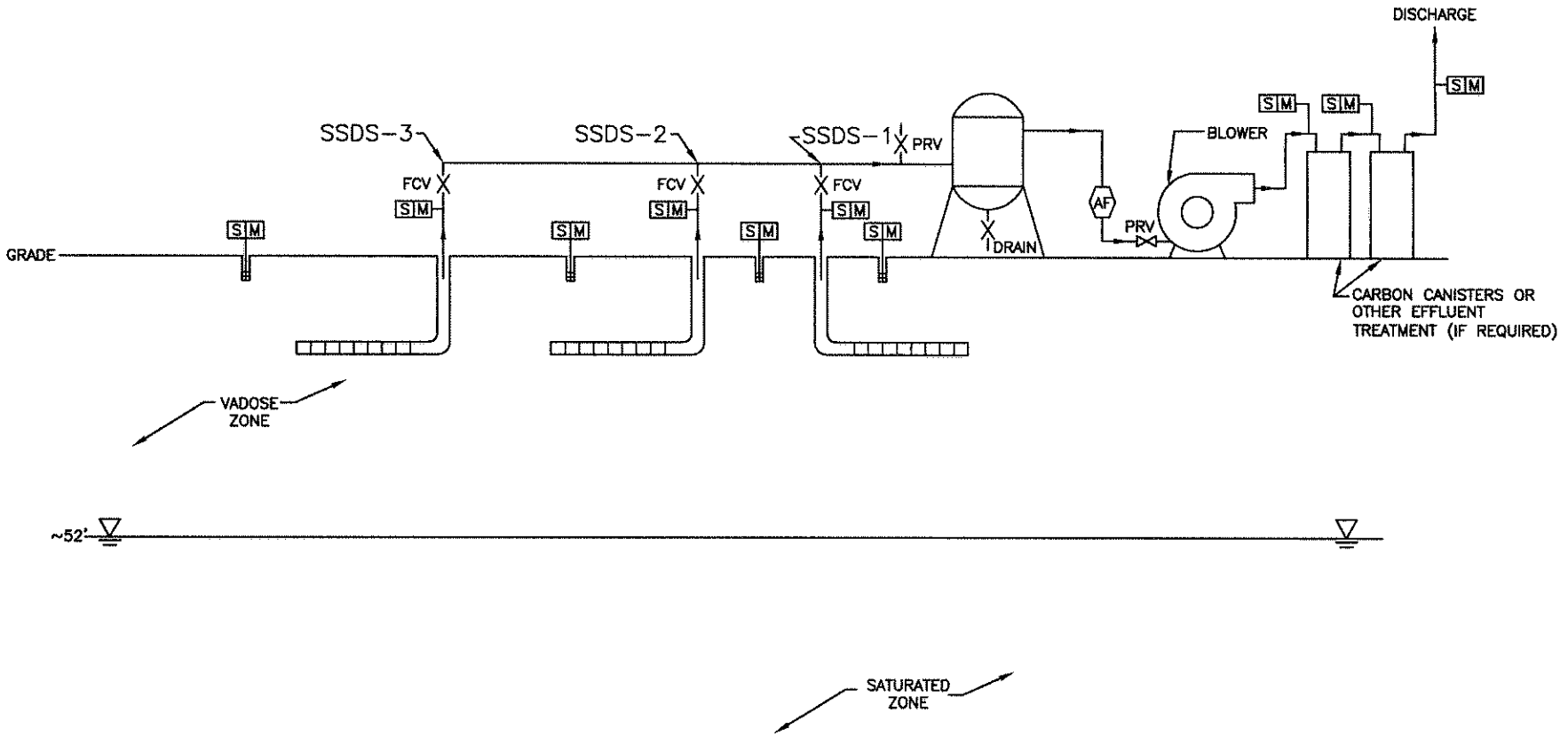
sealed with vapor barrier material or pipe boots in accordance with the manufacturer's instructions. Following placement of the vapor barriers the concrete slabs will be restored.

The perforated laterals will be connected to four-inch-diameter solid Schedule 40 PVC piping that will be extended above the slabs. The solid piping from each leg of the SSDS within the Site will be extended to a remediation equipment room to be located in the southern corner of the Site building. The solid piping from the SSDS within 254 Flatbush Avenue will also be extended to the remediation equipment room in the Site building. The piping will be connected to a blower in the equipment room, which will discharge above the building roof via a stack. The flow rate for each leg of the SSDS will be approximately 70 scfm at a vacuum of up to 30"WC per leg of the system. Therefore, a blower capable of a total flow of 210 to 240 SCFM at the targeted vacuum is indicated for the SSDS. An Amtek Rotron model EN 707 5-horsepower blower meets the specifications for the SSDS. This blower, or an equivalent, will be selected (specifications in Appendix D). The selected blower will be installed in the remediation room, which will be insulated to reduce noise. The blower will be equipped with a moisture separator with a high water safety switch, an air filter, an air flow meter, vacuum gauges, an effluent stack, and an associated control panel. A schematic plan showing the SSDS process flow, operating equipment, and monitoring points is presented in Figure 3.2.1.2.

The SSDS exhaust stack will be located above the roof a minimum of 10 feet from windows and ventilation inlets. The stack height will be determined based on the results of the SSDS emissions testing performed during the initial start-up period. Stack discharge limits will conform to the NYSDEC's DAR-1 guidance. The stack will be outfitted to allow the use of carbon or other effluent treatment, if required based on the initial start-up results.

Sub-slab monitoring points will be necessary to optimize the operation of the SSDSs. The monitoring points will also allow for periodic SVI monitoring to confirm that SVI is not occurring near the outer limits of the SSDS ROI and to assess when/if the potential for SVI is no longer present, as will be described in the SMP. Monitoring points will be installed through the slabs at the locations shown in Figure 3.2.1.1. The monitoring points will provide locations to confirm establishment of a downward pressure gradient across the slabs when the SSDSs are operating and allow for sub-slab vapor sampling. Each monitoring point will be constructed using a stainless steel screen connected to inert tubing. The screens will be installed through the slab and into the underlying soil at a depth of approximately six inches below the slabs. The top of the tubing will be equipped with a valve for monitoring purposes. Each monitoring point annulus will be gravel-packed to approximately six inches below grade and a bentonite seal will be installed above the gravel pack and in contact with the concrete slab. Each monitoring point will be protected by installing a steel protective manhole encased in concrete at the top of the slab. The base of the manhole will be layered with poly sheeting to further reduce the potential for SVI through the monitoring points and for short-circuiting between the atmosphere and the monitoring point screens.

Following the completion of construction, the SSDS will be placed online by the system construction contractor with oversight by the FPM QEP. The SSDS will be monitored until system vacuums and airflows are stabilized. Modifications (valve adjustments) may be made to operating equipment to optimize SSDS performance. Additional monitoring will be conducted on a weekly basis during the one-month startup period.



LEGEND:

- PROCESS LINE
- GROUNDWATER SURFACE
- AF — INLINE AIR FILTER
- PRV — PRESSURE RELIEF VALVE
- FRV — FLOW CONTROL VALVE
- S M — SAMPLE/MONITOR POINT

FPM GROUP

FIGURE 3.2.1.2
SCHEMATIC OF SSDS PROCESS FLOW

248 FLATBUSH AVENUE
BROOKLYN, NY

Drawn By: H.C.	Checked By: B.C.	Date: 4/13/15

A calibrated photoionization detector (PID) will be utilized to monitor initial SSDS effluent emissions. Effluent samples will also be collected to evaluate SSDS emissions compliance following system startup. During the startup period, effluent samples will be collected on a weekly basis from the effluent sampling port located between the blower and the effluent stack pipe utilizing a Tedlar air sampling bag. Each sample will be transported via overnight courier to a NYSDOH ELAP-certified laboratory for analysis of VOCs by EPA Method T0-15. The analytical results will be compared to NYSDEC's DAR-1 guidance to evaluate system emissions and determine emissions treatment requirements. As noted in the RI/AA Report, the SSDS pilot test emissions testing results indicated that effluent treatment is unlikely to be necessary. However, in the event that effluent treatment is required (carbon canisters or other), then sampling will be performed between the blower and the effluent treatment to monitor system performance and also downstream of the effluent treatment to monitor emissions compliance.

Following SSDS startup, the performance of the SSDS with respect to sub-slab depressurization will be verified by monitoring the pressure beneath the building at the monitoring points to confirm that a downward pressure gradient is established. Monitoring will be performed during the startup period. Monitoring will be performed using magnahelic gauges and/or a calibrated Landtec gas monitor with a sensitivity of 0.01" WC. The SSDS operating parameters may be adjusted during the startup period as needed to ensure that a downward pressure gradient is established across the building slabs. The results of the startup period sub-slab pressure monitoring will be reported in the FER.

Periodic sub-slab pressure monitoring will be continued following the startup of the SSDS to confirm that a downward pressure gradient remains established while the SSDS is running. Additional SVI monitoring will be conducted following termination of the SSDS operation to confirm the post-remedial condition. Procedures for sub-slab pressure and SVI monitoring during and following SSDS operation will be provided in the Monitoring Plan in the SMP.

All SSDS observations will be recorded in a system logbook that will be kept at the Site for operator reference. The logbook will include operating logs for recording system parameters from the various gauges and figures showing the SSDS lateral piping and monitoring point layout and equipment configuration. SSDS performance observations to be recorded will include obtaining pressure readings at the designated monitoring points to evaluate the SSDS ROIs.

3.2.2 Institutional Control – Environmental Easement

An IC will be implemented for the Site in the form of an environmental easement. The environmental easement process will be implemented by the NYSDEC upon approval of this RDWP. The environmental easement will:

- Require the remedial party or Site owner to complete and submit to the NYSDEC a periodic certification of ECs and ICs in accordance with Part 375-1.8(h)(3);

- Allow the use and development of the Site for residential use, which allows for restricted residential, commercial, and industrial uses as defined by Part 375-1.8(g), subject to land use restrictions under local zoning laws;

- Restrict the use of Site groundwater as a source of potable or process water without necessary water quality treatment as determined by the NYSDOH or County Health Department; and

- Require compliance with the NYSDEC-approved SMP.

3.2.3 Site Management Plan

A Site Management Plan (SMP) will be prepared for the Site following the completion of remedial construction activities and in conjunction with the preparation of the Final Engineering Report and execution of the environmental easement, as more fully described below. The SMP will include an Institutional and Engineering Control Plan that identifies the use restrictions and ECs for the Site and details the procedures and requirements to make sure the ICs and ECs remain in place and effective. The ICs include an environmental easement with requirements for periodic certification, restrictions on property and groundwater uses, and compliance with the SMP, as described above. The EC is the SSDS, which requires OM&M, and periodic inspection. The SMP will also include provisions for maintaining Site access controls and NYSDEC notifications. The SMP will also include provisions for periodic SVI monitoring to assess whether SSDS operation can eventually be terminated and to confirm the post-remedial condition in the event that the SSDS operation is terminated. Procedures for sub-slab pressure and SVI monitoring during and following SSDS operation will be provided in the Monitoring Plan in the SMP.

3.3 Reporting

Reporting will be conducted in several formats during the remedial process, including emergency notifications (if needed), monthly progress reports, interim data submittals, and the Final Engineering Report (FER). All reporting will comply with NYSDEC electronic submittal requirements.

In the event of an emergency, the NYSDEC representative will be contacted via email or telephone within 24 hours of the occurrence and any necessary information about the nature of the emergency and its resolution will be relayed. Emergency notifications will be documented, at a minimum, in the associated monthly progress report and the FER.

During the remedial construction period monthly progress reports will be prepared and submitted to the NYSDEC's designated representative by the 10th day of each month documenting all action taken during the previous month (reporting period), all anticipated activities for the upcoming month, approved modifications to work plans or schedules, results of sampling or other data generated during the reporting period, QA/QC information, percent complete information, unresolved delays encountered or anticipated, efforts made to mitigate delays, and citizen participation activities undertaken or anticipated. Monthly progress reports will present information in a summary manner and are not intended to be comprehensive.

Interim data submittals may be used to document major remedial milestones that are achieved prior to the completion of onsite remedial construction activities. Interim data submittals are anticipated to be used only if there is a significant delay in the remedial schedule that is anticipated to affect the completion of remedial construction and/or the associated FER. Major remedial milestones may include the completion of sub-slab or above-grade SSDS construction,

the completion of SSDS startup testing, or additional milestones, as warranted. If necessary, interim data submittals will document the work completed to accomplish the milestone, present summary data and supporting lab reports as applicable, and include data interpretation and conclusions. If necessary, NYSDEC approval may be requested for proposed modifications of the remedial system(s), remedial program, and/or schedule.

An FER will be prepared in accordance with DER-10, Section 5.8 to document the completed remedial construction; the FER will adhere to the NYSDEC's most recent template for this document. The FER will include the certification for the remedial program, as provided in Section 1.5 of DER-10, by a professional engineer (PE) licensed to practice in New York State. The FER will include sufficient information and documentation to support the certification. The FER will document all activities completed in accordance with the approved RDWP and will include the data supporting the completed construction activities. The summary of the completed remedial actions will include a description of any problems encountered and their resolution, a description of any changes to the design and why the design changes were required, the concentrations of contaminants removed and/or treated, a full listing of all waste streams, and restoration actions. The FER will also include a list of the RAOs applicable to the remedial action, tables and figures containing applicable pre- and post-remedial sampling data sufficient to document the remediation action, figures showing the ROI of the installed SSDS, as-built drawings to document the remedial action, and identification of the IC (including the boundary of the real property subject to the environmental easement and a copy of the easement). The FER will also include a complete description of the ECs established at the Site, including the SSDS.

An SMP will also be prepared following the NYSDEC's most recent template for this document and will be submitted separately from the FER. The SMP will include an EC/IC Plan, a Monitoring Plan, and an Operation and Maintenance (O&M) Plan. The SMP will also include provisions for NYSDEC access and notifications and will include a HASP and CAMP for all site management activities. Reporting under the SMP will be accomplished through the preparation and submittal of periodic review reports (PRRs) prepared in accordance with the provisions of DER-10.

The EC/IC Plan will identify all ICs (including use restrictions) and ECs for the Site and detail the steps and media-specific requirements necessary to ensure that the ECs and ICs remain in place and effective. The EC/IC Plan will include a description of the environmental easement IC, including land and groundwater use restrictions and the steps needed for periodic review and certification of the IC. The EC/IC Plan will also include a description of the ECs, including provisions for their management and control. The area of the Site where residual contamination remains present and is subject to management under the SMP will be identified. The EC/IC Plan will also include provisions for property transfers, including notifications to the NYSDEC.

The Monitoring Plan will include provisions to assess the performance and effectiveness of the remedy. The Monitoring Plan is anticipated to include procedures for SSDS emissions monitoring, sub-slab pressure monitoring, and SVI monitoring. The Monitoring Plan will also include a schedule of monitoring frequencies and submittals to the NYSDEC and provisions for determining when monitoring is no longer necessary.

The O&M Plan will include provisions to ensure the continued operation, monitoring, maintenance, inspection, and reporting of the mechanical and physical components of the

remedy (SSDSs). The O&M Plan will include procedures for compliance monitoring and O&M of the physical components of the remedy. The O&M Plan will also include procedures for evaluating the performance of the remedy relative to the remedial objectives.

3.4 Remedial Action Schedule

A schedule for remedial activities is provided on Figure 3.4.1. This schedule includes timeframes for construction contractor procurement, milestone activity dates, projected dates for submittal of deliverables to the NYSDEC, timeframes for submittal reviews, and projected approval dates. It should be noted that this schedule is based on a number of assumptions, including anticipated review times, laboratory analytical turnarounds, redevelopment schedules, and other factors that may vary. The schedule may also be affected by weather conditions and other factors that are not controlled.

The remedial action schedule will be reviewed at least monthly in association with preparation of the monthly progress reports (discussed above) and the NYSDEC will be notified of any proposed modifications, the reason for the modifications, and the proposed actions to mitigate adverse schedule impacts. A revised remedial action schedule will be provided as necessary.

3.5 Green Remediation Principles and Techniques

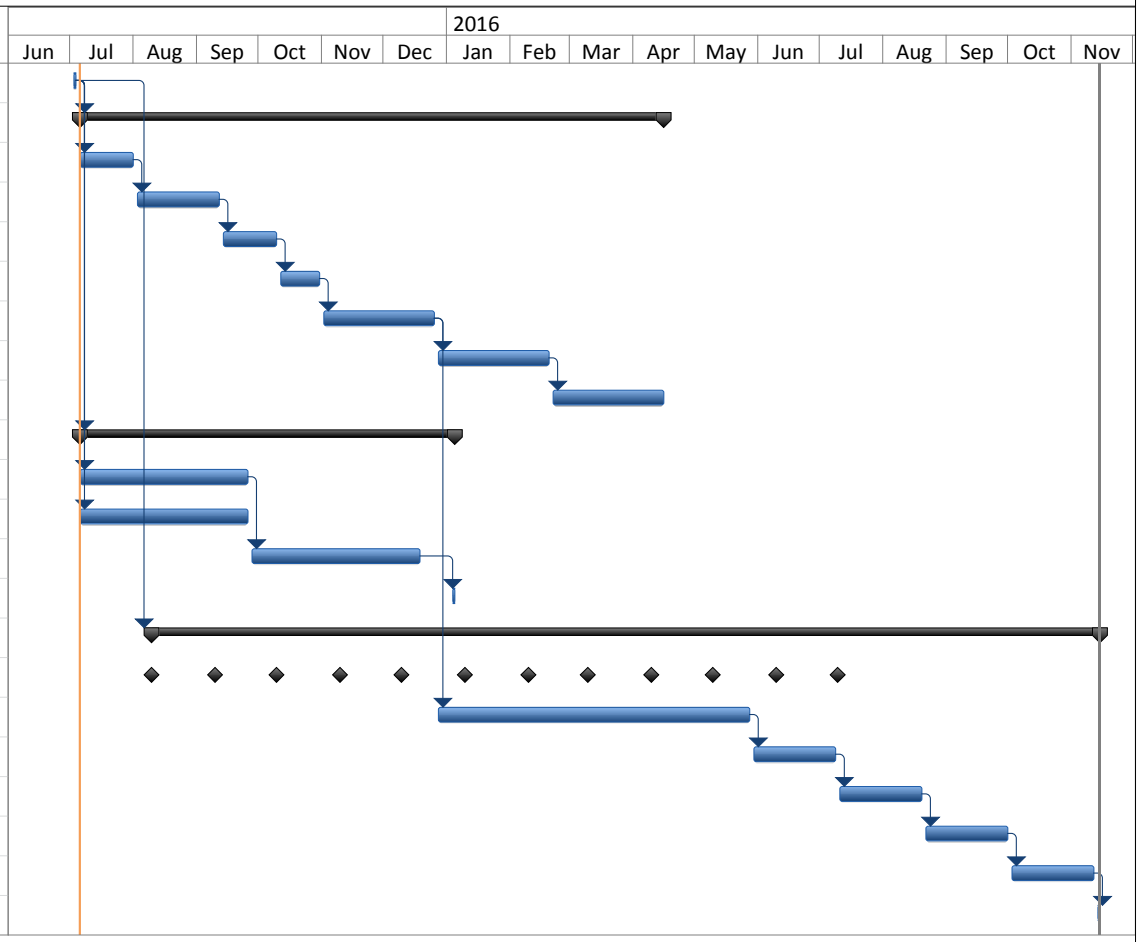
Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy, as per DER-31. Green remediation components may include consideration of the long-term environmental impacts of remedial technologies and stewardship, reducing greenhouse gas and other emissions, increasing energy efficiency and minimizing use of non-renewable energy, conserving resources, reducing waste, conserving and maximizing natural habitat, fostering green communities and working landscapes, and integrating the remedy with the end-use. These components have been incorporated into the development of the remedial procedures presented in this work plan within the context of the selected remedial actions and technologies, the Site's location in a working commercial/industrial area, the absence of significant natural habitat on the Site, cost concerns, and the need for the implemented remedy to be protective of public health and the environment.

Efforts will be made during all remedial operations to reduce the use of energy. These efforts, which will also reduce emissions, include:

- Not allowing trucks to idle while waiting for loading or unloading of remedial components or labor;
- Properly sizing operating remedial equipment (blower);
- Car-pooling when multiple personnel are needed onsite;
- Combining site visits with travel to other nearby locations;
- Coordination of OM&M events to reduce vehicle trips;
- Selection of local material suppliers and backfill sources, as feasible; and

FIGURE 3.4.1
SCHEDULE FOR REMEDIAL ACTIVITIES
CINDERELLA 248 LLC SITE, NYSDEC #224160
248 FLATBUSH AVENUE, BROOKLYN, NEW YORK

ID	Task Name
1	**NYSDEC approval of RD Work Plan (7/3/15)**
2	**Sub-Slab Depressurization System**
3	Prepare RFP
4	Solicit Remedial Construction Contractor Proposals
5	Negotiations and Contractor Selection
6	Mobilization
7	Trenching and SSDS Sub-slab Construction
8	SSDS Above-grade Equipment Construction
9	SSDS Startup and Testing
10	**Institutional Control**
11	Prepare Environmental Easement
12	Prepare Alta Survey
13	NYSDEC Review/Approval of Environmental Easement
14	Record Environmental Easement
15	**Reporting**
16	Monthly Progress Reports
29	Prepare Draft FER and SMP
30	NYSDEC Review of Draft FER and SMP
31	Revise Draft FER and SMP
32	NYSDEC Review of Draft Final FER and SMP
33	Finalize FER and SMP
34	Submit Final FER and SMP for NYSDEC Approval



Project: CinderellaFigure341rev2
Date: Mon 7/6/15

Task	External Milestone	Manual Summary Rollup
Split	Inactive Task	Manual Summary
Milestone	Inactive Milestone	Start-only
Summary	Inactive Summary	Finish-only
Project Summary	Manual Task	Deadline
External Tasks	Duration-only	Progress

FPM

- Encouraging subcontractors, through the contracting process, to use alternative fuels and diesel particulate filters.

Reducing waste is another cornerstone of green remediation; waste reduction will be accomplished by:

- Coordinating sampling events so as to minimize the number of QA/QC samples needed;
- Properly designing and locating the SSDS emissions stacks so as to minimize/eliminate the need for effluent treatment and associated waste generation; and
- Use of electronic submittals for reporting wherever possible.

Recycled materials will be used, where appropriate and feasible, to reduce the need for use of virgin materials. Recycled materials to be considered for use include:

- Recycled concrete aggregate (RCA) for use as backfill;
- Recycled materials for slab restoration; and
- Recycled carbon for use in SSDS effluent treatment, if needed.

Conservation of the environment and integration of the remedy with the end-use will be addressed through placement of remedial components below the Site slab, which is planned to be re-used as a locker room and management area for a gym. Monitoring ports will be located in flush-mounted manholes in the floor in this area, allowing for monitoring to be conducted in coordination with ongoing gym activities. Remedial components will also be housed within an insulated remediation equipment room in this area, eliminating the need for construction of a separate equipment room on the Site building roof.

The FER will include a discussion of the green remediation practices and technologies employed throughout the remedial program. The SMP will also include green remediation principles and practices, including remedial operation and monitoring optimization.

SECTION 4.0
REFERENCES

Advanced Cleanup Technologies. December 1, 2005. *Phase I Environmental Site Assessment, 248 Flatbush Avenue, Brooklyn, New York.*

Advanced Cleanup Technologies. March 16, 2007. *Soil Vapor Contamination (Figure 1), 248 Flatbush Avenue, Brooklyn, New York.*

Arcadis US, Inc. June 16, 2011. *Phase I Environmental Site Assessment, 248 Flatbush Avenue, Brooklyn, New York.*

Arcadis US, Inc. June 16, 2011. *Summary of Phase II Investigation Activities, 248 Flatbush Avenue, Brooklyn, New York.*

FPM Group, Ltd. July 2013. *Remedial Investigation/Alternatives Analysis Work Plan, Cinderella 248, LLC Site, 248 Flatbush Avenue, Brooklyn, New York.*

FPM Group, Ltd. October 2014. *Remedial Investigation/Alternatives Analysis Report, Cinderella 248, LLC Site, 248 Flatbush Avenue, Brooklyn, New York.*

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

New York State Department of Environmental Conservation. May 2010. *DER-10 Technical Guidance for Site Investigation and Remediation.*

New York State Department of Environmental Conservation. March 2015. *Decision Document, Cinderella 248 LLC Brownfield Cleanup Program, Brooklyn, Kings County, Site No. C224160.*

U.S. Department of the Interior. 1967, Photorevised 1995. Brooklyn*, NY 15' Quadrangle (Map)*. *U.S. Geological Service, National Mapping Division. Reston, VA.*

U.S. Environmental Protection Agency, 1994, *Radon Prevention in the Design and Construction of Schools and Other Large Buildings.* EPA/625/R-92/016

U.S. Environmental Protection Agency, 1991, *Handbook Sub-Slab Depressurization for Low-Permeability Fill Material – Design & Installation of a Home Radon Reduction System.* EPA/625/6-91/029

U.S. Geological Survey. 2001. *Water Table of the Upper Glacial Aquifer on Western Long Island, New York in March-April 2000.*

APPENDIX A

DECISION DOCUMENT

DECISION DOCUMENT

Cinderella 248 LLC
Brownfield Cleanup Program
Brooklyn, Kings County
Site No. C224160
March 2015

Prepared by
Division of Environmental Remediation
New York State Department of Environmental Conservation

DECLARATION STATEMENT - DECISION DOCUMENT

Cinderella 248 LLC
Brownfield Cleanup Program
Brooklyn, Kings County
Site No. C224160
March 2015

Statement of Purpose and Basis

This document presents the remedy for the Cinderella 248 LLC site, a brownfield cleanup site. The remedial program was chosen in accordance with the New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375.

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (the Department) for the Cinderella 248 LLC site and the public's input to the proposed remedy presented by the Department.

Description of Selected Remedy

The elements of the selected remedy are as follows:

1. Remedial Design

   A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:

   a. Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;

   b. Reducing direct and indirect greenhouse gases and other emissions;

   c. Increasing energy efficiency and minimizing use of non-renewable energy;

   d. Conserving and efficiently managing resources and materials;

   e. Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;

   f. Maximizing habitat value and creating habitat when possible;

   g. Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and

   h. Integrating the remedy with the end use where possible and encouraging green and sustainable redevelopment.

2. Vapor Mitigation

   Any current and future buildings located at 248 Flatbush Avenue, Brooklyn, NY, will be required to have a sub-slab depressurization system, or a similar engineered system, to prevent the migration of vapors into the building from groundwater and/or soil. This system will also be designed and constructed to address potential vapor intrusion in off-site buildings at 244, 250, 252 and 254 Flatbush Avenue, and 82 St Marks Avenue.

3. Institutional Controls (ICs)

   Imposition of an institutional control in the form of an environmental easement for the controlled property that:

   a. requires the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);

   b. allows the use and development of the controlled property for residential use, which allows for restricted-residential use, commercial use and industrial use, as defined by Part 375-1.8(g), although land use is subject to local zoning laws;

   c. restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or County DOH; and

   d. requires compliance with the Department approved Site Management Plan.

4. Site Management Plan (SMP)

   A Site Management Plan is required, which includes the following:

   a. an Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

      i. Institutional Controls: The Environmental Easement will require periodic certification, restrict property and groundwater uses, and require compliance with a Site Management Plan.

      ii. Engineering Controls: The sub-slab depressurization system will require monitoring and maintenance.

   b. This IC/EC plan includes, but may not be limited to:

      i. descriptions of the provisions of the environmental easement including any land use and groundwater use restrictions;

      ii. provisions for the management and inspection of the identified engineering controls;

      iii. maintaining site access controls and Department notification; and

      iv. the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

Declaration

The remedy conforms with promulgated standards and criteria that are directly applicable, or that are relevant and appropriate and takes into consideration Department guidance, as appropriate. The remedy is protective of public health and the environment.

March 27, 2015

Date

Robert Cozzy, Director
Remedial Bureau B

DECISION DOCUMENT

Cinderella 248 LLC
Brooklyn, Kings County
Site No. C224160
March 2015

SECTION 1: SUMMARY AND PURPOSE

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), has selected a remedy for the above referenced site. The disposal of contaminants at the site has resulted in threats to public health and the environment that would be addressed by the remedy. The disposal or release of contaminants at this site, as more fully described in this document, has contaminated various environmental media. Contaminants include hazardous waste and/or petroleum.

The New York State Brownfield Cleanup Program (BCP) is a voluntary program. The goal of the BCP is to enhance private-sector cleanups of brownfields and to reduce development pressure on "greenfields." A brownfield site is real property, the redevelopment or reuse of which may be complicated by the presence or potential presence of a contaminant.

The Department has issued this document in accordance with the requirements of New York State Environmental Conservation Law and 6 NYCRR Part 375. This document is a summary of the information that can be found in the site-related reports and documents.

SECTION 2: CITIZEN PARTICIPATION

The Department seeks input from the community on all remedies. A public comment period was held, during which the public was encouraged to submit comment on the proposed remedy. All comments on the remedy received during the comment period were considered by the Department in selecting a remedy for the site. Site-related reports and documents were made available for review by the public at the following document repositories:

Brooklyn Public Library, Pacific Branch
25 Fourth Avenue at Pacific Street
Brooklyn, NY 11217
Phone: (718) 638-1531

Brooklyn Community Board #6
250 Baltic Street
Brooklyn, NY 11201
Phone: (718) 643-3027

Receive Site Citizen Participation Information By Email

Please note that the Department's Division of Environmental Remediation (DER) is "going paperless" relative to citizen participation information. The ultimate goal is to distribute citizen participation information about contaminated sites electronically by way of county email listservs. Information will be distributed for all sites that are being investigated and cleaned up in a particular county under the State Superfund Program, Environmental Restoration Program, Brownfield Cleanup Program, Voluntary Cleanup Program, and Resource Conservation and Recovery Act Program. We encourage the public to sign up for one or more county listservs at http://www.dec.ny.gov/chemical/61092.html

SECTION 3: SITE DESCRIPTION AND HISTORY

Site Location: The site is located at 248 Flatbush Avenue in Brooklyn, Kings County, and is Block 936 and Lot 12. It is bounded to the east by Flatbush Avenue, to the south by a commercial building, to the west by a small courtyard and residences, and to the north by a liquor store and restaurant.

