SOIL VAPOR INVESTIGATION WORK PLAN

FOR THE PROPERTY LOCATED AT:
129-09 JAMAICA AVENUE, RICHMOND HILL, NY
TAX BLOCK 9281, LOT 44

PREPARED FOR:
UFI, INC.
173 FOSTER AVENUE
VALLEY STREAM, NY

APRIL 16, 2010

CRAIG PUERTA, PE
SENIOR MANAGER

PETER W. ZIMMERMANN
PRINCIPAL

PREPARED BY:
THE ELM GROUP
267 BROADWAY, FIFTH FLOOR, NEW YORK, NY 10007
WWW.EXPLOREELM.COM

TABLE OF CONTENTS

FIGURES

1.0 INTRODUCTION

The ELM Group (ELM) has prepared this Soil Vapor Work Plan (SVWP) for the property located at 129-09 Jamaica Avenue, Richmond Hill, New York (Site, Figure 1). The SVWP has been prepared in response to a letter from the New York State Department of Environmental Conservation (NYSDEC) dated August 7, 2009, requesting the preparation of a work plan for an off-site soil vapor investigation.

The legal definition of the property is Tax Block 9281, Lot 44. The site is located on a block bound by Hillside Avenue to the north, 130th Street to the east, 127th Street to the west, and Jamaica Avenue to the south, as identified on Figure 1. The site is located in a mixed community consisting of industrial, commercial, and residential applications. The site is bounded to the east by the Long Island Rail Road train tracks, to the northwest by a residential community, to the south by Jamaica Avenue and mixed industrial and residential property use, and to the west by commercial properties, also with integrated residential usage. The Site is currently enrolled in the New York State Brownfields Cleanup Program (Site #C241103).

This work plan focuses on assessing the potential for site-related constituents of interest (COIs) in soil vapor to migrate off-site and contribute to a completed vapor intrusion exposure pathway under current or future conditions. The results of the investigation will be used to refine the conceptual site model (CSM) which details historical release scenarios, the nature and extent and fate and transport of site-related constituents, and complete or potentially complete exposure pathways. Based on this evaluation and the refined CSM, ELM will recommend appropriate next steps consistent with New York State Department of Health (NYSDOH) October 2006 Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH Guidance).

2.0 BACKGROUND

The site was formerly owned and operated by Ideal Vortex Laundry, which utilized a petroleum-based dry cleaning machine beginning in the 1930's through 1950's. UFI, Inc. (UFI) acquired the property in the 1950's and continued laundry operations through November 2002, when all operations ceased. Between 1992 and 1997, UFI utilized a tetrachloroethene (PCE) dry cleaning machine at the site. According to historical knowledge, the machine was a closed-circuit system that recycled PCE during the course of its operation. Typical maintenance activities could have included filter change-out; occasional replacement of liquid-phase PCE lost to the vapor phase during routine cleaning operations, and complete change-out of the PCE liquid according to a maintenance schedule. According to UFI, the PCE-based dry cleaning machine was used no more than three (3) times a week, and all PCE was stored inside the cleaning machine when it was not in use. No other on-site storage of PCE stock product or waste material was identified based on discussions with the site owner. The site is currently vacant, with building structures and subsurface infrastructure still present.

Subsurface soils, on-site soil vapor, and groundwater have been characterized through a program of existing well sampling, shallow soil vapor probes, investigative soil borings, and the installation of new groundwater monitoring wells during a remedial investigation performed by ELM in November 2008 through February 2009. Results of ELM's investigation are summarized in a Remedial Investigation Report submitted to NYSDEC in January 2010.

A target analyte list (TAL) has been developed to include the principal COIs, which have been detected in soil, groundwater, and/or soil vapor samples collected at the site, which represent the primary potential risk and remedy drivers at the site. These COIs include tetrachloroethene, trichloroethene, cis-1,2-dichloroethene, and vinyl chloride. Although some petroleum-related compounds have been detected on-site, these constituents were not detected at concentrations or locations that would warrant further investigation during previous soil vapor investigations and have not been included on the TAL. Results of the 2008 soil vapor sampling are shown on Figure 2.

3.0 PROJECT OBJECTIVES

The scope of work of this soil vapor investigation includes a phased sampling plan that will be used to help update and refine the CSM and evaluate off-site soil vapor conditions. This evaluation will involve the measurement of COIs in soil vapor, the determination of soil properties and hydrogeological conditions, and the evaluation of natural attenuation of COIs in the vadose zone. The results of these analyses will be evaluated using multiple lines of evidence to determine appropriate next steps, consistent with NYSDOH Guidance.

The objectives of this off-site investigation are as follows:

1. Evaluate the concentrations of COIs in off-site soil vapor and indoor air and compare these data with the results of on-site investigations; and
2. Evaluate measured concentrations of COIs to determine if additional off-site investigation is warranted, and if so, to develop a work plan(s).
3. Evaluate measured concentrations of COIs with comparison to NYSDOH's Soil Vapor/Indoor Air Matrices to determine appropriate next steps.

Procedures for the collection and laboratory analysis of soil vapor and indoor air samples will be consistent with the NYSDOH Guidance.

