February 2, 2018

Mr. Eugene Melnyk, P.E
New York State Department of Environmental Conservation
Region 9 Office
270 Michigan Avenue
Buffalo, NY 14203

Subject**:** **Soil Vapor Intrusion Investigation Work Plan**
Exxon Mobile Oil Corporation – Former Buffalo Terminal
Operable Unit 2 East – Buckeye Property
Buffalo, New York

Dear Mr. Meknyk:

Amec Foster Wheeler Environment & Infrastructure, Inc., in association with AMEC E&E PC (AMEC) has prepared this Soil Vapor Intrusion Investigation Work Plan (SVI Work Plan) on behalf of ESCP LLC to conduct vapor intrusion (VI) studies at three structures on Operable Unit (OU) 2 East at the former ExxonMobil refinery (the Site) in Buffalo, NY. This VI study is being conducted in response to the OU2 East Decision Document provided to Elk Street Commerce Park by the New York State Department of Environmental Conservation (NYSDEC) on December 6, 2017. The VI study will be conducted in accordance with the 2006 New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York (most recently updated in 2017).

SITE DESCRIPTION

OU-2 East encompasses portions of the former terminal, including: the northern portion of the Former Refinery Area, Northern Tank Yard Area, Administrative Offices and Operations Area, Northeast Process and Storage Area, and a small northern portion of the Central Rail and Process Area.

SVI sampling will be conducted within three buildings at the Buckeye Terminal (635 Elk Street) previously identified as: 1) the Main Office – Building 154 (also referred to as 152 in some previous reports); 2) Store House - Building 153; 3) and the Laboratory Building. The current building and site layout of OU2 East is shown on Figure 1.

The majority of the Site is currently zoned industrial. It is located in an urban area, generally surrounded by a mixture of industrial and commercial property. A large portion of the site is vacant. The largest active facility on-site is a petroleum distribution terminal. Several smaller commercial businesses operate on the western end of the site.

The Site is located in an area of Buffalo that has numerous parcels of available vacant land. The immediate area surrounding OU2 is comprised of several active industrial uses south of Elk Street, including, the active petroleum distribution terminal; an auto parts recycler; a fertilizer packaging facility and other industrial enterprises to the east; and a sulfuric acid manufacturing plant to the west. North of Elk Street there is vacant land; an auto parts recycler; several industrial enterprises; a tavern; and limited residential housing.

PREVIOUS INVESTIGATIONS

Various remedial investigation have been conducted at the ExxonMobil Former Terminal and the Site is currently participating the NYSDEC Brownfield Program Site No. C915201B. Volatile organic compounds have been identified as contaminants of concern at the Site. SVI sampling was last conducted in 2009 by Roux Associates Inc. Chlorinated compounds, benzene, toluene, ethyl benzene and xylenes (BTEX) were identified in the indoor air of several onsite buildings.

SCOPE OF WORK

Task 1 – Site Inspections

AMEC will visit Buildings 153 and 154 to conduct an inspection of building conditions, an inventory of chemical products stored in the building, and a photo ionization detector survey using a meter with detections in the parts per billion (ppb) range. Observations will be recoded on an Indoor Air Quality Questionnaire and Building Inventory Form included in Attachment 1. During the inspection sample locations will be selected based on available information and the potential for SVI exposure, as described below in the Task 2 description.

The Laboratory Building will be evaluated prior to entry to determine if it is safe for AMEC personnel to conduct the SVI study. If it is safe to enter, the inspection will be conducted and SVI activities described below will be conducted.

Task 2 – Vapor Intrusion Sampling

Vapor intrusion sampling will be conducted in general accordance with the attached SOP (Attachment 1). The sampling methods comply with current NYSDOH VI guidance. Samples will be collected in Summa-type canisters over a 24 hour period.

Building 153. Four subslab samples and six indoor air samples, including one duplicate, will be collected in Building 153. The subslab sample locations will be selected after review of data collected during the site inspection and will be based on proximity to potential contamination areas, as well as floor layout and floor construction (i.e. footings and floor drains) of the buildings. Five indoor air samples will be collocated with the subslab samples. The sixth sample location will be placed either in an additional occupied space or to achieve special distribution of samples throughout the building.

Building 154. Four subslab samples, including one duplicate, and four indoor air samples will be collected in Building 154. Sample IDs are included in Table 1. The subslab sample locations will be selected after review of data collected during the site inspection and will be based on proximity to potential contamination areas, as well as floor layout and floor construction (i.e. footings and floor drains) of the buildings. Three indoor air samples will be collocated with the subslab samples. The fourth sample location will be placed either in an additional occupied space or to achieve spatial distribution of samples throughout the building.

Laboratory Building. One subslab samples and two indoor air samples will be collected in the Laboratory Building due to the size of the building and safety conditions inside. The subslab sample locations will be selected near the center of the building to avoid disturbing pealing lead-based paint on the walls and based on proximity to potential contamination areas, as well as floor layout and floor construction (i.e. footings and floor drains) of the buildings. One indoor air sample will be collocated with the subslab sample. The second sample location will be placed to achieve special distribution of samples throughout the building.

One ambient/background air sample will be collected for each day SVI sampling is conducted.

Samples will be shipped to Centek Laboratories, Inc. of Syracuse, NY for TO-15 analysis. The laboratory will report results for chlorinated solvents and BTEX (the contaminants of concern previously identified at the Site).

Task 3 – Data Evaluation and Report

Upon receipt of the laboratory analysis a chemist review of the data will be completed. AMEC will prepare a letter report that documents the field sampling activities, summarizes the results, and present conclusions. The letter report will include tables, figures, and attachments as appropriate, including the Laboratory-provided Form Is. Results will be compared to the NYSDOH Soil Vapor Intrusion Decision Matrices. Results for compounds not included in the decision matrix will be compared to the 90th percentile in the "Indoor Air" table in Study of Volatile Organic Chemicals in Air of Fuel Oil Heated Homes from Appendix C of the NYSDOH Soil Vapor Intrusion Guidance. Because the NYSDOH does not have indoor air guidelines for commercial properties, results will also be compared to the United States Environmental Protection Agency Regional Screening Levels for "Composite Worker Air" with a target hazard quotient of 1.0.

