



**CONESTOGA-ROVERS  
& ASSOCIATES**

# **SOIL VAPOR INTRUSION INVESTIGATION WORK PLAN**

**FORMER BUFFALO CHINA SITE  
51 HAYES PLACE  
BUFFALO, NEW YORK  
BROWNFIELD CLEANUP SITE NO. C915209**

**MARCH 2009  
REF. NO. 037191(7)**

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## 1.0 INTRODUCTION

This Soil Vapor Intrusion Investigation (SVII) Work Plan was prepared to identify and evaluate potential off-Site soil vapor receptors as a result of previously identified environmental impacts at the former Buffalo China Site (Site). The SVII will focus on evaluating a select group of both residential and commercial properties located to the south of the Site.

The Site is currently owned by Niagara Ceramics and is located at 51 Hayes Place, Buffalo, New York, as shown on Figure 1. In March 2004, Buffalo China sold the property to Niagara Ceramics. Buffalo China has entered into a Brownfield Cleanup Agreement (BCA #C915209) with the New York State Department of Environmental Conservation (NYSDEC) to investigate and remediate, as appropriate, potential areas of environmental concern associated with the Site.

During previous investigation and sampling events conducted under this BCA, volatile organic compounds (VOCs), specifically trichloroethene and associated degradation products, have been identified as the contaminants of concern in groundwater at the Site.

This document presents the Work Plan for the completion of the SVII to define and delineate the nature and extent of chemical soil vapor presence associated with the Site's former operations in off-Site environmental media. This Work Plan has been prepared in accordance with the NYSDEC draft document DER-10, "Technical Guidance for Site Investigation and Remediation," dated December 2002 (DER-10), and the New York State Department of Health's (NYSDOH's) Final document, "Guidance for Evaluating Soil Vapor Intrusion in the State of New York," October 2006 (SVI Guidance).

In addition, SVI sampling will be conducted in accordance with the protocols and procedures described in this plan and corresponding plans such as the Soil Vapor Intrusion Field Sampling Plan provided as Appendix A, the Site-Specific Quality Assurance Project Plan (QAPP), and the Site-Specific Health and Safety Plan (HASP).

### 1.1 SAMPLING OBJECTIVES

The primary objective of the SVII presented herein has been developed based on the currently available knowledge of on-Site and off-Site conditions and represents a general approach to the collection of soil vapor samples for the purpose of evaluating potential soil vapor intrusion pathways. As such, this Work Plan may require modification

following further investigative work. Soil vapor quality data obtained through the procedure outlined below will be evaluated to assess potential human health risks related to soil vapor migration towards and into off-Site buildings. The proposed investigation will be focused on those areas where soil vapor concentrations of chemicals are suspected to be present downgradient of the Site at levels that may exceed the NYSDOH's *Action Levels Requiring Mitigation* (Action Levels). Once the investigation is complete, a determination will be made as to the need for additional investigation activities to completely define the nature and extent of any identified impacts or for the development of mitigation system(s).

## 1.2 REPORT ORGANIZATION

The Work Plan is organized as follows:

- i) Section 1.0 – Introduction: The introduction presents an overview of the project to date;
- ii) Section 2.0 – Site History and Description: Descriptions of the Site location, physical condition, and current and historic use are presented in Section 2.0;
- iii) Section 3.0 – Objectives, Scope, and Rationale: Definitions of the objectives, scope, and rationale for the work to be conducted, and the tasks involved in examining the vapor intrusion pathway at the Site are presented in Section 3.0;
- iv) Section 4.0 – Proposed Investigation Activities: The Work Plan for the proposed SOSSVII is presented in Section 4.0; and
- v) Section 5.0 – Schedule: A preliminary project schedule is presented in Section 5.0.

The QAPP and HASP for the SVII have been prepared and submitted under separate covers.

## **2.0 SITE DESCRIPTION AND HISTORY**

### **2.1 SITE DESCRIPTION**

The Former Buffalo China Site is located at 51 Hayes Place in Buffalo, New York. The Site location and Site plan are shown on Figures 1 and 2, respectively. The Site comprises approximately 10 acres and is bounded on the north by Conrail Railroad tracks, on the east by an adjoining warehouse currently leased by Robinson Home Products and other commercial/industrial facilities, and on the south and west by commercial, industrial, and residential properties. Interstate I-190 is located nearby to the south of the Site, while the City of Buffalo School 26 and adjacent playground is located a few hundred feet to the southwest. The nearest body of water is the Buffalo River, located approximately 1/4 to 1/2 mile south and east of the Site. Figure 2 provides a layout of the Site.

The Site includes buildings, outdoor storage silos, a rail spur, roadways, and parking areas. The manufacturing building is a multi-story structure covering approximately 4 acres. The building is connected to the warehouse to the east. Another smaller building referred to as the Harrison Street warehouse is located in the northwest corner of the Site and covers an area of approximately 1/2 acre. The primary access to the Site is through the east side of the Site off of Bailey Avenue or via Hayes Place off of Seneca Street. The property has been used for the manufacture of china for the past 100 plus years. During that time period, the manufacturing facility expanded to adjacent industrial properties which included the Harrison Street Warehouse which was part of the former Standard Mirror Co. The Harrison Street Warehouse was a separate parcel located to the east of Harrison Street, while the remainder of the Standard Mirror facility was located on the west side of Harrison Street.

### **2.2 PHYSICAL SETTING**

The Site lies within the City of Buffalo corporation limits on a relatively flat parcel of land. The Site is located in an urban-industrial area of the City. Previous Site investigations determined that the Site is underlain by fill materials ranging in thickness from 0 to 4 feet below ground surface (bgs). Fill materials are underlain by clay deposits which range in depth from 4 feet bgs extending to a depth of approximately 16.9 feet bgs. Underlying the clay deposits is bedrock, which for the Buffalo area typically consists of carbonate sedimentary rock.

### **2.2.1      GEOLOGY**

According to the Phase I report prepared by Environmental Associates, Inc. (EA) in February 2004, the soils in the area of the Site were deposited by extensive glaciation forming a glacial till deposit underlain by limestone bedrock. The bedrock in the area of the Site, Onondaga Limestone is generally 5 feet or more bgs consisting of an intermixed light-grey limestone and dark-grey chert bedrock. Bedrock outcrops were not observed on the Site.

According to the Phase I report prepared by EA, the soils beneath the Site are classified as Urban land (Ud). Ud is generally covered by asphalt, concrete, buildings, and other impervious structures. It includes parking lots, shopping and business centers, and industrial parks. These areas generally range from 3 to 500 acres or more and are mostly level to gently sloping. The former Buffalo China Site and the surrounding neighborhood are consistent with this description of Ud.

The fill encountered at the Site ranged in thickness from 0.5 feet to 16 feet, with the thickest fill encountered along the soil mound at SB-2-07, SB-3-07, and SB-4-07, north of the Harrison Street Warehouse. It should be noted that the borings at these locations began at the top of the soil mound and extended through the mound to the top of rock, resulting in increased thicknesses of fill material. The soil mound is roughly 10 feet high. The fill consists of medium to coarse-grained sand and gravel, with clay present at deeper depths (6.5 to 8 feet bgs). Fill materials within the soil mound consisted of broken dishes, porcelain chunks, glass, and other assorted small building and process debris.

The native soils underlying the fill generally consist of dense clay underlying sand and/or silt; however, the soil stratigraphy is highly variable, and silt and clay generally underlies the fill at the Site.

### **2.2.2      TOPOGRAPHY AND SURFACE WATER DRAINAGE**

The United States Geological Survey (USGS) 7.5-minute Topographic Quadrangle Map of Buffalo, SE, New York indicates that the Site's ground surface is generally level. Aside from the hilly nature of the Soil Mound, a visual inspection confirmed that the Site is generally flat with some gentle sloping for runoff to Site storm sewers or ditches. The general direction of on-Site surface water drainage appears to be toward a series of storm drains located throughout the paved portions of the Site. The on-Site storm sewers are connected to the City of Buffalo combined sewer system. Under normal

conditions the drainage flows to the Buffalo Sewer Authority Bird Island Treatment Plant. Under overflow conditions, the flow would be discharged through the Hamburg Drain to the mouth of the Buffalo River.

The nearest natural body of water is the Buffalo River, which is located approximately 0.4 miles south of the Site. The Buffalo River meanders in a westerly direction toward Lake Erie located approximately 2.8 miles west of the Site. The surface elevation for the Site is approximately 590 feet above mean sea level (AMSL).

### **2.2.3      GROUNDWATER CONDITIONS**

Based on the EA Phase I report, shallow and regional (deep) groundwater both flow in a westerly-southwesterly direction toward Lake Erie. The Phase I report assumed that the groundwater table typically conforms to surface and bedrock topography. Multiple rounds of water level measurements in the overburden wells were completed in 2007, and 2008.

In December 2008, six bedrock groundwater monitoring wells were installed. Water level data was collected in January 2009 and March 2009 from both the overburden and bedrock wells.

Based on the data, groundwater flow in the overburden soil and the bedrock appears to be in a west-southwesterly (Figure south) direction towards the Buffalo River.



### 3.0 OBJECTIVES, SCOPE, AND RATIONALE

The objective of the soil vapor intrusion evaluation to be conducted by Conestoga-Rovers & Associates (CRA) is to define the nature and extent of off-Site vapor intrusion impacts related to past Site activities so that a response scenario, if necessary, can be developed that is protective of human health and the environment. The specific objectives of the scope of work presented in this Work Plan are:

- evaluate the potential off-Site migration of VOCs in the soil vapor west of the Site; and
- determine the impact or potential impact of the soil vapor to human health.

## **4.0 PROPOSED INVESTIGATION ACTIVITIES**

### **4.1 PREPARATION OF DETAILED WORK PLANS**

#### **4.1.1 QUALITY ASSURANCE PROJECT PLAN**

A QAPP has been prepared for the Site in accordance with the Resource Conservation and Recovery Act (RCRA) Quality Assurance Project Plan Guidance, NYSDEC, March 1991 and "EPA Guidance for Quality Assurance Project Plans," United States Environmental Protection Agency (USEPA) QA/G-5, USEPA/600/R-98/018, February 1998, NYSDEC's, December 2002, Draft DER-10 Technical Guidance for Site Investigation and Remediation, Section 2, Quality Assurance for Sampling, and Laboratory Analysis. The QAPP describes protocols necessary to achieve specified data quality objectives. The QAPP has been previously prepared and submitted under separate cover.

#### **4.1.2 HEALTH AND SAFETY PLAN**

A HASP has been prepared in accordance with 29 Code of Federal Regulations (CFR) Part 1910 and 29 CFR 1926 and has been reviewed and signed by an appropriate health and safety professional as specified in the NYSDEC's December 2002, *Draft DER-10 Technical Guidance for Site Investigation and Remediation*. The HASP specifies protective measures and procedures to be followed during the field activities to minimize exposure of workers and the surrounding community to hazardous Site-related materials. The Site-specific HASP has been previously prepared and submitted under separate cover.

### **4.2 FIELD INVESTIGATION**

A series of sampling activities will be completed to characterize the off-Site conditions to delineate the extent of off-Site contaminant migration and the impact of soil vapor intrusion on the indoor air quality of the surrounding properties. The following subsections describe the field activities to be conducted during the SVII.

Based on the findings of the SVII, additional investigation activities and data analyses may be proposed to further define the impact to on-Site and off-Site receptors.

The following scope of work was designed to meet the objectives set forth in Section 3.0. The scope of work consists of:

- installation of sub-slab soil vapor sampling implants;
- collection of sub-slab soil vapor and indoor and outdoor ambient air samples;
- survey of sampling locations; and
- preparation of Soil Vapor Intrusion Evaluation Report.

In order to help delineate the potential source of VOCs, vapor sampling will be conducted in a selected group of both residential and commercial structures.