4.0 RATIONALE FOR SELECTION OF SAMPLING LOCATIONS

The primary focus of this phased soil vapor investigation first is to determine whether off-site migration of site-related COIs has caused soil vapor intrusion in the neighboring residential properties along the western boundary of the property. Based on the results of a soil vapor sampling event which took place on November 11, 2008 (Figure 2), NYSDOH believes that further investigation is warranted to determine whether off-site migration of site-related constituents has occurred in the vicinity of SV-7, SV-11, and SV-12.

Following the acceptance of the work plan, a site visit will be conducted to finalize the selected locations for sampling prior to the commencement of each phase of the sampling. NYSDEC and NYSDOH representatives will be requested to join ELM during the site visit to confirm final proposed sample locations. No sampling is proposed to be performed during the initial site visit.

The focus of the sampling program will be on the collection of sub-slab soil vapor and indoor air samples from residential homes and additional soil vapor samples from beneath the sidewalks at selected locations. All collection of sub-slab samples will be performed to a maximum depth of 2" beneath any existing slabs and soil vapor samples will be collected at a depth of 5'-6' beneath the lowest existing grade surfaces. Indoor air samples will be collected from the

basement levels if present. If no basement is present, an indoor air sample will be collected from the first floor living space.

Soil vapor samples will be collected from all probes for the measurement of COIs, oxygen (O_2), methane (CH_4), and carbon-dioxide (CO_2), and these data will be used to assess vapor transport mechanisms and natural attenuation of hydrocarbon vapors in soil, if any.

5.0 SCOPE OF WORK

Prior to initiation of soil vapor sampling at any off-site locations, a site visit will be performed by ELM representatives in order to review site conditions. The observations made and information gained during the visit will be used for the final selection of sampling locations.

A utility mark-out will be arranged and completed by the DigNet of New York City & Long Island (DigNet) prior to the site visit. Mark-outs will be utilized during the site visit to verify or relocate soil vapor sampling points and ELM will make reasonable efforts to identify utility lines inside homes. It is anticipated that a representative from any off-site properties where sampling will be conducted will be present during the site visit to assist ELM with identification of any utility lines.

It is assumed that the visit will be performed in accordance with the provisions of any negotiated access agreements. The tasks anticipated for site reconnaissance will include the review of the following, including any additional requirements as required by the NYSDOH guidance:

- The location of any above or below ground storage tanks;
- Surface staining or cracks in pavement or concrete (indoor locations only);
- Staining or cracks in building foundations (indoor locations only);
- The location of standing water, drains, or sumps (indoor locations only);
- A product inventory survey will be conducted to document the presence of any household items (paint cans, cleaners, etc) that may represent additional sources of COIs within the homes (indoor locations only). ELM will recommend that any confounding sources of COIs be removed from the homes, to the degree practicable;
- Analysis of heating/cooling systems within residences;
- The identification of any potential sources of interference (indoor locations only);
- The location of monitoring wells and the current level of the water table; and
- An estimate of the change in elevation between the neighboring sites and the UFI Site.

The site reconnaissance will include documenting all observations in field notes and photographs.

ELM will evaluate the results and refine the CSM to determine whether there is sufficient evidence to support a conclusion that the off-site migration of site-related constituents may be

contributing to a complete vapor intrusion exposure pathway under current or future conditions.

The residential properties were broken into the following four groups of homes. These groups have been selected to represent four key off-site areas based on the result of previous soil vapor sampling activities which took place on-site in 2008.

- **Group 1** - Four southernmost homes on the east side of the block (8643-8637 127th Street) proximate to SV-11.
- **Group 2** - Six homes on the east side of the block (8635-8625 127th Street) proximate to SV-12.
- **Group 3** - Four homes (8623-8615 127th Street) proximate to SV-7,
- **Group 4** - Two homes (8613-8611 127th Street).

These groups of targeted homes are illustrated on Figure 3 & 4.

Following the selection of the sampling locations, the investigation will consist of the following steps:

Phase I –Off-Site Sidewalk Locations

The following locations are proposed for sampling:

- Installation and collection of up to five soil vapor samples in the sidewalk on the western side of 127th Street between Hillside Avenue and Jamaica Avenue. The samples along 127th Street will be collected in proximity to the north (near Hillside Avenue). An ambient air sample and one duplicate sample for Quality Assurance/Quality Control will also be collected.
- Installation and collection of up to five soil vapor samples in the sidewalk on the southern side of Jamaica Avenue between 127th Street and 130th Street. An ambient air sample and one duplicate sample for Quality Assurance/Quality Control purposes will also be collected.
- Installation and collection of up to ten soil vapor samples in the sidewalk on the western side of 130th Street between Jamaica Avenue and Hillside Avenue, to the east of the site. An ambient air sample and one duplicate sample for Quality Assurance/Quality Control will also be collected.
- Collection of soil vapor samples from each probe using Summa canisters and chemical analysis by modified EPA Method TO-15.
- Collection of ambient air samples for COIs and analysis by modified EPA Method TO-15 to represent background conditions.
- On-site measurement and select laboratory analysis of soil gas samples for O_2, CO_2, and CH_4 to provide information needed to assess the persistence of hydrocarbon vapors.
- Preparation of a report for submission to NYSDOH and NYSDEC.