HEALTH AND SAFETY

AMEC will perform the SVI sampling in accordance with a Site Specific Health and Safety Plan (HASP) developed specifically for the work involved. The HASP will identify potential job hazards and options for hazard mitigation, including use of personal protective equipment, and will list emergency contact information. AMEC employees performing work in the field will be required to read and comply with the HASP.

ANTICIPATED SCHEDULE

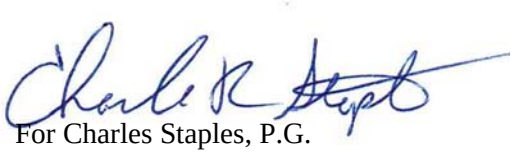
Following is the anticipated schedule for the SVI work described in this Work Plan:

- Week of February 5, 2018 – obtain NYSDEC approval of the SVI Work Plan
- Week of February 5, 2018 – complete site Air Questionnaire
- Week of February 5, 2018 – conduct SVI sampling
- Week of February 12, 2018 – laboratory analysis of samples
- Week of February 19, 2018– obtain analytical results,
- Week of March 5, 2018 - issue report to NYSDEC

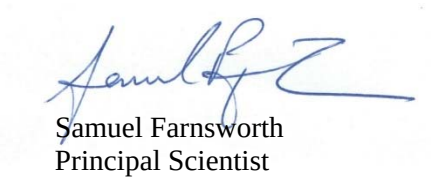
We trust that this Work Plan satisfies the requirements of NYSDEC. Please contact Sam Farnsworth of AMEC at (978) 392-5322 should you have any questions or require additional information.

Sincerely,

AMEC E & E, PC

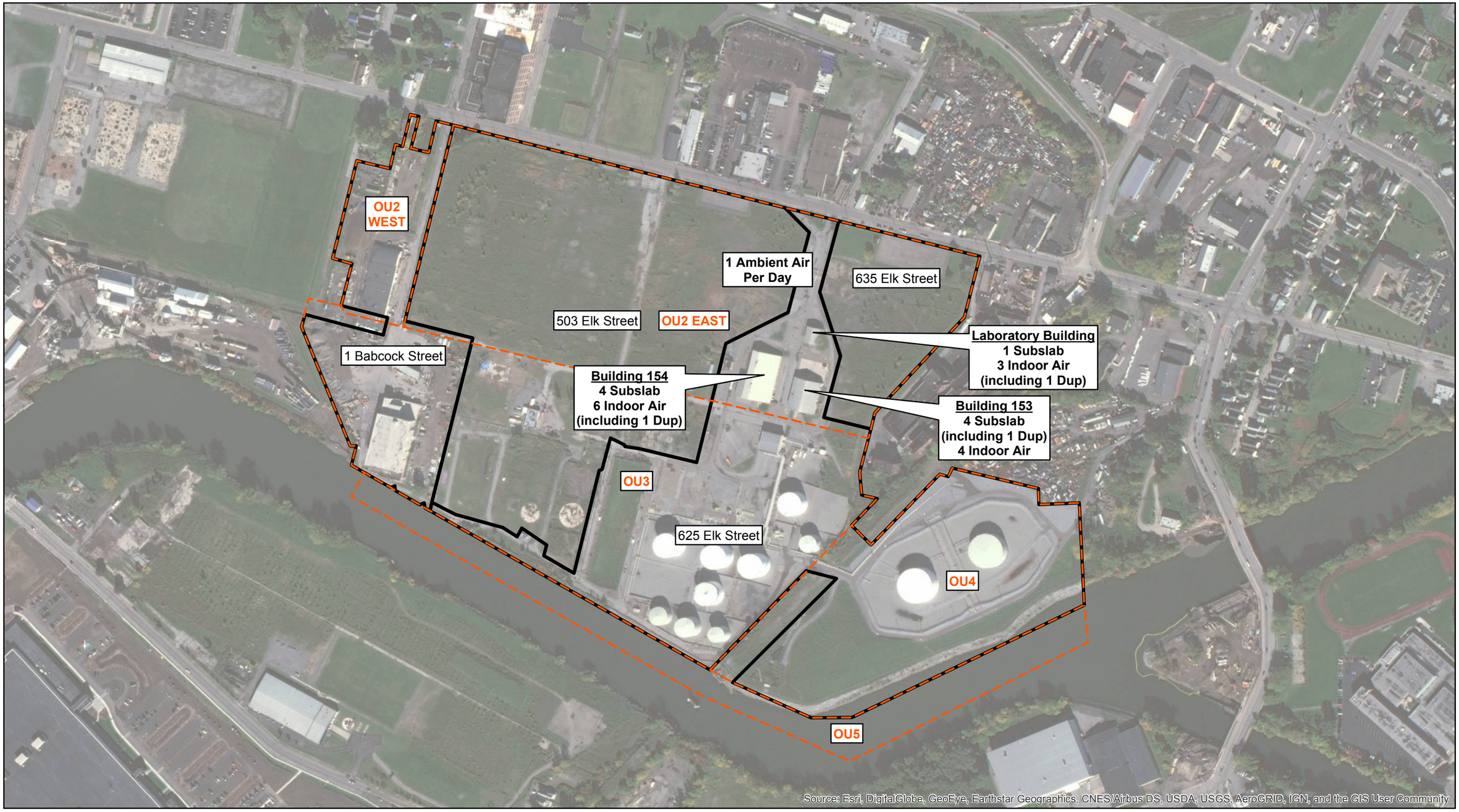


For Charles Staples, P.G.
Senior Scientist



Samuel Farnsworth
Principal Scientist

cc: Paul Neureuter/ESCP
Ben Genes/ESCP
Charles Staples/AMEC
Pat Potoriero/AMEC
Dayne Crowley/AMEC



amec foster wheeler

N

0 175 350 Feet

Tax Parcel Identification
1 Babcock Street – One Babcock Terminal Inc. 122.12-1-20.1
503 Elk Street – ExxonMobil Oil Corporation 123.13-1-2.111
625 Elk Street – Buckeye Terminals LLC 123.13-1-2.112
635 Elk Street – ExxonMobile Oil Corporation 123.13-1-2.113