#### **4.2.1      SOIL GAS QUALITY ASSESSMENT**

Delineation of potential indoor sources within residential dwellings and commercial businesses is critical to evaluating the human health risk. Commercial facilities are inclined to have specific issues in terms of evaluating indoor sources of VOCs relative to their business. For example, carpeting is known to emit a number of VOCs, welding shops would be expected to use degreasing solvents, and auto repair and car dealer businesses are likely to have indoor air impacts from petroleum hydrocarbons. (Prior spills and diffusion into concrete floors could also represent an ongoing source of indoor VOCs.) In these cases, a variety of different indoor air environments are involved, and it may be difficult to differentiate sub-slab and indoor sources if VOCs are detected in the subsurface. In order to address this issue, it is proposed that both sub-slab and indoor air sampling should be undertaken concurrently at both residential and commercial facilities. Residential, commercial, indoor, and outdoor air samples would be analyzed for the full TO-15 list.

The tasks involved in the assessment of potential vapor intrusion into building indoor air are described below. It is recommended that a minimum of one round of sub-slab soil vapor, and indoor and outdoor ambient air sampling should be completed to properly evaluate soil vapor intrusion. Should the initial round of sampling indicate VOC concentrations in excess of "no further action levels" outlined on the NYSDOH mitigation matrices (NYSDOH, 2006) for soil vapors beneath the sub-slab, a second round of sub-slab sampling along with indoor air and soil vapor sampling will be conducted to verify results and further define soil vapor impacts at the off-Site locations. Proposed soil vapor sampling locations are shown on Figure 3. The following tasks represent the general approach that would be followed to complete the investigation.

#### **4.2.1.1     TASK 1: SUB-SLAB PROBE/IMPLANT INSTALLATION**

To investigate the potential for contaminants in the subsurface to volatilize from soil and groundwater to soil gas within the unsaturated overburden at off-Site locations, the installation and sampling of semi-permanent sub-slab soil gas probes at selected locations is proposed.

Before installing the sub-slab vapor probes, a building inventory will be conducted in accordance with the NYSDOH Guidance. The building inventory will be used to determine the final sample locations.

A total of seven semi-permanent sub-slab gas probes are proposed, as indicated on Figure 3. One sub-slab sample will be collected from each of these proposed locations. Each sub-slab gas probe will consist of one shallow soil gas probe installed in a central location away from foundation footings, just below the surface of the slab.

The sub-slab probe will be installed by drilling a 1/2- to 1-inch diameter hole through the slab with a drill and spline bit. Before drilling, the location of all sub-slab utilities, both public and building-specific, will be identified and marked. No water will be used during the installation of the probe. If dust prevention is necessary, the location may be covered by a towel or cloth and drilling will proceed through a pre-cut hole in the cloth.

After drilling through the slab, the slab thickness will be measured and recorded. A 1/8-inch diameter nylon sample tubing of sufficient length extending from the base of the slab to the ground surface will be installed. The drill hole will be filled with pre-hydrated granular cement/bentonite to ground surface. The tubing at ground surface will be terminated with a valve connection. A typical sub-slab soil vapor probe installation is depicted on Figure 4.

Drilling and sampling equipment will be decontaminated, as required, by washing with an Alconox detergent solution and rinsing with distilled water.

#### **4.2.1.2     TASK 2: SUB-SLAB PROBE SAMPLING**

The sub-slab probe sampling will be conducted a minimum of 72 hours following the installation of the soil gas probes. Equilibration time is needed since oxygen can be introduced into anaerobic portions of the vadose zone during soil probe installation. In

addition, sampling will not be performed during or within 24 hours of a significant rain event [i.e.,  $\geq 0.5$  inches within 24 hours, Cal EPA (2003)].

Written documentation of all field activities, conditions, and sampling processes, including names of field personnel, dates and times, etc., will be collected. Weather conditions (temperature, barometric pressure, wind direction, wind speed, and humidity), surface conditions (presence of standing water and/or non-vegetative cover), and groundwater elevation measurements in monitoring wells in close proximity to the soil gas probes will be documented during soil gas sampling.

The sub-slab samples will be collected using 6-liter capacity Summa™ canisters fitted with a laboratory calibrated critical orifice flow regulation device sized to allow the collection of the soil gas samples over a 24-hour sample collection time. A typical soil vapor intrusion canister set-up is depicted in Figure 5. Only canisters laboratory batch certified clean at the 100 percent level will be used for sampling, so data can be evaluated for assessing potential human health risk. The 24-hour sample collection time for a 6-liter capacity Summa™ canister corresponds to a maximum soil gas sample collection flow rate of approximately 0.0042 liters per minute (L/min). This soil gas sample collection flow rate is well below the maximum flow rate of 0.2 L/min recommended by NYSDOH (2006). A maximum flow rate of 0.1 L/min is recommended to limit VOC stripping from soil, prevent the short-circuiting of ambient air from ground surface that would dilute the soil gas sample, and increase confidence regarding the location from which the soil gas sample is obtained. The low flow rate of 0.0042 L/min provides the most representative sample of in-situ conditions.

Prior to sample collection, soil gas probe purging will be conducted at a maximum flow rate of 0.1 L/min. A maximum of three soil gas probe “dead volumes” will be purged to remove potentially stagnant air from the internal volume of the soil gas probe and ensure that soil gas representative of the porous media beneath the sub-slab is drawn into the Summa™ canister. The soil gas probe “dead volumes” will be calculated based on field measurements of probe construction (i.e., tubing length and tubing inner diameter) and aboveground sampling equipment. A helium blanket over the sample probe will be used to evaluate short circuiting of the sampling train from the ambient air.

Concurrently with the sub-slab soil vapor samples, indoor and outdoor ambient air samples will be collected. Outdoor air samples will be collected upwind of the investigation area in which the sub-slab samples are being collected. Indoor air samples will be collected in the same areas as sub-slab samples, concurrently. There are seven residential locations proposed for sampling.

Since the previous FSP submitted for the Site does not contain soil vapor sampling procedures, detailed procedures for soil vapor sampling have been included in Appendix A of this Work Plan.

The soil gas samples will be analyzed using the USEPA's TO-15 gas chromatograph/mass spectrometer (GC/MS) methodology. This analysis will provide results for the full list of TO-15 VOCs (Table 1) for residential and commercial sub-slab and ambient indoor samples and outdoor samples.

All samples will be analyzed by a New York State Environmental Laboratory Approval Program (ELAP)-certified laboratory capable of providing Level B Analytical Services Protocol (ASP) deliverables.

Quality control/quality assurance (QC/QA) measures implemented during the soil gas sampling event will include maintaining a minimum residual negative pressure in the Summa™ canisters of approximately 1 to 5 inches of mercury following sample collection, and the collection of one field duplicate sample for every 20 samples collected.

#### **4.2.1.3     TASK 3: INDOOR AIR SAMPLING**

Indoor air soil vapor samples should be collected in the breathing zone between 3 and 5 feet above the ground, preferably during the heating season. Each sample will be collected from the lowest point within the home (i.e., basement, crawlspace, etc.) The sample will be collected for a 24-hour duration. The 24-hour sample collection time for a 6-litre capacity Summa™ canister corresponds to a maximum soil gas sample collection flow rate of approximately 0.0042 L/min.

The indoor air soil vapor samples will be analyzed using the USEPA's TO-15 gas GC/MS methodology. This analysis will provide results for full TO-15 list of VOCs. All soil vapor samples will be analyzed by a laboratory with appropriate ELAP certification, as specified in NYSDOH guidance (NYSDOH, 2006), and will be conducted in accordance with ASP Category B protocols.

QC/QA measures implemented during indoor air soil vapor sampling events will include maintaining a minimum residual negative pressure in the Summa™ canisters of approximately 1 to 5 inches of mercury. Collection of one field duplicate sample for

every 20 samples, or at least one duplicate sample per sampling event will also be conducted.

#### **4.2.1.4     TASK 4: OUTDOOR AIR SAMPLING**

Ambient outdoor air soil vapor samples will be collected upwind of the building in which the sub-slab and indoor air samples are collected. A typical indoor and outdoor air sampling canister set up is depicted in Figure 6. One ambient outdoor air sample per sample event/day will be collected concurrently with the proposed sub-slab soil vapor and indoor air samples. Outdoor air samples will be collected from the breathing zone between 3 and 5 feet above the ground surface over a 24-hour duration. The 24-hour sample collection time for a 6-litre capacity Summa™ canister corresponds to a maximum soil gas sample collection flow rate of approximately 0.0042 L/min.

The outdoor air soil vapor samples will be analyzed using the USEPA's TO-15 gas GC/MS methodology. This analysis will provide results for full TO-15 list of VOCs. All soil vapor samples will be analyzed by a laboratory with appropriate ELAP certification, as specified in NYSDOH guidance (NYSDOH, 2006), and will be conducted in accordance with ASP Category B protocols.

QC/QA measures implemented during outdoor air soil vapor sampling events will include maintaining a minimum residual negative pressure in the Summa™ canisters of approximately 1 to 5 inches of mercury. Collection of one field duplicate sample for every 20 samples, or at least one duplicate sample per sampling event will also be conducted during sub-slab soil vapor sampling.

The proposed sampling activities are summarized on Table 2.

#### **4.2.1.5     TASK 5: SCREENING ASSESSMENT OF SOIL GAS QUALITY DATA**

As an initial assessment of the significance of the soil gas sample analytical results, the chemical concentrations detected in the soil gas samples will be compared to, or screened against, chemical-specific generic soil gas screening criteria. The State of New York does not develop generic screening levels for volatile chemicals in soil vapor; however, it has developed target indoor air concentrations for only a very limited number of chemicals (specifically, four compounds: carbon tetrachloride, trichlorethene, tetrachloroethane, and 1,1,1-trichlorethane). In addition to the State of New York target

indoor air concentrations, the USEPA has developed chemical-specific generic soil gas screening criteria (USEPA 2002). Sub-slab soil vapor, indoor air and outdoor air sample analyte concentrations from each structure, in conjunction with other factors including but not limited to the nature and extent of environmental contamination in all media and the potential for preferential pathways, will be evaluated to assess the potential and extent of soil vapor intrusion.

The soil vapor data will be compared to both the NYSDOH target indoor air concentrations as well as the USEPA chemical-specific generic soil gas screening criteria. Should any volatile chemicals be detected in soil gas, indoor, or outdoor ambient air samples at concentrations greater than the New York State target indoor air concentrations or the USEPA generic soil gas screening criteria, the potential for these chemicals to impact indoor air quality will be assessed further.

#### **4.3        SAMPLE ANALYSES AND DATA VALIDATION**

Analytical data collected during the Site Investigation will be validated to demonstrate the usability of the data to support the conclusions of the Site Investigation.

All analytical work will be subcontracted to an ELAP- and CLP/ASP-certified laboratory(s) (e.g., Test America, Accutest, or Air Toxics). All analytical data generated by the subcontract laboratory(s) will be assessed and validated by a CRA Data Validator/Chemist in accordance with the requirements of the QAPP. Data validation and a Data Usability Summary Report will be conducted and prepared in accordance with DER-10 as outlined in the Site-specific QAPP.

#### **4.4        EXPOSURE ASSESSMENT**

A qualitative human health exposure assessment will be performed using the data collected during the SVII. The assessment will be performed in accordance with Appendix 3B of the NYSDEC DER-10 and the NYSDOH SVI Guidance.

#### **4.5        SOIL VAPOR PROBE SURVEY**

After the sub-slab vapor probes are installed, CRA will survey the newly installed well locations and elevations relative to mean sea level.



The top of each probe will be surveyed to the nearest 0.01 foot relative to the National Geodetic Vertical Datum (NGVD) and a survey point will be marked on the probe casing. The survey will also include the ground elevation at each probe to the nearest 0.10 foot relative to the NGVD. The probe location will be surveyed to the nearest 1.0 foot.