Phase II – Off-Site Northwest Adjacent Homes

Note: This work will commence on or about November 15, 2010, in conjunction with the beginning of the 2010 heating season.

- Pending results of the access agreement negotiations, a minimum of four sub-slab soil vapor samples and four concurrent indoor air samples would be collected. One set of sub-slab and indoor air samples would be collected from one home from each Group. The samples will be collected from the basement levels (if present). If no basement is present, a sub-slab sample will be collected from the existing first floor level of the home. For each day of sampling activities, one ambient (outdoor) air sample will be collected within the vicinity of the indoor testing. One duplicate sample for Quality Assurance/Quality Control will be collected per group of homes sampled.
- Sampling from each probe using Summa canisters and chemical analysis of COIs by modified EPA Method TO-15;
- Collection of ambient air samples for COIs and analysis by modified TO-15 to represent background conditions;
- A single representative soil sample would be collected at a depth of approximately 5-6 ft bgs from beneath the sidewalk along 127th St. This soil sample would be analyzed for grain size, moisture content, density, and specific gravity.
- On-site measurement and select laboratory analysis of soil gas samples for O_2, CO_2, and CH_4 to provide information needed to assess the persistence of hydrocarbon vapors;
- Data tabulation and validation;
- Interpretation of the data in the context of the CSM;
- Preparation of a report for submission to NYSDOH and NYSDEC.

NOTE: ELM cannot guarantee obtaining access agreements to the adjoining homes. If access inside the targeted homes is not permitted, collection of soil vapor samples in the homes immediately north or south adjacent of the targeted homes will be considered as an alternative. If access inside these homes is not permitted, collection of soil vapor samples in the backyard areas of the houses at depths approximating that of the basement slabs may be considered as another alternative.

6.0 METHODS

The methods proposed for the completion of the investigation are described in the subsections below.

6.1. Underground Utility Clearances

The DigNet will be contacted prior to the site reconnaissance to provide utility mark-outs in the sidewalks. Final sampling locations will be modified, as necessary, based on the utility locations.

6.2. Soil Vapor/Sub-Slab Probe Installation

A temporary soil vapor probe will be installed at each of the proposed locations, at an appropriate depth. Soil vapor sampling will not be performed within 48 hours of a significant rainfall event (1/2 inch of water or greater).

To install each probe, ELM will drill a 3/8" hole using a hand-held hammer drill, advancing the bit beneath the sidewalk or basement slab. Upon drilling beneath the slab or to the desired depth, a 1/8" Teflon tube will be implanted into the hole, and the annular space sealed with bentonite slurry to prevent ambient air from entering the area around the probe. Once the seal is secure, ELM will connect a "T" fitting and valve on the above-surface end of the tubing, and using a syringe, purged the vapors in the probe and tubing of three volumes. As required by the NYSDOH Guidance, a helium (He) tracer will be used as part of the sampling process and the testing will follow the NYSDOH guidance, specifically Figure 2.4a, which is attached to this workplan as Figure 5. Prior to sample collection the He vapor will be screened using a field meter. The measurement recorded will be less than 5% He at each soil vapor sampling location (NYSDOH allows for 10%). Following this procedure the soil vapor samples will be collected in Summa™ canisters at a flow rate of no greater than 200 ml/min. All residential sub-slab samples will be collected for a period of 24 hours to account for averaging in a residential setting. All soil vapor samples will be collected for a period of eight hours. Following sample collection, He percentages will again be measured and recorded. The soil vapor samples will be analyzed by H & P Mobile Geochemistry for VOCs via EPA TO-15 analysis. Sub-slab samples will be collected directly beneath (max 2" depth) the existing slab (if present) and soil vapor samples will be collected at a depth of 5'-6' beneath existing grade surface.

During sample collection, ELM will maintain a sample log sheet summarizing the following information:

- Sample Identification;
- Date and time of sample collection;
- Sampling depth;
- Name of sampler;
- Sampling methods and devices;
- Purge volumes;
- Volume of soil vapor extracted;
- Vacuum measurements on Summa canisters before and after sample collection;
- Chain of custody protocols and records used to track samples from sampling point to analysis;
- Simple schematic of sample locations, including a basic schematic of samples collected from inside homes detailing sample locations and basic home layout.

ELM will perform periodic checks on the sample equipment to ensure that the sample is being collected properly and the correct vacuum is being achieved. Upon the conclusion of sampling, a slight vacuum will be left in the Summa canister to evaluate if there was any leakage during

transit. If no vacuum remains in the canister, the canister will be discarded and the sample will be re-collected.

6.3. Indoor Air Samples

Samples of indoor air will be collected on the same day as collection of sub-slab samples from any given location, using Summa canisters at a flow rate of no greater than 200 ml/min. Indoor residential sampling will be conducted during the normal heating season beginning November 15, per the NYSDOH Guidance. Indoor air samples will be collected for a period of 24 hours. The Summa canisters will be placed at a height of 3 to 5 feet above the basement and first floor living space floor to simulate the breathing zone elevation. A site inspection and product inventory survey will be conducted during initial site reconnaissance, as discussed above. ELM may request that any products that may potentially interfere with sampling results be removed prior to sampling, if possible.