Site Features: The site is a one-story building with a full basement that encompasses the entire property. It is approximately 2,300 square feet in area and is currently vacant. There is no parking associated with the site. The topography of the site is generally flat and the surrounding area slopes gradually to the northwest. The building is serviced by municipal water and sewer. The sewer connection is present in the southeast corner of the basement. The building was formerly heated via fuel oil-fired heating equipment located in the boiler room of the basement. The heating equipment and associated aboveground storage tank (AST) were disconnected and the heating equipment was removed. The closed AST remains in place.

Current Zoning/Use(s): The site is located in a R7A residential zone with a C2-4 commercial overlay. This zoning permits both residential and commercial uses. The site was most recently used for commercial purposes. Anticipated future use of the site will be commercial and residential, with a structure similar to the architecture of the neighboring buildings on St. Marks Avenue.

Historic Uses(s): The building was constructed between 1888 and 1906 and housed a dry cleaner and shoe repair facility for the last twenty years. Previous uses included a dry goods store, book store, closet/wardrobe business and a woodworker. In 2005, an investigation focused on a reported historic leak of cooling water from the first floor dry cleaning machine into the basement boiler room. Based on elevated field instrument readings, it was concluded that the subsurface soil beneath the boiler room was impacted by solvents. Contaminated soil was excavated, under direction of the owner, to a depth of 5 feet below the basement floor. Confirmation sampling resulted in trace levels of volatile organic compounds (VOCs) below the recommended levels in the Department’s technical and administrative guidance memorandum (TAGM) 4046 in use at that time. Also in 2005, deeper soil borings were installed in the basement to determine whether groundwater was impacted. (The full basement is approximately 8 to 10 feet in height.) These borings were installed from the basement floor to a depth of 10 feet and sampled continuously for VOCs. No VOCs were detected above the SCOs.

Site Geology and Hydrogeology: The topographic elevation of the site vicinity is approximately 70 feet above mean sea level. Soils underlying the site are classified as Urban Land and consist of brown silty fine sand and brown to medium sand with some cobbles and trace fine to medium and coarse gravel. The depth to groundwater beneath the site is approximately 60 feet below the basement floor and groundwater flow direction is generally to the northwest. No public water or other supply wells were identified within one-half mile of the site. The nearest body of water is the Gownaus Canal located approximately 0.67 miles west-northwest of the site.

A site location map is attached as Figure 1.

SECTION 4: LAND USE AND PHYSICAL SETTING

The Department may consider the current, intended, and reasonably anticipated future land use of the site and its surroundings when evaluating a remedy for soil remediation. For this site, alternatives (or an alternative) that restrict(s) the use of the site to residential use (which allows for restricted-residential use, commercial use and industrial use) as described in Part 375-1.8(g) were/was evaluated in addition to an alternative which would allow for unrestricted use of the site.

A comparison of the results of the Remedial Investigation (RI) to the appropriate standards, criteria and guidance values (SCGs) for the identified land use and the unrestricted use SCGs for the site contaminants is available in the RI Report.

SECTION 5: ENFORCEMENT STATUS

The Applicant(s) under the Brownfield Cleanup Agreement is a/are Volunteer(s). The Volunteer(s) does/do not have an obligation to address off-site contamination. The Department has determined that this site poses a significant threat to human health and the environment and there are off-site impacts that require remedial activities; accordingly, enforcement actions are necessary.

The Department has sought to identify any parties (other than the Volunteer) known or suspected to be responsible for contamination at or emanating from the site, referred to as Potentially Responsible Parties (PRPs). The Department has attempted to bring an enforcement action against the PRPs. If an enforcement action cannot be brought, or does not result in the initiation of a remedial program by any PRPs, the Department will evaluate the off-site contamination for action under the State Superfund. The PRPs are subject to legal actions by the State for recovery of all response costs the State incurs or has incurred.

SECTION 6: SITE CONTAMINATION

6.1: Summary of the Remedial Investigation

A remedial investigation (RI) serves as the mechanism for collecting data to:

- characterize site conditions;
- determine the nature of the contamination; and

- assess risk to human health and the environment.

The RI is intended to identify the nature (or type) of contamination which may be present at a site and the extent of that contamination in the environment on the site, or leaving the site. The RI reports on data gathered to determine if the soil, groundwater, soil vapor, indoor air, surface water or sediments may have been contaminated. Monitoring wells are installed to assess groundwater and soil borings or test pits are installed to sample soil and/or waste(s) identified. If other natural resources are present, such as surface water bodies or wetlands, the water and sediment may be sampled as well. Based on the presence of contaminants in soil and groundwater, soil vapor will also be sampled for the presence of contamination. Data collected in the RI influence the development of remedial alternatives. The RI report is available for review in the site document repository and the results are summarized in section 6.3.

The analytical data collected on this site includes data for:

- groundwater
- soil
- soil vapor
- indoor air
- sub-slab vapor

6.1.1: Standards, Criteria, and Guidance (SCGs)

The remedy must conform to promulgated standards and criteria that are directly applicable or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, Criteria and Guidance are hereafter called SCGs.

To determine whether the contaminants identified in various media are present at levels of concern, the data from the RI were compared to media-specific SCGs. The Department has developed SCGs for groundwater, surface water, sediments, and soil. The NYSDOH has developed SCGs for drinking water and soil vapor intrusion. For a full listing of all SCGs see: http://www.dec.ny.gov/regulations/61794.html

6.1.2: RI Results

The data have identified contaminants of concern. A "contaminant of concern" is a contaminant that is sufficiently present in frequency and concentration in the environment to require evaluation for remedial action. Not all contaminants identified on the property are contaminants of concern. The nature and extent of contamination and environmental media requiring action are summarized below. Additionally, the RI Report contains a full discussion of the data. The contaminant(s) of concern identified at this site is/are:

TETRACHLOROETHYLENE (PCE)

The contaminant(s) of concern exceed the applicable SCGs for:

- groundwater; and

- soil vapor intrusion

6.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before issuance of the Decision Document.

There were no IRMs performed at this site during the RI.

6.3: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts may include existing and potential future exposure pathways to fish and wildlife receptors, wetlands, groundwater resources, and surface water. The RI report presents a detailed discussion of any existing and potential impacts from the site to fish and wildlife receptors.

Nature and Extent of Contamination:

Based on investigations conducted to date, the primary contaminant of concern is tetrachloroethylene (PCE).

Groundwater -

In early 2014, three new monitoring wells were installed and sampled to further evaluate on-site groundwater conditions. PCE exceeded the NYS groundwater standard at each of the wells, ranging from 6.4 to 25 parts per billion (ppb). The maximum PCE detection was from a location in the basement directly below the former dry cleaning machine. Petroleum-related VOCs were noted at one well at concentrations slightly exceeding the NYS groundwater standards. Previous groundwater and soil data did not show any petroleum-related VOCs, indicating that these detections are not site related. No SVOCs, pesticides, PCBs or site-related metals exceeded the NYS groundwater standards.

Soil -

In late 2013, soil sampling was conducted to further evaluate soil conditions near the former dry cleaning machine and the sewer connection. Soil samples were collected from below the basement slab at depths of 5 to 10 feet, with the deeper borings concentrated in areas of potential contamination. (The basement floor is approximately 8 to 10 feet below ground surface.) All results for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, pesticides and polychlorinated biphenyls (PCBs) were below the Part 375 residential use SCOs.

One sample was collected from the limited material present within a concrete box that contained the sewer trap. All results for VOCs were below the NYS Part 375 unrestricted use SCOs.

Soil Vapor, Indoor Air and Sub-Slab Vapor -

In August 2011, an on-site vapor intrusion investigation included the collection of three sub-slab soil vapor samples, three indoor air samples and one ambient air sample. PCE was detected in the indoor air at concentrations ranging from 1.7 µg/m3 to 24.4 µg/m3, and in the sub-slab at concentrations ranging from 4,010 µg/m3 to 20,800 µg/m3. According to the NYSDOH Matrix 2 for PCE, mitigation to minimize vapor intrusion and subsequent human exposures is recommended.

In early 2014, an off-site soil vapor, sub-slab soil vapor, and indoor air investigation was conducted to further delineate off-site vapor impacts. At the adjacent court yard, the maximum concentration of PCE in soil vapor was 13 µg/m3. Indoor air and sub-slab soil sampling were performed in the basements of two off-site locations southeast and northwest of the site at 254 Flatbush Avenue and 76 St. Marks Avenue. An ambient air sample was also collected from a location outside of 254 Flatbush Avenue. At 254 Flatbush Avenue, PCE in the sub-slab was 3.2ug/m3 and 440 ug/m3; and indoor air was 3.6ug/m3 and 5.7 ug/m3. At 76 St. Marks Avenue, PCE in the sub-slab was ND and 8.4 ug/m3; and indoor air was 1.1 ug/m3. PCE at the ambient air location was 3.9 ug/m3. Further delineation of off-site vapor and groundwater impacts will be completed under the State Superfund Program.

6.4: Summary of Human Exposure Pathways

This human exposure assessment identifies ways in which people may be exposed to site-related contaminants. Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as *exposure*.

Direct contact with contaminants in soil is unlikely because the site is covered with buildings. People are not drinking the contaminated groundwater because the area is served by a public water supply that is not contaminated by the site. Volatile organic compounds in the groundwater may move into the soil vapor (air spaces within the soil), which in turn may move into overlying buildings and affect the indoor air quality. This process, which is similar to the movement of radon gas from the subsurface into the indoor air of buildings, is referred to as soil vapor intrusion. Indoor air impacts that may be the result of soil vapor intrusion have been identified in one on-site building and three off-site structures. Actions are needed to minimize soil vapor intrusion for these structures. Sampling indicates that soil vapor intrusion is a concern for off-site structures and additional investigation is necessary.

6.5: Summary of the Remediation Objectives

The objectives for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. The goal for the remedial program is to restore the site to pre-disposal conditions to the extent feasible. At a minimum, the remedy shall eliminate or mitigate all significant threats to public health and the environment presented by the contamination identified at the site through the proper application of scientific and engineering principles.

The remedial action objectives for this site are:

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 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.

SECTION 7: ELEMENTS OF THE SELECTED REMEDY

The alternatives developed for the site and the evaluation of the remedial criteria are presented in the Alternative Analysis. The remedy is selected pursuant to the remedy selection criteria set forth in DER-10, Technical Guidance for Site Investigation and Remediation and 6 NYCRR Part 375.

The selected remedy is a Track 2: Restricted use with generic soil cleanup objectives remedy.

The selected remedy is referred to as the Sub-Slab Depressurization System remedy.

The elements of the selected remedy, as shown in Figure 2, are as follows:

1. Remedial Design

   A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:

   a. Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
   b. Reducing direct and indirect greenhouse gases and other emissions;
   c. Increasing energy efficiency and minimizing use of non-renewable energy;
   d. Conserving and efficiently managing resources and materials;
   e. Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
   f. Maximizing habitat value and creating habitat when possible;
   g. Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
   h. Integrating the remedy with the end use where possible and encouraging green and sustainable redevelopment.

2. Vapor Mitigation

   Any current and future buildings located at 248 Flatbush Avenue, Brooklyn, NY, will be

required to have a sub-slab depressurization system, or a similar engineered system, to prevent the migration of vapors into the building from groundwater and/or soil. This system will also be designed and constructed to address potential vapor intrusion in off-site buildings at 244, 250, 252 and 254 Flatbush Avenue, and 82 St Marks Avenue.

3. Institutional Controls (ICs)

   Imposition of an institutional control in the form of an environmental easement for the controlled property that:

   a. requires the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);

   b. allows the use and development of the controlled property for residential use, which allows for restricted-residential use, commercial use and industrial use, as defined by Part 375-1.8(g), although land use is subject to local zoning laws;

   c. restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or County DOH; and

   d. requires compliance with the Department approved Site Management Plan.

4. Site Management Plan (SMP)

   A Site Management Plan is required, which includes the following:

   a. an Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

      i. Institutional Controls: The Environmental Easement will require periodic certification, restrict property and groundwater uses, and require compliance with a Site Management Plan.

      ii. Engineering Controls: The sub-slab depressurization system will require monitoring and maintenance.

   b. This IC/EC plan includes, but may not be limited to:

      i. descriptions of the provisions of the environmental easement including any land use and groundwater use restrictions;

      ii. provisions for the management and inspection of the identified engineering controls;

      iii. maintaining site access controls and Department notification; and

      iv. the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

FIGURE 1 – SITE LOCATION

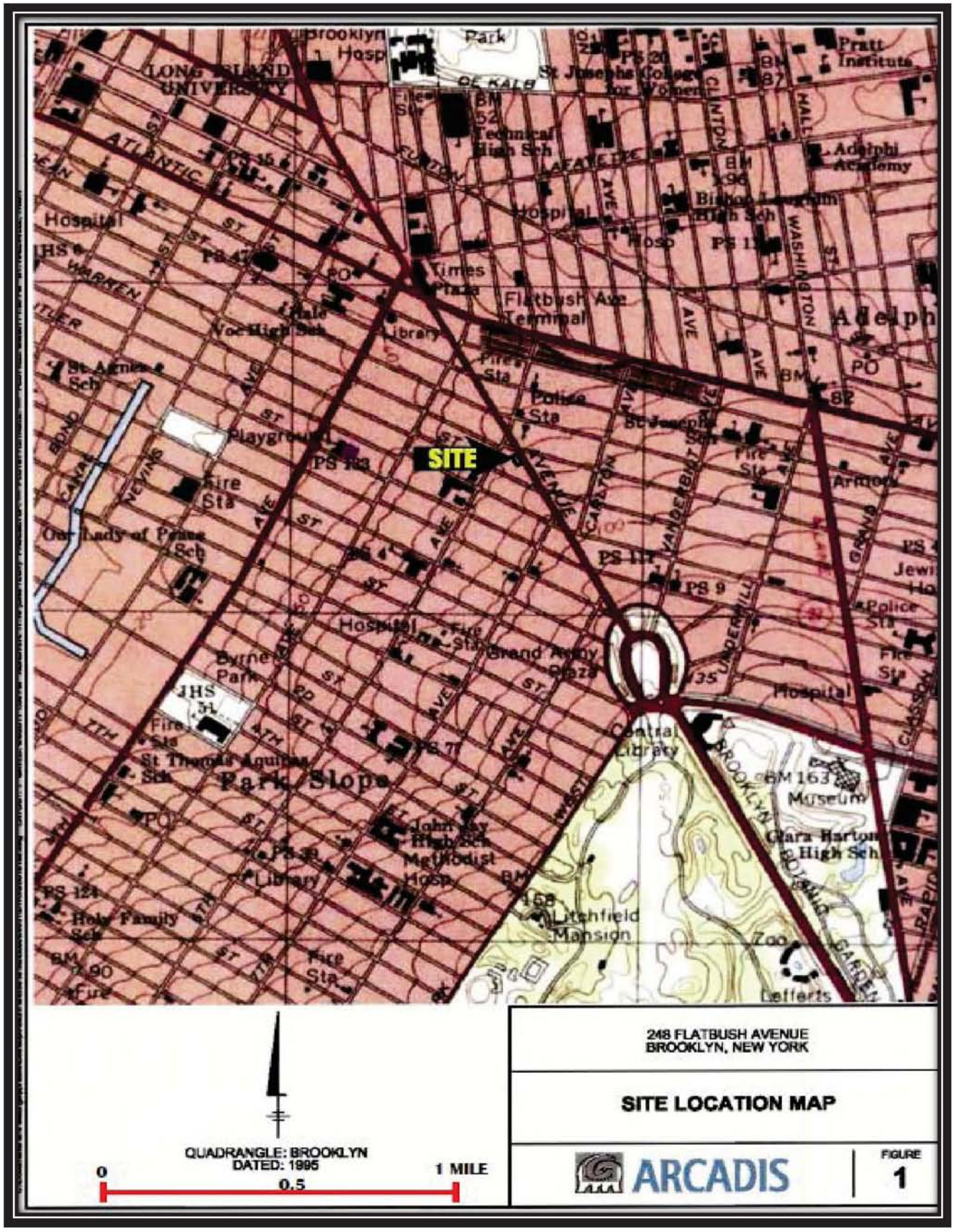


FIGURE 1A – SITE AND VICINITY

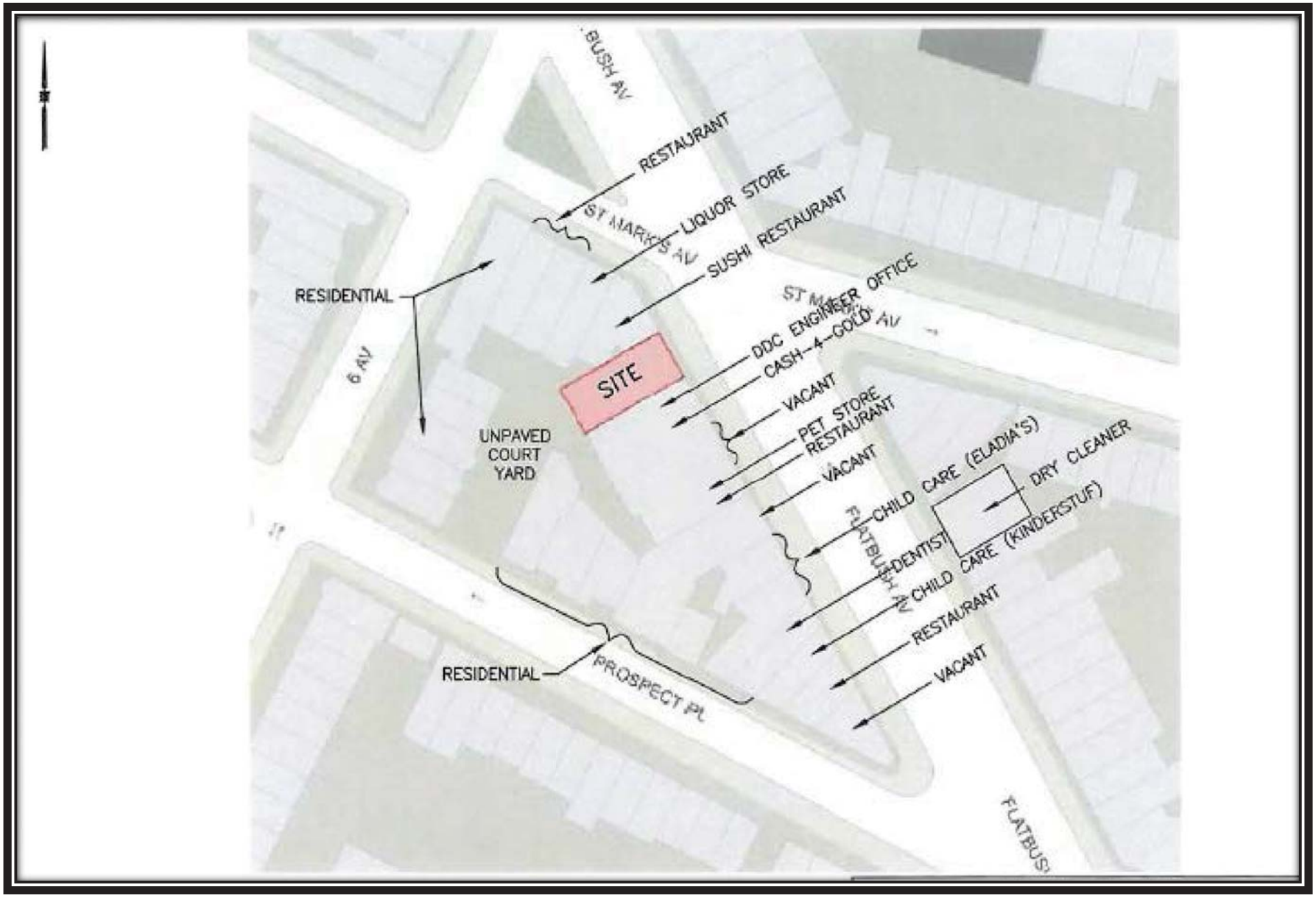
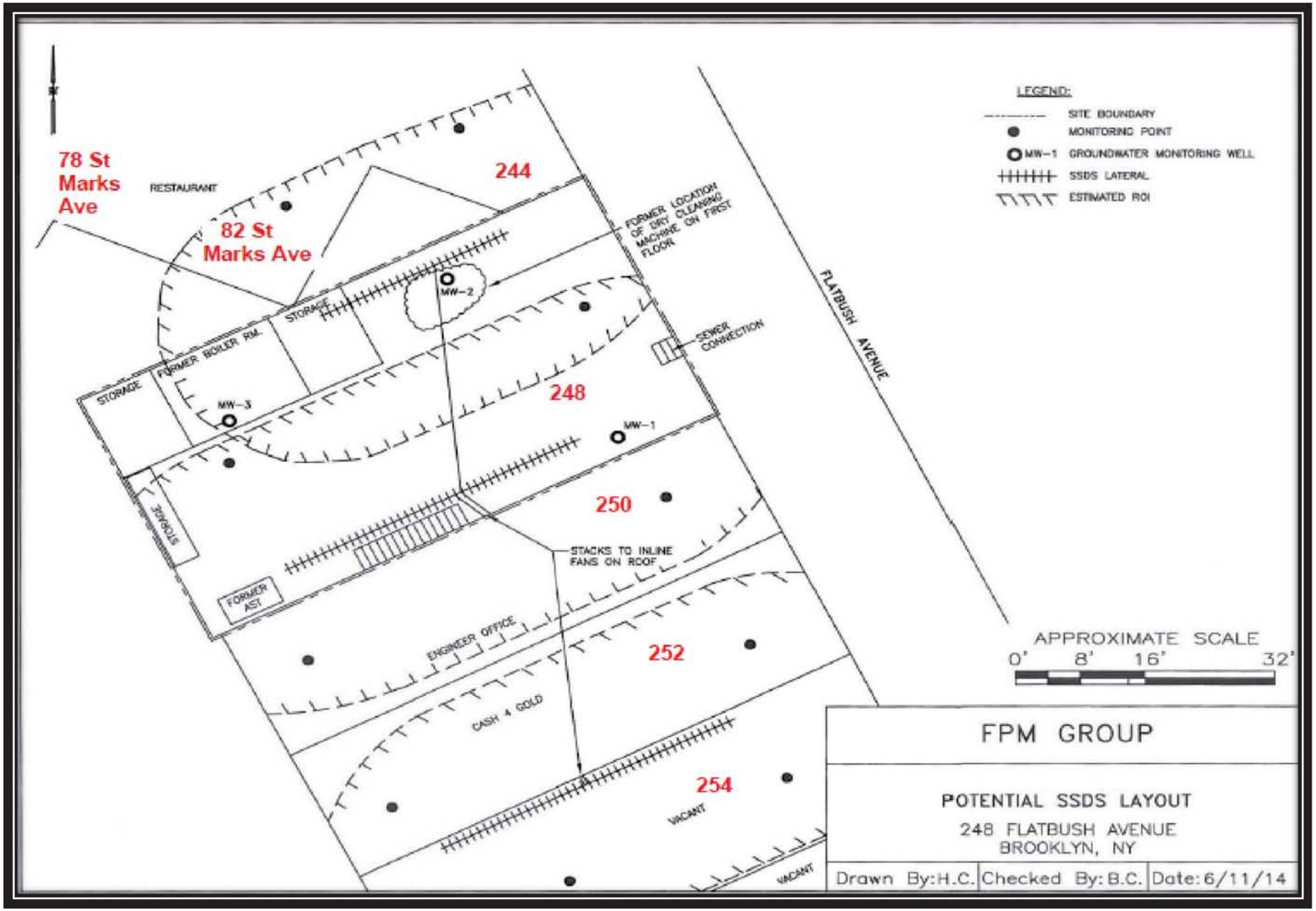


FIGURE 2 – PROPOSED REMEDY - SSDS LAYOUT



APPENDIX B

HEALTH AND SAFETY PLAN
INCLUDING
COMMUNITY AIR MONITORING PLAN

APPENDIX B
HEALTH AND SAFETY PLAN AND COMMUNITY AIR MONITORING PLAN

This worker Health and Safety Plan (HASP) has been prepared by FPM Engineering Group PC (FPM) for New York State Department of Environmental Conservation (NYSDEC) Brownfield Program Site #C224160, identified as the 248 Cinderella, LLC Site located at 248 Flatbush Avenue, Brooklyn, New York (Site). This HASP is part of the Remedial Design Work Plan (RDWP) and includes measures for the protection of worker health and safety during remedial activities.

A Community Air Monitoring Plan (CAMP) is also included to address potential issues that may affect the Site community during onsite activities.

B.1 Worker Health and Safety Plan

B.1.1 Introduction

This HASP has been written for compliance with "OSHA Hazardous Waste Operations Standards (29 CFR 1910.120)", the guidance documents, "Standard Operating Safety Guidelines (Office of Solid Waste and Emergency Response, 1992)" and the "Occupational Safety and Health Guidance Manual for Hazardous Waste Activities" (U.S. Department of Health and Human Services, 1985).

B.1.2 Scope and Applicability of the HASP

This HASP is designed to be applicable to locations where remedial construction, well abandonment, and sampling are performed at the Site by all parties that either perform or witness the activities. This HASP may also be modified or amended to meet specific needs of the proposed work.

This HASP will detail the Site safety procedures, Site background, and safety monitoring. Contractors will be required to adopt this HASP in full or to follow an FPM-approved HASP. The Health and Safety Officer (HSO) will be present at the Site to inspect the implementation of the HASP; however, it is the sole responsibility of the contractor(s) to comply with the HASP.

The HASP has been formulated as a guide to complement professional judgment and experience. The appropriateness of the information presented should always be evaluated with respect to unforeseen Site conditions that may arise.

B.1.3 Site Work Zone and Visitors

The Site work zone (a.k.a. exclusion zone) during the performance of the remedial construction, well abandonment, and sampling activities will be a 30-foot radius about the work location. This work zone may be extended if, in the judgment of the HSO, Site conditions warrant a larger work zone.

No visitors will be permitted within the work zone without the consent of the HSO. All visitors will be required to be familiar with, and comply with, the HASP. The HSO will deny access to those whose presence within the work zone is unnecessary or those who are deemed by the HSO to be in non-compliance with the HASP.

All Site remedial workers, including the contractors, will be required to have 40-hour hazardous material training (eight-hour refresher courses annually), respirator fit test certification, and current medical surveillance as stated in 29 CFR 1910.120.

The HSO will also give an on-Site health and safety discussion to all Site personnel, including the contractors, prior to initiating the Site work. Workers not in attendance during the health and safety talk will be required to have the discussion with the HSO prior to entering the work zone.

Emergency telephone numbers and directions to the nearest hospital are shown in Table C.1.3.1 and will be kept at the Site in the possession of the HSO and will be available to all Site workers and visitors.

B.1.4 Key Personnel/Alternates

The project coordinator and Quality Assurance Officer (QAO) for this project is Stephanie Davis, CPG and the project engineer is Kevin Loyst, PE. The onsite project manager will be Ben Cancemi, who will also act as the HSO. An assistant project manager and assistant health and safety officer may be designated for the field activities.

B.1.5 Site Background

Based on the Site history and previous analyses of samples, the known chemicals present at the Site include the volatile organic compound tetrachloroethylene (PCE). This chemical is present in groundwater, soil vapor, and indoor air at the Site. PCE has not been found in excess of regulatory criteria in soil that remains present onsite. Remedial construction and sampling activities will include the potential for contact with soil, groundwater, soil vapor, and indoor/outdoor air.

B.1.6 Task/Operation Health and Safety Analysis

This section presents health and safety analyses for the remedial construction and sampling tasks. In general, FPM will employ one to two persons at the Site. No intrusive remedial construction or sampling operations will be conducted by contractors without the presence of an FPM representative onsite. In the event that the HSO is not present on the Site, the Assistant HSO will implement the HASP. Levels of personal protection mentioned in this section are defined in Section B.1.9.

Remedial Construction and Intrusive Sampling Safety Analysis

Intrusive activities, including performing remedial construction and abandoning groundwater monitoring wells, will be performed by construction contractors and FPM personnel. The intrusive remedial construction will generally include cutting trenches into the soil beneath the Site building slab, installation of piping, and placement of backfill beneath the slab, and will be performed by a remedial construction contractor using hand-operated manual or powered equipment. Well abandonment will generally include opening the existing wells and placing grout into each well casing; this work will also be performed by a contractor. The depth to groundwater is approximately 60 feet below the basement floor at the Site and will not be contacted during intrusive activities except during well abandonment. FPM personnel will be present to coordinate, oversee, and monitor intrusive construction and well abandonment activities.

Intrusive sampling will include obtaining sub-slab vapor samples via monitoring points installed into the building basement floor. Intrusive sampling will be performed by FPM personnel.

TABLE B.1.3.1
EMERGENCY TELEPHONE NUMBERS AND
DIRECTIONS TO BROOKLYN HOSPITAL CENTER

Police 911
Ambulance 911
Poison Control Center 212-689-9014
The Brooklyn Hospital Center (Emergency Room) 718-250-8075

FPM Contact Personnel (631-737-6200)

Dr. Kevin J. Phillips, P.E. ..... Cell # 631-374-6066
Kevin Loyst, PE ..... Cell #631-626-5479
Stephanie Davis, Project Coordinator ..... Cell # 516-381-3400
Ben Cancemi, Project Manager ..... Cell # 516-383-7106

Directions to the Brooklyn Hospital Center

121 DeKalb Avenue
Brooklyn, NY 11201
Tel: 718-869-7000

Exit the Site and turn left on to Flatbush Avenue. Travel north on Flatbush Avenue for approximately 10 blocks to Myrtle Avenue. Make a right onto Myrtle Avenue and continue four blocks to Ashland Place. Turn right onto Ashland Place and continue to DeKalb Avenue. Hospital is on northwest corner of DeKalb Avenue and Ashland Place; follow the signs to the Emergency Room.

To minimize the potential for dust inhalation during intrusive activities, the HSO will assess wind and soil moisture conditions and, if it is deemed necessary by the HSO, the affected area will be wetted with potable water. Wind is not anticipated to present a concern as the intrusive remedial construction will all be performed indoors. If soil wetting is determined to be ineffective, the HSO may decide to upgrade personal protection to Level C respiratory protection to include respirators with dust cartridges. If extremely dusty conditions exist that cannot be successfully controlled by dust suppression with potable water, then the HSO may choose to postpone intrusive activities until such time as conditions improve.