#### **4.6        SOIL VAPOR INTRUSION EVALUATION REPORT**

Following completion of all the SVII activities, a draft report will be prepared presenting the results. The SVII Report will include all background information, the analytical and testing data collected during the SVII, an evaluation of the current Site condition, exposure assessment results, references, and recommendations for additional work, if deemed necessary. Data will be presented in both tabulated and graphic forms.

The draft SVII Report will be submitted to the NYSDEC and NYSDOH. Comments by the NYSDEC and NYSDOH regarding the draft report will be addressed and the final report will be revised accordingly. The revised SVII Report will then be submitted final to the NYSDEC and NYSDOH.

## 5.0 SCHEDULE

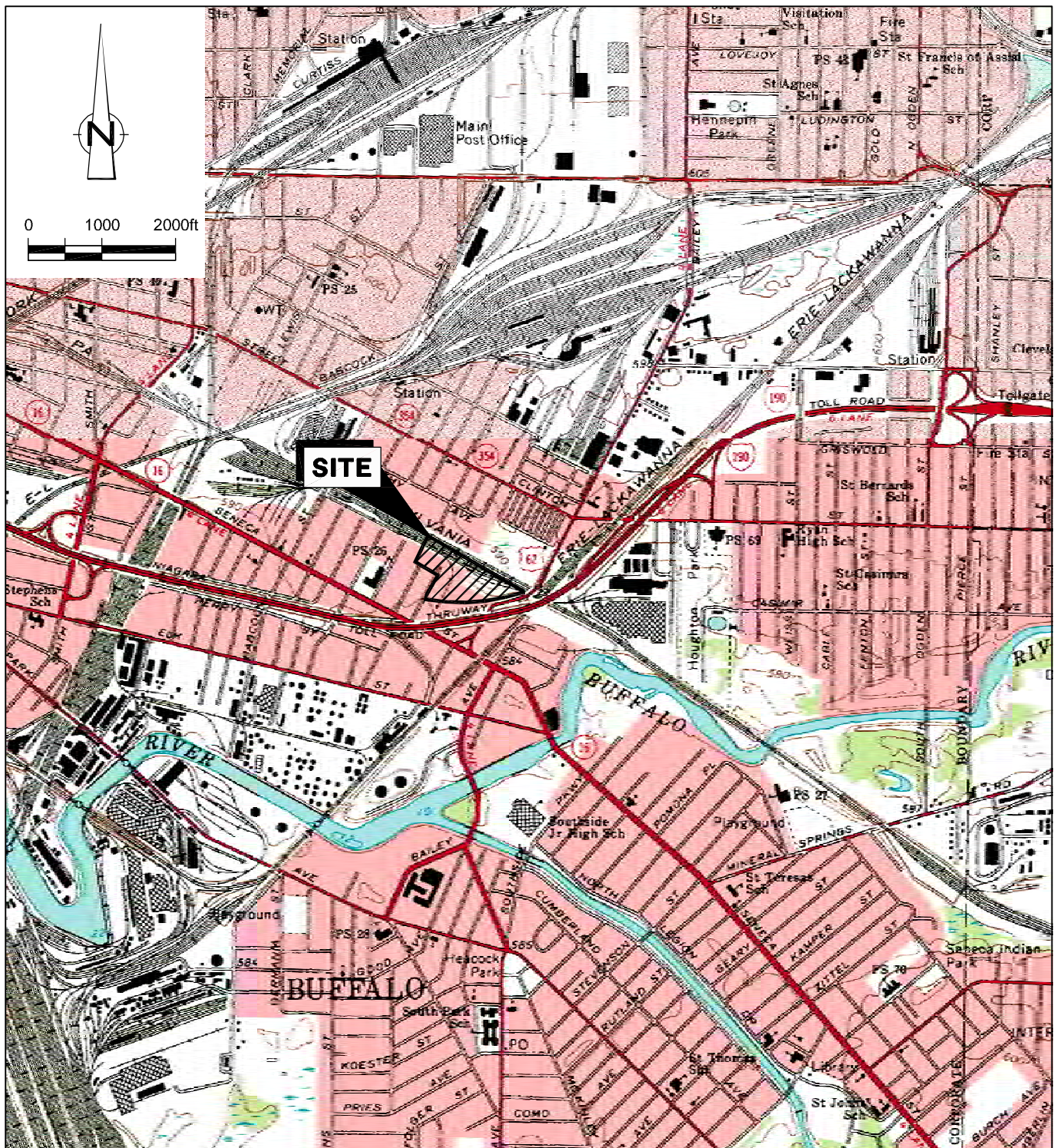
The preliminary Project Schedule for the SVII is presented on Table 3.

## 6.0 REFERENCES

This Section lists the references used to prepare this report.

- i) New York State Department of Environmental Conservation, December 25, 2002, *Draft DER-10 Technical Guidance for Site Investigation and Remediation*.
- ii) New York State Department of Environmental Conservation, December 14, 2006, 6 NYCRR Part 375, *Environmental Remediation Programs Subparts 375-1 to 375-4 and 375-6*.
- iii) New York State Department of Health, October 2006. *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York*.
- iv) United States Environmental Protection Agency, January 1999, *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition*.





**REFERENCE:**

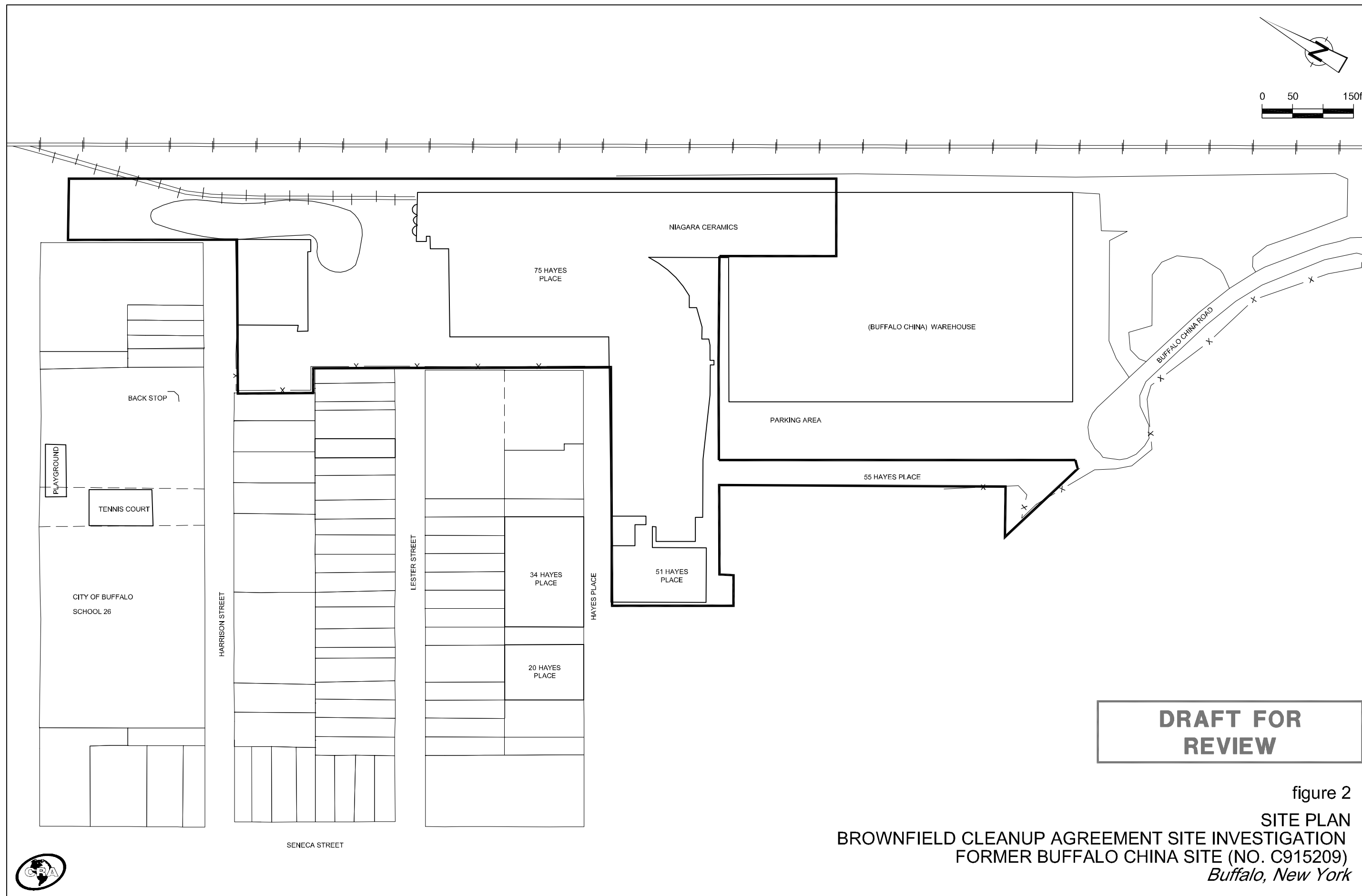
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 TOPOGRAPHIC, 7.5 MINUTES SERIES 1965  
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**DRAFT FOR  
 REVIEW**

figure 1

**SITE LOCATION MAP**  
**BROWNFIELD CLEANUP AGREEMENT SITE INVESTIGATION**  
**FORMER BUFFALO CHINA SITE (NO. C915209)**  
*Buffalo, New York*





**DRAFT FOR  
REVIEW**

figure 2  
SITE PLAN  
BROWNFIELD CLEANUP AGREEMENT SITE INVESTIGATION  
FORMER BUFFALO CHINA SITE (NO. C915209)  
*Buffalo, New York*