6.4. Ambient Air Samples

Outdoor (ambient) air commonly contains VOCs at measurable concentrations, and can contribute a positive bias to soil vapor samples. To characterize such "background" concentrations, one ambient (outdoor) air sample will be collected for each day of soil vapor sampling activities. Ambient air samples will be collected near the area of the field sampling crew, and preferentially upwind. Ambient air samples will be collected using clean certified, batch certified Summa canisters and flow controllers designed to collect a sample over approximately an 8-hour period, corresponding to the working day. The Summa canisters will be placed at a height of 3 to 5 feet above grade to simulate the breathing zone elevation.

6.5. Laboratory Analysis of Soil Vapor and Outdoor Air Samples

The NYSDOH Guidance describes the process for selection of a site-specific list of COIs. Factors to be considered include:

- volatile chemicals which have been previously detected in environmental media; and
- volatile chemicals which are known or demonstrated constituents of the contamination in question.

Using this process, a list of COIs has been developed and is presented in Section 2.0. All soil vapor samples will be analyzed by H & P Mobile Geochemistry for VOCs. This laboratory is ELAP-certified for EPA Method TO-15. Soil vapor, indoor and outdoor air samples will be analyzed according to EPA method TO-15. All summa canisters will be certified clean by the laboratory.

7.0 DATA ANALYSIS AND INTERPRETATION

The primary data analysis will be an evaluation of the concentration of COIs in vapor samples collected from indoor air in the basements of neighboring houses and from soil vapor underneath the slabs of these houses, as well as from underneath the sidewalk slabs, if necessary. Both the specific compounds identified and the concentrations of the COIs will be evaluated in comparison with soil vapor data collected on-Site and any volatile compounds identified by the background inventory surveys conducted in the homes to identify potential background interference. These data will be reported in micrograms per cubic meter of soil

vapor ($\mu g/m^3$). A Data Usability Summary Report (DUSR) will be generated from a qualified environmental scientist upon the completion of the testing.

The results of this the soil vapor investigation will be evaluated consistent with the NYSDOH Guidance, including its decision matrices for TCE and PCE, to determine appropriate next steps. The results of the vapor and soil sampling will be used to update and refine the CSM for soil vapor.

8.0 REPORTING TASKS AND SCHEDULE

For Phase I, sampling will begin within several weeks of obtaining approval from the NYSDEC of this work plan. For Phase II, sampling will begin within four weeks of obtaining both access to the adjoining properties and approval from NYSDEC and NYSDOH of this Work Plan, but not prior to the beginning of the normal heating season beginning November 15. Laboratory reports will be received within a standard two to four-week turnaround time.

ELM will prepare an interim memorandum or letter report presenting the results of the first phase of sampling within approximately two-three weeks after receipt of QA/QC'd results of the sidewalk sampling efforts. A second report will be prepared for submission to NYSDOH and NYSDEC following the completion of Phase II indoor air sampling, approximately four weeks from receipt of final Laboratory results of such sampling.