Legend

Operable Unit

Property Boundary

Figure 1
OU2 East
Proposed SVI Samples

ExxonMobil Former Buffalo Terminal
Buffalo, New York

Prepared/Date: BRP 02/05/18 | Checked/Date: JMF 02/05/18

Document: P:\Projects\Krog-Renova-36171673974.0_Deliverables\4.5_Databases\GIS\MapDocuments\WorkPlan_11x17LS.mxd PDF: P:\Projects\Krog-Renova-36171673974.0_Deliverables\4.2_Work_Plans\SVI\OU2 East\Figure 1 - OU2 East.pdf 02/05/2018 9:24 AM brian.peters

TABLE 1
OU2 East
SVI Samples

Location	Sample Type	Sample ID
Building 154	subslab	OU2E-154-SV100
Building 154	subslab	OU2E-154-SV101
Building 154	subslab	OU2E-154-SV102
Building 154	subslab	OU2E-154-SV103
Building 154	Indoor Air	OU2E-154-IA100
Building 154	Indoor Air	OU2E-154-IA101
Building 154	Indoor Air	OU2E-154-IA102
Building 154	Indoor Air duplicate	OU2E-154-IA103
Building 154	Indoor Air	OU2E-154-IA104
Building 154	Indoor Air	OU2E-154-IA105
Building 153	subslab	OU2E-153-SV100
Building 153	subslab	OU2E-153-SV101
Building 153	subslab	OU2E-153-SV102
Building 153	subslab duplicate	OU2E-153-SV103
Building 153	Indoor Air	OU2E-153-IA100
Building 153	Indoor Air	OU2E-153-IA101
Building 153	Indoor Air	OU2E-153-IA102
Building 153	Indoor Air	OU2E-153-IA103
Laboratory	Subslab	OU2E-LAB-SV100
Laboratory	Subslab	OU2E-LAB-SV101
Laboratory	Indoor Air	OU2E-LAB-IA100
Laboratory	Indoor Air	OU2E-LAB-IA101
Laboratory	Indoor Air duplicate	OU2E-LAB-IA102
Outside	Ambient Air	OU2E-OUT-AA100

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

Site Name: _____ Site Code: _____ Operable Unit: _____

Building Code: _____ Building Name: _____

Address: _____ Apt/Suite No: _____

City: _____ State: _____ Zip: _____ County: _____

Contact Information

Preparer's Name: _____ Phone No: _____

Preparer's Affiliation: _____ Company Code: _____

Purpose of Investigation: _____ Date of Inspection: _____

Contact Name: _____ Affiliation: _____

Phone No: _____ Alt. Phone No: _____ Email: _____

Number of Occupants (total): _____ Number of Children: _____

☐ Occupant Interviewed? ☐ Owner Occupied? ☐ Owner Interviewed?

Owner Name (if different): _____ Owner Phone: _____

Owner Mailing Address: _____

Building Details

Bldg Type (Res/Com/Ind/Mixed): _____ Bldg Size (S/M/L): _____

If Commercial or Industrial Facility, Select Operations:

If Residential Select Structure Type:

Number of Floors: _____ Approx. Year Construction: _____ ☐ Building Insulated? ☐ Attached Garage?

Describe Overall Building 'Tightness' and Airflows(e.g., results of smoke tests):

Foundation Description

Foundation Type: _____ Foundation Depth (bgs): _____ Unit: FEET

Foundation Floor Material: _____

Foundation Wall Material: _____

Foundation Floor Thickness: _____

Foundation Wall Thickness: _____ Unit: INCHES

☐ Floor penetrations? Describe Floor Penetrations: _____

☐ Wall penetrations? Describe Wall Penetrations: _____

Basement is: _____ Basement is: _____ ☐ Sumps/Drains? Water In Sump?: _____

Describe Foundation Condition (cracks, seepage, etc.) : _____

☐ Radon Mitigation System Installed? ☐ VOC Mitigation System Installed? ☐ Mitigation System On?

Heating/Cooling/Ventilation Systems

Heating System: _____ Heat Fuel Type: _____ ☐ Central A/C Present?

Vented Appliances

Water Heater Fuel Type: _____ Clothes Dryer Fuel Type: _____

Water Htr Vent Location: _____ Dryer Vent Location: _____

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

PRODUCT INVENTORY

Building Name: _____ Bldg Code: _____ Date: _____

Bldg Address: _____ Apt/Suite No: _____

Bldg City/State/Zip: _____

Make and Model of PID: _____ Date of Calibration: _____

Location	Product Name/Description	Size (oz)	Condition *	Chemical Ingredients	PID Reading	COC Y/N?
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐

* Describe the condition of the product containers as **Unopened (UO)**, **Used (U)**, or **Deteriorated (D)**

** Photographs of the **front and back** of product containers can replace the handwritten list of chemical ingredients. However, the photographs must be of good quality and ingredient labels must be legible.

Product Inventory Complete? ☐ Were there any elevated PID readings taken on site? ☐ ☐ Products with COC?

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

Site Name: _____ Site Code: _____ Operable Unit: _____

Building Code: _____ Building Name: _____

Address: _____ Apt/Suite No: _____

City: _____ State: _____ Zip: _____ County: _____

Factors Affecting Indoor Air Quailty

Frequency Basement/Lowest Level is Occupied?: _____ Floor Material: _____

☐ Inhabited? ☐ HVAC System On? ☐ Bathroom Exhaust Fan? ☐ Kitchen Exhaust Fan?