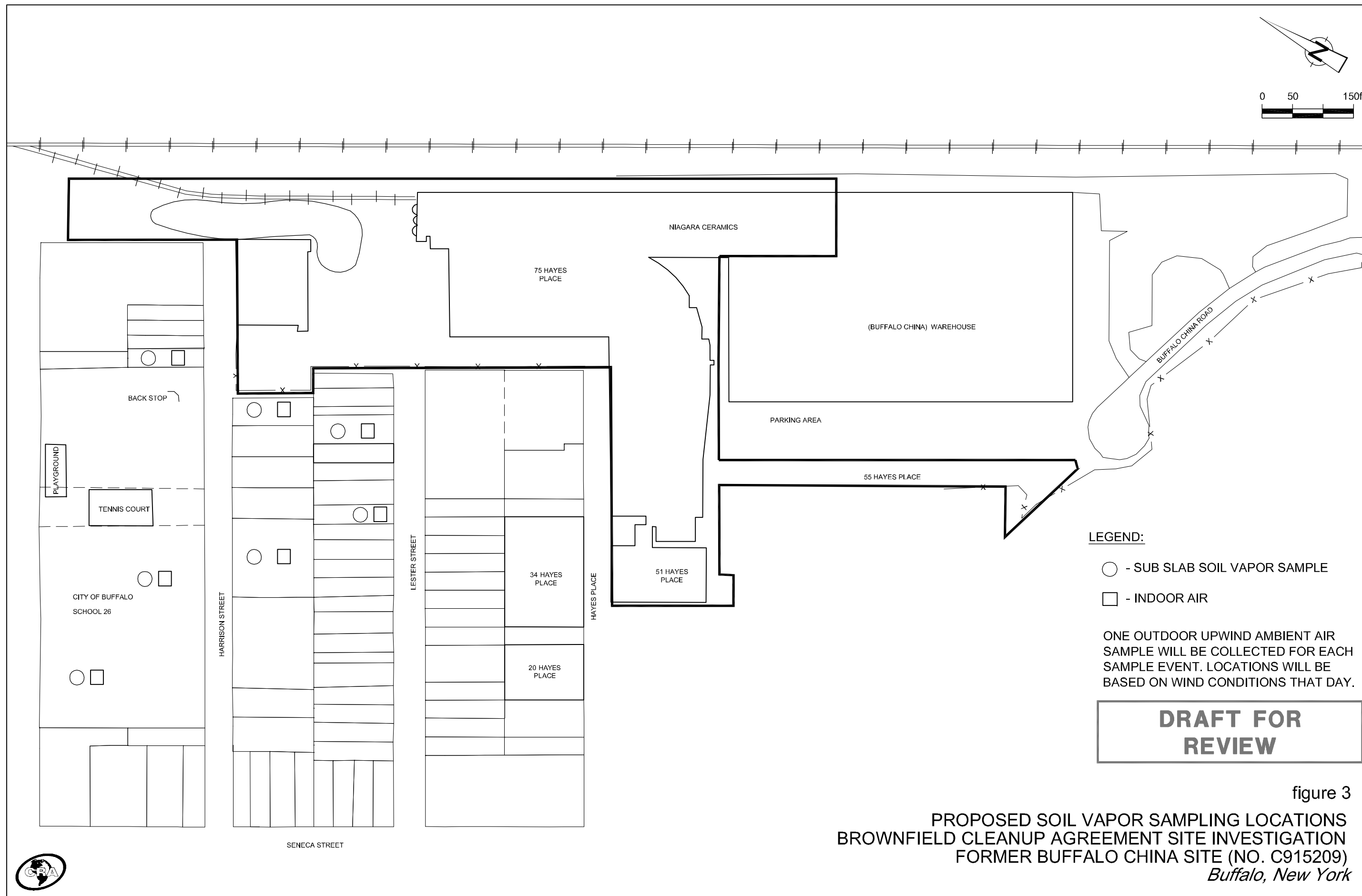


figure 3  
PROPOSED SOIL VAPOR SAMPLING LOCATIONS  
BROWNFIELD CLEANUP AGREEMENT SITE INVESTIGATION  
FORMER BUFFALO CHINA SITE (NO. C915209)  
*Buffalo, New York*



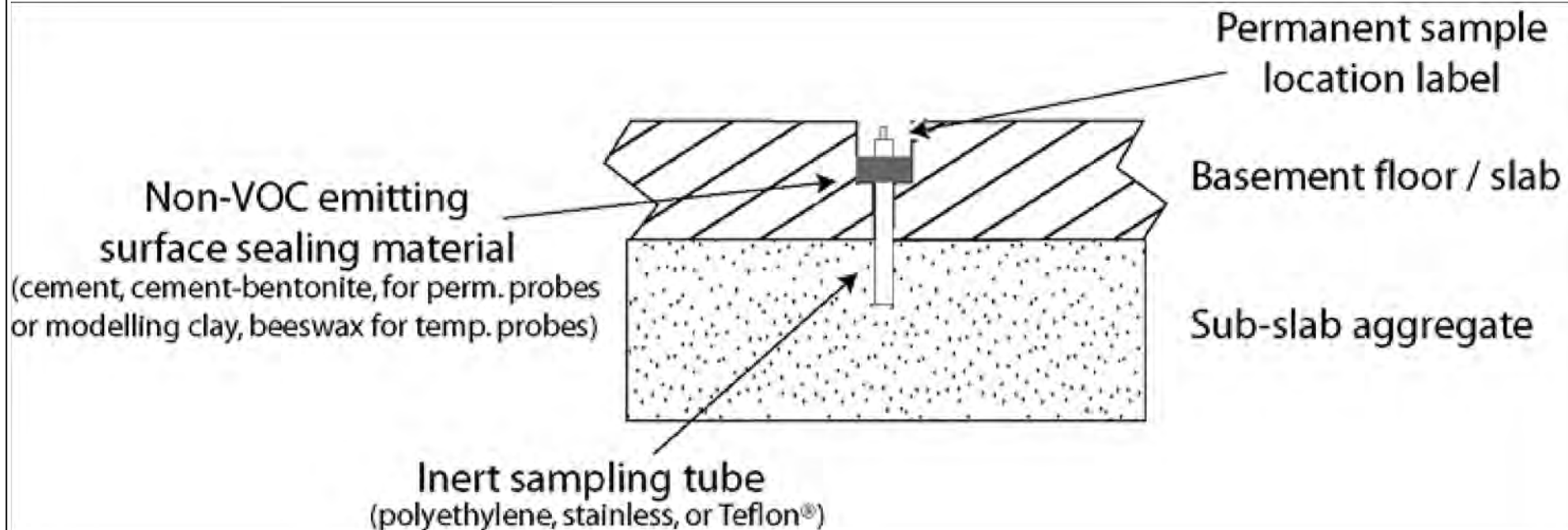


figure 4

TYPICAL SUB-SLAB SOIL VAPOR PROBE INSTALLATION  
BROWNFIELD CLEANUP AGREEMENT SITE INVESTIGATION  
FORMER BUFFALO CHINA SITE (NO. C915209)

*Buffalo, New York*





figure 5

SOIL VAPOR INTRUSION CANISTER SET-UP  
BROWNFIELD CLEANUP AGREEMENT SITE INVESTIGATION  
FORMER BUFFALO CHINA SITE (NO. C915209)  
*Buffalo, New York*





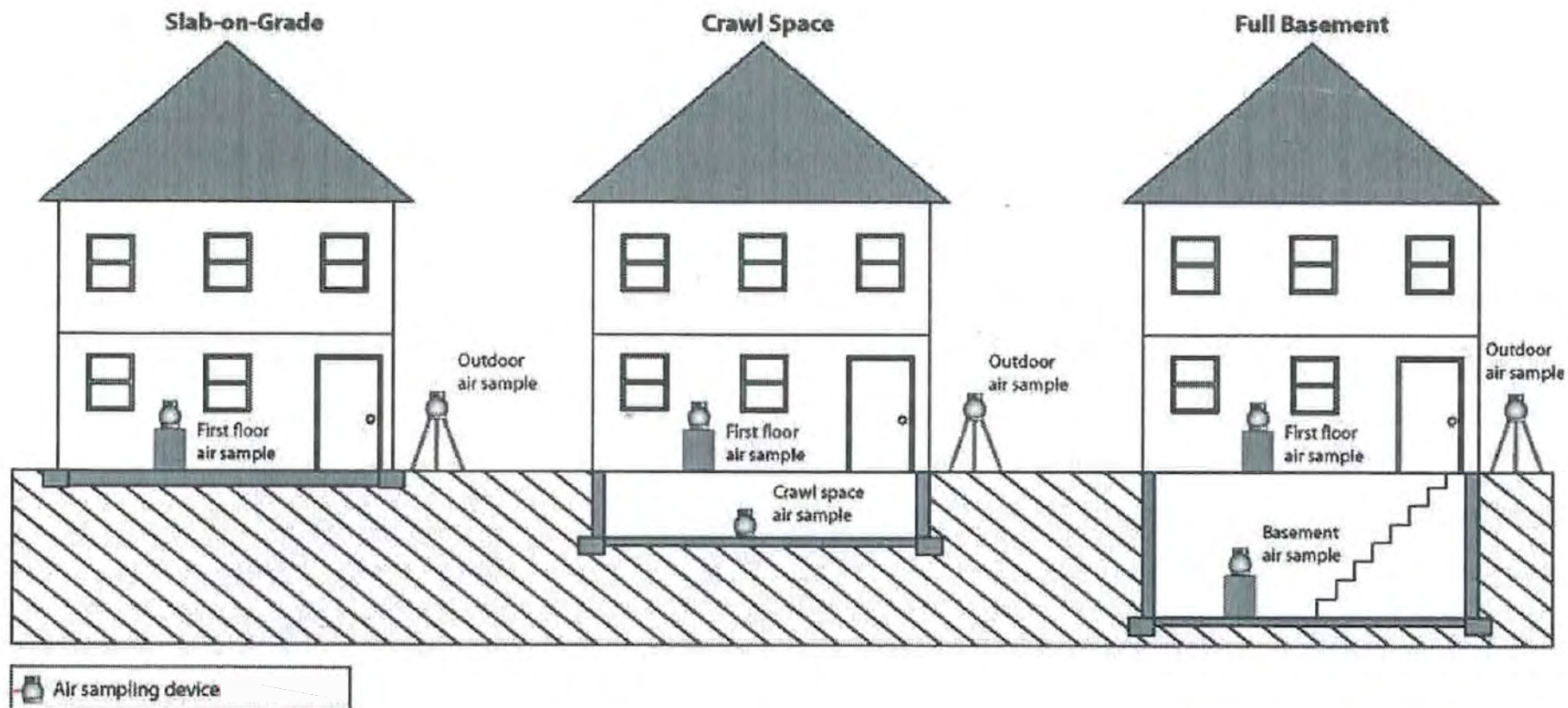


figure 6

TYPICAL INDOOR AND OUTDOOR AIR SAMPLING CANISTER SET-UP  
 BROWNFIELD CLEANUP AGREEMENT SITE INVESTIGATION  
 FORMER BUFFALO CHINA SITE (NO. C915209)  
 Buffalo, New York



TABLE 1

**TARGETED QUANTITATION LIMITS FOR VAPOR-PHASE SAMPLES  
FORMER BUFFALO CHINA SITE (NO. 915209)  
BUFFALO, NEW YORK**

<i>Compound</i>	<i>CAS Number</i>	<i>Molecular Weight</i>	<i>Reporting Limit ppbv</i>	<i>Reporting Limit <math>\mu\text{g}/\text{m}^3</math></i>
<i>Volatile Organic Compounds(TO-15 Compounds)</i>				
Acetone (2-propanone)	67-64-1	58.08	4	10
Benzene	71-43-2	78.11	0.16	0.51
Bromodichloromethane	75-27-4	163.83	0.16	1.1
Bromoethene	593-60-2	106.96	0.16	0.70
Bromoform	75-25-2	252.75	0.16	1.7
Bromomethane (Methyl bromide)	74-83-9	94.95	0.16	0.62
1,3-Butadiene	106-99-0	54.09	0.40	0.88
2-Butanone (Methyl ethyl ketone)	78-93-3	72.11	0.4	1.2
Carbon disulfide	75-15-0	76.14	0.4	1.2
Carbon tetrachloride	56-23-5	153.84	0.16	1.0
Chlorobenzene	108-90-7	112.56	0.16	0.74
Chloroethane	75-00-3	64.52	0.40	1.06
Chloroform	67-66-3	119.39	0.16	0.78
Chloromethane (Methyl chloride)	74-87-3	50.49	0.40	0.83
3-Chloropropene (allyl chloride)	107-05-1	76.53	0.40	1.25
2-Chlorotoluene (o-Chlorotoluene)	95-49-8	126.59	0.16	0.83
Cyclohexane	110-82-7	84.16	0.16	0.55
Dibromochloromethane	124-48-1	208.29	0.16	1.4
1,2-Dibromoethane	106-93-4	187.88	0.16	1.2
1,2-Dichlorobenzene	95-50-1	147.01	0.16	1.0
1,3-Dichlorobenzene	541-73-1	147.01	0.16	1.0
1,4-Dichlorobenzene	106-46-7	147.01	0.16	1.0
Dichlorodifluoromethane (Freon 12)	75-71-8	120.92	0.40	1.98
1,1-Dichloroethane	75-34-3	98.97	0.16	0.65
1,2-Dichloroethane	107-06-2	98.96	0.16	0.65
1,1-Dichloroethene	75-35-4	96.95	0.16	0.63
1,2-Dichloroethene (cis)	156-59-2	96.95	0.16	0.63
1,2-Dichloroethene (trans)	156-60-5	96.95	0.16	0.63
1,2-Dichloropropane	78-87-5	112.99	0.16	0.74
cis-1,3-Dichloropropene	10061-01-5	110.98	0.16	0.73
trans-1,3-Dichloropropene	10061-02-6	110.98	0.16	0.73
1,2-Dichlorotetrafluoroethane (Freon 114)	76-14-2	170.93	0.16	1.1
Ethylbenzene	100-41-4	106.16	0.16	0.69
4-Ethyltoluene (p-Ethyltoluene)	622-96-8	120.2	0.16	0.79
n-Heptane	142-82-5	101.2	0.16	0.66
Hexachlorobutadiene	87-68-3	260.76	0.16	1.7
n-Hexane	110-54-3	86.18	0.40	1.41
Methylene chloride	75-09-2	84.94	0.4	1.4
4-Methyl-2-pentanone (MIBK)	108-10-1	100.16	0.4	1.64
MTBE (Methyl tert-butyl ether)	1634-04-4	88.15	0.4	1.4