9.0 KEY PERSONNEL CONTACT LIST

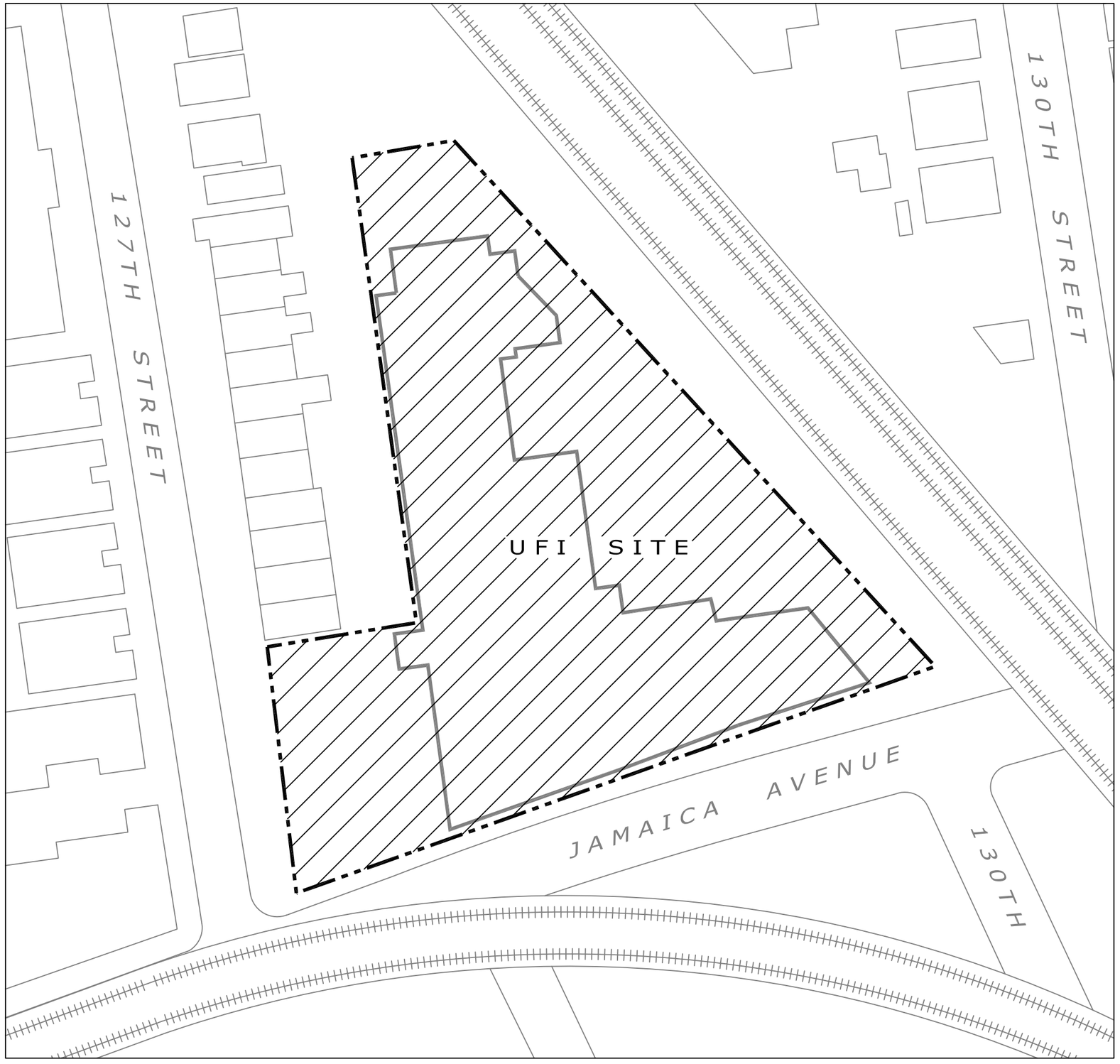
Contact information is provided for the following key project personnel:

Craig Puerta, ELM Project Manager	(212) 962-4301 (office); (917) 952-8216 (cell)
Richard Sena, UFI Representative	(845) 623-0941 (office); (917) 406-1947 (cell)

10.0 REFERENCES

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

FIGURES



LEGEND

PROPERTY LINE (APPROX.)

RAILROAD

NOTES:

SOURCE:

1. VERTEX ENGINEERING SERVICES, INC., SOIL BORING AND PROCESS WATER WELL LOCATION PLAN, 8/22/03, PROJECT NO. 5062.00.
2. AERIAL PHOTO, GOOGLE EARTH.

0 60 120

SCALE: 1:60

TITLE:

FIGURE 1

SITE FIGURE

LOCATION:

129-09 JAMAICA AVENUE,
RICHMOND HILL, NEW YORK

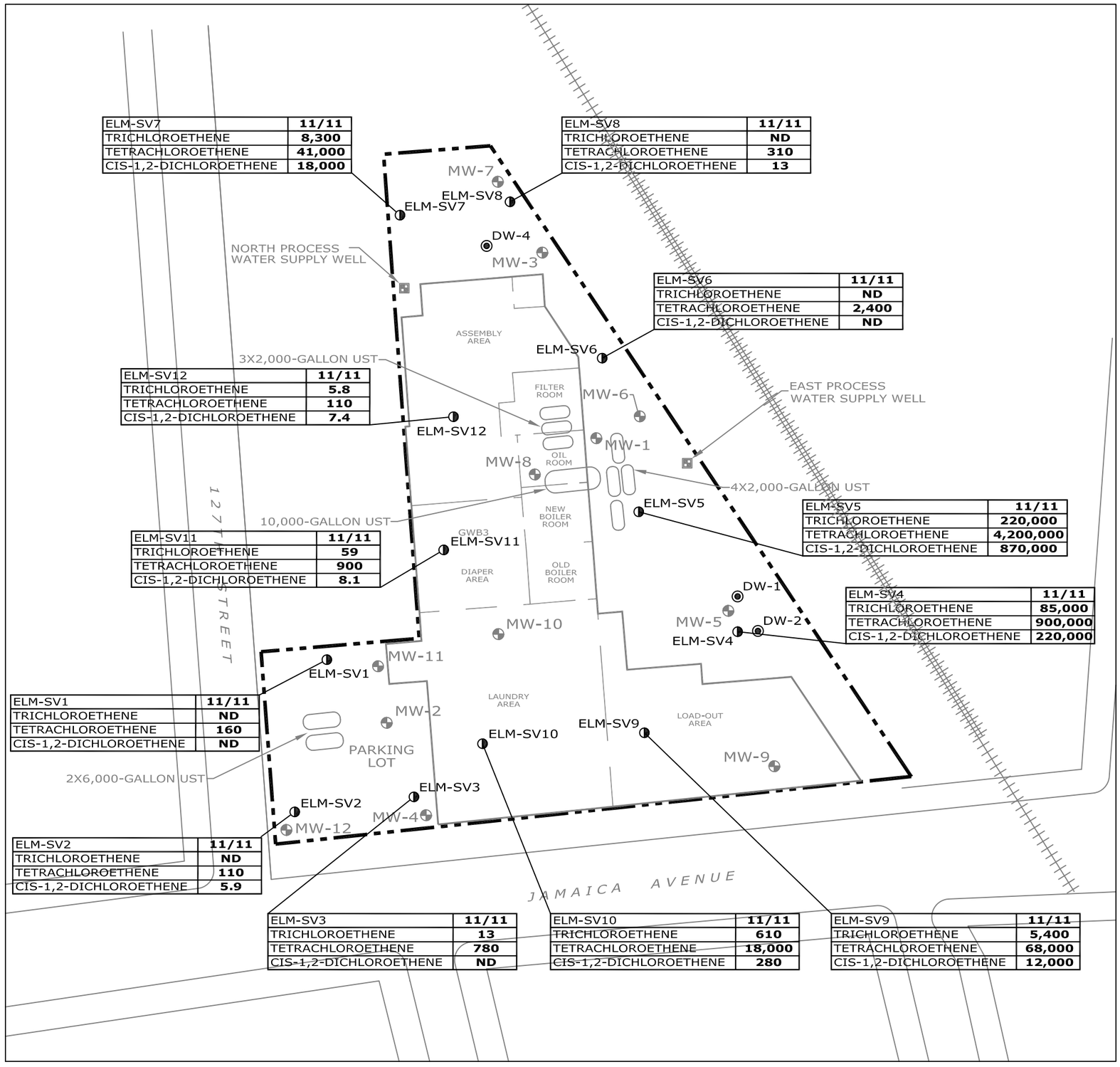
DATE: 1/6/10

FILENAME: 207078_SITEMAP_NY_V2.dwg

LAYOUT: AIR_SAMPLE_REV1-1

The ELM Group

218 WALL STREET, Pprinceton, NEW JERSEY 08540
4920 YORK ROAD, SUITE 290, HOLICONG, PENNSYLVANIA 18928
612 MAIN STREET, BOONTON, NEW JERSEY 07005
267 BROADWAY, FIFTH FLOOR, NEW YORK, NEW YORK 10007
2475 BAGLYOS CIRCLE, BETHLEHEM, PENNSYLVANIA 18020
www.ExploreELM.com



LEGEND

- PROPERTY LINE (APPROX.)
- RAILROAD
- PROCESS WATER SUPPLY WELL LOCATION
- MW-1 — EXISTING MONITORING WELL LOCATION AND ID
- OSW-1 — EXISTING OFF-SITE MONITORING WELL LOCATION AND ID
- ELM-SV1 — SOIL VAPOR PROBE LOCATION AND ID
- DW-2 — FORMER DRYWELL LOCATION AND ID

ELM-SV6	11/11	SOIL VAPOR SAMPLE ID AND SAMPLE DATE
TRICHLOROETHENE	ND	TRICHLOROETHENE RESULTS IN ug/m3
TETRACHLOROETHENE	2,400	TETRACHLOROETHENE RESULTS IN ug/m3
CIS-1,2-DICHLOROETHENE	ND	CIS-1,2-DICHLOROETHENE RESULTS IN ug/m3

ND — NOT DETECTED

SOURCE:

1) VERTEX ENGINEERING SERVICES, INC., SOIL BORING AND PROCESS WATER WELL LOCATION PLAN, 8/22/03, PROJECT NO. 5062.00.

0 60 120

SCALE: 1:60

TITLE:

FIGURE 2

SOIL VAPOR SAMPLING RESULTS CVOCs (ug/m3)

LOCATION:

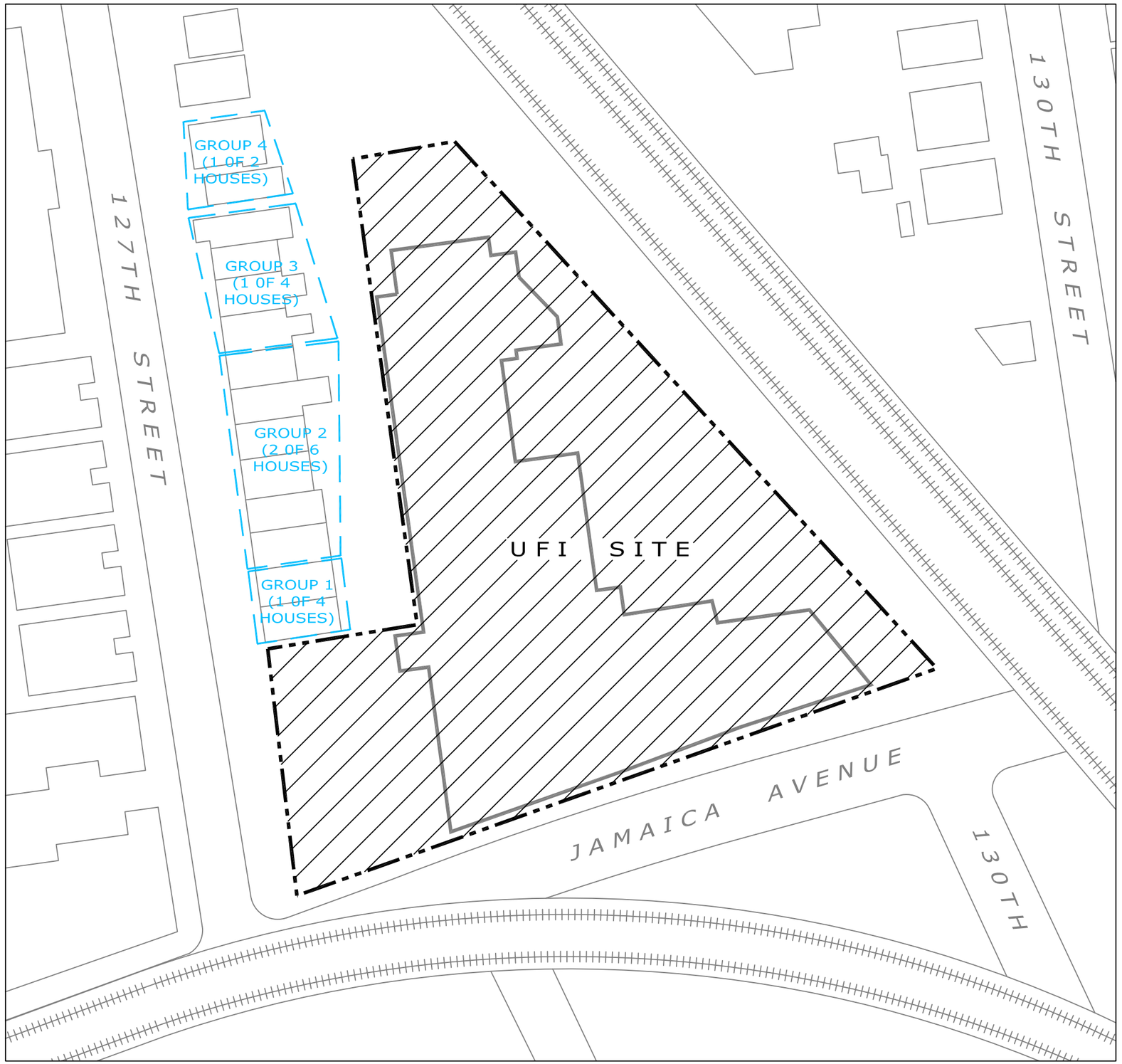
129-09 JAMAICA AVENUE,
RICHMOND HILL, NEW YORK

DATE: 05/21/09

FILENAME: 207078_DATA_NY_V2.dwg

LAYOUT: SOIL_VAPOR_V2

ENVIRONMENTAL LIABILITY MANAGEMENT, LLC
267 BROADWAY | FIFTH FLOOR | NEW YORK, NY 10007
WWW.EXPLOREELM.COM
NEW JERSEY - PENNSYLVANIA - NEW YORK



LEGEND

PROPERTY LINE (APPROX.)

RAILROAD

NOTES:

SOURCE:

1. VERTEX ENGINEERING SERVICES, INC., SOIL BORING AND PROCESS WATER WELL LOCATION PLAN, 8/22/03, PROJECT NO. 5062.00.
2. AERIAL PHOTO, GOOGLE EARTH.

0 60 120

SCALE: 1:60

TITLE:

FIGURE 3

PROPOSED HOMES GROUP LOCATIONS

LOCATION:

129-09 JAMAICA AVENUE,
RICHMOND HILL, NEW YORK

DATE: 01/14/10

FILENAME: 207078_SITEMAP_NY_V2.dwg

LAYOUT: AIR_SAMPLE_REV1-2

The ELM Group

218 WALL STREET, PRINCETON, NEW JERSEY 08540
4920 YORK ROAD, SUITE 290, HOLICONG, PENNSYLVANIA 18928
612 MAIN STREET, BOONTON, NEW JERSEY 07005
267 BROADWAY, FIFTH FLOOR, NEW YORK, NEW YORK 10007
2475 BAGLYOS CIRCLE, BETHLEHEM, PENNSYLVANIA 18020
www.ExploreELM.com