Organic vapors have not presented a concern during previous intrusive activities at this Site. Nevertheless, organic vapor concentrations will be monitored in the work zone during intrusive activities by utilizing a Photovac MicroTIP PID or equivalent. The PID will be "zeroed" by exposing the PID to ambient (outdoor) air prior to intrusive activities and the upper range of calibration will be established by calibrating at 98 to 100 parts per million (ppm) of isobutylene. Background organic vapor concentrations will then be established in the work zone prior to intrusive activities and recorded in the HSO field book. Upon commencement of intrusive activities, PID readings will be obtained in the workers' breathing zone. Readings will be obtained following the initial penetration of the building slab and approximately every 10 minutes thereafter during intrusive operations. At the discretion of the HSO, PID readings may be obtained more frequently. All readings and observations will be recorded in the HSO field book. PID air monitoring will be conducted by FPM personnel. Steady-state PID readings greater than five ppm in the worker's breathing zone will require upgrading to Level C personal protective equipment. Steady-state readings, for this purpose, will be defined as readings exceeding five ppm above background for a minimum of ten seconds at points approximately one foot above and then around the borehole opening. These points will define the worker's breathing zone. Level C personal protection will be implemented including full-face air-purifying respirators with dust and organic vapor cartridges (personal protective equipment will be described in greater detail in Section C.1.9). All FPM personnel and contractors must be properly trained and fit tested prior to donning respirators.

If PID readings exceed steady-state levels greater than 50 ppm above background or any conditions exist for which the HSO determines require Level B personal protective equipment, all work at the Site will cease immediately and all personnel will evacuate the work zone. Evacuation will occur in the upwind direction if discernible. Specific evacuation routes will be discussed prior to commencement of work at each location based on work location and wind direction and an evacuation meeting place will be determined. Level B conditions are not anticipated to be encountered; however, if level B conditions arise, no Site work will be performed by FPM or contractors and a complete evaluation of the operation will be performed and this HASP will be modified.

All personnel will be required to wear chemical-resistant nitrile gloves when the potential for dermal contact with groundwater is possible. This will include handling equipment retrieved from the wells during abandonment operations. IN general, dermal contact with soil or groundwater and equipment that has been in contact with soil or groundwater will be avoided.

Other Safety Considerations

- Noise

During operations that may generate potentially harmful levels of noise, the HSO will monitor noise levels with a Realistic^{tm} hand-held sound level meter. Noise levels will be monitored in decibels (dBs) in the A-weighted, slow-response mode. Noise level readings which exceed the 29 CFR 1910.95

permissible noise exposure limits will require hearing protection (see Table B.1.6.1 for Permissible Noise Exposures).

TABLE B.1.6.1
PERMISSIBLE NOISE EXPOSURES*

Duration Per Day Hours	Sound Level dBA Slow Response
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
½	110

Notes:

When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: $C_1/T_1+C_2/T_2+.....C_n/T_n$ exceeds unity, then, the mixed exposure should be considered to exceed the limit value. C_n indicates the total time of exposure at a specified noise level, and T_n indicates the total time of exposure permitted at that level.

Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

*Standards derived from 29 CFR 1910.95

Hearing protection will be available to all Site workers during remedial activities and will be required for exceedances of noise exposure limits. The hearing protection will consist of foam, expansion-fit earplugs (or other approved hearing protection) with a noise reduction rating of at least 29 dB. Hearing protection must alleviate worker exposure to noise to an eight-hour time-weighted average of 85 dB or below. In the event that the hearing protection is inadequate, work will cease until a higher level of hearing protection can be incorporated.

- Slip/Trip/Fall Preventative Measures

To reduce the potential for slipping, tripping, or falling, the work zone will be kept clear of unnecessary equipment. In addition, all Site remedial construction workers will be required to wear work boots with adequate tread to reduce the potential for slipping (work boots must be leather or chemical-resistant and contain steel toes and steel shanks).

- Insects

Potential insect problems include, but are not limited to stinging insects such as bees, wasps, and hornets, and ticks. Prior to commencement of work, the work area will be surveyed for nests and hives

to reduce the possibility of disturbing stinging insects. In addition, each Site worker will be asked to disclose any allergies related to insect stings or bites. The worker will be requested to keep his or her anti-allergy medicine on Site.

Tick species native to Long Island consist of the pinhead-sized deer tick and the much-larger dog tick. Ticks are unlikely to exist at the Site due to a paucity of suitable habitat. All Site workers will be advised to avoid walking through vegetated areas and will be advised to check for ticks on clothing periodically.

- Potential Electrical and Other Utility Hazards

Potential electric hazards consist mainly of overhead and underground power lines. Other utilities that may present hazards include telephone lines, gas lines, sewer lines, water lines, and other overhead or underground utilities. Prior to commencement of intrusive work at the Site, all locations will be inspected with respect to overhead lines. As the remedial construction work will take place primarily within the Site building, overhead lines are not anticipated to present a significant concern. Intrusive work involving heavy equipment will not be performed when the horizontal distance between the equipment and overhead wires is less than 30 feet.

Underground potential utility hazards will be minimized by contacting the One-Call service to provide markouts of the utilities beneath adjoining public streets.

- Heat/Cold Stress

Heat stress may become a concern especially if protective clothing is donned that will decrease natural ventilation. To assist in reducing heat stress, an adequate supply of water or other liquids will be staged on the Site and personnel will be encouraged to rehydrate at least every two hours even if not thirsty. In addition, a cool rest area will be designated during sunny or warm days and Site workers will break for at least 10 minutes every two hours in the rest area, and, in very hot weather, workers wearing protective clothing may be rotated.

Indications of heat stress range from mild (fatigue, irritability, anxiety, decreased concentration, dexterity or movement) to fatal. Medical help will be obtained for serious conditions.

Heat-related problems are:

- Heat rash: caused by continuous exposure to heat and humid air and aggravated by chafing clothes. Decreases ability to tolerate heat.

- Heat cramps: caused by profuse perspiration with inadequate fluid intake and chemical replacement (especially salts). Signs: muscle spasm and pain in the extremities and abdomen.

- Heat exhaustion: caused by increased stress on various organs to meet increased demands to cool the body. Signs: shallow breathing; pale, cool, moist skin; profuse sweating; dizziness and lassitude.

- Heat stroke: the most severe form of heat stress. Can be fatal. Medical help must be obtained immediately. Body must be cooled immediately to prevent severe injury and/or death. Signs: red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; coma.

Cold exposure is a concern if work is conducted during cold weather, marginally cold weather during precipitation periods, or moderate to high wind periods. To assist in reducing cold exposure the following measures will be taken when cold exposure concerns are present:

- All personnel will be required to wear adequate and appropriate clothing. This will include head gear to prevent the high percentage loss of heat that occurs in this area (thermal liners for hard hats if hard hats are required).

- A readily-available warm shelter will be identified near the work zone.

- Work and rest periods will be scheduled to account for the current temperature and wind velocity conditions.

- Work patterns and the physical condition of workers will be monitored and personnel will be rotated, as necessary.

- Indications of cold exposure include shivering, dizziness, numbness, confusion, weakness, impaired judgment, impaired vision, and drowsiness. Medical help will be obtained for serious conditions if they occur.

Cold exposure-related problems are:

- Frost bite: Ice crystal formation in body tissues. The restricted blood flow to the injured part results in local tissue destruction.

- Hypothermia: Severe exposure to cold temperature resulting in the body losing heat at a rate faster than the body can generate heat. The stages of hypothermia are shivering, apathy, loss of consciousness, decreasing pulse and breathing rate, and death.

The Buddy System

All activities in contaminated or potentially contaminated areas will be conducted by pairing off the Site workers in groups of two (or three if necessary). Each person (buddy) will be able to provide his or her partner with assistance, observe his or her partner for signs of chemical, cold, or heat exposure, periodically check the integrity of his or her partner's protective clothing, and notify the HSO or others if emergency help is needed. The buddy system will be instituted at the beginning of each work day in contaminated or potentially contaminated areas. If new workers arrive on Site, a buddy will be chosen prior to the new worker entering the work zone that includes contaminated or potentially contaminated areas.

Site Communications

Two sets of communication systems will be established at the Site: internal communication among personnel onsite, and external communication between onsite and offsite personnel. Internal communication will be used to alert team members to emergencies, pass along safety information such as heat stress check, protective clothing check, etc, communicate changes in the work to be accomplished, and maintain Site control. Due to ambient noise, verbal communications may be difficult at times. The HSO will carry a whistle (and compressed air horn if respirators are donned) to signal Site workers. A single whistle blast will be the signal to immediately evacuate the work zone through the access control point. This signal will be discussed with all Site workers prior to commencement of intrusive work.

An external communication system between onsite and offsite personnel will be established to coordinate emergency response, report to the Project Manager, and maintain contact with essential offsite personnel. A field telephone will be available at all times in the HSO's vehicle. In addition, a backup telephone will be identified prior to the commencement of Site operations and this location will be relayed to all Site workers.

General Safe Work Practices

Standing orders applicable during Site remedial construction and sampling operations are as follows:

- No smoking, eating, drinking, or application of cosmetics in the work zone.
- No matches or lighters in the work zone.
- All Site workers will enter/exit work zone through the Site access point.
- Any signs of contamination, uncontrolled safety hazards, or unusual conditions will require evacuating the Site immediately and reporting the information to the HSO.
- Loose-fitting clothing and loose long hair will be prohibited in the work zone during heavy equipment operations.
- A signal person will direct the backing of work vehicles.
- Equipment operators will be instructed to check equipment for abnormalities such as oozing liquids, frayed cables, unusual odors, etc.

B.1.7 Personnel Training Requirements

All FPM personnel and contractor personnel will receive adequate training prior to entering the Site. FPM and remedial construction contractor personnel will, at a minimum, have completed OSHA-approved, 40-hour hazardous materials Site safety training and OSHA-approved, eight-hour safety refresher course within one year prior to commencing field work. In addition, each worker must have a minimum of three days field experience under the direct supervision of a trained, experienced supervisor.

Prior to Site field work, the HSO will conduct an in-house review of the project with respect to health and safety with all FPM personnel who will be involved with field work at the Site. The review will include discussions of signs and symptoms of chemical exposure and heat/cold stress that indicate potential medical emergencies. In addition, review of PPE will be conducted to include the proper use of air-purifying respirators.

B.1.8 Medical Surveillance Program

All remedial construction workers participating in intrusive activities at the Site must participate in a medical surveillance program in accordance with 29 CFR 1910.120. A medical examination and consultation must have been performed within the last twelve months to be eligible for field work.

The content of the examination and consultation will include a medical and work history with special emphasis on symptoms related to the handling of hazardous substances, health hazards, and fitness for duty including the ability to wear required personal protective equipment under conditions (i.e., temperature extremes) that may be expected at the work Site.

All medical examinations and procedures will be performed by, or under the supervision of, a licensed physician. The physician shall furnish a written opinion containing:

- The results of the medical examination and tests;
- The physician's opinion as to whether the employee has any detected medical conditions which would place the worker at increased risk of material impairment of the employee's health from work in hazardous waste operations;
- The physician's recommended limitations upon the worker assigned to the work; and
- A statement that the worker has been informed by the physician of the results of the medical examination and any further examination or treatment.

An accurate record of the medical surveillance will be retained. The record will consist of at least the following information:

- The name and social security number of the employee;
- The physician's written opinions, recommended limitations, and results of examinations and tests; and
- Any worker medical complaints related to exposure to hazardous substances.

B.1.9 Personal Protective Equipment

General Considerations

The two basic objectives of the personal protective equipment (PPE) are to protect the wearer from safety and health hazards, and to prevent the wearer from incorrect use and/or malfunction of the PPE.

Potential Site hazards have been discussed previously in Section B.1.6. The duration of Site activities is estimated to be periods of several days. All work is expected to be performed during daylight hours and workdays, in general, are expected to be eight to ten hours in duration. Any work performed beyond daylight hours will require the permission of the HSO. This decision will be based on the adequacy of artificial illumination and the type and necessity of the task being performed.

Personal protection levels for the Site activities, based on past investigations at the Site, are anticipated to be Level D with the possibility of upgrading to Level C. The equipment included for each level of protection is provided below.

Level C Protection

Level C personnel protective equipment includes:

- Air-purifying respirator, full-face
- Chemical-resistant clothing includes: Tyvek[tm] (spunbonded olefin fibers) for particulate and limited splash protection or Saranex[tm] (plastic film-laminated Tyvek) for permeation resistance to solvents.
- Coveralls*, or
- Long cotton underwear*
- Gloves (outer), chemical-resistant
- Gloves (inner), chemical-resistant
- Boots (outer), leather or chemical-resistant, steel toe and shank
- Boot covers (outer), chemical-resistant (disposable)*
- Hard hat (face shield)*
- Escape mask*
- 2-way radio communications (inherently safe)*

(*) optional

Meeting all of these criteria permits use of Level C protection:

- Oxygen concentrations are not less than 19.5% by volume.
- Measured air concentrations of identified substances will be reduced by the respirator below the substance's threshold limit value (TLV).
- Atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any body area left unprotected by chemical-resistant clothing.
- Job functions do not require self-contained breathing apparatus.
- Direct readings are below 50 ppm on the PID.

Level D Protection

Personnel protective equipment:

- Coveralls
- Gloves*
- Boots/shoes, leather or chemical-resistant, steel toe and shank

- Safety glasses or chemical splash goggles*
- Hard hat (face shield*)
- Escape mask*

(*) optional

Meeting any of these criteria allows use of Level D protection:

- No contaminant levels above 5 ppm organic vapors or dusty conditions are present.
- Work functions preclude splashes, immersion, or the reasonable potential for unexpected inhalation of any chemicals above the TLV.

Additional Considerations for Selecting Levels of Protection

Another factor that will be considered in selecting the appropriate level of protection is heat and physical stress. The use of protective clothing and respirators increases physical stress, in particular, heat stress on the wearer. Chemical protective clothing greatly reduces natural ventilation and diminishes the body's ability to regulate its temperature. Even in moderate ambient temperatures, the diminished capacity of the body to dissipate heat can result in one or more heat-related problems.

All chemical protective garments can be a contributing factor to heat stress. Greater susceptibility to heat stress occurs when protective clothing requires the use of a tightly-fitted hood against the respirator face piece, or when gloves or boots are taped to the suit. As more body area is covered, less cooling takes place, increasing the probability of heat stress.

Wearing protective equipment also increases the risk of accidents. It is heavy, cumbersome, decreases dexterity, agility, interferes with vision, and is fatiguing to wear. These factors all increase physical stress and the potential for accidents. In particular, the necessity of selecting a level of protection will be balanced against the increased probability of heat stress and accidents.

Donning and Doffing Ensembles

- Donning an Ensemble

A routine will be established and practiced periodically for donning a Level C ensemble. Assistance may be provided for donning and doffing since these operations are difficult to perform alone. Table B.1.9.1 lists sample procedures for donning a Level C ensemble. These procedures should be modified depending on the particular type of suit and/or when extra gloves and/or boots are used.

- Doffing an Ensemble

Exact procedures for removing Level C ensembles must be established and followed to prevent contaminant migration from the work area and transfer of contaminants to the wearer's body, the doffing assistant, and others. Doffing procedures are provided in Table B.1.9.2. These procedures should be performed only after decontamination of the suited worker. They require a suitably attired assistant. Throughout the procedures, both worker and assistant should avoid any direct contact with the outside surface of the suit.

TABLE B.1.9.1
SAMPLE LEVEL C DONNING PROCEDURES

1. Inspect the clothing and respiratory equipment before donning (see Inspection in subsection C.1.7).

2. Adjust hard hat or headpiece if worn, to fit user's head.

3. Standing or sitting, step into the legs of the suit; ensure proper placement of the feet within the suit; then gather the suit around the waist.

4. Put on chemical-resistant safety boots over the feet of the suit. Tape the leg cuff over the tops of the boots.

5. Don the respirator and adjust it to be secure, but comfortable.

6. Perform negative and positive respirator facepiece seal test procedures.

   – To conduct a negative pressure test, close the inlet part with the palm of the hand or squeeze the breathing tube so it does not pass air, and gently inhale for about 10 seconds. Any inward rushing of air indicates a poor fit. Note that a leaking facepiece may be drawn tightly to the face to form a good seal, giving a false indication of adequate fit.

   – To conduct a positive pressure test, gently exhale while covering the exhalation valve to ensure that a positive pressure can be built up. Failure to build a positive pressure indicates a poor fit.

7. Depending on type of suit:

   – Put on inner gloves (surgical gloves).

   – Additional overgloves, worn over attached suit gloves, may be donned later.

8. Put on hard hat

9. Have assistant observe the wearer for a period of time to ensure that the wearer is comfortable, psychologically stable, and that the equipment is functioning properly.

TABLE B.1.9.2
DOFFING PROCEDURES

1. Remove any extraneous or disposable clothing, boot covers, outer gloves, and tape.

2. Remove respirator by loosening straps and pulling straps over the top of the head and move mask away from head. Do not pull mask over the top of the head.

3. Remove arms, one at a time, from suit, avoiding any contact between the outside surface of the suit and wearer's body and lay the suit out flat behind the wearer. Leave internal gloves on, if any.

4. Sitting, if possible, remove both legs from the suit.

5. After suit is removed, remove internal gloves by rolling them off the hand, inside out.

Respirator Fit Testing

The fit or integrity of the facepiece-to-face seal of a respirator affects its performance. Most facepieces fit only a certain percentage of the population; thus each facepiece must be tested on the potential wearer in order to ensure a tight seal. Facial features such as scars, hollow temples, very prominent cheekbones, deep skin creases, dentures or missing teeth, and the chewing of gum and tobacco may interfere with the respirator-to-face seal. A respirator shall not be worn when such conditions prevent a good seal. The worker's diligence in observing these factors shall be evaluated by periodic checks. Fit testing will comply with 29 CFR 1910.1025 regulations.

Inspection

The PPE inspection program will entail five different inspections:

- Inspection and operational testing of equipment received from the factory or distributor;
- Inspection of equipment as it is issued to workers;
- Inspection after use;
- Periodic inspection of stored equipment; and
- Periodic inspection when a question arises concerning the appropriateness of the selected equipment, or when problems with similar equipment arise.

The inspection checklist is provided in Table B.1.9.3. Records will be kept of all inspection procedures. Individual identification numbers will be assigned to all reusable pieces of equipment and records should be maintained by that number. At a minimum, each inspection should record the ID number, date, inspector, and any unusual conditions or findings. Periodic review of these records may indicate an item or type of item with excessive maintenance costs or a particularly high level of down-time.

TABLE B.1.9.3
PPE INSPECTION CHECKLIST

CLOTHING

Before use:

- Determine that the clothing material is correct for the specified task at hand.
- Visually inspect for imperfect seams, non-uniform coatings, tears, and/or malfunctioning closures.
- Hold up to light and check for pinholes.
- Flex product and observe for cracks or other signs of deterioration.
- If the product has been used previously, inspect inside and out for signs of chemical attack, including discoloration, swelling, and/or stiffness.

During the work task, periodically inspect for:

- Evidence of chemical attack such as discoloration, swelling, stiffening, and softening. Keep in mind, however, that chemical permeation can occur without any visible effects.
- Indication of physical damage, including closure failure, tears, punctures, and/or seam discontinuities.

GLOVES

Before use:

- Pressurize glove to check for pinholes. Either blow into glove, then roll gauntlet toward fingers, or inflate glove and hold under water. In either case, no air should escape.

AIR-PURIFYING RESPIRATORS

- Inspect air-purifying respirators before each use to be sure they have been adequately cleaned.
- Check material conditions for signs of pliability, deterioration, and/or distortion.
- Examine cartridges to ensure that they are the proper type for the intended use, the expiration date has not been passed, and they have not been opened or used previously.
- Check faceshields and lenses for cracks, crazing, and/or fogginess.
- Air-purifying respirators will be stored individually in resealable plastic bags.

Storage

Clothing and respirators will be stored properly to prevent damage or malfunction due to exposure to dust, moisture, sunlight, damaging chemicals, extreme temperatures, and impact. Storage procedures are as follows:

- Clothing: Potentially-contaminated clothing will be stored in a well-ventilated area separate from street clothing, with good air flow around each item, if possible. Different types and materials of clothing and gloves will be stored separately to prevent issuing the wrong materials by mistake, and protective clothing will be folded or hung in accordance with manufacturer's recommendations.

- Respirators: After each use air-purifying respirators will be dismantled, washed, and placed in sealed plastic bags.

PPE Maintenance

Specialized PPE maintenance will be performed only by the factory or an authorized repair person. Routine maintenance, such as cleaning, will be performed by the personnel to whom the equipment is assigned. Respirators will be cleaned at the end of each day with alcohol pads or, preferably, by washing with warm soapy water.

Decontamination Methods

All personnel, clothing, equipment, and samples leaving the work zone area of the Site must be decontaminated as needed to remove any harmful chemicals that may have adhered to them. Decontamination methods either (1) physically remove contaminants (2) inactivate contaminants by chemical detoxification or disinfection/sterilization, or (3) remove contaminants by a combination of both physical and chemical means. In many cases, gross contamination can be removed by physical means involving dislodging/displacement, rinsing, wiping off, and evaporation. Contaminants that can be removed by physical means include dust, vapors, and volatile liquids. All reusable equipment will be decontaminated by rinsing in a bath of detergent and water (respirators, gloves to be reused). Monitoring equipment will be decontaminated by wiping with paper towels and water. All used PPE to be discarded will be disposed offsite as solid waste.

The effectiveness of the decontamination will be evaluated near the beginning of Site activities and will be modified if determined to be ineffective. Visual observation will be used for this purpose. The HSO will inspect decontaminated materials for discoloration, stains, corrosive effects, visible dirt, or other signs of possible residual contamination.

B.2 Community Air Monitoring Plan

This Community Air Monitoring Plan (CAMP) will be implemented at the Site by FPM during the intrusive remedial construction activities and sampling, including trenching, pipe-laying, backfilling, well abandonment, and sampling. Due to the nature of the contaminant at the Site, there is a potential for organic vapor emissions as these activities occur. In addition, there is the potential for dust to be associated with intrusive activities. To address these concerns, organic vapor monitoring and dust monitoring will be performed.

Any CAMP monitoring results that exceed the action levels described below will be reported (or notice provided by another arrangement acceptable to the NYSDEC) when identified if a NYSDEC

representative is present at the Site or within two hours by phone call or email to the NYSDEC Project manager when no NYSDEC representative is onsite. Exceedances of the CAMP action levels will also be summarized in the monthly progress reports, including the duration of the exceedance(s) and any response actions taken.

B.2.1 Organic Vapor Monitoring

Under the CAMP, organic vapor concentrations will be monitored at the boundaries of the work zone during intrusive activities. It will be the responsibility of the HSO to implement the plan and to ensure that proper action is taken in the event that any of the established action levels are exceeded.

To monitor organic vapors, a PID capable of calculating 15-minute running average concentrations will be used and maintained in good operating condition. Calibration of the PID will be performed according to manufacturer's instructions. Background levels of organic vapors will be measured at the work zone boundary prior to beginning work and upwind of the work area periodically using a PID. Monitoring may be performed more frequently at the discretion of the HSO. Organic vapors will be monitored continuously at the downwind perimeter of the work area during ground intrusive activities.

PID readings will be recorded in the field logbook for both background and work area perimeter. Logbook recordings will include the time, location, and PID readings observed. Downwind perimeter levels will be recorded in the log whenever the level reaches 5 ppm above the background along with the action(s) taken to mitigate the level. If the level of organic vapors exceeds 5 ppm above the background at the downwind perimeter of the work area, work activities will be halted and monitoring continued. The vapor emission response plan will then be implemented.

B.2.1.1 Vapor Emission Response Plan

The vapor emission response plan includes the following trigger levels and responses:

- Greater than 5 ppm at perimeter:

  In the event the level of organic vapors exceeds 5 ppm above the background at the downwind perimeter of the work area, activities will be halted and monitoring continued. If the organic vapor level then decreases to below 5 ppm above background, work activities can resume but organic vapor readings will be obtained more frequently as directed by the HSO.

- 5 ppm to 25 ppm at perimeter and less than 5 ppm at the work zone boundary:

  If the level of organic vapors is greater than 5 ppm but less than 25 ppm over background at the downwind perimeter of the work area, activities will be halted, the source of the vapors will be identified and corrective actions will be taken. Monitoring will be continued and activities will resume if the organic vapor concentration at half the distance to the nearest residential or commercial structure, whichever is less, is below 5 ppm over background. More frequent intervals of monitoring will be performed as directed by the HSO.

- Above 25 ppm at perimeter:

  If the level of organic vapors is above 25 ppm at the perimeter of the work area, activities will be shut down. Should such a shutdown be necessary, downwind air monitoring will continue as directed by the HSO to confirm that organic vapor concentrations decrease. Actions will be taken to abate the source of vapor emissions and activities will not resume until the source is

controlled.

B.2.1.2 Major Vapor Emission Response Plan

The Major Vapor Emission Response Plan shall automatically be placed into effect if:

- Efforts to abate the emission source are unsuccessful and levels above 5 ppm persist for more than 30 minutes in the 20-foot zone; or

- The vapor levels are greater than 10 ppm above background in the 20-foot zone.

Upon activation of the Major Vapor Emission Response Plan, the following activities will be undertaken:

- All emergency response contacts as listed in the HASP will be notified;

- Air monitoring will be conducted at 30-minute intervals within the 20-foot zone. If two successive readings below action levels are measured, air monitoring will be halted or modified as directed by the HSO; or

- If air monitoring readings remain above action levels, work will be halted and further measures taken to reduce organic vapors.

If a Major Vapor Emission Response Plan is implemented, the NYSDEC and NYSODH will be contacted within 24 hours.

B.2.2 Dust Monitoring

Dust (particulate) monitoring will be performed during intrusive activities with the potential to create dust. Monitoring will be performed using a Miniram personal monitor calibrated according to the manufacturer's instructions. The Miniram will be capable of calculating 15-minute running average concentrations and operated continuously at the downwind perimeter of the work zone during ground intrusive activities. To ensure the validity of the fugitive dust measurements, appropriate QA/QC measures will be employed, including periodic instrument calibration, operator training, daily instrument performance (span) checks, and record-keeping on daily log sheets. If measurable dust levels are noted, then readings will also be obtained upwind of the work zone. If the downwind particulate level exceeds the upwind level by more than 100 micrograms per cubic meter (ug/m^3), then dust suppression techniques will be employed or work will be halted or controlled such that dust levels are reduced at the downwind perimeter to within 150 ug/m^3 of the upwind level.

If dust is generated during ground intrusive activities, then dust suppression will be performed, as discussed in Section B.1.6 of this HASP. Corrective measures may include increasing the level of PPE for onsite personnel and implementing additional dust suppression techniques. Should the action level of 150 $\mu g/m^3$ continue to be exceeded, work will stop and the NYSDEC will be notified as described in Section B.2 above. The notification will include a description of the control measures implemented to prevent further exceedances.

Reasonable fugitive dust suppression techniques will be employed during all intrusive remedial construction activities that may generate fugitive dust. Particulate (fugitive dust) monitoring will be employed onsite remedial construction activities that may generate fugitive dust.

Fugitive dust that migrates offsite has the potential for transporting contaminants offsite. Although there may be situations when the monitoring equipment does not measure dust at or above the action level, visual observation may indicate that dust is leaving the Site. If dust is observed leaving the working area, additional dust suppression techniques will be employed.

The following techniques have been shown to be effective for controlling generation and migration of dust during intrusive activities and will be used as needed during intrusive remedial construction activities at the Site:

- Wetting equipment and exposed soil;
- Restricting vehicle speeds to 10 mph;
- Covering areas of exposed soil after investigation activity ceases; and
- Reducing the size and/or number of areas of exposed soil.

When techniques involving water application are used, care will be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will be considered to prevent overly wet conditions, conserve water, and provide an effective means of suppressing fugitive dust.

Evaluation of weather conditions is also necessary for proper fugitive dust control. When extreme wind conditions may make dust control ineffective, intrusive remedial construction actions may be suspended until wind speeds are reduced.

B.2.3 Noise Monitoring

When using heavy equipment, there is a potential for noise to impact the surrounding community. Remedial construction work will be performed only during normal working hours when ambient noise levels are elevated due to ongoing activities in the surrounding community, which is primarily urban and commercial. In addition, much of the work will be performed indoors in a vacant building. Therefore, the potential for noise impacts on the surrounding community is low.

However, if pedestrians are present in the Site vicinity, it is possible for noise impacts to occur. To address these concerns and other safety concerns, pedestrians will be barred from entering the work zone. In addition, the HSO will periodically monitor noise levels at the work zone boundary and the closest property boundary with a Realistic^{tm} hand-held sound level meter. Noise levels will be monitored in dBs in the A-weighted, slow-response mode. If noise level readings exceed an eight-hour time-weighted average of 85 dB at the work zone boundary or at the closest property boundary, the HSO will take appropriate measures to reduce noise exposure beyond these boundaries. These measures may include extension of the work zone boundary, issuing appropriate hearing protection devices as discussed in Section B.1.6 of this plan, or other measures, as appropriate. In the event that the noise exposure measures are inadequate, work will cease until noise levels can be reduced to below 85 dB at the work zone boundary and/or at the closest property boundary.

APPENDIX C

QUALITY ASSURANCE PROJECT PLAN

APPENDIX C
QUALITY ASSURANCE PROJECT PLAN

This Quality Assurance Project Plan (QAPP) is applicable to all remedial construction and sampling activities at New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) Site #C224160, identified as Cinderella 248, LLC located at 248 Flatbush Avenue, Kings County (Brooklyn), New York (Site). The remedial construction work is for installation of a sub-slab depressurization system (SSDS) beneath the Site and a nearby building. During remedial construction and SSDS startup sampling of the SSDS effluent will be performed. Information concerning the vacuum radius of influence (ROI) of the SSDS will also be obtained, as described in Section 3.2.1 of the Remedial Design Work Plan (RDWP). During SSDS operation sampling will be performed to evaluate sub-slab soil vapor and indoor air conditions at the Site and nearby buildings. Sampling procedures during SSDS operation will be included in the Monitoring Plan section of the Site Management Plan.