TABLE 1

**TARGETED QUANTITATION LIMITS FOR VAPOR-PHASE SAMPLES  
FORMER BUFFALO CHINA SITE (NO. 915209)  
BUFFALO, NEW YORK**

<i>Compound</i>	<i>CAS Number</i>	<i>Molecular Weight</i>	<i>Reporting Limit ppbv</i>	<i>Reporting Limit <math>\mu\text{g}/\text{m}^3</math></i>
Styrene	100-42-5	104.14	0.16	0.68
Tertiary butyl alcohol (TBA)	75-65-0	74.122	4	12
1,1,2,2-Tetrachloroethane	79-34-5	167.86	0.16	1.1
Tetrachloroethene (PCE)	127-18-4	165.85	0.16	1.1
Toluene	108-88-3	92.13	0.16	0.60
1,2,4-Trichlorobenzene	120-82-1	181.46	0.40	3.0
1,1,1-Trichloroethane	71-55-6	133.42	0.16	0.9
1,1,2-Trichloroethane	79-00-5	133.42	0.16	0.9
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon TF)	76-13-1	187.38	0.16	1.2
Trichloroethene (TCE)	79-01-6	131.4	0.16	0.86
Trichlorofluoromethane (Freon 11)	75-69-4	137.38	0.16	0.9
1,2,4-Trimethylbenzene	95-63-6	120.19	0.16	0.79
1,3,5-Trimethylbenzene	108-67-8	120.19	0.16	0.79
2,2,4-Trimethylpentane	540-84-1	114.23	0.16	0.75
Vinyl chloride	75-01-4	62.5	0.16	0.41
Xylenes (m&p)	1330-20-7	106.16	0.40	1.74
Xylenes (o)	95-47-6	106.16	0.16	0.69
1,2-Dichloroethene (total)	540-59-0	96.95	0.16	0.63
1,4-Dioxane	123-91-1	88.11	4.0	14
Isopropyl Alcohol	67-63-0	61.09	4.0	10.0
Methyl Butyl Ketone	591-78-6	100.16	0.4	1.64
Methyl methacrylate (upon request only)	80-62-6	100.1	0.4	1.64
Naphthalene (upon request only)	91-20-3	128.17	0.4	2.1
Tetrahydrofuran	109-99-9	72.11	4.0	12

TABLE 2

**SUMMARY OF SAMPLING AND ANALYSIS PROGRAM  
FORMER BUFFALO CHINA SITE (NO. C915209)  
BUFFALO, NEW YORK**

<i>Sample Matrix</i>	<i>Field Parameters</i>	<i>Analytical Parameters</i>	<i>Analytical Method</i>	<i>Number of Samples</i>	<i>Field Duplicates</i>	<i>Field Blanks</i>	<i>Trip Blanks</i>	<i>MS/MSD</i>
Vapor-Phase Sampling								
Sub-Slab Soil Vapor	None	TCL VOCs	TO-15	7	1	NA	NA	NA
Ambient Outdoor Air	None	TCL VOCs	TO-15	1 Per Event	NA	NA	NA	NA
Indoor Air	None	TCL VOCs	TO-15	7	NA	NA	NA	NA

Notes:

Dup Laboratory Duplicate.

MS Matrix Spike.

MSD Matrix Spike Duplicate.

NA Not applicable.

TCL Target Compound List.

VOCs Volatile Organic Compounds.

TABLE 3

**PROPOSED SCHEDULE  
BROWNFIELD CLEANUP SITE INVESTIGATION  
FORMER BUFFALO CHINA SITE (NO. C915209)  
BUFFALO, NEW YORK**

<i>Task</i>	3/27/2009	03/30/09 - 04/3/09	04/06/09 - 04/10/09	04/13/09 - 04/24/09	04/27/09 - 05/01/09	05/04/09 - 05/26/09	6/1/2009
Work Plan Submittal							
NYSDEC Review and Approval							
Project Fact Sheet Distribution							
Resident Contact/Obtain Access Agreements							
Sampling							
Analysis							
Raw Data Submittal							

**APPENDIX A**

**SOIL VAPOR INTRUSION FIELD SAMPLING PLAN**

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FIGURE 2a	SOIL VAPOR INTRUSION CANISTER SET-UP
FIGURE 3a	TYPICAL INDOOR AND OUTDOOR AIR SAMPLING CANISTER SET-UP

## 1.0 SOIL VAPOR INTRUSION

This section presents the vadose zone sampling protocol for evaluating the potential presence of volatile organic compounds (VOCs) in indoor air due to subsurface soil and/or groundwater impacts. The sampling protocol presented herein consists of conducting a physical survey of the building to be sampled in conjunction with a building occupant interview, followed by collection of representative ambient air and vadose-zone vapor samples with Summa™ canisters. All vadose-zone and ambient air samples will be analyzed for the full United States Environmental Protection Agency (USEPA) TO-15 list. Table 1 in the SVI Work Plan lists the TO-15 parameters and the associated reporting limits.

There are as many as four types of soil vapor intrusion samples that can be typically collected as part of a Soil Vapor Intrusion Evaluation. Those samples are:

- Soil Vapor: a soil vapor sample is collected from the subsurface soil (vadose zone) using a "well" point similar in construction to a groundwater monitoring well. Soil vapor samples can be nested as well in order to monitor at varying depths;
- Sub-slab: a sub-slab vapor sample is collected from a borehole installed through the concrete floor of a building and monitors the vapors located directly beneath the floor;
- Indoor Air : an indoor air sample is collected from 3 to 5 feet off the floor within the breathing zone; and
- Ambient Outdoor Air: an ambient outdoor air sample is collected from the outdoors from an upwind location at 3 to 5 feet above the ground surface within the breathing zone.

Section 1.1 describes the physical building survey to be conducted enabling a qualitative assessment of factors that could potentially influence air quality. Section 2.0 presents the quality assurance/quality control (QA/QC) measures and laboratory analytical methodology to be applied in the sample analysis. Further QA/QC details can be found in the QAPP which outlines methodologies, data deliverables (New York State Department of Environmental Conservation [NYSDEC] Analytical Services Protocol [ASP] Category B), Data Usability Summary Reporting requirements, and other quality control measures.



## 1.1 PHYSICAL BUILDING SURVEY

A physical survey will be conducted of the buildings to be sampled, including interviewing building occupants. The purpose of the physical survey is to obtain data that will allow a qualitative assessment of factors that potentially could influence air quality. The physical survey includes collecting data on aspects of the building configuration such as building layout, attached garages, utility entrances into the building, ventilation system design, foundation conditions, presence of foundation sump, building material types (e.g., recent carpeting/linoleum and/or painting), presence of fireplace, location of laundry facilities, etc. The physical survey also includes collecting data related to occupant lifestyle choices that could potentially influence air quality such as use of cleaning products, dry-cleaner use, indoor storage of paints and/or petroleum hydrocarbon products, use of aerosol consumer products, smoking, hobbies, crafts, etc.

The physical survey will be documented by completing Form 1 – Building Physical Survey Questionnaire.

## 1.2 SOIL VAPOR INTRUSION SAMPLING REQUIREMENTS

Soil vapor intrusion samples (sub-slab, indoor air, and outdoor air) will be collected in accordance with the New York State Department of Health's (NYSDOH's) *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006* (NYSDOH Soil Vapor Guidance). As such, soil vapor intrusion sampling will meet the following minimum requirements.

- The preferred seasonal period for the collection of indoor air and sub-slab vapor samples is during the heating season. For the Northeast, the heating season generally runs from November 15 to March 31, however, these dates are not absolute. Soil vapor and outdoor ambient air samples can be collected any time throughout the year. Should SVI-related samples be collected outside of the heating season, additional sampling during the next available heating season may be necessary to verify out-of-season results. Sampling personnel should refer to the specific work plan(s) for sampling details and frequency.
- Indoor air samples will be collected from within the building structures at locations considered representative of the breathing zone space (3 to 5 feet above the floor), which may include the collection of samples from within the basement area, main floor, or possibly upper floors.

- Outdoor ambient air samples will be collected from an upwind location on the building property 3 to 5 feet above the ground. Outdoor air samples are always collected in conjunction with indoor air samples, sub-slab vapor samples, and/or soil vapor samples. The outdoor sample provides data on upwind sources that could affect other vapor samples. Outdoor samples will be collected for each day that SVI-related sampling is occurring.
- All soil vapor intrusion samples will be collected using a Summa™ canister (6-liter capacity) equipped with a critical orifice flow regulation device sized to allow the collection of an air sample over a 24-hour sampling period, at a rate of 0.0042 liters per minute (L/min). The critical orifice flow regulation device will be supplied and calibrated by the laboratory selected to conduct the sample analysis.
- Sub-slab vapor samples will be collected from a central location within the building away from footers and building walls that could influence the collection of the sample. The sample will be collected from the aggregate material located directly beneath the floor.
- Indoor air samples will be collected from the center of the monitoring area, but away from high traffic areas to minimize the potential for disturbances during sample collection.
- Summa™ canisters will be labeled with a unique sample designation number as described in Section 5.0 and the QAPP. Both the sample number and the sample location information will be recorded on Form 2 - Air Sampling Field Data Sheet.
- The Summa™ canister vacuum will be measured immediately prior to canister deployment and recorded on Form 2 - Air Sampling Field Data Sheet.
- A tracer gas (i.e., Helium) will be used to ensure that ambient air is not being drawn into the Summa™ canister during the collection of soil vapor and sub-slab vapor samples. The details regarding the use of a tracer gas are provided in Section 2.0.
- The critical orifice flow controller will be installed, as supplied by the laboratory, on the Summa™ canister, the canister will be opened fully at the beginning of sample collection period, and the start time recorded on Form 2- Air Sampling Field Data Sheet.
- At the start and the end of the 24-hour sample period, a portable photoionization detector (PID) will be used to screen for VOC presence in the sample area. Results of the PID monitoring are recorded on Form 2 - Air Sampling Field Data Sheet.
- Other data recorded on Form 2 - Air Sampling Field Data Sheet will include: outside and interior temperatures both at the start and end of the sample period, equipment serial numbers, sampler name, and any comments.

- For the collection of indoor air samples and sub-slab vapor samples, following equipment setup, the building occupant will be given a list of instructions to follow while the Summa™ canister is in operation (collecting a sample) in the building. The instructions are listed on Form 3 - Air Sampling Instructions to Building Occupants. The date and completion time of the 24-hour sample period will be written on Form 3, and the occupant will be instructed that the sampling team will return to pick up the canister after approximately 24 hours.
- The canister valve will be closed fully at the end of the sample period (after 24 hours) and the end time recorded on the field data sheet. If there is evidence of canister disturbance during the sample collection, this will be recorded on Form 2- Air Sampling Field Data Sheet.
- The Summa™ canister vacuum will be measured immediately after canister retrieval at the end of the 24-hour sample period and recorded on the field data sheet. Any samples where the canister reached atmospheric pressure will be rejected and the canisters returned for cleaning. The minimum vacuum required to be considered a valid sample will be 1 inch Hg vacuum. Once the vacuum is measured, the safety cap will be securely tightened on the inlet of the Summa™ canister prior to shipment to the laboratory under Conestoga-Rovers & Associates (CRA) chain of custody procedures. The requirement for residual vacuum retained in the canister following sample collection is to ensure that a driving force was maintained to collect a steady flow rate until the end of the sampling event.
- The Summa™ canister vacuum will be measured by the laboratory immediately prior to sample analysis and recorded on the analytical data report.
- Prior to use, all canisters will be batch certified clean in accordance with the QAPP and USEPA "Specifications and Guidance for Contaminant-Free Sample Containers," EPA 540/R-93/051.