Alternate Heat Source: _____ ☐ Is there smoking in the building?

☐ Air Fresheners? Description/Location of Air Freshener: _____

☐ Cleaning Products Used Recently?: Description of Cleaning Products: _____

☐ Cosmetic Products Used Recently?: Description of Cosmetic Products: _____

☐ New Carpet or Furniture? Location of New Carpet/Furniture: _____

☐ Recent Dry Cleaning? Location of Recently Dry Cleaned Fabrics: _____

☐ Recent Painting/Staining? Location of New Painting: _____

☐ Solvent or Chemical Odors? Describe Odors (if any): _____

☐ Do Any Occupants Use Solvents At Work? If So, List Solvents Used: _____

☐ Recent Pesticide/Rodenticide? Description of Last Use: _____

Describe Any Household Activities (chemical use,/storage, unvented appliances, hobbies, etc.) That May Affect Indoor Air Quality:

☐ Any Prior Testing For Radon? If So, When?: _____

☐ Any Prior Testing For VOCs? If So, When?: _____

Sampling Conditions

Weather Conditions: _____ Outdoor Temperature: _____ °F

Current Building Use: _____ Barometric Pressure: _____ in(hg)

Product Inventory Complete? _____ ☐ Building Questionnaire Completed?

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

Building Code: _____ Address: _____

Sampling Information

Sampler Name(s): _____ Sampler Company Code: _____

Sample Collection Date: _____ Date Samples Sent To Lab: _____

Sample Chain of Custody Number: _____ Outdoor Air Sample Location ID: _____

SUMMA Canister Information

Sample ID:					
Location Code:					
Location Type:					
Canister ID:					
Regulator ID:					
Matrix:					
Sampling Method:					

Sampling Area Info

Slab Thickness (inches):					
Sub-Slab Material:					
Sub-Slab Moisture:					
Seal Type:					
Seal Adequate?:	☐	☐	☐	☐	☐

Sample Times and Vacuum Readings

Sample Start Date/Time:					
Vacuum Gauge Start:					
Sample End Date/Time:					
Vacuum Gauge End:					
Sample Duration (hrs):					
Vacuum Gauge Unit:					

Sample QA/QC Readings

Vapor Port Purge:	☐	☐	☐	☐	☐
Purge PID Reading:					
Purge PID Unit:					
Tracer Test Pass:	☐	☐	☐	☐	☐

Sample start and end times should be entered using the following format: MM/DD/YYYY HH:MM

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

LOWEST BUILDING LEVEL LAYOUT SKETCH

Please click the box with the blue border below to upload a sketch of the lowest building level .
The sketch should be in a standard image format (.jpg, .png, .tiff)

Clear Image

Design Sketch

Design Sketch Guidelines and Recommended Symbology

- Identify and label the locations of all sub-slab, indoor air, and outdoor air samples on the layout sketch.
- Measure the distance of all sample locations from identifiable features, and include on the layout sketch.
- Identify room use (bedroom, living room, den, kitchen, etc.) on the layout sket
- Identify the locations of the following features on the layout sketch, using the appropriate symbols:

B or **F**	Boiler or Furnace	o	Other floor or wall penetrations (label appropriately)
HW	Hot Water Heater	**xxxxxxx**	Perimeter Drains (draw inside or outside outer walls as appropriate)
FP	Fireplaces	**######**	Areas of broken-up concrete
WS	Wood Stoves	● SS-1	Location & label of sub-slab samples
W/D	Washer / Dryer	● IA-1	Location & label of indoor air samples
S	Sumps	● OA-1	Location & label of outdoor air samples
@	Floor Drains	● PFET-1	Location and label of any pressure field test holes.

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

FIRST FLOOR BUILDING LAYOUT SKETCH

Please click the box with the blue border below to upload a sketch of the first floor of the building.
The sketch should be in a standard image format (.jpg, .png, .tiff)

Clear Image

Design Sketch

Design Sketch Guidelines and Recommended Symbology

- Identify and label the locations of all sub-slab, indoor air, and outdoor air samples on the layout sketch.
- Measure the distance of all sample locations from identifiable features, and include on the layout sketch.
- Identify room use (bedroom, living room, den, kitchen, etc.) on the layout sket
- Identify the locations of the following features on the layout sketch, using the appropriate symbols:

B or **F**	Boiler or Furnace	o	Other floor or wall penetrations (label appropriately)
HW	Hot Water Heater	**xxxxxxx**	Perimeter Drains (draw inside or outside outer walls as appropriate)
FP	Fireplaces	**######**	Areas of broken-up concrete
WS	Wood Stoves	● SS-1	Location & label of sub-slab samples
W/D	Washer / Dryer	● IA-1	Location & label of indoor air samples
S	Sumps	● OA-1	Location & label of outdoor air samples
@	Floor Drains	● PFET-1	Location and label of any pressure field test holes.

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

OUTDOOR PLOT LAYOUT SKETCH

Please click the box with the blue border below to upload a sketch of the outdoor plot of the building as well as the surrounding area. The sketch should be in a standard image format (.jpg, .png, .tiff)

Clear Image

Design Sketch

Design Sketch Guidelines and Recommended Symbology

- Identify and label the locations of all sub-slab, indoor air, and outdoor air samples on the layout sketch.
- Measure the distance of all sample locations from identifiable features, and include on the layout sketch.
- Identify room use (bedroom, living room, den, kitchen, etc.) on the layout sket
- Identify the locations of the following features on the layout sketch, using the appropriate symbols:

B or **F**	Boiler or Furnace	o	Other floor or wall penetrations (label appropriately)
HW	Hot Water Heater	**xxxxxxx**	Perimeter Drains (draw inside or outside outer walls as appropriate)
FP	Fireplaces	**######**	Areas of broken-up concrete
WS	Wood Stoves	● SS-1	Location & label of sub-slab samples
W/D	Washer / Dryer	● IA-1	Location & label of indoor air samples
S	Sumps	● OA-1	Location & label of outdoor air samples
@	Floor Drains	● PFET-1	Location and label of any pressure field test holes.