The remedial construction and sampling work will be overseen by FPM Engineering Group, PC (FPM) on behalf of the Volunteer, 248 Cinderella LLC. The FPM Project Engineer is Kevin Loyst, PE, the Project Coordinator is Stephanie O. Davis, CPG, and the Project Manager is Ben Cancemi, CPG. Ms. Davis and Mr. Cancemi are qualified environmental professionals (QEPs). Resumes for project personnel are included in Attachment 1 at the end of this QAPP.

Table C.1 presents a summary of the analytical methods that will be used during remedial construction and sampling and the QA/QC sample program. QA/QC samples are further discussed below.

C.1 Data Quality Objectives

The Data Quality Objectives (DQOs) will be applicable to all data-gathering activities at the Site. DQOs will be incorporated into sampling, analysis, and quality assurance tasks associated with remedial activities.

The data users for this project are FPM, the NYSDEC, and the New York State Department of Health (NYSDOH). The Site owner will also be provided with the data. No other data users are anticipated. The data collected during remedial construction and SSDS startup are intended to evaluate volatile organic compounds (VOCs) in SSDS emissions and the vacuum ROI of the SSDS.

For this project, field screening will be performed during intrusive remedial construction activities. Field screening includes monitoring for organic vapors in the soil when it is exposed during remedial construction and in the air in the work zone using a Photovac MicroTIP photoionization detector (PID), or equivalent, and visual observations of soil characteristics. All readings and observations will be recorded by the onsite FPM QEP in a field notebook.

C.2 Standards, Criteria, and Guidance

The following standards, criteria, and guidance (SCGs) have previously been identified for the Site:

- NYSDEC's DER-10 Technical Guidance for Site Investigation and Remediation;

TABLE C.1
REMEDIAL CONSTRUCTION SAMPLING MATRIX
248 FLATBUSH AVENUE, BROOKLYN, NEW YORK

Sample Type	Matrix	Sample Location	Number/ Frequency	Preparation and Analysis	Sample Bottles/Preservation	Holding Time
Sub-Slab Soil Vapor	Vapor	Six Inches Below Slab	As needed	VOCs (Method TO-15)	One Summa Canister	30 days
Indoor/Outdoor Air	Air	3 to 5 feet above grade	As needed	VOCs (Method TO-15, low-level)	One Summa Canister	30 days
Soil	Soil	Below slab	As needed	TCL VOCs (Methods 5035/5035a and 8260B)	One Glass VOA Vial with MEOH Two Glass VOA vials with water One 2 oz CWM glass	Frozen within 48 hours of collection, 14 days until analysis.
Groundwater	Water	Monitoring wells	As needed	TCL VOCs plus TICs (Methods 5030B/ 8260B)	Two 40 ml glass VOA vials with HCL	14 days
SSDS Emissions	Air	SSDS emissions stack	Once per week during SSDS startup	VOCs (Method TO-15)	One Tedlar Bag	30 days
Equipment blanks	Lab water	-	One per day during soil or groundwater sampling	TCL VOCs (Methods 5030B/ 8260B)	Two glass VOA vials with HCL	14 days
Trip blanks	Lab water	-	One per cooler of soil or groundwater samples	TCL VOCs (Method 8260B)	Two glass VOA vials with HCL	14 days
	Lab Air	-	One per shipment	VOCs (Method TO-15)	One Summa Canister	30 days
Blind duplicates	Soil Vapor/Air	Same as associated primary samples	One per 20 primary samples	VOCs (Method TO-15)	One Summa Canister	30 days
	Soil		One per 20 primary samples	TCL VOCs (Methods 5035/5035a and 8260B)	One Glass VOA Vial with MEOH Two Glass VOA vials with water One 2 oz CWM glass	Frozen within 48 hours of collection, 14 days until analysis.
	Groundwater		One per 20 primary samples	TCL VOCs plus TICs (Methods 5030B/ 8260B)	Two 40 ml glass VOA vials with HCL	14 days
MS/MSD	Soil	Same as associated primary samples	One per 20 primary soil samples	TCL VOCs (Methods 5035/5035a and 8260B)	One Glass VOA Vial with MEOH Two Glass VOA vials with water One 2 oz CWM glass	Frozen within 48 hours of collection, 14 days until analysis.
	Groundwater		One per 20 primary groundwater samples	TCL VOCs plus TICs (Methods 5030B/ 8260B)	Two 40 ml glass VOA vials with HCL	14 days

Notes:

MS/MSD = Matrix spike/matrix spike duplicate
VOCs = Volatile organic compounds
MEOH = Methanol
HCL = Hydrochloric acid
TCL = Target Compound List
TICs = Tentatively-identified compounds

- The NYSDEC's Class GA Ambient Water Quality Standards, which are used to evaluate the groundwater chemical analytical results;

- The 6 NYCRR Subpart 375-6 Remedial Program Soil Cleanup Objectives, which are used to evaluate soil sample results;

- The 6 NYCRR Parts 370, 371, and 372 regulations for hazardous waste management, which are used to guide hazardous waste characterization and disposal;

- The NYSDOH *Final Guidance for Evacuating Soil Vapor Intrusion in the State of New York (October 2006); and*

- The NYSDEC Division of Air Resources (DAR-1) *Guidelines for the Control of Toxic Ambient Air Contaminants (November 1997,October 2010)*

For the remedial construction and sampling work the SCGs pertaining to air will be applicable. Previous testing conducted during the Remedial Investigation (RI) at the Site has not identified any PCE-impacted soil that exceeds SCGs. Hazardous waste is also not anticipated to be encountered. However, in the event that impacted soil and/or hazardous waste is identified during remedial work, then the SCGs pertaining to soil and/or hazardous waste will be applicable. Groundwater sampling will not be conducted during the remedial program and the groundwater monitoring wells are scheduled to be abandoned. Therefore, the SCGs pertaining to groundwater are not anticipated to be needed during the remedial program.

C.3 Quality Assurance/Quality Control Procedures

QA/QC procedures will be utilized during the performance of the remedial construction and sampling work to ensure that the resulting chemical analytical data accurately represent the condition of the sampled matrix. The following sections include descriptions of the QA/QC procedures to be utilized.

➢ Equipment Decontamination Procedures

Any non-disposable subsurface equipment (i.e., vapor implants), if used during intrusive sampling activities, will be decontaminated by washing in a potable water and Alconox solution and rinsing in potable water prior to use at each location to reduce the potential for cross contamination. All sampling equipment will be either dedicated disposable equipment or will be decontaminated prior to use at each location. The decontamination procedures utilized for all non-disposable sampling equipment will be as follows:

1. The equipment will be scrubbed in a bath of potable water and low-phosphate detergent followed by a potable water rinse;

2. The equipment will be rinsed with distilled water; and

3. The equipment will be allowed to air dry, if feasible, and wrapped in aluminum foil (shiny side out) for storage and transportation.

- QA/QC Samples

If in-situ matrix (soil, groundwater, soil vapor or indoor air) sampling becomes necessary, then QA/QC samples will be collected during in-situ matrix sampling activities to evaluate the potential for field or laboratory contamination and to evaluate the laboratory's analytical precision and accuracy. A sampling chart showing the number and types of primary samples, analytical methods, and QA/QC samples was presented on Table C.1. The specific types of QA/QC samples to be collected are described below.

Although soil or groundwater sampling are not planned to be conducted during remedial construction activities, in the event that soil or groundwater sampling become necessary then decontamination procedures will be evaluated by the use of equipment blank samples. These samples consist of aliquots of laboratory-supplied water that are poured over or through the dedicated or decontaminated sampling equipment and then submitted to the laboratory for analysis. An equipment blank sample will be prepared for each day that soil or groundwater sampling is conducted at the Site and will be analyzed for the same analytes as the soil or groundwater samples collected that day. The equipment blanks will be labeled in a manner to prevent identification by the analytical laboratory.

Trip blank samples will be utilized to evaluate the potential for VOC cross-contamination between in-situ matrix samples in the same cooler or shipping container. Trip blank samples consist of laboratory-provided containers filled with laboratory water or laboratory air that are sealed in sample containers at the laboratory and that are transported to and in the field with the other sample containers. A trip blank will be shipped with each group of in-situ matrix samples (soil, groundwater, and/or soil vapor/indoor air) and will be managed in the field and analyzed in the laboratory in the same manner as the primary environmental samples.

Blind duplicate samples will be obtained at a frequency of at least one per every 20 in-situ matrix samples and will be used to attest to the precision of the laboratory. A blind duplicate consists of a separate aliquot of sample collected at the same time, in the same manner, and analyzed for the same parameters as the primary environmental sample. The blind duplicate samples are labeled in a manner such that they cannot be identified by the laboratory. The sample results are compared to those of the primary environmental sample to evaluate laboratory analytical precision.

Matrix spike/matrix spike duplicate (MS/MSD) samples will be collected at a frequency of one per 20 in-situ matrix soil or groundwater samples. The purpose of the MS/MSD samples is to confirm the accuracy and precision of laboratory results based on a particular matrix. The MS/MSD results will be evaluated during the preparation of the DUSRs, as discussed below.

- Chain-of-Custody Procedures

For each day of sampling, chain-of-custody (COC) sheets will be completed and submitted to the laboratory with the samples collected that day. A copy of each COC sheet will be retained by the FPM QEP for sample tracking purposes. Each COC sheet will include the project name, the sampler's signature, the sampling locations and intervals, and the analytical parameters requested.

- Data Usability Summary Reports

All chemical analytical results will be evaluated using the sample data packages, sample data summary packages, and case narratives provided by the analytical laboratory. The data evaluation will be performed to verify that the analytical results are of sufficient quality to be relied upon to assess the potential presence of contaminants in the groundwater, soil vapor, indoor air, and/or soil samples. A DUSR will be prepared for each data package containing in-situ matrix samples following the "Guidance for the Development of Data Usability Summary Reports" provided by the NYSDEC (Appendix 2B of DER-10). The resume of the anticipated DUSR preparer, Richard Baldwin, CPG, who is independent from this project is included in Attachment 2.

C.4 Sample Analysis

All samples will be submitted to NYSDOH ELAP-certified laboratories. The anticipated laboratory for SSDS emissions samples is York Analytical Laboratories, Inc. of Stratford, Connecticut. The anticipated analytical laboratory for in-situ matrix soil vapor and indoor air samples (if collected) is Centek Laboratories of Syracuse, New York. The anticipated analytical laboratory for in-situ matrix soil and groundwater samples (if collected) is Alpha Analytical of Westborough, Massachusetts. Analytical data will be provided by the laboratories in electronic format, in accordance with DER-10, Section 1.15.

SSDS emissions samples will be analyzed for VOCs using Method TO-15. The preparation and analytical methods used will be as per the NYS ASP with Category A-equivalent (report-only) deliverables. Sub-slab soil vapor and indoor/outdoor air samples, if collected, will be analyzed for VOCs using Method TO-15. Low-level analyses will be performed for the indoor air samples. Groundwater and soil samples, if collected, will be analyzed for VOCs using Method 8260B. The analytical methods used will be as per the NYS ASP with Category B-equivalent deliverables. EDDs will be prepared and uploaded into the NYSDEC's environmental information management system.

C.5 Data Evaluation

The data collected will be assembled, reviewed, and evaluated following each sampling round. The SSDS emissions samples will be used to assess compliance with NYSDEC's Division of Air Resources (DAR-1) *Guidelines for the Control of Toxic Ambient Air Contaminants.* The soil vapor and indoor air samples, if collected, will be used to assess the potential for soil vapor intrusion. The soil and groundwater samples, if collected, will be used to assess the nature and extent of residual VOC impacts.

C.6 Project Organization

The Project Manager and field supervisor for this project will be Ben Cancemi, CPG. Mr. Cancemi will also serve as the health and safety officer. The Project Coordinator and QA/QC officer will be Stephanie Davis, Senior Hydrogeologist. Resumes for project personnel are included in Attachment 1. Subcontracted services will include remedial construction services (subcontractor to be determined), well abandonment services (subcontractor to be determined), and laboratory services (York Analytical Laboratories, Inc).

ATTACHMENT 1
RESUMES OF PROJECT PERSONNEL

Stephanie O. Davis, PG, CPG

FPM group — Engineering and Environmental Science

Ms. Davis has diversified experience in geology and hydrogeology. Her professional technical experience includes groundwater, soil, and soil vapor investigations, design and management of soil and groundwater remediation projects, design and installation of groundwater containment systems, design and evaluation of soil vapor mitigation systems, groundwater flow modeling, aquifer testing and interpretation, evaluation of site compliance with environmental regulations, environmental permitting, and personnel training. Ms. Davis presently manages several large-scale investigation and remedial programs, including program scopes, budgets, staffing, and schedules.

Functional Role	Title	Years of Experience
Senior Project Manager	Corporate Vice President	30+

Personal Data

Education

M.S./1984/Geology/University of Southern California
B.S./1981/Geology/Bucknell University

Registration and Certifications

Certified Professional Geologist #9487, (AIPG) 1995
California Registered Geologist #5192, 1991
Pennsylvania Registered Geologist #PG-000529-G, 1994
OSHA – Approved 40 hour Health and Safety Training Course (1990)
OSHA - Approved 8 hour Health and Safety Training Refresher Courses (1991-Present)
OSHA-Approved 8-hour Site Safety Supervisor Training Course (2008)
National Ground Water Association
Long Island Association of Professional Geologists
USEPA Triad Training for Practitioners

Employment History

1993-Present	FPM Group
1992-1993	Chevron Research and Technology Co.
1990-1992	Chevron Manufacturing Co.
1984-1990	Chevron Exploration, Land, and Production Company

Continuing Education

- Treatment of Contaminated Soil and Rock
- Groundwater Pollution and Hydrology
- Environmental Law and Regulation
- Remedial Engineering
- Soil and Foundation Engineering
- Environmental Geochemistry
- Project Management Professional (PMP) training

Detailed Experience

Site Investigations

- **Program Manager** for ongoing investigation and remedial projects at several New York State Inactive Hazardous Waste Disposal sites, Voluntary Cleanup Program (VCP) sites, and Brownfield Cleanup Program (BCP) sites. Investigations have included site characterization, Remedial Investigations/Feasibility Studies (RI/FS), and Resource Conservation and Recovery Act (RCRA) facility investigations and closures. Remedial services have included contaminated soil removal; ORC and HRC injections; design, installation, and operation of air sparge/soil vapor extraction (AS/SVE) systems and sub-slab depressurization systems (SSDS), capping, and other remedial services.
- **Program Manager, NYS BCP Site, Far Rockaway, NY.** Managed all aspects of pre-application investigation, BCP application, RI Work Plan development, and Citizen Participation Plan (CPP) for a chlorinated solvent site. Responsible for scope development, NYSDEC and NYSDOH coordination, budget, schedule, staffing, and report management.
- **Program Manager, Site Characterization (SC) for NYS Inactive Hazardous Waste Disposal Site, Flushing, NY.** Responsible for SC scope development, budget, schedule, SC Work Plan and report review, staffing, and agency negotiations for a chlorinated solvent site undergoing residential redevelopment.
- **Program Manager** for all Phase I ESA, Phase II investigations, and remediation projects for a major commercial developer on Long Island, New York. Projects have included environmental services associated for the purchase and redevelopment of office buildings, aerospace facilities, former research and development facilities, and large manufacturing plants. Remedial services have included RCRA closures, UIC closures, tank removals, and BCP projects.

- **Program Manager, Remedial Investigation/ Feasibility Study (RI/FS), Levittown, NY.** Managed all aspects of RI/FS for a Class 2 Inactive Hazardous Waste Disposal (Superfund) site involving chlorinated solvents. Responsibilities included RI/FS scope, budget and schedule development, RI/FS work plan, HASP, CAMP, and QAPP, coordination with client, tenants, and regulatory agencies, report review, remedial approach development, and conceptual design.
- **Project Manager, RCRA Facilities Investigation (RFI), Barksdale AFB, LA, AFCEE**. Responsible for all aspects of field program planning, solicitation and selection of subcontractors, mobilization and establishment of a field office, supervising multiple field crews, installation and sampling of monitoring wells, collection and soil samples, data tracking and management and preparation of an RFI report. The scope of work included characterization of the nature and extent of groundwater and soil contamination at thirteen Solid Waste Management Units (SWMUs), performing a base-wide evaluation of background contaminant concentrations, and developing a long-term monitoring (LTM) program for the base.
- **Field Services Manager, UST Investigation, Plattsburgh AFB, NY, AFCEE**. Responsible for field crew training, coordination of sampling crews at multiple sites, sample labeling, handling, tracking, and shipping, field data management and remote field office management. The scope of work included collection of over 450 groundwater samples to characterize groundwater conditions in the vicinity of 150 USTs using a Geoprobe sampling rig, well points, and rapid turnaround-time analysis.
- **Project Manager** for site investigation activities, including soil vapor sampling, soil sampling and analysis, groundwater sampling and analysis, and geotechnical evaluation for numerous sites in Suffolk County, New York. The resulting data were utilized by a major supermarket company in the negotiations for the purchase of the properties and in the property remediation prior to development.
- **Project Manager, Site Investigation, Bronx, NY, NYCT.** Managed field sampling and data analysis activities, including soil vapor analysis, soil sample analysis, and groundwater sampling and analysis at an active commercial bus terminal. Made recommendations for site remediation, including UST removal, soil excavation and disposal, and free-phase product extraction.
- **Project Manager, RCRA Facilities Investigation, City of Richmond, CA**. Prepared RFI work plan, incorporating existing geologic, chemical, and historical data, evaluating newly-acquired site data, and developing recommendations for further investigation and remedial action at a former municipal landfill.
- **Project Manager, Site Investigation, Bay Shore, NY. Manufacturing facility.** Managed onsite and offsite soil and groundwater sampling program. Compiled and evaluated data and prepared a comprehensive report of the investigation results for the Suffolk County Department of Health Services (SCDHS) and NYS Department of Environmental Conservation (NYSDEC). Proposed remediation technologies for onsite soil contamination and onsite and offsite groundwater contamination.
- **Project Manager, Site Investigation, Newark Airport, NJ, FAA.** Managed and conducted a soil and groundwater sampling program adjacent to Runway 29. Analyzed chemical analytical data and developed recommendations.
- **Project Manager, Remedial Investigation, Richmond Refinery, CA.** Supervised and conducted drilling, soil sampling, cone penetrometer testing, and well installation at a refinery process water effluent treatment system and former municipal landfill.
- **Senior Hydrogeologist, multiple sites, NY metro area**. Supervised drilling, installation, development, and sampling of monitoring wells at numerous sites in the greater New York metro area. Utilized resulting stratigraphic, hydrologic, and chemical analytical data to evaluate site conditions.
- **Program Manager, multiple sites, major New York Metro area automobile dealer.** Managed all investigation and remedial activities for a major automobile retailer with multiple facilities. Sites included tanks, petroleum spills, underground injection control (UIC) systems, soil vapor intrusion issues, and hazardous waste management. Responsible for work scope and budget preparation, staffing and oversight, client and regulatory agency interactions, addressing insurance issues, reporting and certification, and project closeouts.
- **Program Manager, SWTP groundwater monitoring program, Town of East Hampton.** Managed groundwater sampling and reporting for the Scavenger Waste Treatment Plant (SWTP). Responsibilities included oversight of well installation, purging and sampling the SWTP groundwater monitoring wells, and providing data to the Town for reporting purposes.

Remediation

- **Program Manager, NYSDEC BCP site, NY City, major real estate developer.** In responsible charge of all investigation and remedial activities at a NYSDEC BCP site in New York City. Prepared the Remedial Investigation and Remedial Work Plan; coordinated with the owner, other contractors, and the NYSDEC; prepared for and conducted citizen participation activities; supervised all waste characterization, profile preparation, and waste management; developed the Final Engineering Report (FER) and Site Management Plan (SMP) for NYSDEC approval; and ensured that all remedial requirements were met such that the Certificate of Completion (COC) was issued. Continuing activities include coordination of the ongoing site management, communications with the NYSDEC and NYSDOH, and preparation of the annual Certification Report.
- **Program Manager, Major Oil Storage Facility (MOSF) closure, Glen Harbor, NY. Real estate developer.** Responsibilities included coordination of the work scope with the NYSDEC and NCDOH, development of work plans for tanks, UIC, and petroleum spill closure, budget and schedule development, staffing and oversight, reporting and certification, and closeout of all environmental issues such that residential redevelopment could proceed.
- **Program Manager, Delineation and Remedial Services, NYS Spill Site, St. James, NY.** Responsible for client and agency coordination, budget, schedule, staffing, remedial design and reporting for a petroleum release at a Service Station property with offsite impacts.
- **Program Manager, RCRA Closure Site, Freeport, NY.** Managed all aspects of RCRA Closure of a former printing facility, including scope, budget and schedule development, Closure Plan, NYSDEC interactions, QAPP, and specifications for contractor services.
- **Program Manager, Sub-slab depressurization system (SSDS), Brooklyn, NY.** Managed all aspects of SSDS implementation, including delineation sampling, remedial design, budget and schedule, construction services testing, reporting, and O&M manual development for a former dry cleaner site in an active shopping center.
- **Program Manager, SSDS, Bronx, NY.** Responsible for all aspects of SSDS implementation for a former dry cleaner site in a mixed-use building, including delineation sampling, SSDS design, construction contractor services, testing, reporting, and O&M manual development.
- **Project Manager, Soil Remediation, Hauppauge, NY. Metal plating facility.** Planned remedial project and managed contractor support for soil remediation. Project was completed and approved by SCDHS.
- **Remedial Design, AS/SVE projects.** Developed pilot test plans, evaluated pilot test results, and prepared conceptual designs for several air sparge/soil vapor extraction (AS/SVE) systems to treat petroleum and/or chlorinated solvent VOCs. These systems were subsequently installed and Ms. Davis provides ongoing review of system operations and remedial monitoring results.
- **Program Manager, Waste soil management, Brooklyn, NY. Travelers Insurance.** In responsible charge of several task orders for waste characterization of a 90,000-cy construction soil stockpile at a municipal sewer facility. Responsibilities included development and implementation of Sampling and Analysis Plans (SAP), coordination of staffing, review of lab data, preparation of Field Sampling Summary Reports (FSSR), coordination with disposal facilities, and preparation of waste profiles.
- **Program Manager, NYS Inactive Hazardous Waste Disposal (Superfund) site, Hicksville, NY. Property owner.** Responsibilities included developing and implementing pre-demolition investigations, developing and implementing remedial actions (source removal) in conjunction with retail redevelopment, conceptual design and installation of sub-slab depressurization systems (SSDSs), maintaining ongoing OM&M programs.
- **Project Manager, Remedial projects, Patchogue, NY. US Tape.** Designed and performed indoor underground storage tank abandonment program, leaching pool remediation plan, and managed contractor support for closure activities at a manufacturing facility. SCDHS provided oversight and approval.
- **Senior Hydrogeologist, Remedial design for a landfill, Richmond, CA.** Contributed to the design of a groundwater containment and remediation system for a former municipal landfill, including subsurface groundwater barrier walls and extraction wells.
- **Project Manager, Soil remediation, Carle Place, NY, Kimco.** Designed remedial plan and supervised soil remediation activities at an active construction site involving excavation and disposal of 5,000 tons of PCB-, metal-, and petroleum-contaminated soil. NYSDEC oversaw and approved the completed remediation.

- **Project Manager, Groundwater containment system, Richmond, CA**. Coordinated technical aspects of groundwater barrier wall construction, including routing, permitting, design, material selection, and field activities.
- **Project Manager, Multiple UIC investigations and closures, Suffolk and Nassau Counties, NY** Responsible for investigation and remediation of contaminated cesspool and stormwater drain pool in systems. Fully conversant with SCDHS SOP 9-95 and USEPA UIC regulations for investigation and cleanup of leaching pool systems, including Action Levels and Cleanup Standards, groundwater monitoring criteria, and remedial requirements.
- **Project Coordinator, UIC Closure, Hempstead, NY.** Coordinated and supervised all aspects of waste management for a UIC closure, including disposal facility review, waste sampling and classification, manifesting, project closeout, and taxation issues.

Hydrogeologic Evaluations

- **Project Manager, well permitting, East Hampton, NY. Private client**. Prepared Engineer's Report for Long Island Well Permit for a 230-gpm irrigation supply well. Responsible for evaluation of well interference, salt water upcoming, impacts from contaminants, and other factors affecting the proposed well. Performed well design (gravel pack size, screen size, etc.) for numerous groundwater wells on Long Island. Familiar with sieve analyses, well construction and development methods.
- **Senior Hydrogeologist, groundwater modeling, East Hampton,** NY. Utilized Visual Modflow to evaluate the impact of a contaminant plume on a proposed SCWA wellfield. Model development included evaluation of recharge, aquifer properties, subsurface stratigraphy, boundary conditions, plume source and concentration, and various wellfield locations and pumping rates.
- **Hydrogeologist, aquifer testing, Manhattan, NY. NYCT.** Participated in a multi-day, multi-well aquifer pumping test for NYCT. Responsible for operating and maintaining data logging equipment, coordinating manual water level measurements, and analyzing resulting drawdown data.
- **Hydrogeologist, aquifer evaluation, Brooklyn, NY. NYCT.** Evaluated subsurface geologic conditions for subway site utilizing existing boring logs, topographic, and historic map data.
- **Hydrogeologist, aquifer testing, Queens, NY. NYCT**. Performed slug tests on monitoring wells at an East Side Access site, and evaluated hydrologic properties using the HYDROLOGIC ISOAQX computer program.
- **Hydrogeologist, remedial wells, Deer Park, NY. USEPA.** Supervised drilling, installation and development of groundwater extraction, injection, and monitoring wells at a Superfund site. Interpreted aquifer and well performance from development data and recommended modification of drilling and development procedures.
- **Hydrogeologist, aquifer testing, NYC, NYCT**. Performed aquifer pumping and slug tests and evaluated hydrologic properties using the computer program AQTESOLV.

  Hydrogeologist, aquifer evaluation, Mattituck Airport, Mattituck, NY. Performed water level and water quality monitoring at a NYSDEC Superfund site. Constructed groundwater elevation contour maps and utilized chemical analytical data to predict contaminant plume migration.
- **Senior Hydrogeologist, DEIS services, Lazy Point, NY. Town of East Hampton**. Prepared a detailed evaluation of groundwater conditions and potential impacts for a water extension to Lazy Point for a draft Environmental Impact Statement (DEIS). Evaluated current and historic groundwater data and analytical models to determine potential impacts for both Lazy Point and the drinking water source area and prepared associated portions of the DEIS.

Landfills

- **Program Manager, Greenhouse gas monitoring program, Town of Islip, NY**. Responsibilities include scope and budget management, staffing, client and USEPA coordination, reporting review, and troubleshooting.
- **Project Manager, Landfill Closure Investigations, Town of East Hampton, NY**. Prepared Closure Investigation work plans, including Hydrogeologic investigations, methane investigations, surface leachate investigations, and vector investigations. Prepared final Closure Investigation Reports, approved by the NYSDEC.
- **Project Manager, Landfill monitoring networks, Town of East Hampton, NY.** Supervised installation of groundwater and methane monitoring wells at the landfills, including hollow-stern auger and mud-rotary well installations, split-spoon soil sampling and boring log preparation, oversight and interpretation of wireline electric logging, and completion of initial baseline monitoring events.

- **Hydrogeologist, Landfill groundwater monitoring, NJ, private client.** Performed groundwater sampling at a radio tower facility constructed on a landfill. Analyzed results and made recommendations.
- **Hydrogeologist, Landfill gas monitoring, Town of East Hampton, NY.** Conducted methane monitoring at two landfills over a multi-year period.
- **Program Manager, Landfill monitoring programs, Town of East Hampton, NY.** Supervises ongoing groundwater and methane monitoring programs, including field team coordination, communications with the Town, report scheduling, data review, and report review prior to distribution to the client and NYSDEC. Negotiated successfully with NYSDEC for reduced monitoring frequencies based on historic monitoring results.
- **Senior Hydrogeologist, Landfill plume modeling, Town of East Hampton, NY.** Conducted groundwater flow modeling to evaluate the nature and extent of a landfill plume and its fate. Findings were presented at public meetings and were used to determine the configuration of the landfill's groundwater monitoring network.
- **Hydrogeologist, Septage lagoon Superfund site, Town of East Hampton, NY.** Conducted sampling of former septage lagoons at a landfill. Evaluated the resulting data and prepared a delisting petition for this NYSDEC Superfund site.
- **Hydrogeologist, containment system modeling, Richmond, CA.** Used the FLOW PATH modeling program to predict groundwater flow directions and evaluate extraction well locations and pumping rates for a groundwater containment and remediation system at a former municipal landfill.
- **Program Manager, Landfill gas monitoring program, Town of Islip, NY.** Manages monthly methane monitoring for all landfills, including onsite and offsite monitoring wells, methane collection systems, and flare systems. Data is recorded electronically and downloaded to computer for formatting prior to expedited delivery to Town.
- **Program Manager, Landfill monitoring reporting program, Town of Smithtown, NY.** Supervised and reviewed production of quarterly and annual monitoring reports for all monitoring programs at the landfills for Town compliance with NYSDEC requirements, including tabulation and reporting of groundwater and methane monitoring data, solid waste and recycling collection data, yard waste composting operations, and landfill leachate collection and disposal data.
- **Program Manager, Landfill remediation, Town of Huntington, NY.** An historic landfill was removed from parkland under the NYSDEC's ERP. Responsibilities included work scope development, schedule and budget management, staffing, client and regulatory agency coordination and reporting, and report review and certification.

Environmental Data Analysis

Ms. Davis has participated in multiple sessions of environmental geochemistry training provided by environmental geochemists, including physical chemistry, thermodynamics, ionic interactions, complexation, biologic effects, and other basic principles. Training also included field sampling procedures and effects on chemical data, chemical analytical methods and equipment, and QA/QC procedures and interpretation. Attended periodic environmental chemistry training sessions hosted by environmental laboratories and participated in hands-on training in data and QA/QC evaluation.