Refer to the appropriate Work Plan for the approximate locations of the proposed sampling locations. Health and safety procedures are presented in the Site-Specific Health and Safety Plan (HASP).

## **2.0 QUALITY ASSURANCE/QUALITY CONTROL**

QA/QC samples will be collected during all sampling activities. The specific quality control requirements for the Site are provided in the QAPP.

For soil vapor intrusion air sampling, QA/QC samples will include:

- the ambient outdoor air sample per sampling event; and
- one field duplicate sample per sampling event or for every 20 samples. (Field duplicate samples will be collected by connecting two Summa™ canisters in parallel using a T-connector and valve assembly. The canisters will be opened while the valve is closed. After opening the canister valve(s), the tubing valve will be opened, allowing soil vapors to be drawn into each Summa™ canister simultaneously).

## **2.1 ANALYTICAL METHOD/LABORATORY**

All samples will be analyzed by a NYSDOH Environmental Laboratory Approval Program (ELAP)- and Contract Laboratory Program (CLP)-certified laboratory in accordance with the NYSDEC ASP, 2000.

All sample analyses will be conducted in accordance with NYSDEC ASP Category B protocols.

The soil vapor samples will be analyzed by a certified laboratory using the USEPA TO-15 gas chromatograph/mass spectrometer (GC/MS) methodology.

## **2.2 CANISTER CLEANING**

Prior to use, all canisters will be batch certified clean by the testing laboratory, in accordance with USEPA Method TO-15 and the USEPA guidance document entitled "Specifications and Guidance for Contaminant-Free Sample Containers," EPA 540/R-93/051. Documentation of the cleaning activities will be maintained by the laboratory.

## **2.3 SOIL GAS PROBE LEAK TESTING PROCEDURE**

Leak testing is recommended as a quality control check when collecting soil vapor intrusion samples. The leak testing setup ensures that no ambient air has leaked into the

soil gas probe or sampling assembly, which may affect (i.e., dilute) the analytical results. Contaminants in ambient air can leak into the sampling system and result in a "false positive." Sub-slab and soil vapor samples require the use of a leak testing setup, while indoor air and ambient outdoor air samples do not. The leak testing will be conducted by completing the following two steps:

- Step 1 - Vacuum Test: used to ensure that the tubing and fittings/valves that make up the sampling assembly are airtight; and
- Step 2 - Tracer Test: used to ensure that ambient air during soil gas sample collection is not drawn down the soil gas probe annulus through an incomplete seal between the formation and the soil gas probe casing.

The vacuum and tracer tests are detailed below.

### **Step 1 - Vacuum Test**

- The sampling assembly will be connected to the soil gas probe valve at the surface casing. Once connected, the sampling assembly will consist of the soil gas probe, the vacuum gauge supplied by the laboratory, personal sampling pump, and Summa™ canister, all connected in series (i.e., in the order of soil gas probe, vacuum gauge, pump, and canister), using tee-connectors or tee-valves.
- The personal sampling pump will be used to conduct the vacuum test. The vacuum test will consist of opening the valve to the personal sampling pump while leaving closed the valves to the Summa™ canister and the soil gas probe. The pump will then be operated to ensure that it draws no air from the sampling assembly (i.e., creates a negative pressure or vacuum within the sampling assembly), thus establishing that all assembly connections are airtight. The sampling pump low-flow detect switch will likely activate within 10 to 15 seconds, turning the pump off. A negative pressure or vacuum should be established within the sampling assembly and should be sustained for at least 1 minute.
- If the pump is capable of drawing flow, or if the vacuum is not sustained for at least 1 minute, all fittings and tubing will be checked for tightness (or replaced), and the vacuum test will be repeated.
- The readings from the vacuum gauge pressure indicator will be recorded in the field logbook, to retain a record that the pump was able to create a vacuum within the sampling assembly (it will also be noted whether the low-flow detect switch on the pump was activated), and that the vacuum was sustained for at least 1 minute.

## **Step 2 - Tracer Test**

During a tracer test, a tracer compound (i.e., helium) is released at ground surface immediately around the soil gas probe surface casing, and is used to test for ambient air leakage down the annulus of the soil gas probe and into the soil gas sample. CRA will use helium as a tracer compound.

- The presence of helium within the sampling assembly will be monitored during purging and soil gas sample collection using a helium meter installed in-line with the sampling assembly just before the personal sampling pump.
- Helium is readily available at a variety of retail businesses, is safe to use, and does not interfere with laboratory analytical method detection limits.
- A containment unit will be constructed to cover the soil gas probe surface casing. The containment unit will consist of an over-turned plastic pail set into a ring of dry bentonite to create a seal between the ground surface and the rim of the pail. The pail can be set directly on top of the sampling assembly tubing connected to the soil gas probe, which when pressed into the dry bentonite, should create a sufficient seal around the tubing. The pail will have two holes: one to allow for the introduction of helium; and the other to allow for air trapped inside the pail to escape while introducing the helium. The second hole will also allow insertion of the helium meter to measure helium content under the pail.
- Prior to soil gas probe purging, helium will be introduced into the containment unit to obtain a minimum 50-percent helium content level. The helium content within the containment unit will be confirmed using the helium meter and recorded in the field logbook. Helium will continue to be introduced into the containment unit during soil gas probe purging and sampling, but care will be taken not to increase the pressure within the containment unit beyond that of atmospheric pressure.
- During soil gas probe purging and sampling, the helium meter will be connected in-line with the sampling assembly. In the event that the helium meter measures a helium content with the sampling assembly of greater than 10 percent of the source concentration (i.e., 10 percent of the helium content measured within the containment unit), the soil gas probe will be judged to permit significant leakage such that the collected soil gas sample will not be considered reliable and representative of soil gas concentrations within the formation (ITRC 2007).

### 3.0 DATA VALIDATION

Analytical data collected during the Site Investigation will be validated to demonstrate the usability of the data to support the conclusions of the Site Investigation.

All analytical work will be subcontracted to an ELAP- and CLP/ASP-certified laboratory(s). All analytical data generated by the subcontract laboratory(s) will be assessed and validated by a CRA Data Validator in accordance with the requirements of the QAPP. A Data Usability Summary Report will be prepared in accordance with DER-10 and the QAPP.

## **4.0 FIELD PROCEDURES**

All monitoring and sampling activities described in this document shall be conducted in accordance with the protocols detailed in this section as well as the standards and criteria set forth in the corresponding Work Plans, QAPP, and HASP.

Site dedicated equipment will be used whenever possible.

### **4.1 SUB-SLAB SOIL GAS SAMPLING**

#### **4.1.1 SUB-SLAB SOIL GAS PROBE IMPLANT INSTALLATION**

To investigate the potential for contaminants in the subsurface to volatilize from soil and groundwater to soil gas within the unsaturated overburden at the Site, the installation and sampling of permanent sub-slab soil gas probe implants at selected locations are proposed. Each soil gas probe implant will be installed in the soil or fill material located just below the slab.

The soil gas probe implant is installed by drilling a ½- to 1-inch hole through the slab with a drill and spline bit. Prior to drilling ensure all sub-slab utilities, both public and building specific are marked. No water should be used during the installation of the probe implant. If dust prevention is necessary, the location may be covered by a towel or cloth, and drilling should proceed through a pre-cut hole in the cloth.

After drilling through the slab, measure the slab thickness, and cut a ⅛-inch diameter nylon sampling tubing of sufficient length to extend to the ground surface reaching the base of the slab and give the required surface termination. The drill hole will be filled with pre-hydrated granular bentonite to ground surface. The tubing at ground surface will be terminated with a valve connection. A typical sub-slab soil gas probe implant installation is shown on Figure 1a.

Drilling and sampling equipment will be decontaminated, as required by the QAPP, by washing with an Alconox detergent solution and rinsing with distilled water.

#### **4.1.2 SUB-SLAB SOIL VAPOR SAMPLING**

Sub-slab soil vapor sampling will be conducted no sooner than 72 hours following the installation of the soil gas probe implants. Equilibration time is needed since oxygen can



be introduced into anaerobic portions of the vadose zone during soil probe installation. In addition, sampling will not be performed during or within 24 hours of a significant rain event [e.g.,  $\geq 0.5$  inches after Cal EPA [2003]].

Written documentation of all field activities, conditions, and sampling processes, including names of field personnel, dates and times, etc. is required. Weather conditions (temperature, barometric pressure, wind direction, wind speed, and humidity); surface conditions (presence of standing water and/or non-vegetative cover); and groundwater elevation measurements in monitoring wells in close proximity to the soil gas probes must be documented during soil gas sampling.

The sub-slab soil gas samples will be collected using a 6-liter capacity Summa™ canister fitted with a laboratory calibrated critical orifice flow regulation device sized to allow the collection of the soil gas samples over a 24-hour sample collection time (see Figure 5.2a). Only canisters certified clean at the 100-percent level will be used for sampling, so data can be evaluated for the purpose of assessing potential human health risk. The 24-hour sample collection time for a 6-liter capacity Summa™ canister corresponds to a maximum soil gas sample collection flow rate of approximately 0.0042 L/min.

Prior to sample collection, soil gas probe purging will be conducted at a maximum flow rate of 0.1 L/min. A maximum of three soil gas probe "dead volumes" will be purged to remove potentially stagnant air from the internal volume of the soil gas probe and ensure that soil gas representative of the formation is drawn into the soil gas probe. The soil gas probe "dead volumes" will be calculated based on field measurements of probe construction (i.e., below ground tubing length and tubing inner diameter) and aboveground sampling equipment. Due to concern that purged air may impact the indoor air quality, purged air will be collected in an appropriate receptacle (i.e., Tedlar™ bag) to prevent potential impacts to indoor air. The purged air will be scanned with a calibrated PID with a 10.6-eV lamp and the results recorded in the field book.

Sub-slab soil vapor samples will be analyzed using the USEPA's TO-15 gas GC/MS methodology. This analysis will provide results for VOCs found in sub-slab soil vapor. All soil vapor samples will be analyzed by a laboratory with appropriate ELAP certification, as specified in NYSDOH guidance (NYSDOH 2006), and will be conducted in accordance with ASP Category B protocols.

QC/QA measures implemented during sub-slab soil vapor sampling events will include maintaining a minimum residual negative pressure in the Summa™ canisters of approximately 1 to 5 inches of Mercury. Collection of one field duplicate sample for

every 20 samples, or at least once per sampling event will also be conducted during sub-slab soil vapor sampling.

Sub-slab vapor sampling locations will be abandoned when they are no longer needed for investigation or post mitigation activities. The "well" points will be abandoned by removing the tubing and valve from the slab. The residual hole will be backfilled with a non-shrink grout.

#### **4.2      OUTDOOR AIR SOIL VAPOR SAMPLING**

Ambient outdoor air soil vapor samples should be taken upwind of the building in which the sub-slab and indoor air samples are collected. Outdoor air soil vapor samples should be collected in the breathing zone between 3 and 5 feet above the ground surface (see Figure 5.3a). The sample should be collected over a 24-hour duration. The 24-hour sample collection time for a 6-liter capacity Summa™ canister corresponds to a maximum soil gas sample collection flow rate of approximately 0.0042 L/min.