AMEC FOSTER WHEELER ENVIRONMENT AND INFRASTRUCTURE, INC.
STANDARD OPERATING PROCEDURE
SUBSTRUCTURE SOIL VAPOR, SOIL VAPOR, OR AMBIENT AIR SAMPLING

STANDARD OPERATING PROCEDURE

SUBSTRUCTURE SOIL VAPOR, SOIL VAPOR, OR AMBIENT AIR SAMPLING

1.0 SCOPE AND APPLICABILITY

This Standard Operating Procedure (SOP) describes the methods to be used for substructure soil vapor, soil vapor, and/or ambient air sampling used to evaluate human exposure to VOCs through vapor intrusion. The equipment may include SUMMA® canisters, flow controllers, vacuum gauges, hammer drill, or any other type of equipment used during field activities.

2.0 RESPONSIBILITIES

It is the primary responsibility of the project Field Operations Leader and field samplers to assure that the proper sampling procedures are followed and that all field data records are completed.

It is the responsibility of the project safety officer to draft and enforce safety measures which provide the best protection for all persons involved directly with sampling.

It is the responsibility of any subcontractors (i.e., drilling contractors) to follow the proper designated sampling procedures that are stated in their contracts and outlined in the Project Health and Safety Plan.

It is the responsibility of all personnel involved with sample collection to maintain a clean working environment and to ensure that all procedures are followed.

3.0 PROCEDURES

3.1 8 or 24-Hour Substructure Soil Vapor Sampling

Substructure soil vapor samples will be collected from beneath residential, commercial, industrial, institutional, and multiuse buildings using SUMMA® type air canisters equipped with metering flow controllers for the purpose of collecting a "time-averaged" soil vapor sample. This technique is intended for 8 to 24-hour sample collection and may be collected in conjunction with indoor air samples. In some instances, 20-minute grab soil vapor samples will be permitted to identify potential VOC contamination beneath the slab (See Subsection 4.5.5.2). Substructure soil vapor samples may be collected from one of the following areas:

Area 1) Subslab soil vapor sample obtained via a temporary installed sampling port through apparent vapor barrier (such as floor slab or plastic liner); or

Area 2) Air sample obtained from crawl space or basement without an apparent vapor barrier.

Substructure soil vapor grab sampling will require the following equipment:

- 1.4 or 6-liter, stainless steel, pre-evacuated SUMMA®-type canister - laboratory provided
- Pressure gauge with integrated 8 or 24-hour metering valve - laboratory provided
- Two, 9/16-inch, open-end wrenches
- PID – part per billion range -for screening crawl space/cracks
- Utility Knife
- Electric hammer drill with 3/8-inch diameter drill bits
- Two 50-ft long electrical extension cords
- ¼-inch O.D. Teflon® tubing
- ¼-inch stainless steel valve and stainless steel "tee" type fitting
- 60 cc polyethylene syringe for purging tubing
- Non-toxic modeling clay (e.g., Plastalina), or other approved seal.
- Quick-drying expansive Portland cement
- Wristwatch
- Flashlight
- COC form - laboratory provided
- Field Data Record (FDR) Indoor Air Quality Questionnaire and Building Inventory Form (Appendix A)

Procedure for Substructure Soil Vapor Sample Collection:

The procedures for substructure soil vapor sample collections will be dependent on location area (Area 1 or Area 2). During the occupant/owner interview and building survey the lowest accessible portion of the building (e.g., crawl space, basement, or first floor of slab-on-grade construction) will be observed to assess which substructure sampling area category is applicable. The steps provided below should be considered a general guidance on the collection of substructure soil vapor samples for each location area; the sequence can be modified as needed based on site- or project-specific conditions at the time of sample collection.

Area 1: Subslab soil vapor sample obtained via temporary installed sampling port through apparent vapor barrier (i.e. floor slab or plastic liner).

1. **Select and prepare the sample collection point.**

- Observe the condition of the building floor slab for apparent penetrations such as concrete floor cracks, floor drains, or sump holes.
- Document the floor conditions on the FDR sampling form and select a potential location or locations for a temporary subsurface probe.
- The location or locations should be central to the building away from foundation walls and apparent penetrations.
- Review the proposed location or locations with the occupant/owner describing how the sampling port or ports will be installed.
- Document the proposed location(s) and describe the location(s) on the FDR sampling form.
- Using the PID, screen indoor air in the area of floor penetrations such as concrete floor cracks, floor drains, or sump holes. Record the indoor air PID readings on the FDR sampling form.

2. Installation of temporary subsurface sample point

- Drill through the thickness of the slab using a 3/8-inch drill bit. Extend the hole about three inches into the subslab material using either the drill bit or a steel probe rod. Sweep hole to remove excess dust.
- Insert a section of ¼-inch O.D. Teflon® tubing to the bottom of the floor slab (making sure not to push dirt/dust into the bottom of the tube). Seal the annular space between the ¼-inch tubing and 3/8-inch hole at the concrete surface with modeling clay, or other approved seal.
- Connect the ¼ -inch Teflon® tubing to a stainless steel valve using compression fittings. Open the in-line valve and purge the probe tubing using a polyethylene 60 cc syringe. Close the valve, remove and cap the syringe, and connect the ¼-inch Teflon® tubing and in-line valve to a SUMMA®-type canister. The air/soil vapor syringe will be discharge out of doors. For duplicate sample locations connect a second canister before purging by installing a ¼ -inch stainless steel "tee" fitting between the probe discharge tubing and the stainless steel valve.

