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July 17, 2019
File No. 12.0076252.10

Jessica LaClair
Environmental Engineer
Division of Environmental Remediation
New York State Department of Environmental Conservation
625 Broadway
Albany, NY 12233-7013

Re: Building 338 Sub-Slab Vapor Investigation
Former IBM East Fishkill Facility, Hopewell Junction, NY
NYSDEC Site No. 314054, EPA ID NYD000707901

Dear Ms. LaClair

GZA GeoEnvironmental of New York (GZA) has prepared this letter on behalf of i.park84, LLC to detail the collection of sub-slab soil gas and indoor air samples within Building 338 at the Former IBM East Fishkill Facility located at 2070 Route 52, Hopewell Junction, NY (Site). The objective of the sampling was to evaluate the sub-slab soil vapor and indoor air within Building 338 in order to assess the potential for soil vapor intrusion. Future sampling will be conducted to evaluate the potential exposures to Site-related contaminants via the soil vapor intrusion pathway for future occupants once the building remodeled and the heating ventilation and air conditioning (HVAC) is operational. Investigation activities were conducted in accordance GZA's March 6, 2019 Sub-Slab Vapor Investigation Work Plan – Building 338 (Work Plan) approved by the New York State Department of Environmental Conservation (NYSDEC) on March 15, 2019, except where otherwise noted.

FIELD INVESTIGATION ACTIVITIES

The field investigation activities included a pre-sampling building inspection, installation of permanent sub-slab vapor monitoring points, and the collection and analysis of sub-slab soil vapor, indoor air and ambient air samples.

BUILDING INSPECTION

GZA conducted a pre-sampling inspection of Building 338 on June 16, 2019 to evaluate the condition of the slab as well as to identify materials currently or historically stored or used within the building that have a potential to be a source of volatile chemicals.

The interior building slab was observed to be in good condition with minimal cracking. GZA observed raised areas constructed of concrete within the first floor of the building (**Figure 1**). It is unknown if these raised areas are filled with concrete or other fill material (e.g., soil). These areas were elevated approximately 24 inches above the slab.

During the inspection, GZA observed metal working operations in the eastern portion of the building. GZA did not observe other operations involving materials/chemicals that could interfere with the proposed sampling. GZA did observe a supply of cleaning materials in the southern portion of the Building in the vicinity of SS-01. These materials were moved to the western portion of the Building to be kept at a distance from the proposed indoor air sampling locations during sampling. A copy of the completed New York State Department of Health (NYSDOH) Indoor Air Quality Questionnaire and Building Inventory can be found in **Attachment A**.

SUB-SLAB VAPOR MONITORING POINT INSTALLATION

One June 16, 2019, permanent sub-slab vapor monitoring points (SS-01 through SS-04) were installed within Building 338. The locations of SS-02 and SS-03 were relocated from the locations identified in the Work Plan due to the presence of the elevated concrete surfaces.

The sub-slab vapor monitoring points were constructed by coring an approximate 3-inch diameter hole through the concrete floor slab and installing a 2-inch-diameter by approximately 1.5-ft-long 20-slot schedule 40 PVC screen equipped with a capped port flush with the existing slab. Sub-slab vapor monitoring points were installed approximately 12-inches below the slab. The sub-slab vapor monitoring points were sealed with a mixture of bentonite and cement and installed flush with the existing slab. **Figure 1** depicts the location of the sub-slab vapor monitoring points.

SAMPLING AND ANALYSIS

On June 17, 2019, GZA mobilized to the Site to perform leak testing and to collect air samples. Helium integrity testing was performed on each sub-slab vapor monitoring points in accordance with the Work Plan.

Following completion of leak testing, the following samples were collected:

- One sub-slab soil vapor sample from each sub-slab vapor monitoring point (SS-01 through SS-04);
- One co-located indoor air sample in the vicinity of each sub-slab vapor monitoring point (IA-01 through IA-04);
- Two ambient air samples on the exterior of Building 338 (AA-01 and AA-02); and
- One duplicate ambient air sample (DUP-06181) at sample location AA-01.