The outdoor air soil vapor samples will be analyzed using the USEPA's TO-15 gas GC/MS methodology. This analysis will provide results for VOCs. All soil vapor samples will be analyzed by a laboratory with appropriate ELAP certification, as specified in NYSDOH guidance (NYSDOH 2006), and will be conducted in accordance with ASP Category B protocols.

QC/QA measures implemented during outdoor air soil vapor sampling events will include maintaining a minimum residual negative pressure in the Summa™ canisters of approximately 1 to 5 inches of Mercury. Collection of one field duplicate sample for every 20 samples, or at least once per sampling event will also be conducted during sub-slab soil vapor sampling.

#### **4.3      INDOOR AIR SOIL VAPOR SAMPLING**

Indoor air soil vapor samples should be collected in the breathing zone between 3 and 5 feet above the ground, preferably during the heating season (see Figure 5.3a). The sample should be taken for a 24-hour duration. The 24-hour sample collection time for a 6-liter capacity Summa™ canister corresponds to a maximum soil gas sample collection flow rate of approximately 0.0042 L/min.

The indoor air soil vapor samples will be analyzed using the USEPA's TO-15 gas GC/MS methodology. This analysis will provide results for VOCs. All soil vapor samples will be analyzed by a laboratory with appropriate ELAP certification, as

specified in NYSDOH guidance (NYSDOH 2006), and will be conducted in accordance with ASP Category B protocols.

QC/QA measures implemented during indoor air soil vapor sampling events will include maintaining a minimum residual negative pressure in the Summa™ canisters of approximately 1 to 5 inches of Mercury. Collection of one field duplicate sample for every 20 samples, or at least once per sampling event will also be conducted during sub-slab soil vapor sampling.

## 5.0 RECORD KEEPING

A bound logbook and the forms found in Appendix A will be used to record all pertinent sampling data including:

- i) date(s) and time(s) of sub-slab probe purging and sampling;
- ii) depth of probe;
- iii) names of sampling personnel;
- iv) time of beginning and end of purge;
- v) volume purged;
- vi) methods of purging and sampling;
- vii) initial and final PID readings;
- ix) sample volume collected and analyses requested;
- x) sample identification number; and
- xi) Chain of Custody number.

Field logbooks will be numbered and maintained in a safe location. Entries will be made only in indelible ink. Any corrections will be marked through with a single line so as to remain legible and will be initialed.

### 5.1 **SAMPLE DESIGNATION**

A unique sample numbering system will be used to identify each collected sample. This system will provide a tracking number to allow retrieval and cross-referencing of sample information. The sample numbering system to be used is described as follows:

Example:	SO-12345-052605 - AA-XXX
Where:	SO - Designates sample Type (SO = Soil, WG = Groundwater)
12345:	CRA Project Number
052605:	Date of collection (mm/dd/yy)
AA:	Sampler initials
XXX:	Unique sample number

QC samples will also be numbered with a unique sample number.

Further details regarding the sample designations are outlined in the QAPP.

## 5.2 DECONTAMINATION OF EQUIPMENT

Decontamination procedures will be applicable to all drilling, sampling, and testing activities. Soil gas probe installation equipment mobilized to the Site will receive an initial decontamination prior to use. Decontamination will consist of cleaning of the equipment to the satisfaction of the Site Representative. The equipment used to install the soil gas probe will be decontaminated between soil gas probe installations.

The field sampling equipment decontamination procedures will be as follows:

- i) non-phosphate detergent wash;
- ii) tap water rinse;
- iii) distilled water rinse;
- iv) isopropanol rinse;
- v) air dry; and
- vi) distilled water rinse.

When practicable, sampling equipment will be wrapped in a material that will prevent it from becoming contaminated.

## 6.0 REFERENCES

- Cal EPA, 2004. Guidance on the Evaluation and Migration of Subsurface Vapor Intrusion to Indoor Air - Interim Final, Department of Toxic Substances Control, California Environmental Protection Agency, December 15 (revised February 7, 2005).
- IDEM, 2006. Draft Vapor Intrusion Pilot Program Guidance. Indiana Department of Environmental Management, April 26.
- MDEP, 2003. Indoor Air Sampling and Evaluation Guide, WSC Policy #02-430, Office of Research and Standards, Massachusetts Department of Environmental Protection, April.
- NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation," December 2002.
- NYSDEC Analytical Services Protocol, 2000.
- NYSDOH "Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York," October 2006.
- NYSDEC TAGM 3028-"Contained-In" Criteria for Environmental Media, November 1992.
- USEPA "Specifications and Guidance for Contaminant-Free Sample Containers," EPA 540/R-93/051.

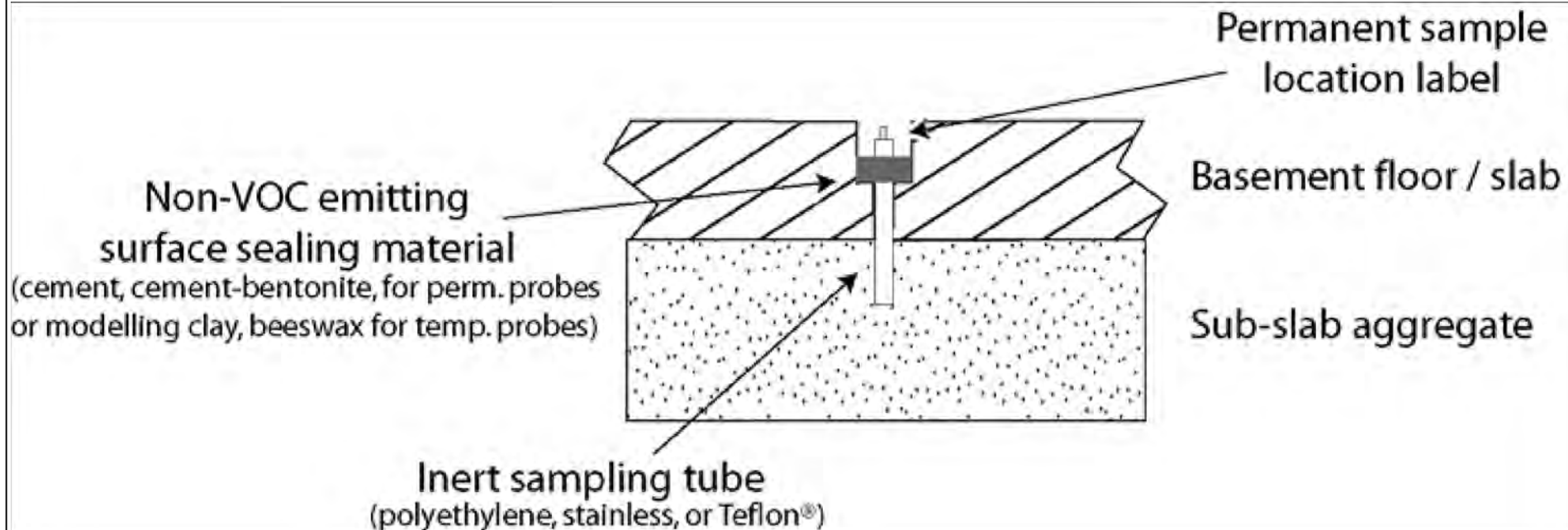


figure 1a

TYPICAL SUB-SLAB SOIL VAPOR PROBE INSTALLATION  
BROWNFIELD CLEANUP AGREEMENT SITE INVESTIGATION  
FORMER BUFFALO CHINA SITE (NO. C915209)

*Buffalo, New York*





figure 2a

SOIL VAPOR INTRUSION CANISTER SET-UP  
BROWNFIELD CLEANUP AGREEMENT SITE INVESTIGATION  
FORMER BUFFALO CHINA SITE (NO. C915209)  
*Buffalo, New York*





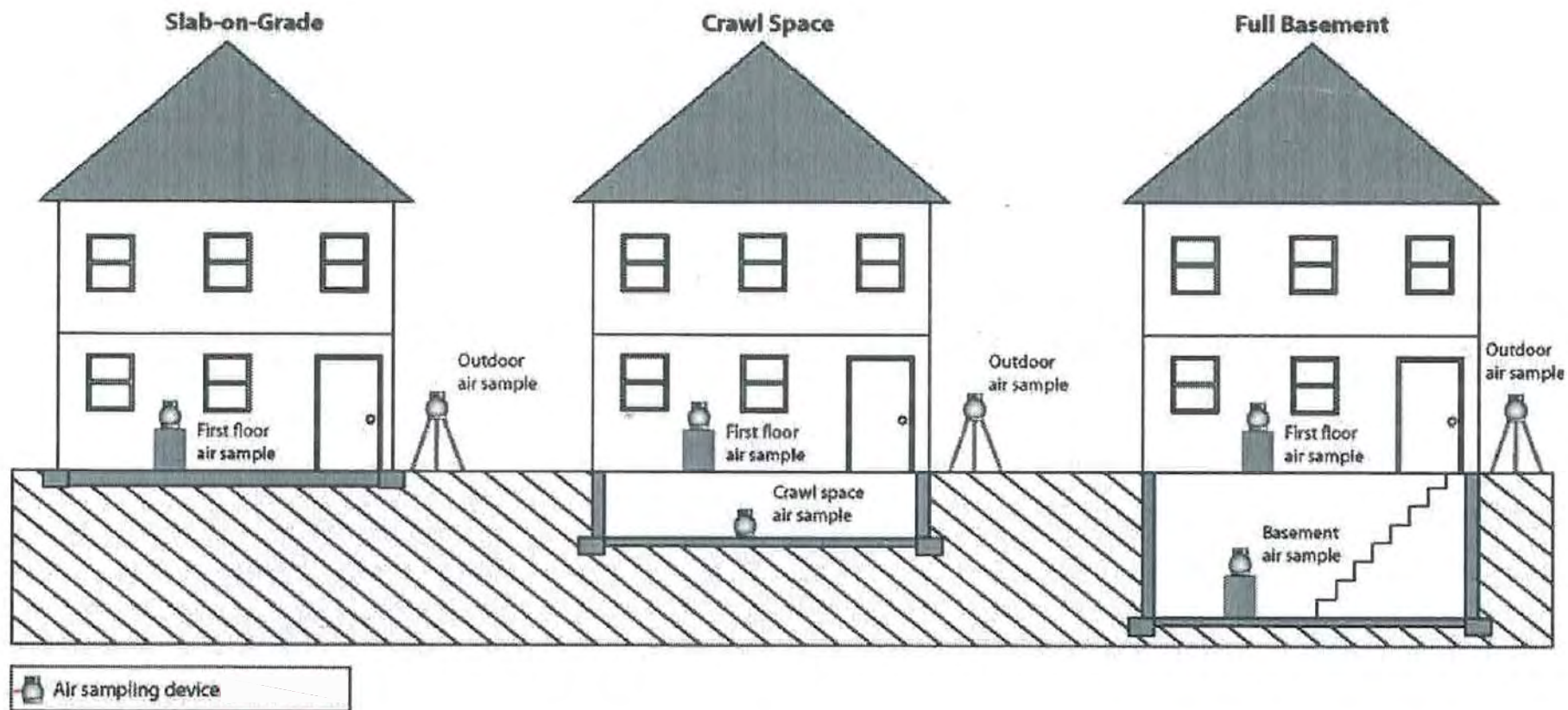


figure 3a

TYPICAL INDOOR AND OUTDOOR AIR SAMPLING CANISTER SET-UP  
 BROWNFIELD CLEANUP AGREEMENT SITE INVESTIGATION  
 FORMER BUFFALO CHINA SITE (NO. C915209)  
 Buffalo, New York



## FORM 1: PHYSICAL BUILDING SURVEY QUESTIONNAIRE

Address: \_\_\_\_\_

Building Owner: \_\_\_\_\_

Occupant Name: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_ Inspector: \_\_\_\_\_ Sample No.: \_\_\_\_\_