3. Preparation of 8 or 24-hour SUMMA®-type canister and collection of sample

- Place SUMMA®-type canister adjacent to the temporary sampling port.
- Record SUMMA®-type canister serial number on sampling summary form and COC.
- Record sample identification on canister identification tag, and record on sampling summary form and COC.
- Remove brass plug from canister fitting.
- Install pressure gauge/metering valve on canister valve fitting and tighten. If pressure gauge has additional (2nd) fitting, install brass plug from canister fitting into gauge fitting and tighten.
- Open and close canister valve.
- Record gauge pressure on sample summary form and COC. Gauge pressure must read >25 inches Hg. Replace SUMMA®-type canister if gauge pressure reads <25 inches Hg.
- Remove brass plug from gauge fitting and store for later use.
- Connect subsurface probe to end of in-line particular filter via ¼-inch O.D. Teflon® tubing and "swagelok®-type" fittings.
- Open canister valve and in-line stainless steel valve to initiate sample collection.
- Record date and local time (24-hour basis) of valve opening on sampling summary form and COC.
- Take digital photograph of SUMMA®-type canister and surrounding area.

4. Termination of 8 or 24-hour sample collection

- Revisit SUMMA®-type canister approximately at end of sample collection period (e.g., 8 or 24 hours after initiation of sample collection) and record gauge pressure on the FDR sampling form and COC.
- Record date and local time (24-hour basis) of valve closing on the FDR sampling form and COC.
- Close canister valve.
- Disconnect Teflon® tubing and remove pressure gauge / flow valve from canister.
- Reinstall brass plug on canister fitting and tighten.
- Remove SUMMA®-type canister from sample collection area.

- Remove temporary probe and fill the hole with quick drying hydraulic cement. Finish flush with floor surface.

Area 2: Air sample obtained from crawl space or basement without an apparent vapor barrier.

1. **Select and prepare the sample collection point**
    - Observe the area for the apparent presence of items or materials that may potentially produce or emit VOCs and interfere with analytical laboratory analysis of the collected sample. Record relevant information on Building Inventory Form and document with digital photographs.
    - Using the PID, screen indoor air in the location intended for sampling and in the vicinity of potential VOC sources (e.g., paints, glues, household cleaners, dry cleaned clothes, etc.) to assess the potential gross presence of VOCs. Record PID readings on the FDR sampling form. Items or materials exhibiting PID readings shall be considered probable sources of VOCs and documented clearly to aid in evaluating sample results.

2. **Preparation of 8 or 24-Hour SUMMA®-type canister and collection of sample**

    - Place SUMMA®-type canister at breathing zone height (approximately 3 to 5 ft above basement floor or about 1 ft above floor of crawl space). Canister can be placed on a stable surface, such as a table or bookshelf, or affixing to a wall or ceiling support with nylon rope. Avoid placing canisters near windows or other potential sources of drafts and air supply vents.
    - Record SUMMA®-type canister serial number on sampling summary form and COC.
    - Record sample identification on canister identification tag, and record on sampling summary form and COC.
    - Remove brass plug from canister fitting.
    - Install pressure gauge / metering valve on canister valve fitting and tighten. If pressure gauge has additional (2nd) fitting, install brass plug from canister fitting into gauge fitting and tighten.
    - Open and close canister valve.
    - Record gauge pressure on sample summary form and COC. Gauge pressure must read >25 inches Hg. Replace SUMMA®-type canister if gauge pressure reads <25 inches Hg.
    - Remove brass plug from gauge fitting and store for later use.

- Open canister valve to initiate sample collection.
- Record date and local time (24-hour basis) of valve opening on sampling summary form and COC.
- Take digital photograph of SUMMA®-type canister and surrounding area.

3. Termination of 8 or 24-hour sample collection

- Revisit SUMMA®-type canister approximately at end of sample collection period (e.g., 8 to 24 hours after initiation of sample collection) and record gauge pressure on the FDR sampling form and COC.
- Record date and local time (24-hour basis) of valve closing on the FDR sampling form and COC.
- Close canister valve.
- Remove pressure gauge / flow valve from canister.
- Reinstall brass plug on canister fitting and tighten.
- Remove SUMMA®-type canister from sample collection area.

4. Preparation and shipment of sample to analytical laboratory

- Pack SUMMA®-type canister in shipping container, note presence of brass plug installed in tank fitting.
- Complete COC and place requisite copies in shipping container.
- Close shipping container and affix custody seal to container closure.

Quality Assurance/Quality Control (QA/QC) samples:

The collection of QA/QC samples will include the submittal of blind sample duplicates to the analytical laboratory for analyses of target compounds. Area 2- type duplicate samples will be collected "side-by-side" over the same time interval. Area 1- type duplicate samples will be obtained using a stainless steel "tee" type fitting and ¼ -inch O.D. Teflon®- tubing connected to the same subsurface probe.

3.2 Substructure Soil Vapor Grab Sampling

Substructure soil vapor grab samples will be collected from beneath residential, commercial, industrial, institutional, and multiuse buildings with an apparent vapor barrier using SUMMA® type air canisters equipped with metering flow controllers. This technique is intended for 20 minute sample collection. Substructure soil vapor grab samples may be collected from a temporary installed sampling port through an apparent vapor barrier (such as floor slab or plastic liner).

Substructure soil vapor grab sampling will require the following equipment:

- 1.4-liter or 6-liter, stainless steel, pre-evacuated SUMMA® canister - laboratory provided
- Pressure gauge with integrated 20-minute metering valve - laboratory provided
- PID
- Utility Knife
- Electric hammer drill with 3/8-inch diameter drill bit
- Two 50-ft long electrical extension cords
- ¼-inch O.D. Teflon® tubing
- ¼-inch stainless steel valve and stainless steel "tee" type fitting
- 3/16-inch I.D. silastic tubing
- 60 cc polyethylene syringe for purging tubing
- Quick-drying hydraulic cement
- Wristwatch
- Flashlight
- Dust pan and broom
- COC form - laboratory provided
- Field Data Record (FDR) Indoor Air Quality Questionnaire and Building Inventory Form (Appendix A)

Procedure for 20-Minute Substructure Soil Vapor Grab Sample Collection

Survey the lowest accessible portion of the building (e.g., crawl space, basement, or first floor of slab-on-grade construction) will be observed to assess applicability of sampling technique (e.g., Is there a vapor barrier?). The steps provided below should be considered a general guidance on the collection of substructure soil vapor samples; the sequence can be modified as needed based on site- or project-specific conditions at the time of sample collection.