LEGEND

Sampling Group

8619 House Number

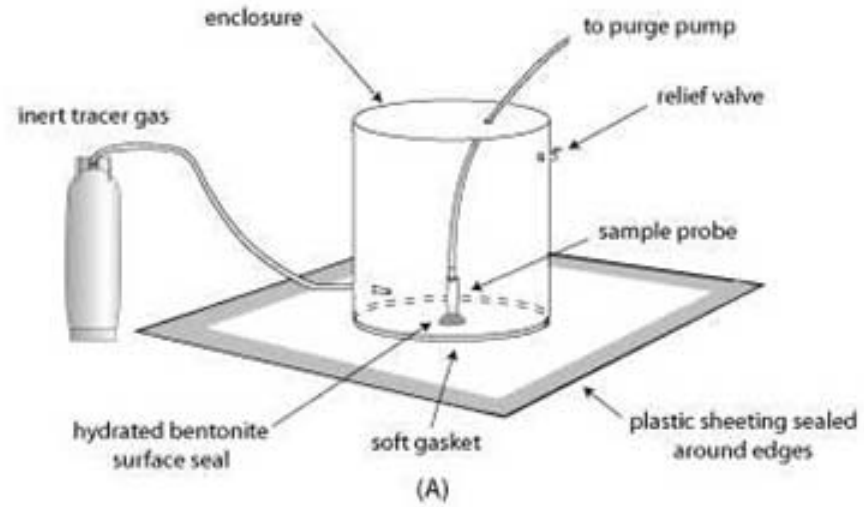
Not to Scale

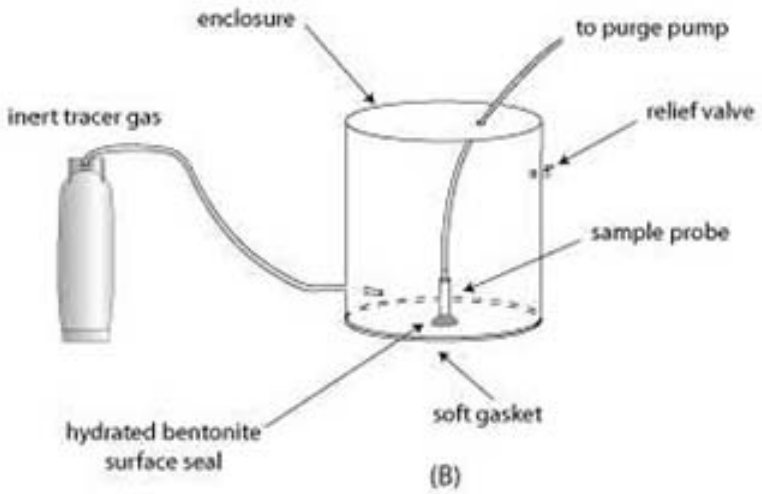
TITLE:

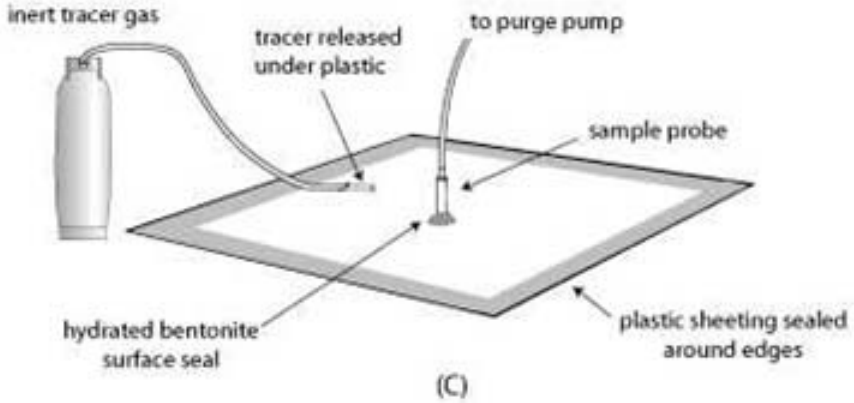
Figure 4
Targeted Houses Adjoining the Property

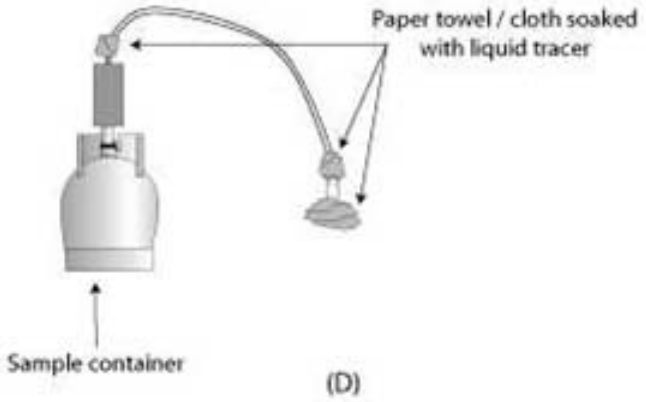
LOCATION:	Uniforms For Industry 129-09 Jamaica Avenue Richmond Hill, NY
DATE:	September 3, 2009
FILENAME:	Vapor Intrusion.mxd
LAYOUT:	ELM B Landscape (11x17).mxd

The ELM Group, Inc.
215 WALL STREET, PRINCETON, NEW JERSEY 08540
4920 YORK ROAD, SUITE 290, HOLICONG, PENNSYLVANIA 18928
612 MAIN STREET, BOONTON, NEW JERSEY 07005
267 BROADWAY, FIFTH FLOOR, NEW YORK, NEW YORK 10007
2475 BACLYOS CIRCLE, BETHLEHEM, PENNSYLVANIA 18020
www.exploreELM.com









note: during the introduction of tracer gas, measures should be taken to maintain ambient air pressure within the enclosure

FIGURE 5
TRACER GAS ILLUSTRATION EXAMPLE DURING TESTING

LOCATION:	
DATE:	03/05/10
PROJECT NO.:	207078
FILE NAME:	

ENVIRONMENTAL LIABILITY MANAGEMENT, LLC
267 BROADWAY, 5TH FLOOR, NEW YORK, NY 10007