- **Data Evaluation, multiple projects.** Reviewed and evaluated numerous soil, groundwater, product, indoor/ambient air, and soil vapor chemical analytical datasets, including evaluation of batch and site-specific QA/QC samples, laboratory narratives, comparison to regulatory agency criteria, historic data, and background data.
- **QAPPs, multiple projects.** Developed and implemented numerous QAPP, including QAPP design, sample delivery group (SDG) evaluations, sampling procedures and sequences, and QA/QC sample preparation/collection.
- **DUSR Preparation, multiple projects.** Prepared Data Usability Summary Reports (DUSRs) for numerous chemical analytical datasets for projects overseen by USEPA, NYSDEC and other regulatory agencies, including soil, groundwater, soil vapor, indoor air, and ambient air datasets.
- **Electronic Data Deliverables, multiple projects.** Implemented protocols and procedures for all FPM sites for which NYSDEC Electronic Data Deliverables (EDDs) are required. Responsibilities included staff training, data package QA/QC, client interactions, budget and schedule impact assessments, and dissemination of EDD training information.
- **Data Evaluation, multiple sites.** Performed forensic assessments of historic environmental chemical analytical data to resolve apparent discrepancies with modern data and other inconsistencies.

- **Leachate test assessments**. Assessed leachate test protocols and results to determine the most applicable methods to evaluate and develop soil cleanup objectives for non-regulated compounds.
- **Organic parameter breakdown assessments.** Interpreted numerous organic parameter datasets to evaluate breakdown sequences, likely original parameters, and rates of degradation.
- **Insitu remediation assessments, multiple sites**. Formulated numerous chemical treatment plans for insitu remediation, including assessment of contaminant concentrations and distribution, chemical processes and indicators, natural attenuation indicators, additional stociometric demands, and hydrogeologic factors.

Community Impacts

- **Community Monitoring Plans, multiple hazardous waste sites**. Developed Community Air Monitoring Plans (CAMP) for investigation and remediation projects, including monitoring procedures, action levels, and mitigation measures for odors, traffic, noise, dust, and/or vapors with the potential to affect surrounding communities. Each CAMP was reviewed and approved by the NYSDEC and NYSDOH and was implemented under agency oversight. Presented CAMP findings at numerous community meetings. Addressed community and agency questions and issues
- **Vector Assessments, multiple landfill sites, Long Island, NY**. Evaluated and implemented abatement for vectors (rodents, flies, and seagulls) in association with landfill closures, including inspection and reporting of vector populations, development of vector abatement plans, and assisting Town personnel with vector abatement.
- **Odor Abatement, NYSDEC BCP site, NYC, NY. Major real estate developer**. Developed and implemented an odor abatement plan for highly-odorous soil discovered during a remedial project. The site was surrounded by three public schools; complaints following discovery of odorous soil resulted in a job shutdown until the nuisance was abated. The odor abatement plan was prepared and implemented within 24 hours and involved immediate covering of the odorous soil followed by spot excavation and removal during non-school hours (night work) and the use of odor-controlling foam. The removal was completed within one week without further incident. The NYSDEC and NYSDOH approved the completed work, allowing the job to recommence.
- **Vector Assessment, transfer station, Town of East Hampton, NY**. Conducted inspections of intense fly infestations at a Town transfer station building to identify the locations and migration pathways of flies inside the building and to develop an abatement plan. This plan was successfully implemented and abated the nuisance flies.
- **Soil Vapor Intrusion Assessments, multiple sites**. Developed and implemented air and soil vapor investigations of residential and commercial properties, as approved by the NYSDEC/NYSDOH, to evaluate potential air quality impacts and determine if mitigation or monitoring was necessary. Monitoring/mitigation designs were developed for NYSDEC/NYSDOH approval.
- **CAMP Monitoring, multiple sites**. Conducted odor, dust, noise, and organic vapor monitoring in communities surrounding environmental sites. Data were collected and interpreted in accordance with NYSDEC and/or NYSDOH guidance and the results were submitted to these agencies together with recommendations for mitigation, if appropriate.
- **Project Manager, Environmental data assessment, Windmill Village, Town of East Hampton, NY.** Evaluated environmental data obtained during due diligence testing for a proposed housing development. Recommended additional sampling and confirmed the absence of impacts.

Expert Witness/Technical Services

- **Expert Witness/Technical Services, residential project, Glen Harbor, NY. Private client**. Provided expert witness and technical services regarding environmental conditions and remedial procedures for residential redevelopment of a former oil terminal, including preparing and obtaining NYSDEC and NCDOH approval of remedial work plans, preparing remedial cost estimates and schedules, and providing testimony at a public hearing before the Town Board from which a change of zone was requested. The proposed change of zone, although subject to considerable public opposition, was approved, allowing redevelopment and associated remediation of the property to move forward.

- **Expert Witness/Technical Services, petroleum spill site, Westbury, NY. Private client.** Provided expert witness and technical services to a petroleum company defending NYSDEC cost recovery claims for a petroleum spill. The spill site involved two very large petroleum releases at gasoline stations adjoining the defendant's property. Services provided included evaluating tank tests, groundwater, soil and soil vapor chemical analytical data, petroleum fingerprint data, remediation activities and costs. Prepared numerous detailed timelines of activities, large displays of site information and subsurface conditions, and cost allocation calculations. Conducted a detailed subsurface investigation to evaluate stratigraphic conditions.
- **Expert Technical Services, development site, Village of Larchmont, NY**. Assisted the Village in successfully opposing the construction of a very large superstore in the adjoining community, including evaluating previous environmental investigations, developing cost estimates and scopes of work for a full environmental site assessment, preparing scoping cost estimates for likely remediation scenarios, preparing technical documents in support of the Village's position, and making a presentation at a public hearing. The proposed project was subsequently withdrawn.
- **Expert Hydrogeologist Services, development site, Town of Carmel, NY**. Provided technical evaluation of a proposed water district. The proposed water district would impact existing residents due to limited available water supplies and likely impact on existing wells. The work included evaluation of aquifer pumping tests, determining impacts on nearby wells, assessment of likely increased water demand, preparation of supporting documents, and presentations at project hearings. The proposed project was subsequently conditionally approved by the NYSDEC with significant modifications to protect the water rights of existing residents.
- **Expert Technical Services, solvent plume site, Nassau County, NY. Private client**. Provided technical support to a property owner subject to a USEPA investigation as the potential source of a large chlorinated solvent plume, including evaluation of a plume-wide RI/FS, detailed review of property historic information, multiple meetings with the USEPA, client and counsel, and identification of additional potential source areas.
- **Expert Witness Affidavits, multiple projects**. Prepared affidavits regarding environmental conditions at client properties in support of pending legal actions, including landfill issues, wetlands and navigatable waterway issues, and petroleum spills.
- **Expert Technical Services, road construction projects, Westchester County, NY. Croton Watershed Clean Water Coalition**. Provided technical services to the CWCWC to assess impacts from proposed road construction projects on the Kensico Reservoir and other New York City water supply system facilities. This work included evaluating stormwater pollutant loading calculations, assessing impacts to wetlands, promoting application of more accurate stormwater runoff calculation methods, assessing proposed stormwater management techniques, presenting at public meetings, preparing technical statements for submittal to regulatory agencies, and participating in the NYSDOT SWPPP Guidance committee

Health and Safety

- **Health and safety monitoring, multiple sites**. Implemented HASP monitoring at investigation and remediation sites during intrusive activities, including calibration and operation of photoionization detector (PID) and flame ionization detector (FID) for organic vapors and combustible gas indicator (CGI) for methane. Compared results to applicable action levels and implemented protective measures as necessary.
- **CAMP monitoring, multiple sites**. Performed community monitoring, including monitoring for noise, particulates (dust), and organic vapors. Recorded observations and compared to applicable action levels. Calibrated and operated noise meters, particulate monitors, and PID/FID.
- **Radiation screening, multiple sites**. Performed screening for radiation at select sites, including operating Geiger counter in different radiation modes and obtaining background readings.

Miscellaneous Projects

- **Phase I ESAs**. Performed numerous Phase I Site Assessments for residential and industrial sites in the metropolitan New York area.
- **Environmental Trainer.** Conducted aquifer pumping and soil vapor extraction test training. Instructed classes for site investigation methods, aquifer pumping test analysis, and risk assessment.

- **Project Management**. Performs a wide range of project management functions, including development and management of project budgets and schedules, coordination of field and office staffing, document preparation, review, editing, and interaction with clients, regulatory, legal, real estate, consultant, and compliance personnel.
- **Field Mapping Studies**. Organized, supervised, and conducted field mapping studies in Alaska.
- **Downhole Logging**. Directed petroleum well site geophysical logging operations and interpreted geophysical well logs.
- **Geophysical Data Interpretation**. Processed and interpreted seismic reflection data and constructed seismic velocity models.
- **Regulatory Evaluations**. Assisted and reviewed regulator's revision of proposed risk assessment-based UST cleanup guidelines. Reviewed proposed USEPA NPDES permits for remediation system effluent.
- **Geologic Mapping**. Constructed and interpreted structural and stratigraphic cross sections, and structure contour, fault surface, isochore, and isopach maps.

Regulatory Compliance

- **Site Audits**. Has conducted numerous site audits for regulatory compliance, particularly with respect to Resource Conservation and Recovery Act (RCRA), Comprehensive Environmental Responsibility and Liability Act (CERCLA), the Clean Water Act (CWA) and Clean Air Act (CAA).
- **RCRA compliance audits.** Conducted inspections and reporting regarding underground and aboveground storage tanks (USTs and ASTs), hazardous waste storage facilities, waste management and reporting requirements, and hazardous waste storage area closures in compliance with RCRA.
- **CERCLA Compliance**. Oversees and coordinates environmental site assessments (ESAs) for compliance with CERCLA requirements for a wide variety of facilities including operating and historic industrial sites manufacturing plants, abandoned facilities, and multi-property Brownfield sites.
- **Superfund Sites**. Managed multiple investigation and remedial projects at state and federal Superfund sites. Is very familiar with all phases of CERCLA projects including PA/SI, RI, FS, RD and RA. Has overseen activities at many Superfund sites from investigation through closure.
- **CWA Projects.** Conducted investigation and remediation of Class V underground injection control (UIC) Systems, investigation and acquisition of UIC discharge permits, and discharges into surface water bodies.
- **CAA Compliance Projects**. Conducted facility investigations for emissions sources, including paint booths, fume hoods, process discharges and other point sources. Sampled and evaluated remediation system discharges for CAA compliance, recommended emissions treatment when required.

Representative DOD Projects

- **Barksdale RFI, Barksdale AFB, LA, $520K-**Lead Geologist for RFI for multiple Base-wide sites at Barksdale AFB, including landfills, petroleum spills, fire training areas, sewage treatment plans, and chemical spills. Managed field crews and sampling of soil, groundwater, and waste, performed sample and waste management, and coordinated with Base representatives. Prepared RFI Report, including analytical data reports, CS, and recommendations.
- **Barksdale LTM Program, Barksdale AFB, LA, $1.7M-**Lead Geologist for LTM Program for Base-wide Barksdale groundwater, including landfills, petroleum spills, fire training areas, sewage treatment plants, and chemical spills. Supervised field crews, managed samples and waste, prepared LTM Reports and made recommendations for LTM optimization.
- **Site Characterization, Plattsburgh AFB, NY, $720K-**Field Team Leader for SC investigation of fuel oil USTs and petroleum spills at Base housing, officers' quarters, and support building prior to transition of these areas to other uses. Working for AFCEE, developed and conducted an SC for over 200 USTs, including soil and groundwater sampling to identify petroleum contamination. Supervised several field crews in an accelerated sampling program to complete the SC prior to winter conditions. Prepared SC Report submitted to and approved by the NYSDEC.

MGP Site Experience

- **Field Sampling Services. Soil Investigation, Brooklyn Union Greenpoint MGP site**. Conducted soil sampling and screening activities during tank removal activities at this former MGP facility. Tasks included visual observations, screening with a calibrated PID, soil sampling, interfacing with the client, subcontractors and NYSDEC personnel, and report preparation.

- **Program Manager. Soil Vapor Intrusion Investigation and Mitigation, Brooklyn MGP site**. Developed and implemented a soil vapor intrusion (SVI) investigation following the discovery of chlorinated solvents in soil vapor beneath a shopping center constructed on an MGP site. Managed all scheduling, budget and contract issues. Reviewed results and developed an SVI mitigation plan to address the chlorinated solvent vapors. Oversaw design and installation of a sub-slab depressurization system (SSDS) to address SVI. This work was completed on time and within budget.
- **Field Team Supervisor. Soil Remediation, Brooklyn Union Coney Island MGP site**. Responsible for coordinating all field activities associated with segregation and removal of lead-paint impacted soil from MGP waste at this NYSDEC-listed MGP site. Conducted pre-excavation waste characterization, implemented HASP, oversaw subcontractor and FPM staff, coordinated with client and NYSDEC, managed waste manifesting, conducted community air monitoring, and prepared remediation report.

Ben T. Cancemi, CPG

FPM group — Engineering and Environmental Science

Mr. Cancemi has diversified experience in geology and hydrogeology. His professional experience includes groundwater and soil investigations, design and management of soil remediation projects, installation and maintenance of groundwater containment and remediation systems, aquifer testing and interpretation, geotechnical studies, evaluation of site compliance with environmental regulations and environmental permitting.

Functional Role	Title	Years of Experience
Senior Hydrogeologist	Department Manager - Hydrogeology	18

Personal Data

Education
M.S./2001/Hydrogeology/SUNY Stony Brook
B.S./1995/Geology/SUNY Stony Brook

Registration and Certifications
Certified Professional Geologist – American Institute of Professional Geologists
OSHA 40-hour HAZWOPER and Current 8-hour Health and Safety Training and Current Annual Physical
OSHA 8-hour HAZWOPER Supervisor
OSHA 10-hour Construction Safety and Health
OSHA Permit-Required Confined Space Training
Long Island Geologists
National Groundwater Association
MTA NYC Transit Track Safety Certification

Employment History

2001-Present	FPM Group
1998-2001	Burns & McDonnell Engineering Company
1997-1998	Groundwater and Environmental Services
1996-1997	Advanced Cleanup Technologies

Detailed Experience

MGP Site Experience:

- **Field Team Leader, Property Transfer of MGP sites**. Conducted soil and groundwater sampling at several Nicor MGP sites in Illinois prior to property transfer to Con Edison. Coordinated sampling crews, oversaw sampling and sample management, and implemented HASP monitoring.
- **Project Manager, Geophysical Investigation at Brooklyn Union Greenpoint MGP site**. Developed and implemented a geophysical investigation at an MGP site that was subject to differential settlement. Coordinated with client and subcontractors, oversaw survey activities, implemented HASP, interpreted results, and prepared a report to document the completed work.

Hydrogeologic Evaluations

- Performed constant head hydraulic conductivity (packer) testing in boreholes located in fractured bedrock in lower Manhattan, NY to evaluate fracture connectivity with the nearby Hudson and East Rivers and determine hydraulic conductivity and related parameters such that water management procedures could be implemented for redevelopment of the New South Ferry Subway Station.
- Coordinated and performed a hydrogeologic investigation, including utility clearing, soil borings, rock coring, packer testing, aquifer pumping testing, data collection, and interpretation, to evaluate subsurface conditions and determine geologic parameters for a proposed subway extension of the NYC Transit No.7 Subway Line.
- Performed aquifer pumping and slug tests and evaluated hydrologic properties using the computer program AQTESOLV.

Site Investigations/Groundwater Monitoring

- Coordinated and performed an investigation at a vacant commercial property Far Rockaway, NY, including soil, groundwater and soil vapor sampling to assess onsite chlorinated solvent impacts from an adjoining offsite source.
- Coordinated and performed soil and groundwater sampling and soil vapor studies at several aerospace manufacturing facilities on Long Island, NY. Assessments included an evaluation of past manufacturing and facility operations, storage and use of solvents, petroleum and manufacturing-derived wastes, and impacts to soils, soil vapor, and groundwater. Areas of concern were identified for further evaluation and/or corrective action.
- Coordinated and performed long term groundwater monitoring at two closed Town of East Hampton, NY municipal landfills, including the sampling a multi-depth monitoring well network, analysis and interpretation of analytical and hydrogeologic data, and regulatory reporting

in accordance with NYSDEC Part 360 requirements.

- Coordinated and performed soil and groundwater investigations at various agricultural and horticultural properties to evaluate impacts of past herbicide and pesticide usage on the underlying soil and groundwater.
- Managed and performed routine methane monitoring at two Town of East Hampton landfills for compliance with NYSDEC requirements and to evaluate potential offsite migration to the surrounding community. Monitored indoor air with a flame ionization detector (FID) to evaluate impacts to buildings.
- Assisted with groundwater flow modeling for the Springs-Fireplace Road Landfill to evaluate the nature and extent of the landfill plume, its likely downgradient extent, and its fate.
- Coordinated and performed onsite and offsite monitoring at petroleum release sites on Long Island, the New York metropolitan area, and in Westchester County in accordance with NYSDEC Spill program requirements. The monitoring programs generally included sampling multi-depth monitoring well networks utilizing low-flow sampling techniques, analysis/interpretation of analytical and hydrogeologic data, and regulatory reporting.
- Coordinated a soil and groundwater sampling program to evaluate environmental conditions at Terminal A, Logan International Airport, East Boston, Massachusetts. The program included an assessment of the current fuel hydrant system and other locations of potential environmental concern using non-destructive air vacuum extraction-clearing techniques combined with direct-push sampling.
- Managed and performed a soil and groundwater investigation, a remedial soil excavation, and groundwater monitoring at a pyrotechnics manufacturing facility in Suffolk County, NY. The work was performed under the direction of the Suffolk County Department of Health Services (SCDHS) to investigate and remediate contamination from historic use of perchlorate-containing materials at the facility.
- Coordinated and performed soil and groundwater investigations at several automobile dealerships in Westchester County, NY to evaluate potential impacts from petroleum and chemical solvent storage and usage and onsite waste water disposal systems.

Phase I Environmental Site Assessments

- Performed numerous Phase I Environmental Site Assessments (ESAs) for commercial and industrial properties throughout the Northeastern United States for various clients including trucking companies, major airlines, telecommunication companies, chemical/ petroleum storage facilities, aerospace manufacturing facilities, machine shops, retail shopping centers, auto dealerships and service stations.

Remediation

- Managed remedial activities at a NY State Environmental Restoration Program (ERP) Site situated at a former hospital landfill in Northport, NY. Responsibilities contractor management and oversight, soil disposal management, confirmatory testing, data review, and preparation of a final engineering report to document remedial activities.
- Performed pilot testing, design, installation and procurement of numerous multi-depth soil vapor extraction (SVE) and air sparge (AS) remediation systems on Long Island and in the NYC metropolitan area to remediate chlorinated solvents and petroleum. Conducted remediation system operation and maintenance, and evaluations of system performance.
- Performed numerous storm water and sanitary leaching structure (UIC) cleanouts utilizing excavation and/or vacuum assisted equipment to remove contaminated sediments and liquids. Conducted waste characterization and profiling, pipe camera surveys, and structure locating utilizing water-soluble dyes and electronic locating equipment.
- Designed and oversaw the installation of a sub-slab depressurization system (SSDS) in the Bronx, NY to mitigate chlorinated solvent impacts. SSDS monitoring was conducted to ensure proper operation and emissions compliance of with NYSDEC air discharge guidelines.
- Operated and maintained remediation systems, including SVE, groundwater pump and treat, AS, dual-phase extraction, SSDS and free-phase petroleum recovery systems.

Health and Safety

- Performed health and safety monitoring at investigation and remediation sites during intrusive activities. Calibrated and operated photoionization detectors (PID) and flame-ionization detectors (FID) for organic vapors and combustible gas indicators (CGI) for methane. Compared results to applicable action levels and took preventative/protective measures as necessary.
- Performed community monitoring, including monitoring for noise, particulates (dust), and organic vapors. Recorded observations and compared to applicable action levels. Calibrated and operated noise meters, particulate monitors, and PID/FID.
- Prepared community air monitoring and health and safety plans for several NYSDEC inactive hazardous waste, brownfield cleanup program, volunteer cleanup program, petroleum spill, and NYC e-designation program sites.
- Performed screening for radiation at select sites. Operated Geiger counter in different radiation modes and obtained and evaluated background readings.

Other

- Coordinated RCRA closure activities and performed confirmatory sampling at a former package manufacturing facility in Garden City, NY. Project duties included contractor procurement, rinsate and soil sampling, and regulatory agency reporting and coordination.
- Prepared a remedial design (RD) work plan for a former hospital landfill on Long Island. The RD work plan included a summary of past investigations, a materials management plan for the excavation and disposal of contaminated soils and debris, a post-excavation sampling plan, a site restoration plan, community air monitoring plan (CAMP), health and safety plan (HASP) and a quality assurance and quality control (QA/QC) plan.
- Managed and performed monthly soil gas sampling and quarterly indoor air quality sampling at an elementary school in southwestern Nassau County, NY. The monitoring and related reporting were performed to ensure that a gasoline groundwater plume migrating through the school property was not impacting the school occupants.
- Performed compliance inspections to assess issues of potential environmental concern at manufacturing, aviation, trucking, retail and not-for-profit facilities.
- Managed and performed methane monitoring at two eastern Long Island landfills to evaluate potential offsite impacts, indoor air quality, and methane generation and migration.
- Managed and coordinated a petroleum spill investigation to evaluate the nature and extent of a fuel oil release at an office building in White Plains, NY. The investigation included excavation and removal of a 5,000-gallon situated over 20 feet below grade, tightness testing of the UST and associated piping, a soil and groundwater investigation, free product recovery utilizing vacuum-enhanced fluid recovery techniques, and coordination and reporting to the NYSDEC and Westchester County Department of Health.

George H. Holmes

FPM group — Engineering and Environmental Science

Mr. Holmes has diversified experience in geology and hydrogeology. His professional experience includes groundwater and soil investigations, routine landfill gas monitoring, Phase I Environmental Site Assessments, soil remediation projects, soil vapor intrusion evaluation, maintenance of groundwater remediation systems, aquifer interpretation, and evaluation of site compliance with environmental regulations.

Functional Role	Title	Years of Experience
Hydrogeologist	Hydrogeologist/Civil Engineer	4

Personal Data

Education
M.S./2011/Civil Engineering/Penn State, PA
B.S./2007/Geology/SUNY Cortland, NY

Registration and Certifications
OSHA 40-hour HAZWOPER Health & Safety Training
Current OSHA 8-hour HAZWOPER Health & Safety Refresher
American Geophysical Union
Long Island Association of Professional Geologists

Employment History
2011-Present FPM Group
2007-2007 Suffolk County Water Authority

Detailed Experience

Landfills

- Manages ongoing landfill gas monitoring projects at three Town of Islip landfills. Monitoring program included monthly collection of landfill gas data from onsite and offsite methane wells, methane collection systems (extraction wells), and flare systems, Volatile Organic Compound (VOC) monitoring, greenhouse gas monitoring, and report preparation. Responsibilities also included frequent correspondence with Town officials and regulatory personnel.
- Manages ongoing field and reporting activities for the U.S. Environmental Protection Agency (EPA) Greenhouse Gas (GHG) Reporting Program at the Blydenburgh Landfill in the Town of Islip. Program included weekly GHG data collection, usage and maintenance of a dedicated data logging system, data management, and report preparation in accordance with EPA specifications.
- Conducts ongoing groundwater and methane monitoring programs for two Town of East Hampton landfills. Responsibilities include collection of routine and baseline groundwater samples, methane monitoring and operating, tabulation of analytical data, and report preparation.

Site Investigation and Monitoring

- Performed soil, soil vapor, indoor air and groundwater monitoring and sampling at numerous commercial, industrial, and retail gasoline sites throughout Long Island, New York City, Westchester County and upstate New York. Monitoring and sampling activities have been conducted in accordance with NYSDEC-approved work plans, Phase II and other investigations.
- Assisted in a groundwater, soil, and soil vapor investigation at a Brownfield Cleanup Program (BCP) Site in Far Rockaway, NY involving chlorinated solvents. Responsibilities included groundwater, soil, and soil vapor sampling for characterization and delineation, subcontractor coordination and oversight, and report preparation.
- Coordinated and managed subcontractors performing soil boring and well installation activities, excavation activities and utility mark-outs at numerous sites throughout Long Island, New York City, Westchester County and upstate New York.
- Conducted sampling of underground injection control (UIC) systems at several locations on Long Island and in New York City. Responsibilities included sample acquisition and management, field screening, equipment decontamination, data tabulation and evaluation, and reporting.
- Skilled in use and calibration of field equipment including photoionization detectors (PID), flame-ionization detectors (FID), Landtec Infrared Gas Analyzer, combustible gas indicator (CGI), water-level meters, interface probes, submersible pumps, groundwater quality instrumentation, and survey equipment.
- Prepared monitoring reports, investigation reports, site plans, contaminant concentration contour maps, groundwater flow direction maps, and NYSDEC EDD's.
- Conducted Phase I Environmental Site Assessments (ESAs) for numerous residential, commercial, industrial and vacant wooded sites in New York State in accordance with ASTM standards. Phase I ESA tasks included site inspections, interviews, evaluation of state and federal databases, record reviews at

local and state government agencies, and report preparation.
- Performed project management tasks including budget analysis, project tracking, invoice approval, client interaction, and preparation of site-specific health and safety plans (HASPs) Community Air Monitoring Plans (CAMPs) and Quality Assurance Project Plans (QAPP)..

Remediations

- Assisted in remedial activities at a NYSOGS and NYSDEC waste tire dump site in Kings Park, NY. Responsibilities included oversight and documentation of excavation and disposal activities, subcontractor coordination and oversight, and coordination with the NYSOGS and NYSDEC.
- Assisted in remedial activities at a New York State Environmental Restoration Program (ERP) brownfield site in Northport, NY. Responsibilities included collection of waste characterization samples, oversight and documentation of excavation and disposal activities, collection of endpoint samples to document the condition of the remaining soil, data tabulation and evaluation and report preparation.
- Assisted in remedial activities at a former fuel terminal site in Glenwood Landing, NY. Responsibilities included collection of waste characterization samples, oversight of excavation and removal of impacted soils, and oversight of floating product removal.
- Provided oversight for the installation of a product recovery system at an industrial site in Flushing, NY. Responsibilities included monitoring product thickness and recovery, field coordination, and documentation.
- Assisted in the investigation and removal of impacted sediments and liquids from several stormwater leaching structures at a NYSDEC Inactive Hazardous Waste Disposal Site in Garden City, NY. Responsibilities included endpoint sampling, subcontractor coordination and oversight, and coordination with the NYSDEC.
- Assisted in a UST removal and the removal of impacted sediments from a leaching pool at a former dry-cleaning site in Levittown, NY. Responsibilities included waste characterization and endpoint sampling, subcontractor coordination and oversight, coordination with various Nassau County agencies and the NYSDEC, and report preparation.
- Managed the removal of impacted sediments and liquids from several leaching pools at a commercial site in Inwood, NY. Responsibilities included waste characterization and endpoint sampling, subcontractor coordination and oversight, data tabulation and evaluation and report preparation.
- Operated and maintained remediation systems including soil vapor extraction, groundwater pump and treat, air sparge systems, and sub-slab depressurization systems.

Health & Safety

- Prepared community air monitoring (CAMP) and health and safety plans (HASP) for several NYSDEC inactive hazardous waste, brownfield cleanup program, and voluntary cleanup program sites, and petroleum sites.
- Performed health and safety monitoring at investigation and remediation sites during intrusive activities. Monitoring included calibration and operation of PID and FID for organic vapors and CGI for methane. Compared results to applicable action levels and took preventative/protective measures as necessary.
- Performed community monitoring, including monitoring for noise, particulates (dust), and organic vapors in accordance with NYSDEC-approved CAMPs. Recorded observations and compared to applicable action levels. Calibrated noise meters, particulate monitors, and PID/FID.

ATTACHMENT 2
RESUME OF DUSR PREPARER

Richard J. Baldwin, C.P.G., P.G.
Apex Companies, LLC, Project Director

Mr. Baldwin is a hydrogeologist with more than twenty five years of experience in the fields of environmental consulting, hydrogeology and geology with particular experience in conducting and supervising environmental investigations and remedial actions at industrial, private, Federal and publicly-owned facilities and sites. Additionally, Mr. Baldwin has experience in evaluating potential environmental impacts of projects including golf courses, housing developments, senior housing, schools and retail shopping centers. For the last several years, Mr. Baldwin's work has focused primarily on sites and facilities located in the Long Island, New York City and Upstate New York areas. He has extensive knowledge and experience pertaining to Long Island's federally-designated sole-source drinking water aquifer system. Mr. Baldwin has extensive experience in evaluating complex laboratory data packages to ensure that they are precise, accurate, repeatable and comparable.

Education

- *Graduate Course Work, San Jose State University, 1985-1988*
- *BA Geology, San Francisco State University, 1982*

Professional Registrations

- *Professional Geologist, PG-000552-G, Commonwealth of Pennsylvania*
- *Certified Professional Geologist, CPG #9158, Amer.Inst. of Prof. Geologists*
- *OSHA Certification, 40-hour Health and Safety Training at Hazardous Waste Sites*
- *OSHA Certification, 8-hou Refresher Health and Safety Training at Hazardous Waste Sites*
- *OSHA Certification, 8-hour Management Training*
- *OSHA Certification, 8-hour Radiation Safety Training*

Continuing Education

- *Princeton Groundwater Hydrogeology and Pollution course*
- *Environmental Law and Regulations Course, U.C. Berkeley Extension*
- *NGWA MODFLOW and MODPATH Modeling Course*
- *NGWA Visual MODFLOW Modeling Course*

Typical Project Experience

Mr. Baldwin has extensive experience in the selection, design, installation and maintenance of a wide range of soil and groundwater remediation systems. Remedial systems have included both active and passive free-product recovery, traditional groundwater pump and treat, soil-vapor extraction, air sparging, bioventing, bioremediation, excavation impacted-soil management and natural attenuation.

Mr. Baldwin has been the principal-in-charge and directly responsible for hundreds of projects related to the wireless telecommunications field. He has overseen the conduct of hundreds of Phase I Environmental Site Assessments (ESAs) and limited Phase II ESAs. He has developed and implemented Soil and Groundwater Management Work Plan to address environmental impairment issues. He has been instrumental in developing appropriate mitigation measures with various project team members including site acquisition, legal counsel and headquarters level staff.