Sampling was conducted in accordance with the NYSDEC-approved Work Plan. Collection of sub-slab vapor samples and indoor air samples was conducted over 30 minutes. During sampling, GZA noted that multiple loading dock doors on the east, west and south walls of Building 338 were periodically opened/closed. GZA

requested that this activity be kept to a minimum and continued with the indoor air sampling. Ambient air samples were collected from an upwind (AA-01) and downwind (AA-02) location over 30 minutes. A duplicate sample was collected at location AA-01. Samples were analyzed by Alpha Analytical by U.S. Environmental Protection Agency (EPA) method TO-15. **Figure 1** depicts the sample locations.

RESULTS

The analytical results of the sub-slab soil vapor and indoor air samples were compared to the Soil Vapor/Indoor Air Matrices provided in NYSDOH's Guidance for Evaluating Soil Vapor Intrusion in the State of New York. Based on the concentrations detected in sub-slab soil vapor and indoor air, the Soil Vapor/Indoor Air Matrix indicates no further action for constituents other than PCE.

Tetrachloroethene (PCE) exceeded the sub-slab vapor matrix value of 100 µg/m^3 at all samples (SS-01 through SS-04) with detected concentrations of 104, 204, 213 and 1010 µg/m^3, respectively. However, PCE was below the indoor air matrix value of 3 µg/m^3 in all samples (IA-01 through IA-04) with concentrations of 0.305, 0.278, 0.332 and 0.305 µg/m^3 respectively. Based on the PCE concentrations detected at SS-04 (1010 µg/m^3) and IA-04 (0.305 µg/m^3), the recommended action indicated on the Soil Vapor/Indoor Air Matrix is mitigation. Based on the PCE concentrations detected at SS-01 through SS-03 and IA-01 through IA-03, no further action is indicated on the Soil Vapor/Indoor Air Matrix. However, as noted earlier, possible interference (increased ventilation from the opening of the loading dock doors) occurred during the indoor air sampling.

The results of the indoor air samples (IA-01 through IA-04) were compared to Table C-1 2003 Upper Fence Study of Volatile Organic Chemicals in air of Fuel Oil Heated Homes for Indoor Air, Table C-2 2001 USEPA BASE 90th Percentile for Indoor Air, Table C-5 Health Effects Institute 95th Percentile for Indoor Air (Indoor Air Background Values), and the NYSDOH Air Guidance Values (AGV). Concentrations of tetrahydrofuran, trichlorofluoromethane and n-hexane exceeded one or more of the Indoor Air Background Values at one or more of the indoor air sampling locations. The results indicated no exceedances of the NYSDOH AGVs for any indoor air sample. The results are presented in **Table 1**.

DISCUSSION

The results of this investigation indicate there is the potential for vapor intrusion within Building 338 based on the elevated concentrations of PCE identified in the sub-slab soil vapors, most notably in the northern portion of the building. However, the indoor air concentrations of PCE do not indicate current exposure. As noted above, the indoor air concentrations could have been affected by the opening/closing of loading dock doors during sampling. Although tetrahydrofuran, trichlorofluoromethane and n-hexane were detected above Indoor Air Background Values concentrations in indoor air were generally higher than the sub-slab soil vapor concentrations indicating that there are other potential sources of these compounds contributing to the detected concentrations rather than sub-slab soil vapor.

GZA recommends further evaluation once the final proposed layout of Building 338 is complete. Based on the proposed use of the building and areas to be occupied following redevelopment, an evaluation should be conducted to determine whether mitigation is needed in portions of the building and the most appropriate mitigation methods.