Selection and preparation of sample collection point

A. Observe the condition of the building floor slab for apparent penetrations such as concrete floor cracks, floor drains, or sump holes. Document the floor conditions on the FDR sampling form and select a potential location or locations for a temporary subsurface probe. The location or locations should be central to the building away from foundation walls and apparent penetrations. Review the proposed location or locations with the occupant/owner describing how the sampling port or ports will be installed. Document the proposed location(s) and describe the location(s) on the FDR sampling form.
B. Using the PID, screen indoor air in the area of floor penetrations such as concrete floor cracks, floor drains, or sump holes. Record the indoor air PID readings on the FDR sampling form.

Installation of temporary subsurface sample point

A. Drill a 3/8-inch diameter hole through the thickness of the slab. Extend the hold about two inches into the subslab material using either the drill bit or a steel probe rod.
B. Insert a section of ¼ -inch O.D. Teflon® tubing to the bottom of the floor slab. Seal the annular space between the 3/8-inch hole and ¼ -inch tubing with modeling clay or other approved seal
C. Connect the ¼ -inch Teflon® tubing to a stainless steel valve using 3/16-inch ID silastic tubing. Open the in-line valve and purge the probe tubing using a polyethylene 60 cc syringe (purging with a PID is also acceptable if no indoor air samples are to be collected). Close the valve, remove and cap the syringe, and connect the silastic tubing to the in-line valve on the SUMMA® canister. The air/soil vapor syringe will be discharge out of doors if indoor air samples are to be collected. For duplicate sample locations connect a second canister before purging by installing a ¼ -inch stainless steel "tee" fitting between the probe discharge tubing and the stainless steel valve.

Preparation of 20-minute SUMMA® canister and collection of sample

A. Place SUMMA® canister adjacent to the temporary sampling port.
B. Record SUMMA® canister serial number on sampling summary form and COC.
C. Record sample identification on canister identification tag, and record on sampling summary form and COC.
D. Remove plastic cap canister fitting.
E. Open and close canister valve.

F. Record gauge pressure on sample summary form and COC. Gauge pressure must read >25 inches Hg. Replace SUMMA® canister if gauge pressure reads <25 inches Hg.
G. Connect canister to silastic tubing already connected to the subsurface probe.
H. Open canister valve and in-line stainless steel valve to initiate sample collection.
I. Record date and local time (20-minute basis) of valve opening on sampling summary form and COC.
J. Take digital photograph of SUMMA® canister and surrounding area.

Termination of 20-minute sample collection

A. Upon completion of 20 minute sample collection, record gauge pressure on the FDR sampling form and COC.
B. Record date and local time (20 minute basis) of valve closing on the FDR sampling form and COC.
C. Close canister valve.
D. Disconnect silastic tubing and recap pressure gauge.
E. Remove SUMMA® canister from sample collection area.
F. Remove temporary probe from hole. Fill hole with a quick drying hydraulic cement. Finish flush with floor surface.

3.3 Indoor Air Sampling

Indoor air samples will be collected from residential, commercial, industrial, institutional, and multiuse buildings. This technique is intended to be a general directive for the collection of indoor air samples using SUMMA®-type air canisters equipped with metering flow controllers for the purpose of collecting a "time-averaged" indoor air sample. This procedure is intended for 8 or 24-hour sample collection and may be collected in conjunction with 8 or 24 hour substructure soil vapor sampling. Indoor air data will be recorded on a field data record.

For the purposes of evaluating the potential vapor migration from soils and groundwater into indoor air, samples will be collected from the lowest usable area of the building. Indoor air samples may be collected from one of the following areas:

1. Unfinished basement or unfinished first floor of slab-on-grade building;
2. Finished basement or finished first floor of slab-on-grade building; or

3. First floor living area above a dirt-floored crawl space or unfinished basement.

Indoor air sampling will require the following equipment:

- 1.4 or 6-liter, stainless steel, pre-evacuated SUMMA®-type canister - laboratory provided
- Pressure gauge with integrated 8 or 24-hour metering valve - laboratory provided
- Two, 9/16-inch, open-end wrenches
- PID – part per billion range detector for screening indoor air
- Wristwatch
- COC form -laboratory provided
- Field Data Record (FDR) Indoor Air Quality Questionnaire and Building Inventory Form (Appendix A)

Procedure for Indoor Air Sample Collection

The following section provides a general guidance on the collection of indoor air samples; the sequence can be modified as needed based on site specific conditions at the time of sample collection.

Selection and Preparation of indoor air sample collection area

A. Conduct interview with occupant/owner. Complete Indoor Air Quality Questionnaire and Building Inventory Form (Appendix A).
B. Observe the area for the apparent presence of items or materials that may potentially produce or emit VOCs and interfere with analytical laboratory analysis of the collected sample. Record relevant information on Building Inventory Form and document with digital photographs.
C. Using the PID, screen indoor air in the location intended for sampling and in the vicinity of potential VOC sources (e.g., paints, glues, household cleaners, dry cleaned clothes, etc.) to assess the potential gross presence of VOCs. Record PID readings on the FDR sampling form. Items or materials exhibiting PID readings shall be documented clearly to assist in evaluating sample results.

Preparation of SUMMA®-type canister and collection of indoor air sample

A. Place SUMMA®-type canister at breathing zone height (approximately 3 to 5 ft above floor). Canister can be placed on a stable surface, such as a table or bookshelf, or affixing to a wall or

ceiling support with nylon rope. Avoid placing canisters near windows or other potential sources of drafts and air supply vents.