Mr. Baldwin has evaluated the potential environmental impacts of proposed projects including golf courses, housing developments, senior housing, schools, automobile repair facilities and retail shopping centers. The potential impacts included those to groundwater quality from herbicide/pesticide application, disposal of sanitary waste and school laboratory waste and the impacts to soil quality from handling and disposal of hazardous materials, leaking underground storage tanks, historic disposal of hazardous waste and pesticide/herbicide application. These impacts were evaluated through a variety of means including the collection and analysis of soil and groundwater samples, geo- and organic-chemistry modeling, groundwater fate and transport modeling and basic research of materials, their uses and their potential migration pathways. Mr. Baldwin has provided expert witness services for various venues ranging from NYSDEC spill and hazardous waste sites to potential noise impacts.

Mr. Baldwin has been involved in hundreds of subsurface soil and groundwater investigations ranging from Phase I & II Environmental Site Assessments (ESAs) to Remedial Investigations. Investigation and delineation techniques have included soil borings, groundwater monitoring well networks, hydropunch/GeoProbe sampling, surface and bore-hole geophysical methods, soil-gas surveys, aquifer testing, surface water and sediment sampling, waste characterization (soils piles, drums, USTs, ASTs, landfills, etc), test pits, and computer fate and transport modeling. Materials investigated have included petroleum products (heating/fuel oil and gasoline), PCB oils, coal tar, heavy metals, chlorinated solvents, explosives, pesticides, herbicides and buried medical waste.

Mr. Baldwin has been in the forefront of both evaluating and addressing shallow soils on Long Island which have been impacted by pesticides (particularly arsenic) and herbicides. This important issue is particularly of concern due to the re-development of agricultural lands for residential and educational end uses. Mr. Baldwin has work closely with the SCDHS and Town of Brookhaven to develop effective and easily implementable Soil Management Plans.

Mr. Baldwin works closely with the U.S. Environmental Protection Agency (EPA), New York State Department of Environmental Conservation (NYSDEC) Region 1, Region 2, Region 3 and Central Office, New York State Department of Health (NYSDOH), Suffolk County

APEX

Department of Health Services (SCDHS) and Nassau County Department of Health (NCDOH). Mr. Baldwin also works with local planning and review boards including the Town of East Hampton, Town of Southampton, Town of Babylon, Town of Brookhaven, Village of Patchogue, Village of Great Neck and New York City on issues ranging from groundwater quality to historic resources to noise impacts.

Mr. Baldwin's projects include supervising and performing Remedial Investigations/Feasibility Studies (RI/FSs), Interim Remedial Actions (IRMs), and implementation of selected remedies at NYSDEC Class 2 and 2a Inactive Hazardous Waste Disposal sites. Other work, conducted with the NYSDEC, includes evaluating and implementing large-scale groundwater and soil treatment systems to remediate MTBE.

Environmental Data Analyses

Mr. Baldwin has received multiple sessions of environmental geochemistry training provided by environmental geochemists, including physical chemistry, thermodynamics, ionic interactions, complexation, biologic effects, and other basic principles. Training also included field sampling procedures and effects on chemical data chemical analytical methods and equipment, and QA / QC procedures and interpretation.

Mr. Baldwin has reviewed and evaluated numerous soil, groundwater, product, indoor / ambient air and soil vapor chemical analytical datasets, including evaluation of batch and site-specific QA / QC samples, laboratory narratives, comparison to regulatory agency criteria, historic data, and background data.

Mr. Baldwin has been responsible for the development and implementation of numerous Quality Assurance Project Plans (QAPP), including QAPP design, sample delivery group (SDG) evaluations, sampling procedures and sequences, and QA / QC sample preparation/collection.

Mr. Baldwin has attended periodic environmental chemistry training sessions hosted by environmental laboratories and participated in hands-on training in data and QA / QC evaluation.

Mr. Baldwin has prepared Data Usability Summary Reports (DUSRs) for numerous chemical analytical datasets for projects overseen by the USEPA, NYSDEC and other regulatory agencies. Datasets evaluated have included soil, groundwater, soil vapor, indoor air and ambient air.

Mr. Baldwin has performed forensic assessments of historic environmental chemical analytical data to resolve apparent discrepancies with modern data and other dataset inconsistencies.
Mr. Baldwin has interpreted numerous organic parameter datasets to evaluate breakdown sequences, likely original parameters and rates of degradation.

Mr. Baldwin has formulated numerous chemical treatment plans for insitu remediation of environment contaminants, including assessment of contaminant concentrations and distribution, chemical processes and indicators, natural attenuation indicators, additional stociometric demands and hydrogeologic factors.

Selected Project Experience

Project Director for Major NY Metro Airport Project

Mr. Baldwin is part of a large project team which has been tasked by a coalition of major airlines to evaluate the efficacy of re-instituting the delivery of jet fuel via a water-borne barge delivery system. As part of the project, Mr. Baldwin evaluated the requirements for permits from various agencies including the NYSDEC, USACE, NYSDOS and New York City. Mr. Baldwin has also been providing ongoing evaluations of potential project design scenarios which required the evaluation of existing data sets (e.g., bathymetric surveys, former permits, etc.), conducting cost-benefit analyses assuming various dredge spoil disposal options, etc. This is a major, on-going project with long-term ramifications at all of the major New York Metropolitan airport facilities.

Project Director for Ferry Terminal Project, Glen Cove, NY

The City of Glen Cove Industrial Development Agency (IDA) has acquired Federal Stimulus Funding to develop a ferry terminal along their waterfront area in order to provide passenger ferry service from the North Shore of Long Island to the New York Metropolitan Area, and potentially to selected Connecticut locations. The selected site is part of the former Li Tungsten and Captains Cove Federal and New York State Department of Environmental Conservation (NYSDEC) Superfund Sites. Both sites were subject to remedial actions and were "closed" by both the United States Environmental Protection Agency (USEPA) and NYSDEC circa 2000. A wide range of contaminant types were potentially associated with both sites including solvents, petroleum, oils, heavy metals and radiation. The

NYSDEC and IDA required the preparation of a Soil Management Plan (SMP) as potentially-impacted soils and bottom sediments were potentially going to be encountered as part of the project. Mr. Baldwin successfully prepared and executed a Dredging / Excavation (D / E) Work Plan which detailed the requirements to field screen all excavated soils and dredge spoils with a radiation detector, photo-ionization detector (PID) and by visual / olfactory inspection. Based upon the results of the field screening, excavated soils and dredge spoils were to be addressed by one of the following: 1) cleared for use as on-site backfill materials; 2) disposed of as non-hazardous, regulated materials; or, 3) as hazardous waste. Mr. Baldwin was also responsible for designing and implementing a sediment sampling and analyses program to: 1) evaluate ambient creek bottom conditions with respect to a wide-range of contaminant types; and, 2) confirm the chemical conditions of the "new sea floor" prior of dredging and excavation activities. Mr. Baldwin also successfully applied for a received a NYSDEC Case-specific Beneficial Use Determination (BUD) finding as part of a cost-effective materials disposal option, as well as successfully applying for a NYSEC Long Island Well permit required as part of continuing project support activities.

Project Director for Marina Property, Glen Cove, NY

Mr. Baldwin was responsible for conducting turn-key environmental and engineering services for this active marina facility. The services included: 1) conducting a high-resolution bathymetric survey of the marina's basin in order to evaluate effective depths / vessel mooring and access restrictions; 2) successful acquisition of a United States Army Corps of Engineers (USACE) / NYSDEC Joint Application permit to repair a failed bulk head; 3) preparation of a full engineered design package to rebuild a failing dock-side water supply system; 4) conduct of a land-ward and marine geotechnical evaluation to determine the suitability of sub-surface materials for future construction projects; 5) collection and analyses of multiple bottom sediment samples to evaluate same for dredging issues; and, 6) participation in the marina design team. As part of this, Apex participated in multiple site meetings to discuss dock geometry, future infrastructure repair requirements, future regulatory permitting requirements, travel lift slip issues, potential future dredging protocols, etc.

Project Director for Marina Property, Patchogue, NY

Mr. Baldwin was responsible for providing turn-key environmental and engineering services for this active marina facility. These services included: 1) conduct of a high-resolution bathymetric survey of the marina's basin in order to evaluate effective depths / vessel mooring and access restrictions; 2) Preparation and submission of a USACE / NYSDEC Joint Application permit for maintenance dredging /marina infrastructure improvement; 3) preparation of a full engineered design package to rebuild a failing travel lift rail system; 4) contractor oversight; and, 5) Participation in the marina design team. As part of this, Apex has participated in multiple site meetings to discuss dock geometry, future infrastructure repair requirements, future regulatory permitting requirements, travel lift slip issues, potential future dredging protocols, etc.

Project Director for 10-Year Dredging and Beach Nourishment Program, Yarmouth, MA

Mr. Baldwin has been responsible for providing permit application preparation services for the Town of Yarmouth on Cape Cod. There are currently 37 Town-wide sites which are subject to multiple local, State and Federal permits for maintenance dredging and beach nourishment activities. The Town of Yarmouth's wetlands and waterways represent a highly-valuable, yet fragile ecosystem/resource. Current and historic dredging and beach nourishment practices on a site-by-site basis over the past decades have resulted in a confusing and difficult-to-manage situation with respect to this highly-complex system. Apex recommended that a 10-Year Town-wide Dredging and Beach Nourishment Program be approved and implemented wherein all 37 Yarmouth and Dennis dredge and beach nourishment sites are included/managed under one comprehensive management program. This will allow for effective use of Town resources, as well as ensuring that the dredge/nourishment sites are appropriately managed within appropriate regulatory guidelines. Again, the overall goal of this program is to allow the Town of Yarmouth to manage more effectively its waterways and beaches.

New York State Department of Environmental Conservation, Groundwater Evaluation and Treatment, Taconic Developmental Disabilities Services Office, Wassaic, NY

Worked on a public water supply site in New York conducting a full-scale groundwater investigation in the vicinity of the facility's supply wells which have been impacted by MTBE. Multiple well clusters were installed surrounding the high-capacity wells to evaluate subsurface conditions. One impacted well was converted to a remediation well to provide hydraulic capture of the MTBE plume prior to its impacting the remaining downgradient wells. A large-scale granulated-activated carbon (GAC) system was installed to treat the water extracted from the well. A 40,000-pound GAC unit was also installed in standby mode to address the facility's drinking water should the concentrations of MTBE ever warrant treatment. Several rounds of groundwater investigation were also conducted to confirm the MTBE source area as a nearby gasoline service station. Pilot testing was conducted and an on-site groundwater treatment system was being designed to provide source area remediation.

New York State Department of Environmental Conservation, Potable Water Treatment System, Village of Brewster, NY

Designed and constructed a supplemental water treatment system at a public water supply plant to address MTBE contamination in the system prior to its distribution. The treatment system consisted of a large air stripping tower, installed in line with an existing air stripper to remove the MTBE to non-detectable concentrations. Additionally, a source area investigation was being conducted to determine the potential source(s) of the MTBE contamination.

New York State Department of Environmental Conservation, Potable Water Treatment System, Sullivan Correctional Facility, Fallsburg, NY

Worked with the NYSDEC to evaluate, design and install a supplemental water treatment system to address MTBE present in a New York State Correctional Facility's drinking water. All four of the facility's wells were impacted. Several remedial options including utilizing GAC or air strippers were evaluated. The selected alternative was a 20,000-pound GAC system which was installed inline and in standby mode.

New York State Department of Environmental Conservation, Large Scale Investigation / Remediation Project, Lake Success, New York

Managed large-scale site activities at a major Long Island aerospace facility. Activities included operations of on-going IRMs (soil vapor extraction and groundwater extraction and treatment systems); citizen participation activities; design and implementation of on-site remedies (drywell removal and soil excavation, installation of fencing and an 1,800 gallon per minute groundwater extraction and treatment system); on- and off-site RIs; regulatory compliance activities; client interactions; multi-task, multi-contractor scheduling and management; and general project management. As part of the RI, prepared a large three-dimensional groundwater flow and particle model utilizing Visual MODFLOW and MODPATH. The model was then utilized to design an optimum groundwater treatment system.

Prepared a scoping plan and RI report for an Inactive Hazardous Waste Disposal site in New York under the NYSDEC Superfund program. The work involved evaluating the nature and extent of halogenated solvents in soil and groundwater both on and off of the site. Was responsible for overseeing all phases of the report preparation, including communications with the NYSDEC and for implementing the citizen participation program. Also involved in the preparation of the FS report and selection of the final remedy which included the use of an innovative groundwater treatment technology, in-well air stripping.

Project Director for Marina Property Assessment, Hampton Bays, NY

The owner of this active marina facility was served with a Notice of Violation (NOV) by the NYSDEC for various environmental issues, mostly related to on-site petroleum storage / delivery systems, as well as impacts potentially associated with marine-activity uses such as vessel bottom paint removal and application, use of preserved woods, vessel maintenance activities, housing-keeping issues, etc. Apex was responsible, with input from the NYSDEC, for developing and implementing a Site Investigation Program to investigate potential soil and groundwater impacts associated with the aforementioned on-site practices. Based upon the results of the investigation, Apex was able to conclude that the fuel distribution system was not leaking and that groundwater was not deleteriously impacted. Minor areas of impacted soil, likely from vessel bottom cleaning activities, were identified. Apex prepared and implemented a NYSDEC-approved Remedial Action Plan which included the following: 1) targeted removal of metals-impacted soils; 2) conversion of the existing gasoline / diesel underground storage tank (UST) / sub-grade distribution system to non-regulated biofuel use; 3) confirmation of facility use of aboveground storage tanks (ASTs) equipped with double-walled containment, 4) permitting a vessel-washing rinsate containment/treatment system; and, 5) use of asphaltic/concrete paving as engineering controls to minimize future potential user contact with remaining impacted soils.

Project Manager for Dredge Spoils Quality Investigation, New London, CT.

Mr. Baldwin was retained by a not-for-profit group concerned that the planned disposition of dredge spoils from the Thames River associated with the US Navy nuclear submarine base would negatively impact the lobster fishery of off Fishers Island in the Long Island Sound. Mr. Baldwin directed the field team which collected gravity cores from along the portion of the Thames River slated for dredging. Mr. Baldwin utilized the services of a nationally-recognized laboratory to analyze the bottom sediment samples for a wide-range of contaminants. Other than potentially elevated concentrations of dioxins, the bottom sediments proved to be relatively free of anthropogenic contaminants.

Project Director for Marina Property Assessment, Center Moriches, NY.

Mr. Baldwin was responsible for conducting an evaluation of environmental conditions at this active marina which was under consideration for re-development with residential housing. Issues evaluated included soil and groundwater conditions associated with on-site vessel repair, bottom paint application/removal, USTs and dredge spoils. Based upon the results of the investigation, impacted soils were excavated, transported to and disposed of at an appropriately-licensed facility. The dredge spoils were not impacted above regulatory criteria and required not special actions. Based upon the results of the investigation and remediation activities, the Suffolk County Department of Health Services approved the site for residential re-development.

Senior Project Manager for Former La Salle Military Academy, Oakdale, NY.

Mr. Baldwin was part of project team that conducted a feasibility study for the redevelopment of a portion of this former educational facility. A major component of the Feasibility Study was the evaluation of an on-site boat basin and associated building infrastructure (e.g., a team house) with respect to potential dredging requirements, permitting issues, bottom sediment conditions and marina design.

Former Hess Terminal, Patchogue River, Patchogue, NY.

Mr. Baldwin conducted a site investigation program at this former major fuel oil terminal site to evaluate the efficacy of same for residential re-development, which would have included a residence-use only marina. The site had been the subject of previous site remediation activities, and the NYSDEC had closed its spill file assuming that the site would only be utilized for commercial or industrial purposes. Soil, groundwater, soil vapor and outdoor ambient air samples were collected and analyzed as part of this evaluation. The results of the investigation indicated that additional soil remediation would have been required to make the property suitable for residential re-development. Additionally, the NYSDEC would have likely required the installation and operation of sub-slab depressurization systems for all on-site residential buildings prior to their approving the plans for the site.

Former Lumber Yard Facility, Arverne, NY.

Mr. Baldwin provided environmental consulting services associated with planned redevelopment of a six-acre parcel of land located on the Barbados Basin. The client proposed to construct and operate a boat marina with associated catering hall/shopping complex on this former lumber yard. An exhaustive site investigation including a geophysical survey, soil and groundwater testing and wetlands/permit evaluation was conducted in accordance with the New York City Environmental Quality Review (CEQR) regulations. Also conducted an exhaustive feasibility study regarding stormwater runoff /sanitary waste disposal options. The results of the investigation indicated that historic fill materials on the subject property contained actionable concentrations of lead. Prepared a site specific Soil Management Plan for submission to the New York City Department of Environmental Protection (NYCDEP). The NYCDEP agreed with the remedial option of capping the lead-impacted fill materials under two feet of clean fill to prevent future site users from coming into contact with same.

Dielectric Fluid Release, Village of Port Washington, NY.

During excavation activities being conducted for installing a team building at a Town-owned marina facility, Town of North Hempstead personnel encountered and broke a major, unmarked buried electric line. This rupture caused the immediate and catastrophic release of an estimated 30,000 gallons of dielectric fluid. Mr. Baldwin was retained by the Town of North Hempstead to oversee the cleanup of surface materials, as well as the evaluation of dielectric fluid floating on top of the water table. Adsorbent booms were placed and maintained along the associated wetlands and all identified areas of impacted soils were remediated. A series of monitoring wells were installed and evaluated to ensure the absence of dielectric fluid floating on the water table which would eventually discharge to the adjacent water way. Based upon the work conducted, the released dielectric fluid did not contain polychlorinated biphenyls (PCBs), and the NYSDEC was satisfied that the released had been adequately remediated.

Brownfield Re-development, Greenport, NY.

Mr. Baldwin managed one of the few active NYSDEC Brownfield sites on Long Island utilizing New York State Environmental Bond Act funding. The work included evaluating a large Village-owned undeveloped water-front property for the presence of undocumented USTs utilizing surface geophysical techniques, removing the USTs and associated impacted soils and preparing Site Investigation and Remedial Action reports. Responsible for all regulatory interactions, subcontractor management and Citizen Participation Plan implementation. The work was conducted concurrently with the redevelopment of the site for use as a public park including a water-front walk way, amphitheater and historic carousal.

Preliminary Site Assessment, Concord Naval Weapons Station, Concord, NY.

Mr. Baldwin was the Project Manager responsible for conducting an environmental investigation in the portion of the Concord Naval Weapons Station known as the Tidal Area. The investigation included collecting and analyzing soil, sediment and groundwater samples from adjacent to and within on-site wetlands. Mr. Baldwin also utilized an aerial

magnetic survey to identify anomalies on a nearby off-shore island which could potentially represent buried railcars full of munitions which were reportedly buried after a major WW II explosion which killed hundreds of people. Mr. Baldwin conducted the field investigation which evaluated the nine magnetic anomalies which turned out to be ship wrecks, a crane, gas well heads, miscellaneous debris, etc. No anomalies representative of buried rail cars were observed. Mr. Baldwin was responsible for conducting a geotechnical evaluation of the materials making up the island, known as Bay Muds, which due to their very poor shear strength, could not have been excavated sufficiently to allow for burial of the rail cars. Therefore, it was Mr. Baldwin's belief that the reported burial of the rail cars full of munitions was incorrect.

Site Investigation Activities, Saint George Ferry Terminal, Staten Island NY

Mr. Baldwin was responsible for implementing a groundwater evaluation of the major ferry terminal site to evaluate the most efficacious means of removing two, large out-of-service No. 6 fuel oil USTs. The work including setting up and conducting a tidal influence study, major aquifer pumping test and conducting three-dimensional groundwater modeling. Evaluated and recommended the use of sheet piling surrounding the two USTs to isolate same from the surrounding aquifer materials and protect the adjacent buildings. The recommended remedial approach was implemented and the USTs were successfully removed with minimal de-watering required and the adjacent buildings were successfully protected.

Bottom Sediment Evaluation, Lake Success, NY

As part of a major environmental investigation of a nearby New York State Superfund site, Mr. Baldwin was responsible for the collection and analysis of bottom sediment samples from Lake Success and two on-site stormwater recharge basins. The results of the investigation indicated that the bottom sediment conditions in the on-site recharge basins and Lake Success were very similar leading to the conclusion that the observed impacts to the basins were likely non-site related and typical of stormwater runoff. Further, a bathymetric survey and at-depth water quality investigation was conducted for Lake Success.

Stormwater Retention Basin Bottom Sediment Evaluation, Lake Success, NY

As part of a major environmental investigation of a New York State Superfund site, Mr. Baldwin was responsible for evaluating the thickness of potentially impacted bottom sediments in two on-site stormwater recharge basins. The basins had reportedly been subject to discharge on impacted non-contact cooling waters and other site process waters. As a cost-saving measure, and in order to collected as much data as quickly as possible, Apex utilized an innovative investigation approach of transecting the surfaces of both frozen basins with a ground-penetrating radar (GPR) units. The GPR data was then cross-correlated with direct field measurements collected utilizing more standard techniques (e.g., gravity coring, penetration tests, etc.) to confirm the accuracy of the geophysical technique. The final data set was utilized to evaluate potential remedial techniques and costs.

Terrestrial/Martian Analogue Evaluation, Dry Valley Lakes, Antarctica

While at the United States Geological Survey (USGS), Mr. Baldwin participated on a project team which evaluated the physical and biota conditions of ice-covered lakes in the Dry Valley Region of Antarctica. Such conditions (e.g., ice-covered lakes in an otherwise frozen, low-precipitation region) were believed to be a strong terrestrial analogue for potential lakes which may have formed in the distant past in the Valles Marineris Canyon System on Mars. The biota of the Dry Valley ice-covered lakes was dominated by primitive stromatolites mounds, with much of the sedimentary section dominated by sand and gravel which had migrated through the ice cover. The overall purpose of the work was to assist NASA in evaluating future Mars landing sites with the highest potential for providing fossilized evidence for life on Mars.

Riverine Sediment Evaluation, Thames River, New London, CT

Mr. Baldwin was retained by a not-for-profit group concerned that the planned disposition of dredge spoils from the Thames River associated with the US Navy nuclear submarine base would negatively impact the lobster fishery of off Fishers Island in the Long Island Sound. Mr. Baldwin directed the field team which collected gravity cores from along the portion of the Thames River slated for dredging. Mr. Baldwin utilized the services of a nationally-recognized laboratory to analyze the bottom sediment samples for a wide-range of contaminants. Other than potentially elevated concentrations of dioxins.

Additional information upon request

APPENDIX D

EQUIPMENT AND MATERIALS SPECIFICATIONS

VAPORBLOCK® PLUS™ VBP20

Under-Slab Vapor / Gas Barrier

Product Description

VaporBlock® Plus™ 20 is a seven-layer co-extruded barrier made from state-of-the-art polyethylene and EVOH resins to provide unmatched impact strength as well as superior resistance to gas and moisture transmission. VaporBlock® Plus™ 20 is a highly resilient underslab / vertical wall barrier designed to restrict naturally occurring gases such as radon and/or methane from migrating through the ground and concrete slab. VaporBlock® Plus™ 20 is more than 100 times less permeable than typical high-performance polyethylene vapor retarders against Methane, Radon and other harmful VOCs.

VaporBlock® Plus™ 20 is one of the most effective underslab gas barriers in the building industry today far exceeding ASTM E-1745 (Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs) Class A, B and C requirements. Available in a 20 (Class A) mil thicknesses designed to meet the most stringent requirements. VaporBlock® Plus™ 20 is produced within the strict guidelines of our ISO 9001:2008 Certified Management System.

Product Use

VaporBlock® Plus™ 20 resists gas and moisture migration into the building envelop when properly installed to provide protection from toxic/harmful chemicals. It can be installed as part of a passive or active control system extending across the entire building including floors, walls and crawl spaces. When installed as a passive system it is recommended to also include a ventilated system with sump(s) that could be converted to an active control system with properly designed ventilation fans.

VaporBlock® Plus™ 20 works to protect your flooring and other moisture-sensitive furnishings in the building's interior from moisture and water vapor migration, greatly reducing condensation, mold and degradation.

Size & Packaging

VaporBlock® Plus™ 20 is available in 10' x 150' rolls to maximize coverage. All rolls are folded on heavy-duty cores for ease in handling and installation. Other custom sizes with factory welded seams are available based on minimum volume requirements. Installation instructions and ASTM E-1745 classifications accompany each roll.

Under-Slab Vapor/Gas Retarder

Product	Part #
VaporBlock Plus 20	VBP20

APPLICATIONS

- Radon Barrier
- Methane Barrier
- VOC Barrier
- Under-Slab Vapor Retarder
- Foundation Wall Vapor Retarder

VaporBlock® Plus™
UNDERSLAB VAPOR RETARDER / GAS BARRIER

VAPORBLOCK® PLUS™ VBP20

Under-Slab Vapor / Gas Barrier

		VAPORBLOCK PLUS 20	
PROPERTIES	**TEST METHOD**	**IMPERIAL**	**METRIC**
Appearance		White/Gold	
Thickness, Nominal		20 mil	0.51 mm
Weight		102 lbs/MSF	498 g/m²
Classification	ASTM E 1745	CLASS A, B & C	
Tensile Strength lbf/in (N/cm) average MD & TD (new material)	ASTM E 154 Section 9 (D-882)	58 lbf	102 N
Impact Resistance	ASTM D 1709	2600 g	
Maximum Use Temperature		180° F	82° C
Minimum Use Temperature		-70° F	-57° C
Permeance (new material)	ASTM E 154 Section 7 ASTM E 96 Procedure B	0.0098 Perms grains/(ft²·hr·in·Hg)	0.0064 Perms g/(24hr·m²·mm Hg)
(after conditioning) Perms (same measurement as above permeance)	ASTM E 154 Section 8, E96 Section 11, E96 Section 12, E96 Section 13, E96	0.0079 0.0079 0.0097 0.0113	0.0052 0.0052 0.0064 0.0074
WVTR	ASTM E 96 Procedure B	0.0040 grains/hr-ft²	0.0028 gm/hr-m²
Radon Diffusion Coeffiecient	K124/02/95	< 1.1 x 10^{-13} m²/s	
Methane Permeance	ASTM D 1434	< 1.7 x 10^{-10} m²/d• atm 0.32 GTR (Gas Transmission Rate) ml/m²•D•ATM	

VaporBlock® Plus™ Placement

All instructions on architectural or structural drawings should be reviewed and followed.
Detailed installation instructions accompany each roll of VaporBlock® Plus™ and can also be located on our website.
ASTM E-1643 also provides general installation information for vapor retarders.

VaporBlock® Plus™
UNDERSLAB VAPOR RETARDER / GAS BARRIER

VaporBlock® Plus™ is a seven-layer co-extruded barrier made using high quality virgin-grade polyethylene and EVOH resins to provide unmatched impact strength as well as superior resistance to gas and moisture transmission.

Note: To the best of our knowledge, unless otherwise stated, these are typical property values and are intended as guides only, not as specification limits. Chemical resistance, odor transmission, longevity as well as other performance criteria is not implied or given and actual testing must be performed for applicability in specific applications and/or conditions. RAVEN INDUSTRIES MAKES NO WARRANTIES AS TO THE FITNESS FOR A SPECIFIC USE OR MERCHANTABILITY OF PRODUCTS REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations and disclaims all liability for resulting loss or damage. Limited Warranty available at www.RavenEFD.com

RAVEN INDUSTRIES

Engineered Films Division
P.O. Box 5107
Sioux Falls, SD 57117-5107
Ph: (605) 335-0174 • Fx: (605) 331-0333

Toll Free: **800-635-3456**
Email: **efdsales@ravenind.com**
www.ravenefd.com
1/11 EFD 1125

Scan QR Code to download current technical data sheets via the Raven website.

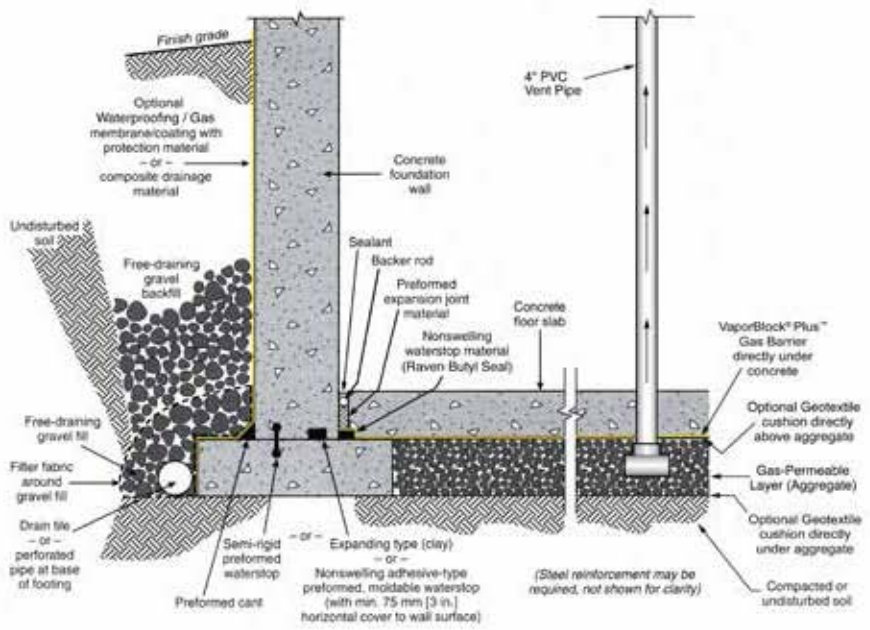
VaporBlock® Plus™
UNDERSLAB VAPOR RETARDER / GAS BARRIER

INSTALLATION GUIDELINES

Please Note: *Read these instructions thoroughly before installation to ensure proper use of* ***VaporBlock® Plus™****. ASTM E 1465, ASTM E 2121 and, ASTM E 1643 also provide valuable information regarding the installation of vapor / gas barriers. When installing this product, contractors shall conform to all applicable local, state and federal regulations and laws pertaining to residential and commercial building construction.*

- **When VaporBlock Plus gas barrier is used as part of an active control system for radon or other gas, a ventilation system will be required.**
- **If designed as a passive system, it is recommended to install a ventilation system that could be converted to an active system if needed.**

Materials List:
VaporBlock® Plus™ Vapor / Gas Barrier
VaporBond Plus 4" Foil Seaming Tape
Butyl Seal 2-Sided Tape
VaporBoot Plus Pipe Boots 12/Box (recommended)
VaporBoot Tape (optional)



Elements of a moisture/gas-resistant floor system. General illustration only.
(Note: This example shows multiple options for waterstop placement.