Contact Name: \_\_\_\_\_ Phone Number: \_\_\_\_\_

How long have you lived in this home? \_\_\_\_\_

Occupation: \_\_\_\_\_

Number of Occupants Adults: \_\_\_\_\_

Children: \_\_\_\_\_

**HOUSE TYPE:** One story \_\_\_\_\_ Two story \_\_\_\_\_ Brick \_\_\_\_\_ Siding \_\_\_\_\_ Stucco \_\_\_\_\_

**DESCRIBE BUILDING:** \_\_\_\_\_ **YEAR CONSTRUCTED:** \_\_\_\_\_

**WEATHER SEALS:** General Condition: Good \_\_\_\_\_ Fair \_\_\_\_\_ Poor \_\_\_\_\_

<b>BASEMENT:</b> None	<input type="checkbox"/>	Finished	Unfinished	Depth below reference point (meters)
Partial	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Full	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
Crawl space	<input type="checkbox"/>	na	na	_____

Number of floors at or above grade: \_\_\_\_\_

Depth of basement below grade: \_\_\_\_\_ ft. Basement Size: \_\_\_\_\_ ft<sup>2</sup>

Foundation construction: Poured concrete ☐ Cinder block ☐ Stone ☐

Any visual evidence of leakage through basement walls or floor ☐

Floor Construction: Poured concrete ☐ Wood ☐ Earth ☐ Brick ☐ Other: \_\_\_\_\_

Floor condition (cracks, drains): \_\_\_\_\_

Condition at floor/wall joint (if visible): \_\_\_\_\_

Any exterior openings from the basement:

☐ Vents

☐ Fans

☐ Windows

## FORM 1: PHYSICAL BUILDING SURVEY QUESTIONNAIRE

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- ☐ Wall openings  
☐ Utility pipe penetrations  
☐ Other: \_\_\_\_\_

Type of ground cover outside of building: grass / concrete / asphalt / other (specify): \_\_\_\_\_

Sub-slab vapor/moisture barrier in place? Yes / No / Don't know

Type of barrier: \_\_\_\_\_

Do you have a sump?: Yes ☐ No ☐

Where: \_\_\_\_\_

If yes, sealed ☐ open ☐ NA ☐

If yes, is there water in the sump?: Yes ☐ No ☐

Is your home serviced with municipal water? Yes ☐ No ☐

Do you have a water well?: Yes ☐ No ☐ Don't know ☐

Well location: \_\_\_\_\_

Do you drink the water obtained from the well? \_\_\_\_\_

What do you use the well for?: \_\_\_\_\_

Do you have a cistern?: Yes ☐ No ☐

If yes, describe its location: \_\_\_\_\_

Do you have a septic system?: Yes ☐ No ☐

If yes, describe its location: \_\_\_\_\_

If yes, describe how septic system is cleaned: \_\_\_\_\_

Have there ever been a fire in the building?: Yes ☐ No ☐

If yes, describe its location and extent: \_\_\_\_\_

Is there a laundry room located inside the house?: Yes ☐ No ☐

If yes, describe its location: \_\_\_\_\_

FURNACE: Location: \_\_\_\_\_

Type:	gas	<input type="checkbox"/>	Forced air	<input type="checkbox"/>
	oil	<input type="checkbox"/>	hot water	<input type="checkbox"/>
	electric	<input type="checkbox"/>	other	_____

Does furnace have outside combustion air vent? \_\_\_\_\_

Do you have a fireplace? Yes ☐ No ☐

Does the fireplace have an outside combustion air vent? Yes ☐ No ☐

Do you use kerosene space heaters? Yes ☐ No ☐

## FORM 1: PHYSICAL BUILDING SURVEY QUESTIONNAIRE

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AIR CONDITIONER: None \_\_\_\_\_ Central \_\_\_\_\_ Room \_\_\_\_\_  
(If yes, which rooms and capacities?) \_\_\_\_\_

RADON SYSTEM: ☐ Yes ☐ No

GARAGE: Do you have an attached garage? ☐ Yes ☐ No

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1. When was the last time dry-cleaned clothes were brought into the house?  
☐ 0 to 5 days ago ☐ 6 to 10 days ago ☐ More than 10 days ago ☐ Don't dry-clean
2. When was your carpet installed?  
☐ In the last six months ☐ More than six months ago ☐ No Carpet
3. When was the last time your carpet was cleaned?  
☐ In the last six months ☐ More than six months ago ☐ Never
4. Do you have any spot removers in the house?  
☐ Yes ☐ No Details: \_\_\_\_\_
5. Do your hobbies include model building, arts and crafts, model railroading, or others that require paints, thinners, or glue?  
☐ Yes ☐ No Details: \_\_\_\_\_
6. Do you perform automotive or other vehicle maintenance or repair at home?  
☐ Yes ☐ No Details: \_\_\_\_\_
7. Please review the following list and check items you know are in your home
  - ☐ Latex caulk
  - ☐ Latex paint
  - ☐ Vinyl cove molding
  - ☐ Linoleum tile
  - ☐ Black rubber molding
  - ☐ Vinyl edge molding
  - ☐ Polystyrene foam insulation
  - ☐ Adhesive removers

## FORM 1: PHYSICAL BUILDING SURVEY QUESTIONNAIRE

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- ☐ Aerosol spray paints
- ☐ Other paints
- ☐ Air fresheners
- ☐ Degreasers
- ☐ Deodorants
- ☐ Disinfectants
- ☐ Furniture Polish
- ☐ Solvents
- ☐ Caulking

8. Do you have pesticides in your home?

- ☐ Yes      ☐ No      ☐ Unsure

9. Do you have any spray insecticides in your home?

- ☐ Yes      ☐ No      ☐ Unsure

10a. Have you painted any area of the interior of your home in the last 12 months?

- ☐ Yes      ☐ No

10b. If yes, please indicate what paint you used

- ☐ Enamel
- ☐ Vinyl
- ☐ Latex
- ☐ Other

11a. Have you painted the exterior of your home in the last 12 months? ☐ Yes   ☐ No

11b. If yes, please indicate what paint you used

- ☐ Enamel
- ☐ Vinyl
- ☐ Latex
- ☐ Other

## FORM 1: PHYSICAL BUILDING SURVEY QUESTIONNAIRE

12. Where do you store your paint, thinner, pesticides, insecticides?

	<i>Paint</i>	<i>Thinner</i>	<i>Pesticides</i>	<i>Insecticides</i>
Garage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Basement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Storage shed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

☐ I don't store these items at home

13. Have you purchased one of the following items in the last 12 months?

- |   |                                   |                                   |
|---|-----------------------------------|-----------------------------------|
| <input type="checkbox"/> Rubberized door mat    | <input type="checkbox"/> Computer | <input type="checkbox"/> Wiring   |
| <input type="checkbox"/> Plastic shower curtain | <input type="checkbox"/> Printer  | <input type="checkbox"/> Linoleum |
| <input type="checkbox"/> Wood stains or paint   | <input type="checkbox"/> VCR      |                                   |

14. Do you have a computer printer in your home?

☐ Yes      ☐ No

15. Do you have a VCR in your home?

☐ Yes      ☐ No

16. Do you use cleaners to maintain your VCR?

☐ Yes      ☐ No

If yes, what type? \_\_\_\_\_

17. Do you have pets?

☐ Yes      ☐ No

If yes, what type? \_\_\_\_\_

If yes, number \_\_\_\_\_

18. Does anyone in the house smoke?      ☐ Yes      ☐ No

19. Questions asked by Occupant that require follow-up.

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## FORM 2: AIR SAMPLING FIELD DATA SHEET

### A) General Information

Sample Identification Number: \_\_\_\_\_

Site Address: \_\_\_\_\_

Sample Canister Location: \_\_\_\_\_

Sample source: Indoor Air / Sub-Slab / Near Slab Soil Gas / Exterior Soil Gas

Sample Date: \_\_\_\_\_ Sampler: \_\_\_\_\_

Sample Time: \_\_\_\_\_ Start: \_\_\_\_\_ Stop: \_\_\_\_\_

Shipping Date: \_\_\_\_\_

Canister Type: 400 mL - 1.0 L Summa Canister/6 L Summa Canister/Other (specify): \_\_\_\_\_

Canister Serial No.: \_\_\_\_\_

Flow Controller Serial No.: \_\_\_\_\_

Were "Instructions for Occupants" followed?

☐ Yes ☐ No

### B) Sampling Information

	Start		Stop	
	Ambient	Interior	Ambient	Interior
Temperature	_____	_____	_____	_____

	Start	Stop
Canister Pressure Gauge Reading:	_____	_____
Time:	_____	_____
PID Reading (ppm):	_____	_____
Basement Depth (ft below grade):	_____	_____
Window Marked:	Yes/No	_____

Was there significant precipitation within 12 hours prior to (or during) the sampling event?

☐ Yes ☐ No

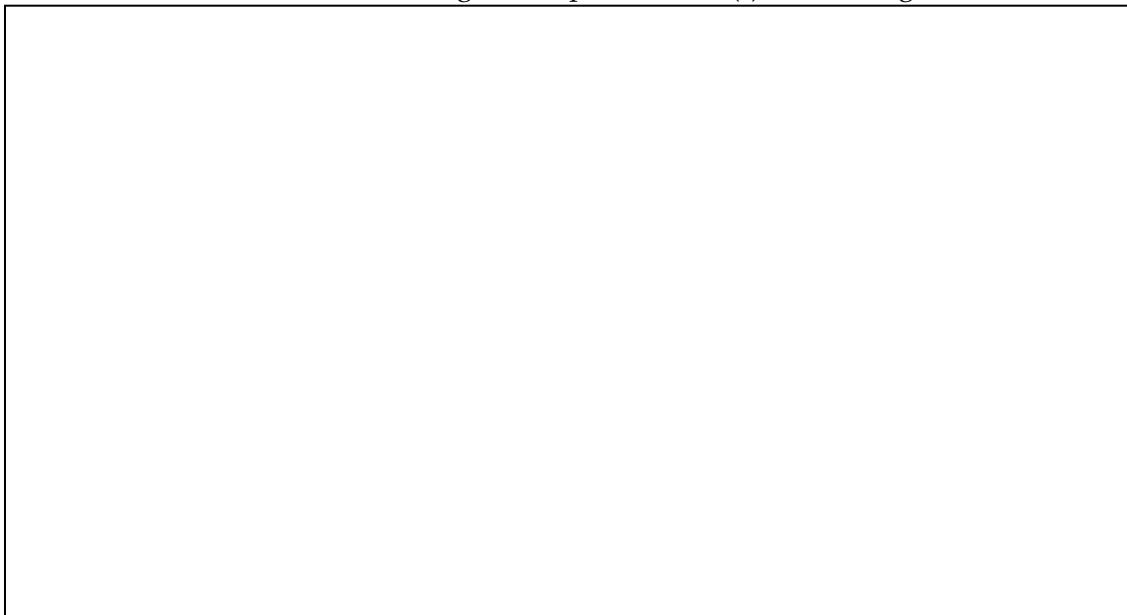
Describe the general weather conditions: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

## FORM 2: AIR SAMPLING FIELD DATA SHEET

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Provide Drawing of Sample Location(s) in Building



C) Comments

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FORM 3: AIR SAMPLING INSTRUCTIONS TO BUILDING OCCUPANTS

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1. The duration of this test is approximately 24 hours.
2. The canister is made of clean stainless steel. It does not contain any moving parts or chemicals.
3. Do not handle or move a canister during testing.
4. Do not smoke around the canister.
5. To the extent possible, leave doors and windows closed during testing.
6. To the extent possible, do not use paint, solvents, glues, and spray cans during testing.
7. If possible, do not bring dry-cleaning into the building during the testing.
8. We will be back tomorrow to pick up the canister about this time.

Canister pick up: Day\_\_\_\_\_

Time\_\_\_\_\_

Thank you for your cooperation.