B. Record SUMMA®-type canister serial number on sampling summary form and COC.
C. Record sample identification on canister identification tag, and record on sampling summary form and COC.
D. Remove brass plug from canister fitting.
E. Install pressure gauge / metering valve on canister valve fitting and tighten. If pressure gauge has additional (2nd) fitting, install brass plug from canister fitting into gauge fitting and tighten.
F. Open and close canister valve.
G. Record gauge pressure on sample summary form and COC. Gauge pressure must read >25 inches Hg. Replace SUMMA®-type canister if gauge pressure reads <25 inches Hg.
H. Remove brass plug from gauge fitting and store for later use.
I. Open canister valve to initiate sample collection.
J. Record date and local time (24-hour basis) of valve opening on sampling summary form and COC.
K. Take digital photograph of SUMMA®-type canister and surrounding area.

Termination of indoor air sample collection

A. Revisit SUMMA®-type canister approximately at end of sample collection period (e.g., 8 or 24 hours after initiation of sample collection) and record gauge pressure on the FDR sampling form and COC.
B. Record date and local time (24-hour basis) of valve closing on the FDR sampling form and COC.
C. Close canister valve.
D. Remove pressure gauge / flow valve from canister.
E. Reinstall brass plug on canister fitting and tighten.
F. Remove SUMMA®-type canister from sample collection area.

Preparation and shipment of sample to analytical laboratory

A. Pack SUMMA®-type canister in shipping container, note presence of brass plug installed in tank fitting.
B. Complete COC and place requisite copies in shipping container.
C. Close shipping container and affix custody seal to container closure.

Quality Assurance/Quality Control (QA/QC) samples:

The collection of QA/QC samples will include the submittal of blind sample duplicates to the analytical laboratory for analyses of target compounds. Duplicate samples will be collected "side-by-side" over the same time interval.

3.4 Ambient Air Sampling

Ambient (outdoor) air samples will be collected in the vicinity of residential, commercial, industrial, institutional, and multiuse buildings. This technique is intended to be a general directive for the collection of ambient air samples using SUMMA®-type air canisters equipped with metering flow controllers for the purpose of collecting a "time-averaged" ambient air sample. This procedure is intended for 8 to 24-hour sample collection. Ambient air sampling information will be recorded on the FDR.

Ambient air sampling will require the following equipment:

- 1.4 or 6-liter, stainless steel, pre-evacuated SUMMA®-type canister - laboratory provided
- Pressure gauge with integrated 8 or 24-hour metering valve - laboratory provided
- Two, 9/16-inch, open-end wrenches
- PID – part per billion range detector for screening air
- Wristwatch
- COC form - laboratory provided
- Field Data Record (FDR) Indoor Air Quality Questionnaire and Building Inventory Form (Appendix A)

Procedure for Ambient (outdoor) Air Sample Collection

The following section provides a general guidance on the collection of ambient air samples; the sequence can be modified as needed based on site specific conditions at the time of sample collection.

Selection and Preparation of ambient sample collection area

A. Choose an area for sample collection that is upwind of the property (properties) being assessed, if possible. Collect sample away from wind breaks, if possible.
B. Observe the area for the apparent presence of items or materials that may potentially produce or emit VOCs and interfere with analytical laboratory analysis of the collected sample (i.e. fuel tanks, gasoline, paint storage, etc.). Record relevant information on Building Inventory Form and document with digital photographs.
C. Using the PID, screen ambient air in the location intended for sampling to assess the potential gross presence of VOCs. Record PID readings on the FDR sampling form.

Preparation of SUMMA® canister and collection of ambient sample

A. Place SUMMA®-type canister approximately 5 ft above ground (or equivalent to the mid-point of the ground story of the building(s). Canister can be placed on a stable surface, or suspended from structure with nylon rope.
B. Record SUMMA®-type canister serial number on sampling summary form and COC.
C. Record sample identification on canister identification tag, and record on sampling summary form and COC.
D. Remove brass plug from canister fitting.
E. Install pressure gauge/metering valve on canister valve fitting and tighten. If pressure gauge has additional (2nd) fitting, install brass plug from canister fitting into gauge fitting and tighten.
F. Open and close canister valve.
G. Record gauge pressure on sample summary form and COC. Gauge pressure must read >25 inches Hg. Replace SUMMA®-type canister if gauge pressure reads <25 inches Hg.
H. Remove brass plug from gauge fitting and store for later use.
I. Open canister valve to initiate sample collection.
J. Record date and local time (24-hour basis) of valve opening on sampling summary form and COC.
K. Take digital photograph of SUMMA®-type canister and surrounding area.

Termination of ambient sample collection

A. Revisit SUMMA®-type canister approximately at end of sample collection period (e.g., 8 or 24 hours after initiation of sample collection) and record gauge pressure on the FDR sampling form and COC.
B. Record date and local time (24-hour basis) of valve closing on the FDR sampling form and COC.
C. Close canister valve.
D. Remove pressure gauge / flow valve from canister.
E. Reinstall brass plug on canister fitting and tighten.
F. Remove SUMMA®-type canister from sample collection area.

Preparation and shipment of sample to analytical laboratory

A. Pack SUMMA®-type canister in shipping container, note presence of brass plug installed in tank fitting.
B. Complete COC and place requisite copies in shipping container.
C. Close shipping container and affix custody seal to container closure.

Quality Assurance/Quality Control (QA/QC) samples:

The collection of QA/QC samples will include the submittal of blind sample duplicates to the analytical laboratory for analyses of target compounds. Duplicate samples will be collected "side-by-side" over the same time interval.

4.0 REFERENCES

New York State Department of Health (NYSDOH), 2006, 2007, 2013 and 2015. Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York. October 2006, as amended June 25, 2007, September 2013 and August 2015.