VAPORBLOCK® PLUS™ PLACEMENT

1.1. Level and tamp or roll granular base as specified. A base for a gas-reduction system may require a 4" to 6" gas permeable layer of clean coarse aggregate as specified by your architectural or structural drawings after installation of the recommended gas collection system. In this situation, a cushion layer consisting of a non-woven geotextile fabric placed directly under **VaporBlock® Plus™** will help protect the barrier from damage due to possible sharp coarse aggregate.

1.2. Unroll **VaporBlock Plus** running the longest dimension parallel with the direction of the pour and pull open all folds to full width. (Fig. 1)

1.3. Lap **VaporBlock Plus** over the footings and seal with Raven Butyl Seal tape at the footing-wall connection. Prime concrete surfaces and assure they are dry and clean prior to applying Raven Butyl Seal Tape. Apply even and firm pressure with a rubber roller. Overlap joints a minimum of 6" and seal overlap with Raven VaporBond Tape. When used as a gas

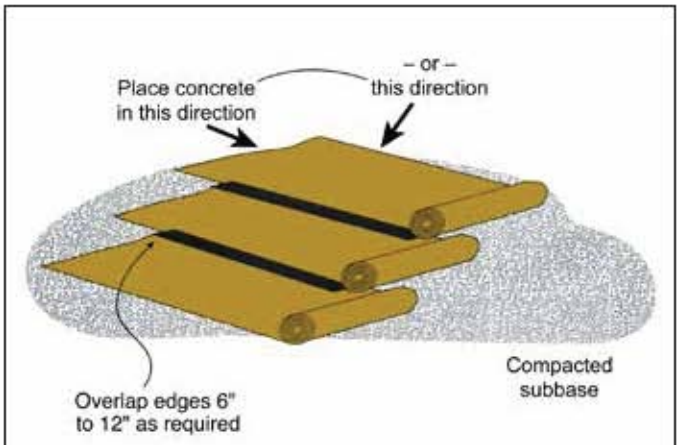


Fig. 1: VaporBlock Plus Overlaping Roll-out Method

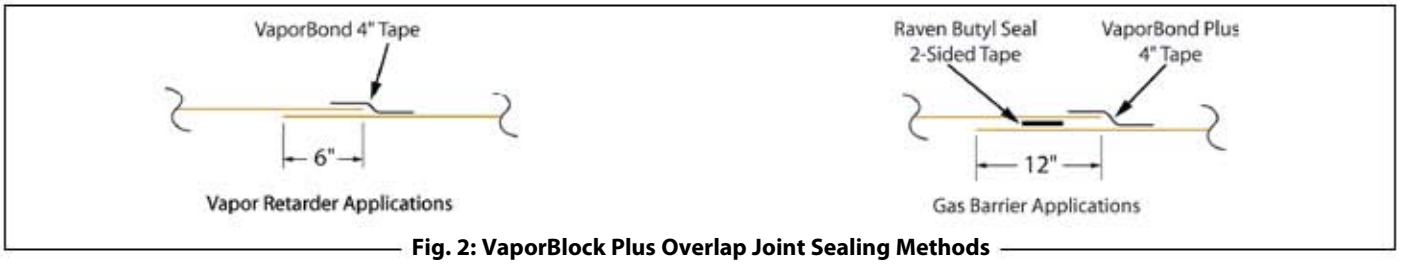


Fig. 2: VaporBlock Plus Overlap Joint Sealing Methods

SINGLE PENETRATION PIPE BOOT INSTALLATION

barrier, overlap joints a minimum of 12" and seal in-between overlap with 2-sided Raven Butyl Seal Tape. Then seal with VaporBond Plus Tape centered on the overlap seam. (Fig. 2)

1.4. Seal around all plumbing, conduit, support columns or other penetrations that come through the **VaporBlock Plus** membrane. Pipes four inches or smaller can be sealed with Raven VaporBoot Plus preformed pipe boots. VaporBoot Plus preformed pipe boots are formed in steps for 1", 2", 3" and 4" PVC pipe or IPS size and are sold in units of 12 per box (Fig. 3 & 5).

Pipe boots may also be fabricated from excess **VaporBlock Plus** membrane (Fig. 4 & 6) and sealed with VaporBoot Tape or VaporBond Plus Tape (sold separately).

Reminder Note: All holes or penetrations through the membrane will need a patch cut to a minimum of 12" from the opening in all directions.

To fabricate pipe boots from **VaporBlock Plus** excess material (see Fig. 4 & 6 for A-F):

A) Cut a square large enough to overlap 12" in all directions.

B) Mark where to cut opening on the center of the square and cut four to eight slices about 3/8" less than the diameter of the pipe.

C) Force the square over the pipe leaving the tightly stretched cut area around the bottom of the pipe with approximately a 1/2" of the boot material running vertically up the pipe. *(no more than a 1/2" of stretched boot material is recommended)*

D) Once boot is positioned, seal the perimeter to the membrane by applying 2-sided Raven Butyl Seal Tape in between the two layers. Secure boot down firmly over the membrane taking care not to have any large folds or creases.

E) Use VaporBoot Tape or VaporBond Plus Tape to secure the boot to the pipe.

VaporBoot Tape (option) – fold tape in half lengthwise, remove half of the release liner and wrap around the pipe allowing 1" extra for overlap sealing. Peel off the second half of the release liner and work the tape outward gradually forming a complete seal.

VaporBond Plus Tape (option) - Tape completely around pipe overlapping the to get a tight seal against the pipe.

F) Complete the process by taping over the boot perimeter edge with VaporBond Plus Tape to create a monolithic membrane between the surface of the slab and gas/ moisture sources below and at the slab perimeter. (Fig. 4 & 6)

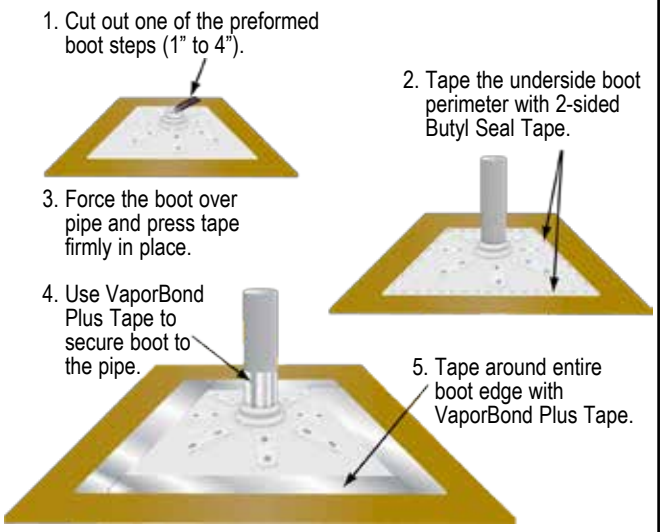


Fig. 3

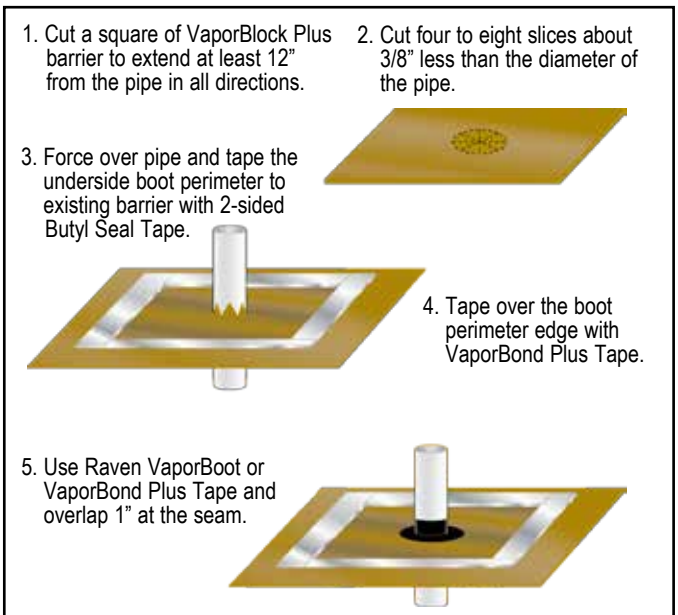


Fig. 4

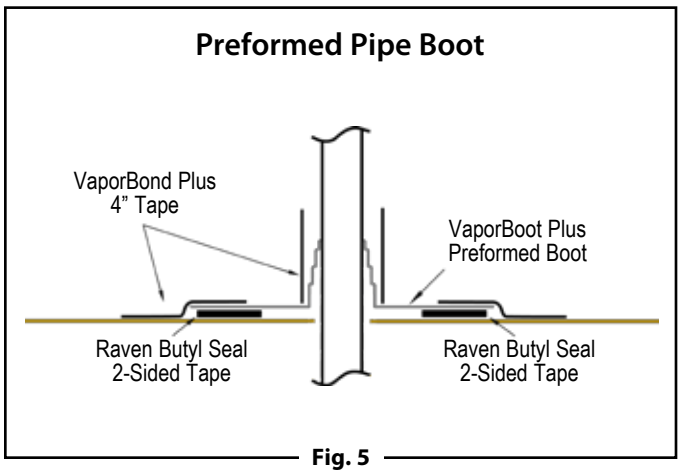


Fig. 5

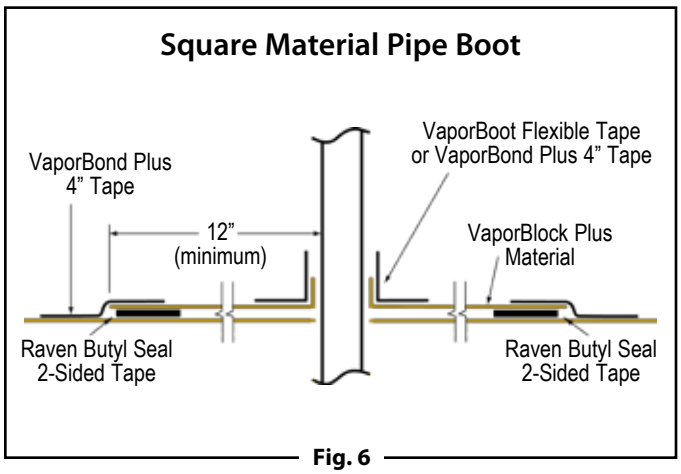


Fig. 6

MULTIPLE PENETRATION PIPE BOOT INSTALLATION

1.5. For side-by-side multiple penetrations;

A) Cut a patch large enough to overlap 12″ in all directions (Fig. 7) of penetrations.

B) Mark where to cut openings and cut four to eight slices about 3/8″ less than the diameter of the penetration for each.

C) Slide patch material over penetration to achieve a tight fit.

D) Once patch is positioned, seal the perimeter to the membrane by applying 2-sided Raven Butyl Seal Tape in-between the two layers. (Fig. 8)

E) After applying Raven Butyl Seal Tape between the patch and membrane, tape around each of the penetrations and the patch with VaporBond Plus 4″ foil tape. (Fig. 9) For additional protection apply an acceptable polyurethane elastomeric sealant around the penetrations. (Fig. 10)

1.6. Holes or openings through **VaporBlock Plus** are to be repaired by cutting a piece of **VaporBlock Plus** 12″ larger in all directions from the opening. Seal the patch to the barrier with 2-sided Raven Butyl Seal Tape and seal the edges of the patch with VaporBond Plus Tape.

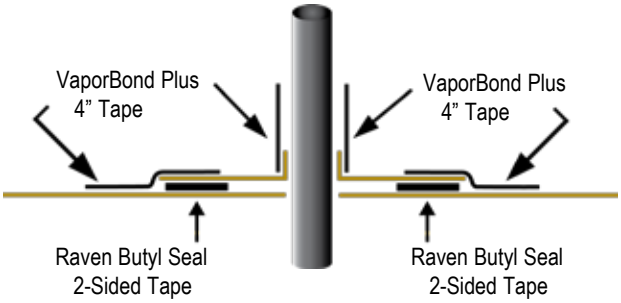


Fig. 6

Cut a patch large enough to overlap 12" in all directions and slide over penetrations (Make openings as tight as possible.)

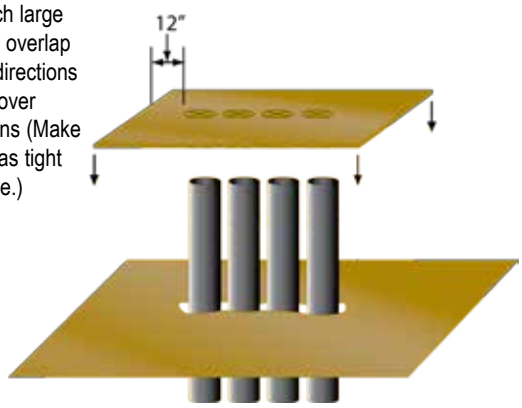


Fig. 7

Once the overlay patch is positioned, seal the perimeter to the membrane by applying 2-sided Raven Butyl Seal Tape in-between the two layers.

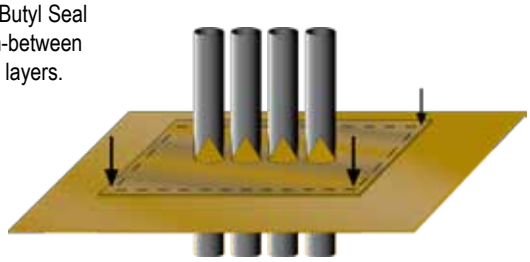


Fig. 8

After applying Raven Butyl Seal Tape between the patch and membrane, tape around the perimeter of the penetration and the patch with VaporBond Plus 4" foil Tape

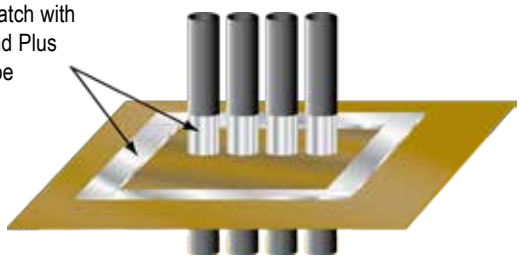


Fig. 9

For additional protection apply an acceptable polyurethane elastomeric sealant around the penetrations.

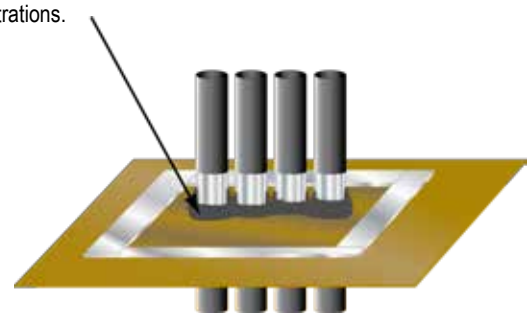


Fig. 10

VAPORBLOCK® PLUS™ PROTECTION

2.1. When installing reinforcing steel and utilities, in addition to the placement of concrete, take precaution to protect **VaporBlock Plus**. Carelessness during installation can damage the most puncture–resistant membrane. Sheets of plywood cushioned with geotextile fabric temporarily placed on **VaporBlock Plus** provide for additional protection in high traffic areas including concrete buggies.

2.2. Use only brick-type or chair-type reinforcing bar supports to protect **VaporBlock Plus** from puncture.

2.3. Avoid driving stakes through **VaporBlock Plus**. If this cannot be avoided, each individual hole must be repaired per section 1.6.

2.4. If a cushion or blotter layer is required in the design between **VaporBlock Plus** and the slab, additional care should be given if sharp crushed rock is used. Washed rock will provide less chance of damage during placement. Care must be taken to protect blotter layer from precipitation before concrete is placed.

VaporBlock® Plus™ Gas & Moisture Barrier can be identified on site as gold/white in color printed in black ink with the following logo and classification listing:

VaporBlock® Plus™
UNDERSLAB VAPOR RETARDER / GAS BARRIER
MEETS ASTM E-1745 CLASS A

VaporBlock® Plus™
Gas & Moisture Barrier

ISO 9001:2008
CERTIFIED MANAGEMENT SYSTEM

Note: To the best of our knowledge, these are typical installation procedures and are intended as guidelines only. Architectural or structural drawings must be reviewed and followed as well as on a project basis. NO WARRANTIES ARE MADE AS TO THE FITNESS FOR A SPECIFIC USE OR MERCHANTABILITY OF PRODUCTS OR GUIDELINES REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations and we disclaim all liability for resulting loss or damage.

RAVEN INDUSTRIES
Engineered Films Division
P.O. Box 5107
Sioux Falls, SD 57117-5107
Ph: (605) 335-0174 • Fx: (605) 331-0333

Toll Free: **800-635-3456**
Email: **efdsales@ravenind.com**
www.VaporBlockPlus.com

8/13 EFD 1127

MATERIAL SAFETY DATA SHEET		QUICK IDENTIFIER (In Plant Common Name)	
		VaporBlock Plus 20	VBP20
Manufacturer's Name	RAVEN INDUSTRIES INC.	***Emergency Telephone Numbers***	800-635-3456 605-335-0174
Address	P.O. Box 5107 Sioux Falls, SD 57117	***Other Information***	1813 "E" Avenue Sioux Falls, SD 57104
Signature of Person Responsible for Preparation	Dan Smith	***Date Prepared***	**February 25, 2008**

Section 1 - IDENTITY

Common Name: (Used on Label)		***CAS***	26221-73-8	13463-67-7	12001-26-2
(Trade Name & Synonyms)	VBP20	***Number(s)***	26221-27-2	9002-88-4	1317-63-3
Chemical Name	**Ethylene Vinyl Alcohol Copolymer** **Copolymer of Ethylene and Octene-1**	***Chemical Family***	Polyolefin	EVOH	
Formula	(CH2 - CH2) n				

Section 2 - HAZARDOUS INGREDIENTS

Principal Hazardous Component(s) - Chemical and Common Nam	***%***	***Threshold Limit Value (units)***
None		

Section 3 - PHYSICAL & CHEMICAL CHARACTERISTICS (Fire & Explosion Data)

Boiling Point	Not Applicable (N/A)			***Specific Gravity***	0.93	***Vapor Pressure, mmHg***	N/A
Percent Volatile by Volume (%)	0	***Vapor Density***	N/A	***Evaporation Rate***	N/A		
Solubility in Water	Insoluble in Water			***Reactivity in Water***	Not Reactive in Water		
Appearance and Odor	White/Gold, odorless plastic film.						
Flash Point	N/A	***Flammability Limits in Air, by Volume (%)***	***Lower*** N/A	***Upper*** N/A	***Auto Ignition Temperature***	> 650 F (estimated)	
Extinguisher Media	Use water spray, dry chemical, foam or carbon dioxide						
Special Fire Fighting Proced.	Fire fighters should wear a self-contained breathing apparatus when there is a possibility of exposure to smoke, fumes or hazardous decomposition products. If possible, water should be applied as a spray from a fogging nozzle since this material is a surface burning material.						
Unusual Fire and Explosion Hazards	None						

Section 4 - PHYSICAL HAZARDS

Stability	***Unstable***		***Conditions to Avoid***
	Stable	X	Temperatures over 560 F will release combustible gases.
Incompatibility (Materials to Avoid)	None		
Hazardous Decomposition Products	The following combustion products may be generated: Carbon dioxide, carbon monoxide, water vapor, and trace volatile organic compounds.		
Hazardous Polymerization	***May Occur***		***Conditions to Avoid*** N/A
	Will not Occur	X	

Section 5 - HEALTH HAZARDS

Threshold Limit Value	N/A

Signs and Symptoms of Exposure

1. Acute Overexposure	Not Determined	***2. Chronic Overexposure***	Not Determined

Medical Conditions Generally Aggravated by Exposure	There are no known medical conditions aggravated by exposure to this product.

Chemical Listed as Carcinogen or Potential Carcinogen		***National Toxicology Program***	Not Listed	***L.A.R.C. Monographs***	Not Listed	***OSHA***	Not Listed
OSHA Permissible Exposure Limit	None	***ACGIH Threshold Limit Value***	None			***Other Expos. Limit Used***	None

Emergency and First Aid Procedures	Most problems will result from exposure to molten materials.
1. Inhalation	Immediately remove victim from area to fresh air. Seek medical attention.
2. Eyes	If contacted by molten material, immediately flush eyes with plenty of cool water for at least 15 minutes. Do not permit victim to rub eyes. Immediately seek medical attention.
3. Skin	If contact by molten material, cool immediately with cool water. Do not attempt to remove any solidified material. Immediately seek medical attention.
4. Ingestion	If material is ingested, contact a physician or Poison Control Center as appropriate whenever any foreign object is swallowed.

Section 6 - SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type)	N/A

Ventilation	***Local Exhaust***	***Mechanical (General)***	***Special***	***Other***
N/A	N/A	N/A	N/A	N/A

Protective Gloves	Wear protective gloves during thermal processing.	***Eye Protection***	Wear eye protection during thermal processing.

Other Protective Clothing or Equipment	Wear protective sleeves when processing material at elevated temperatures to minimize the possibility of thermal burns.

Section 7 - SPECIAL PRECAUTIONS AND SPILL / LEAK PROCEDURES

Precautions to be Taken in Handling and Storage	This product should be stored in a manner that it is not exposed to heat and sources of ignition. A static charge may be present on finished products.
Other Precautions	None

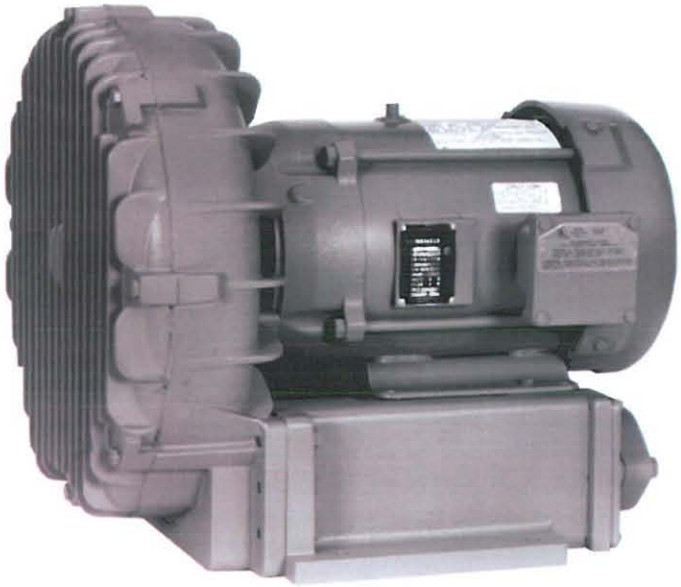
Steps to be Taken in Case Material is Released or Spilled	Spilled material should be swept up and discarded. Comply with applicable federal, state or local regulations.
Waste Disposal Methods	Dispose in accordance with local regulations

IMPORTANT - Do not leave blank spaces. If information is unavailable, unknown or does not apply, so indicate

EN 707 & CP 707 Three-Phase Sealed Regenerative Blower w/Explosion-Proof Motor

FEATURES

- Manufactured in the USA – ISO 9001 compliant
- Maximum flow: 295 SCFM
- Maximum pressure: 85 IWG
- Maximum vacuum: 87 IWG
- Standard motor: 5.0 HP, explosion-proof
- Cast aluminum blower housing, cover, impeller & manifold; cast iron flanges (threaded); teflon lip seal
- UL & CSA approved motor with permanently sealed ball bearings for explosive gas atmospheres Class I Group D minimum
- Sealed blower assembly
- Quiet operation within OSHA standards



MOTOR OPTIONS

- International voltage & frequency (Hz)
- Chemical duty, high efficiency, inverter duty or industry-specific designs
- Various horsepowers for application-specific needs

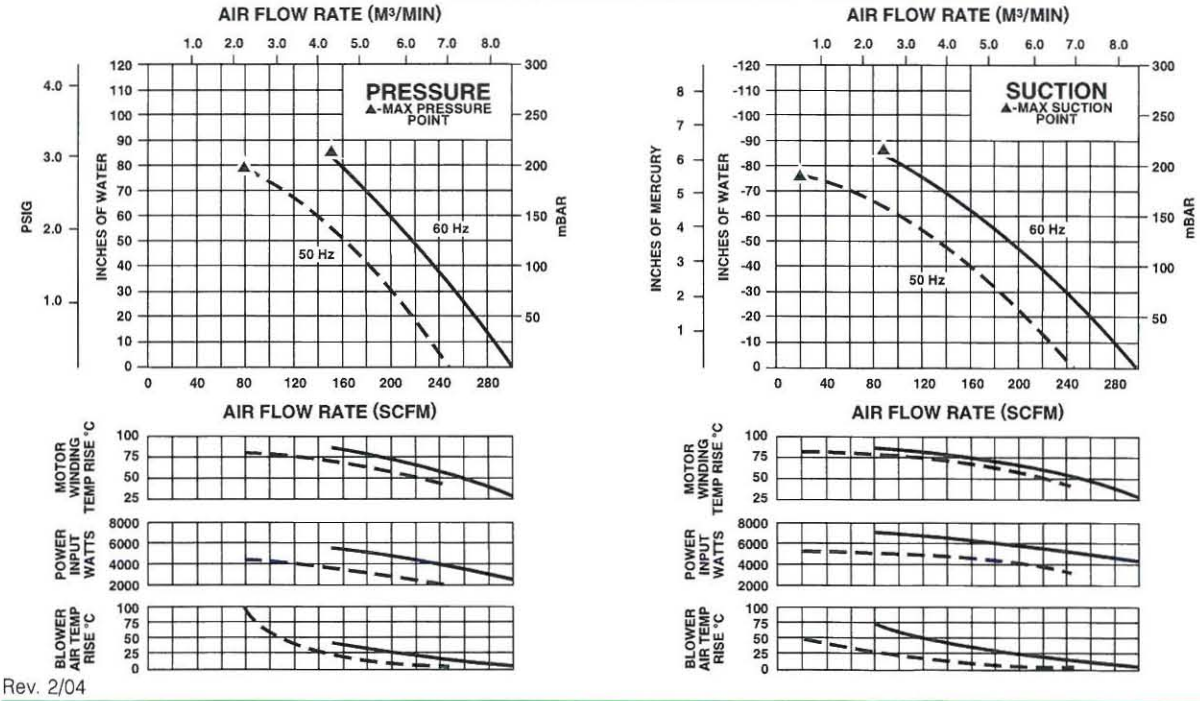
BLOWER OPTIONS

- Corrosion resistant surface treatments & sealing options
- Remote drive (motorless) models
- Slip-on or face flanges for application-specific needs

ACCESSORIES (See Catalog Accessory Section)

- Flowmeters reading in SCFM
- Filters & moisture separators
- Pressure gauges, vacuum gauges & relief valves
- Switches – air flow, pressure, vacuum or temperature
- External mufflers for additional silencing
- Air knives (used on blow-off applications)
- Variable frequency drive package

BLOWER PERFORMANCE AT STANDARD CONDITIONS

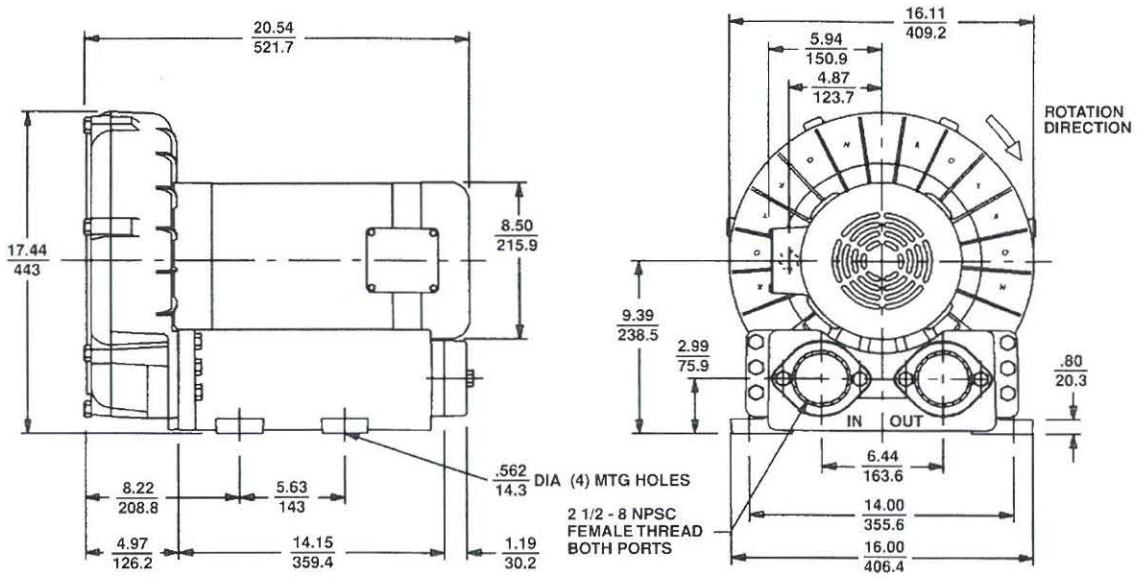


Rev. 2/04

AMETEK Technical and Industrial Products, Kent, OH 44240 • e mail: rotronindustrial@ametek.com • internet: www.ametektmd.com

EN 707 & CP 707 Three-Phase Sealed Regenerative Blower w/Explosion-Proof Motor

Scale CAD drawing available upon request.



DIMENSIONS: IN / MM
TOLERANCES: .XX ± .1 / 2.5
(UNLESS OTHERWISE NOTED)

A 0.75" NPT CONDUIT CONNECTION AT 12 O'CLOCK POSITION

SPECIFICATIONS

MODEL	EN707F72MXL		EN707F86MXL	CP707FW72MXLR
Part No.	038710		038711	038974
Motor Enclosure – Shaft Material	Explosion-proof – **CS**		Explosion-proof – **CS**	Chem XP – **SS**
Horsepower	5.0		5.0	Same as EN707F72MXL – 038710 except add Chemical Processing (CP) features from catalog inside front cover
Phase – Frequency [1]	Three - 60 Hz		Three - 60 Hz	
Voltage [1]	230	460	575	
Motor Nameplate Amps	14	7	5.7	
Max. Blower Amps [3]	15	7.5	6.3	
Inrush Amps	152	76	61	
Starter Size	1	0	0	
Service Factor	1.0		1.0	
Thermal Protection [2]	Class B - Pilot Duty		Class B - Pilot Duty	
XP Motor Class – Group	I-D, II-F&G		I-D, II-F&G	
Shipping Weight	174 lb (79 kg)		174 lb (79 kg)	

[1] Rotron motors are designed to handle a broad range of world voltages and power supply variations. Our dual voltage 3 phase motors are factory tested and certified to operate on both: **208-230/415-460 VAC-3 ph-60 Hz** and **190-208/380-415 VAC-3 ph-50 Hz**. Our dual voltage 1 phase motors are factory tested and certified to operate on both: **104-115/208-230 VAC-1 ph-60 Hz** and **100-110/200-220 VAC-1 ph-50 Hz**. All voltages above can handle a ±10% voltage fluctuation. Special wound motors can be ordered for voltages outside our certified range.

[2] Maximum operating temperature: Motor winding temperature (winding rise plus ambient) should not exceed 140°C for Class F rated motors or 120°C for Class B rated motors. Blower outlet air temperature should not exceed 140°C (air temperature rise plus inlet temperature). Performance curve maximum pressure and suction points are based on a 40°C inlet and ambient temperature. Consult factory for inlet or ambient temperatures above 40°C.

[3] Maximum blower amps corresponds to the performance point at which the motor or blower temperature rise with a 40°C inlet and/or ambient temperature reaches the maximum operating temperature.

Specifications subject to change without notice. Please consult your Local Field Sales Engineer for specification updates.

Rev. 2/04

SERVICE AND PARTS MANUAL FOR BLOWER MODEL

EN707 – EN808 THREE PHASE

Technical & Industrial Products
627 Lake Street, Kent, Ohio 44240 U.S.A.
Telephone: 330-673-3452 Fax: 330-677-3306
e-mail: rotronindustrial@ametek.com
internet: www.ametektip.com

Your Choice. Our Commitment.™

WARRANTY, INSTALLATION, MAINTENANCE AND TROUBLESHOOTING INSTRUCTIONS

TECHNICAL AND INDUSTRIAL PRODUCTS
627 Lake Street, Kent, Ohio 44240 USA
Telephone: 330-673-3452 Fax: 330-677-3306
e-mail: rotronindustrial@ametek.com web site: www.ametektip.com

1. AMETEK Rotron DR, EN and HiE regenerative direct drive blowers are guaranteed for one full year from the date of installation (limited to 18 months from the date of shipment) to the original purchaser only. Should the blower fail we will evaluate the failure If failure is determined to be workmanship or material defect related, we will at our option repair or replace the blower.

2. AMETEK Rotron Minispiral, Revaflow, Multiflow, Nautilair, remote drive blowers, moisture separators, packaged units, CP blowers, Nasty Gas™ models and special built (EO) products are guaranteed for one full year from date of shipment for workmanship and material defect to the original purchaser only. Should the blower fail, If failure is determined to be workmanship or material defect related, we will at our option repair or replace the blower.

3. **Parts Policy** - AMETEK Rotron spare parts and accessories are guaranteed for three months from date of shipment for workmanship and material defect to the original purchaser only. If failure is determined to be workmanship or material defect related we will at our option repair or replace the part.

Corrective Action - A written report will be provided indicating reason(s) for failure, with suggestions for corrective action. Subsequent customer failures due to abuse, misuse, misapplication or repeat offense will not be covered. AMETEK Rotron will then notify you of your options. Any failed unit that is tampered with by attempting repair or diagnosis will void the warranty, unless authorized by the factory.

Terms and Conditions - Our warranty covers repairs or replacement of regenerative blowers only, and will not cover labor for installation, outbound and inbound shipping costs, accessories or other items not considered integral blower parts. Charges may be incurred on products returned for reasons other than failures covered by their appropriate warranty. Out-of-warranty product and in warranty product returned for failures determined to be caused by abuse, misuse, or repeat offense will be subject to an evaluation charge. Maximum liability will in no case exceed the value of the product purchased. Damage resulting from mishandling during shipment is not covered by this warranty. It is the responsibility of the purchaser to file claims with the carrier. Other terms and conditions of sale are stated on the back of the order acknowledgement.

Installation Instructions for SL, DR, EN, CP, and HiE Series Blowers

1. **Bolt It Down** - Any blower must be secured against movement prior to starting or testing to prevent injury or damage. The blower does not vibrate much more than a standard electric motor.

2. **Filtration** - All blowers should be filtered prior to starting. Care must be taken so that no foreign material enters the blower. If foreign material does enter the blower, it could cause internal damage or may exit at extremely high velocity.

   Should excessive amounts of material pass through the blower, it is suggested that the cover(s) and impeller(s) be removed periodically and cleaned to avoid impeller imbalance. Impeller

imbalance greatly speeds bearing wear, thus reducing blower life. Disassembling the blower will void warranty, so contact the factory for cleaning authorization.

3. **Support the Piping** - The blower flanges and nozzles are designed as connection points only and are not designed to be support members.

   Caution: Plastic piping should not be used on blowers larger than 1 HP that are operating near their maximum pressure or suction point. Blower housing and nearby piping temperatures can exceed 200°F. Access by personnel to the blower or nearby piping should be limited, guarded, or marked, to prevent danger of burns.

4. **Wiring** - Blowers must be wired and protected/fused in accordance with local and national electrical codes. All blowers must be grounded to prevent electrical shock. Slo-Blo or time delay fuses should be used to bypass the first second of start-up amperage.

5. **Pressure/Suction Maximums** - The maximum pressure and/or suction listed on the model label should not be exceeded. This can be monitored by means of a pressure or suction gage (available from Rotron), installed in the piping at the blower outlet or inlet. Also, if problems do arise, the Rotron Field representative will need to know the operating pressure/suction to properly diagnose the problem.

6. **Excess Air** - Bleed excess air off. DO NOT throttle to reduce flow. When bleeding off excess air, the blower draws less power and runs cooler.

   Note: Remote Drive (Motorless) Blowers - Properly designed and installed guards should be used on all belts, pulleys, couplings, etc. Observe maximum remote drive speed allowable. Due to the range of uses, drive guards are the responsibility of the customer or user. Belts should be tensioned using belt gauge.

Maintenance Procedure

When properly piped, filtered, and applied, little or no routine maintenance is required. Keep the filter clean. Also, all standard models in the DR, EN, CP, and HiE series have sealed bearings that require no maintenance. Bearing should be changed after 15,000 to 20,000 hours, on average. Replacement bearing information is specified on the chart below.

Bearing Part Number	Size	Seal Material	Grease	Heat Stabilized
510217 510218 510219	205 206 207	Polyacrylic	Nye Rheotemp 500 30% +/- 5% Fill	Yes – 325 F
510449 516440 516648	203 202 307	Buna N	Exxon Polyrex Grease	NO
516840 516841 516842 516843 516844 516845 516846 516847	206 207 208 210 309 310 311 313	Buna N	Exxon Polyrex Grease	NO

Troubleshooting

		POSSIBLE CAUSE	OUT OF WARRANTY REMEDY ***
IMPELLER DOES NOT TURN	Humming Sound	1. * One phase of power line not connected 2. * One phase of stator winding open 3. Bearings defective 4. Impeller jammed by foreign material 5. Impeller jammed against housing or cover 6. ** Capacitor open	1. Connect 2. Rewind or buy new motor 3. Change bearings 4. Clean and add filter 5. Adjust 6. Change capacitor
	No Sound	1. * Two phases of power line not connected 2. * Two phases of stator winding open	1. Connect 2. Rewind or buy new motor
IMPELLER TURNS	Blown Fuse	1. Insufficient fuse capacity 2. Short circuit	1. Use time delay fuse of proper rating 2. Repair
	Motor Overheated Or Protector Trips	1. High or low voltage 2. * Operating in single phase condition 3. Bearings defective 4. Impeller rubbing against housing or cover 5. Impeller or air passage clogged by foreign material 6. Unit operating beyond performance range 7. Capacitor shorted 8. * One phase of stator winding short circuited	1. Check input voltage 2. Check connections 3. Check bearings 4. Adjust 5. Clean and add filter 6. Reduce system pressure/vacuum 7. Change capacitor 8. Rewind or buy new motor
	Abnormal Sound	1. Impeller rubbing against housing or cover 2. Impeller or air passages clogged by foreign material 3. Bearings defective	1. Adjust 2. Clean and add filter 3. Change bearings
	Performance Below Standard	1. Leak in piping 2. Piping and air passages clogged 3. Impeller rotation reversed 4. Leak in blower 5. Low voltage	1. Tighten 2. Clean 3. Check wiring 4. Tighten cover, flange 5. Check input voltage

* 3 phase units

** 1 phase units

*** Disassembly and repair of new blowers or motors will void the Rotron warranty. Factory should be contacted prior to any attempt to field repair an in-warranty unit.

Blower Disassembly:

WARNING: Attempting to repair or diagnose a blower may void Rotron's warranty. It may also be difficult to successfully disassemble and reassemble the unit.

1) Disconnect the power leads. **CAUTION:** Be sure the power is disconnected before doing any work whatsoever on the unit.

2) Remove or separate piping and/or mufflers and filters from the unit.

3) Remove the cover bolts and then the cover. **NOTE:** Some units are equipped with seals. It is mandatory that these seals be replaced once the unit has been opened.

4) Remove the impeller bolt and washers and then remove the impeller. **NOTE:** Never pry on the edges of the impeller. Use a puller as necessary.

5) Carefully note the number and location of the shims. Remove and set them aside. NOTE: If the disassembly was for inspection and cleaning the unit may now be reassembled by reversing the above steps. If motor servicing or replacement and/or impeller replacement is required the same shims may not be used. It will be necessary to re-shim the impeller according to the procedure explained under assembly.

6) Remove the housing bolts and remove the motor assembly (arbor/.housing on remote drive models).

7) Arbor disassembly (Applicable on remote drive models only):
   a) Slide the bearing retraining sleeve off the shaft at the blower end.
   b) Remove the four (4) screws and the bearing retaining plate from the blower end.
   c) Lift the shaft assembly far enough out of the arbor to allow removal of the blower end snap ring.
   d) Remove the shaft assembly from the arbor.
   e) If necessary, remove the shaft dust seal from the pulley end of the arbor.

Muffler Material Replacement:

1) Remove the manifold cover bolts and them manifold cover.

2) The muffler material can now be removed and replaced if necessary. On blowers with fiberglass acoustical wrap the tubular retaining screens with the fiberglass matting before sliding the muffler pads over the screens.

3) Reassemble by reversing the procedure.

NOTE: On DR068 models with tubular mufflers it is necessary to remove the cover and impeller accessing the muffler material from the housing cavity.

Blower Reassembly:

1) Place the assembled motor (assembled arbor assembly for remote drive models) against the rear of the housing and fasten with the bolts and washer.

2) To ensure the impeller is centered within the housing cavity re-shim the impeller according to the procedure outlined below.

3) If blower had a seal replace the seal with a new one.

4) Place the impeller onto the shaft making sure the shaft key is in place and fasten with the bolt, washer and spacer as applicable. Torque the impeller bolt per the table below. Once fastened carefully rotate the impeller to be sure it turns freely.

5) Replace the cover and fasten with bolts.

6) Reconnect the power leads to the motor per the motor nameplate.

Bolt Size	Torque Pound-Force-Foot
1/4-20	6.25 +/- 0.25
5/16-18	11.5 +/- 0.25
3/8-16	20.0 +/- 0.5
½-13	49.0 +/- 1
5/8 –11	90.0 +/- 2

Impeller Shimming Procedure:

WARNING: This unit may be difficult to shim. Extreme care may be exercised.

Tools Needed: Machinist's Parallel Bar
Vernier Caliper with depth measuring capability
Feeler gauges or depth gauge

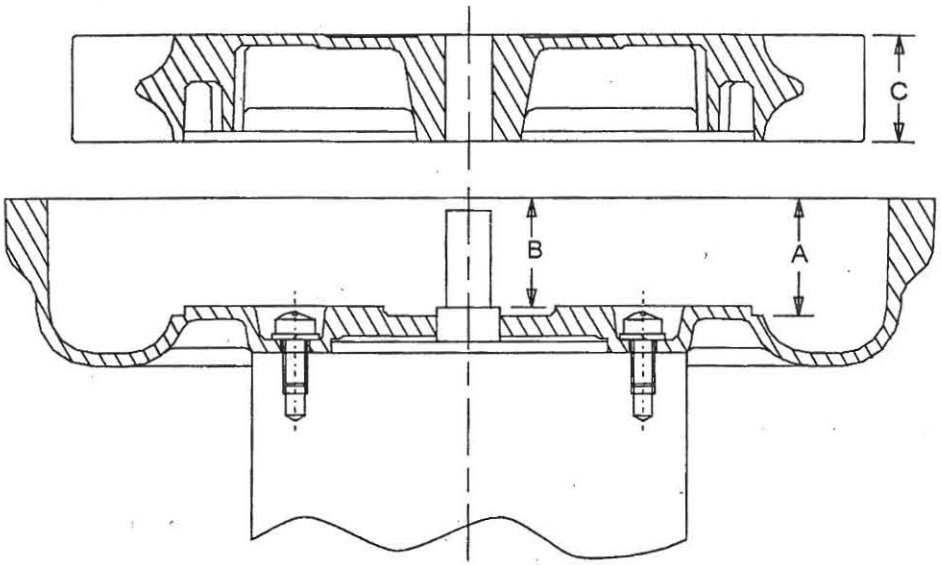
Measure the Following:

Distance from the flange face to the housing (A)
Distance from the flange face to the motor shaft shoulder (B)
Impeller Thickness (C)

Measurements (A) and (B) are made by laying the parallel bar across the housing flange face and measuring to the proper points. Each measurement should be made at three points, and the average of the readings should be used.

Shim Thickness = B – (A+C)/2

After the impeller installation (step #4 above) the impeller/cover clearance can be checked with feeler gauges, laying the parallel bar across the housing flange face. This clearance should nominally be (A-C)/2.



AMETEK®
ROTRON TECHNICAL MOTOR DIVISION
REGENERATIVE BLOWER GROUP

75 North Street
Saugerties, New York 12477
Phone: (845) 246-3401
Fax: (845) 246-3802

EXPLOSION-PROOF BLOWERS

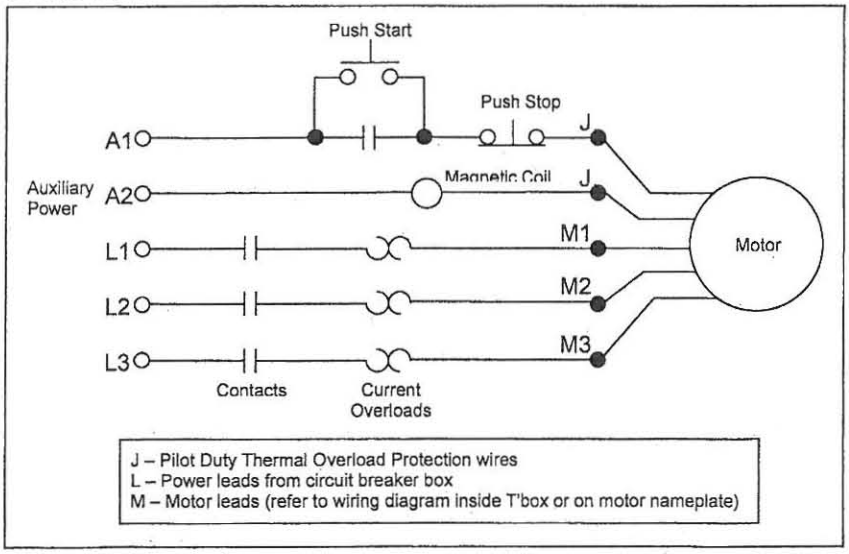
IMPORTANT: Read before wiring this Explosion-proof Blower

This AMETEK Rotron Explosion-proof Regenerative Blower may be equipped with Pilot Duty Thermal Overload (PDTO) or Automatic Thermal Overload (ATO) protection. When properly wired to a motor starter, this protection limits the motor winding temperature rise per the National Electric Code (NEC) article 500. Failure to properly wire this blower is an NEC violation and could cause an explosion. AMETEK Rotron assumes no responsibilities for damages incurred by negligent use of this product, and will not warranty a blower on which the PDTO is not properly connected. Some blowers 1 HP and under do not require PDTO and have built in ATO. Consult the factory if verification of wiring connections is required.

In all cases, follow the motor controller manufacturer's instructions. The following schematic is for conceptual understanding only, and may not apply to all motor/controller combinations.

The manufacturer's wiring diagram found on the motor takes precedent over reference diagrams supplied by AMETEK Rotron Technical Motor Division.

Schematic



The schematic is shown for a three phase motor. For a single phase motor disregard L3 and M3. Pushing the START button completes the auxiliary control circuit, allowing current to flow through the magnetic coil. The contacts are magnetically closed, starting the motor and latching the auxiliary circuit. The motor will continue to run until the STOP push button is depressed, the motor reaches the overload temperature, or the current sensing overloads trip out.

If you have any questions, contact AMETEK Rotron at 914-246-3401 for the location of your area representative.

POLICY REGARDING INSTALLATION OF AMETEK ROTRON REGENERATIVE BLOWERS IN HAZARDOUS LOCATIONS

AMETEK Rotron will not knowingly specify, design or build any regenerative blower for installation in a hazardous, explosive location without the proper NEMA motor enclosure. AMETEK Rotron does not recognize sealed blowers as a substitute for explosion-proof motors. Sealed units with standard TEFC motors should never be utilized where local, state, and/or federal codes specify the use of explosion-proof equipment.

AMETEK Rotron has a complete line of regenerative blowers with explosion-proof motors. Division 1 & 2, Class I, Group D; Class II, Groups F & G requirements are met with these standard explosion-proof blowers.

AMETEK Rotron will not knowingly specify, design or build any regenerative blower for installation in a hazardous, corrosive environment without the proper surface treatment and sealing options.

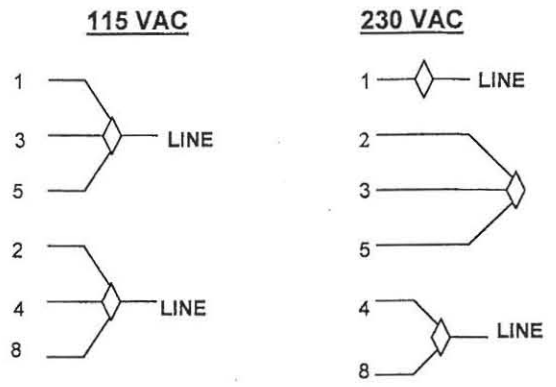
AMETEK Rotron has a complete line of Chemical Processing and Nasty Gas™ regenerative blowers with Chem-Tough™, stainless steel parts, and seals.

AMETEK Rotron offers general application guidance; however, suitability of the particular blower selection is ultimately the responsibility of the purchaser, not the manufacturer of the blower.

FS2 Rev. B 3/10/98

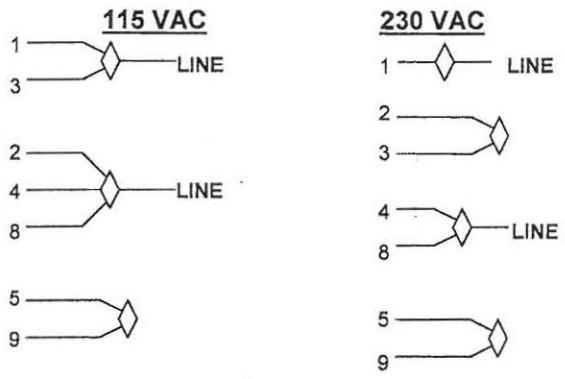
WIRING DIAGRAMS, XP MOTORS

H. 1Ø, 6 WIRE



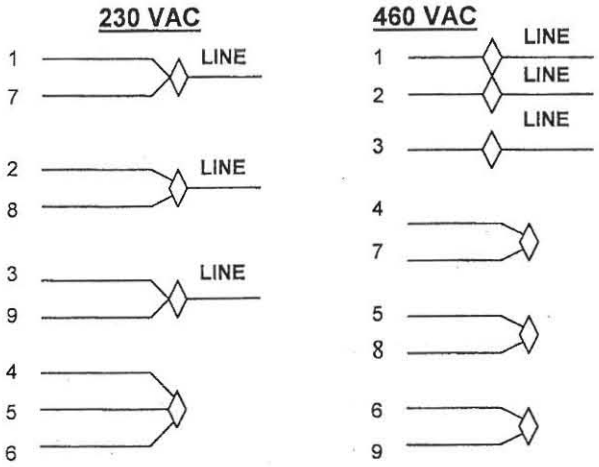
INTERCHANGE LEADWIRES 5 & 8 to REVERSE ROTATION

I. 1Ø, 7 WIRE



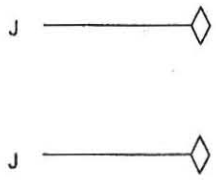
INTERCHANGE LEADWIRES 5 & 8 to REVERSE ROTATION

K. 3Ø, 9 WIRE



INTERCHANGE ANY TWO LEAD LINES TO REVERSE ROTATION

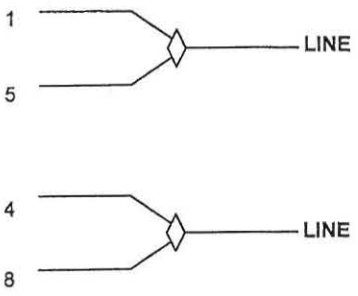
L. PILOT DUTY THERMAL OVERLOADS



HOOK J LEADS TO CONTROL CIRCUITRY

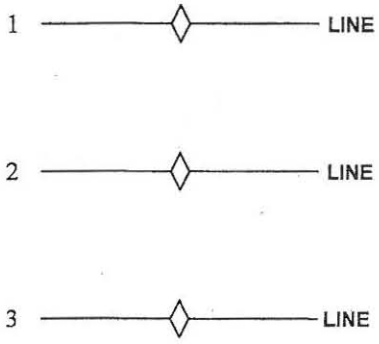
M. 1Ø 230 VAC

SINGLE VOLTAGE



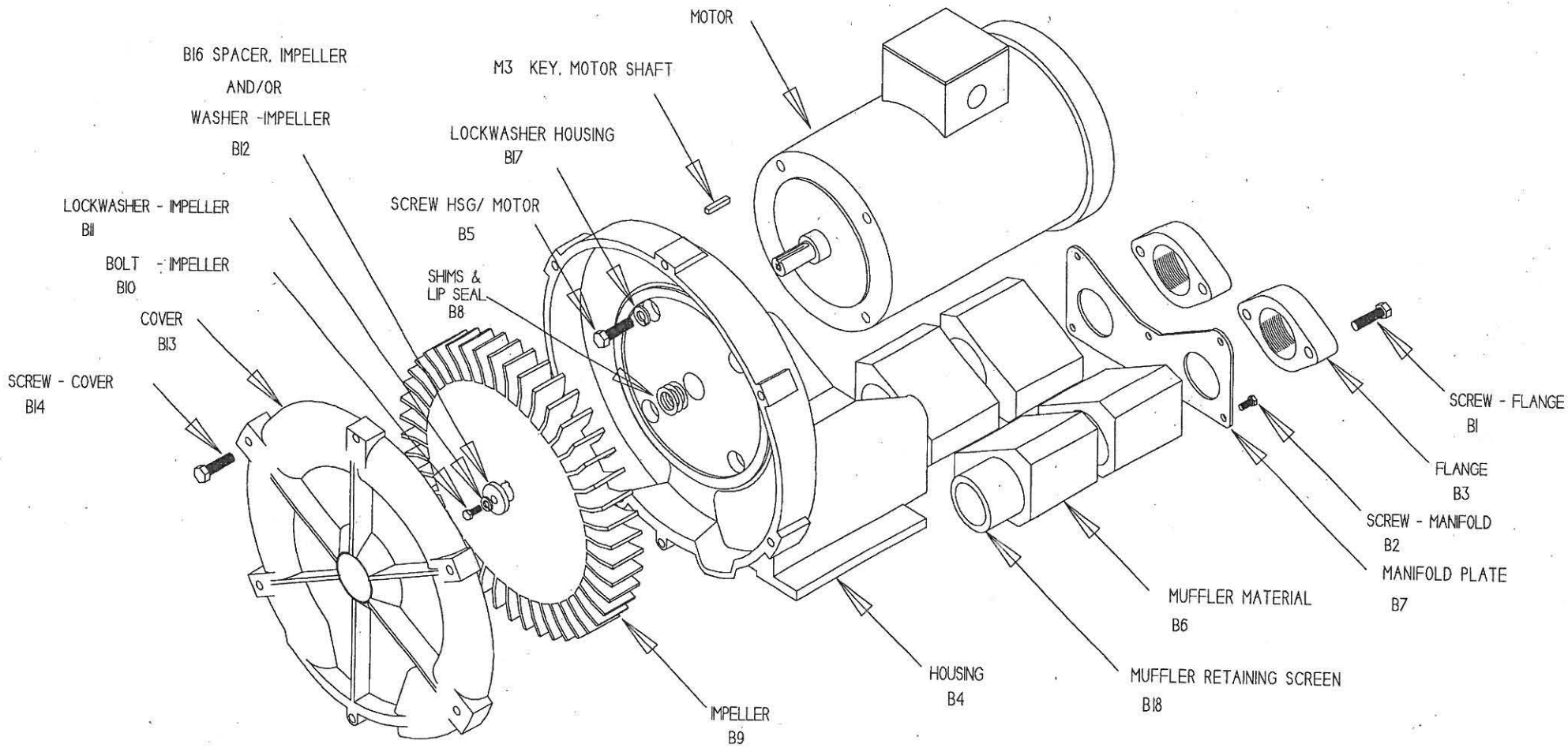
INTERCHANGE LEADWIRES 5 & 8 TO REVERSE ROTATION

N. 3Ø 575 VAC



INTERCHAGE ANY TWO LEAD LINES TO REVERSE ROTATION

ASSEMBLY DIAGRAM
DR/EN/CP/HiE XOX



EN 707/808 3 Phase
Service and Parts Manual

Parts Breakdown

	Model:	EN707	EN808	EN707F_MXL	EN757	EN757	EN808BA_MXL	EN808BA__MXL
	Part No.:	***038181***	***038182***	038710	081176	081174	*038729*	081229
		038439	***038440***	038711	081177		*038731*	081230
		OBSOLETE	***OBSOLETE***				***OBSOLETE***	

Item No.	Qty. Req'd	Description							
M3	1	Key Motor Shaft	510212	511532	510212	510629	510212	511532	511532
B1	4	Screw, Flange	155095	155025	155067	155067	155067	155067	155067
B2		Screw, Manifold	(13 pcs) 120214	120214	Not Used	Not Used	Not Used	Not Used	Not Used
B3	2	Flange	511480	511614	511614	511614	511614	511614	511614
		Screen, Flange Guard	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
B4	1	Housing	516752	516758	516752	552021	552037	550081	516764
B5	4	Screw, Hsg /Motor	251792	140014	251792	251791	251792	140014	155034
B6	36	Muffler Material (Gray)	(40 pcs) 515493	515405	(7) 551720 14 pcs)		552044 14 pcs) 552044	551736	551736
	1	Muffler Material (White)	Not Used	Not Used	551721 (2 pcs)		552045 (2 pcs) 552045	(2) 551737	(2) 551737
B7		Manifold Plate	551264	523432	Not Used	Not Used	Not Used	Not Used	Not Used
B8	*	Shim .002"	272703	511547	272703	510356	272703	511547	511547
	*	Shim .005"	272704	511548	272704	510357	272704	511548	511548
	*	Shim .010"	272705	511549	272705	510358	272705	511549	511549
	*	Shim .020"	272706	511550	272706	510359	272706	511550	511550
	*	Shim .030"	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
B9	1	Impeller	515461	516452	515461	552035	552036	550071	552062
B10	1	Bolt, Impeller	251791	155068	251791	120215	120007	155068	120210
B11	1	Lockwasher, Impeller	251787	251788	251787	120203	251787	251788	251788
B12		Washer, Impeller	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	511529
B13	1	Cover	515462	516447	515462	552023	552023	516447	552061
B14	7	Screw, Cover	(7 pcs) 120215	140016	155236 (9 pcs)		155236 (9 pcs) 155236	(8 pcs) 140016	(8 pcs) 140016
B15		Eye Bolt	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
B16	1	Spacer, Impeller Bolt	478336	511529	478336	510355	478336	511529	515555
B17		Lockwasher, Housing	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
B18	1	Screen, Muffler Retaining, Right (**)	515492	515408	551723	552046	552046	551723	551723
	1	Screen, Muffler Retaining, Left (**)	515491	515407	551723	552046	552046	551723	551723
B19	6	Bolt, Muffler Hsg/Hsg	120251	155025	120251	120007	120007	155025	155025
B19A	4	Bolt, Muffler Hsg/Hsg	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	120214
B20	1	Muffler Housing	515480	515370	550023	552017	552017	550017	550017
		Muffler Discrete	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
	2	Bolt, Motor/Muffler	Not Used	120325	Not Used	Not Used	Not Used	Not Used	Not Used
	2	Lockwasher, Motor/Muffler	Not Used	120203	Not Used	Not Used	Not Used	Not Used	Not Used
	2	Washer, Motor/Muffler	Not Used	155029	Not Used	Not Used	Not Used	Not Used	Not Used
B25		Nut, Rail	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
B26		Rail Mounting	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used
	1	Lip Seal	516691	516693	516691	516587	516693	516693	516693

*As needed **Viewed looking at inlet/outlet ports

Model	Part No.	Motor	Wiring Diagram	Specific Parts	Bearing, Rear (M1)	Bearing, Impeller End (M2)
EN707F72MXL	038710	515552	K + L		510217	510218
EN707F86MXL	038711	529633	N + L			
EN757M72XL	081176	516687	K + L		510449	510217
EN757M86XL	081177	529630	N + L			
EN757F72XL	081174	515552	K + L		510217	510218
EN808BA86MXL	081230	529626	N + L		516840	516844
EN808BA72MXL	081229	515558	K + L			
Discontinued						
EN707F72XL	038181	515552	K + L		510217	510218
EN707F86XL	038439	529633	N + L			
EN808BA72XL	038182	515558	K + L		510840	516844
EN808BA86XL	038440	529626	N + L		Call Factory	Call Factory
EN808BA86MXL	038731	529626	N + L		516840	516844
EN808BA72MXL	038729	515558	K + L			

*As needed **Viewed looking at inlet/outlet ports