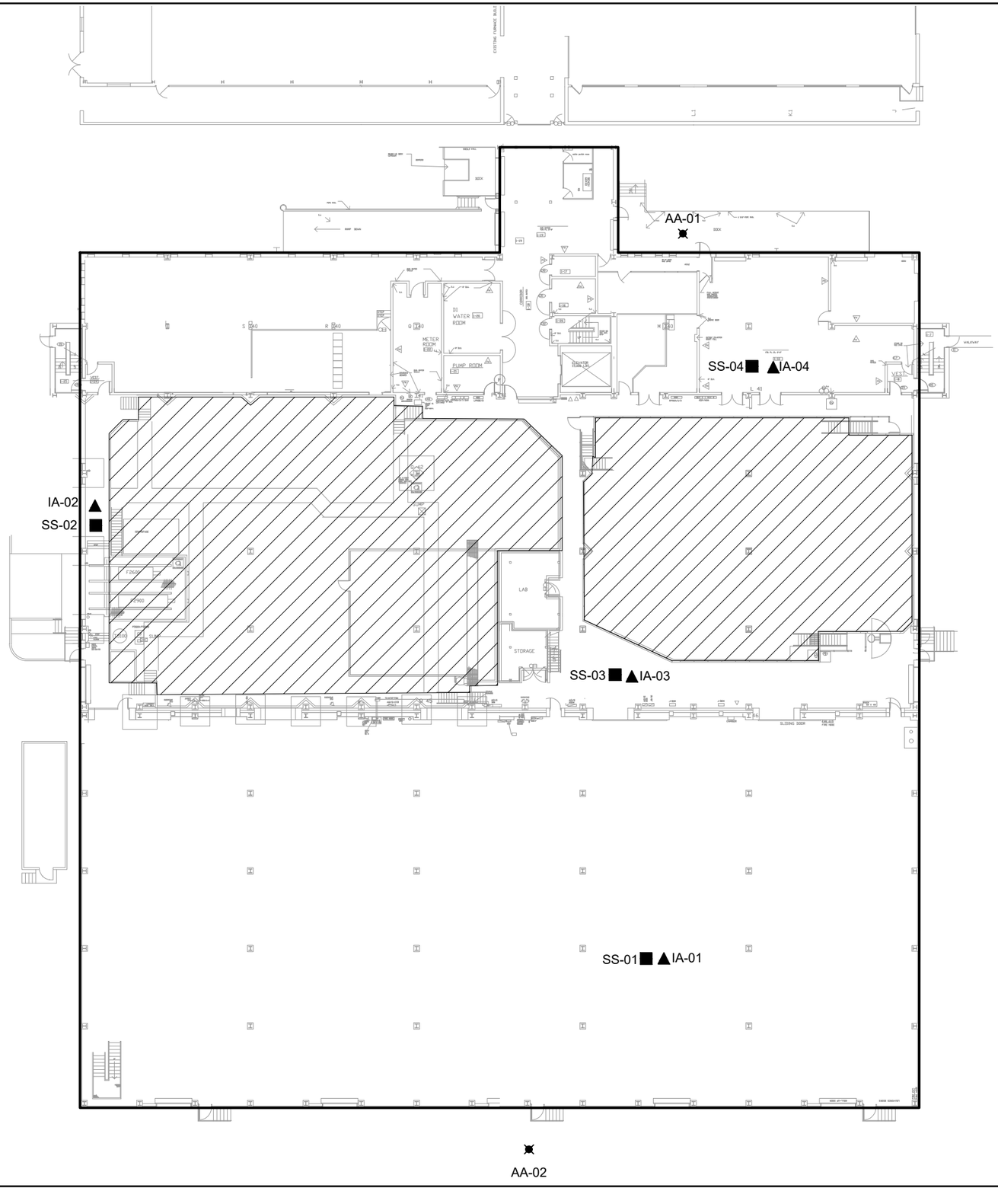
If you have any questions regarding the above, please contact Meredith Hayes at 973.774.3332 or meredith.hayes@gza.com.

Very truly yours,
GZA GEOENVIRONMENTAL OF NEW YORK, INC.

Meredith Hayes
Senior Project Manager

Ernest Hanna, P.E.
Consultant/Reviewer

David Winslow, P.G., Ph.D.
Senior Vice President



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LEGEND:

- BUILDING 338 FOOTPRINT
- APPROXIMATE AREA OF RAISED SLAB
- ■ SUB-SLAB SAMPLE LOCATION
- ▲ INDOOR AIR SAMPLE LOCATION
- ✱ AMBIENT AIR SAMPLE LOCATION

0 200' 400' 800'

SCALE IN FEET

NO.	ISSUE/DESCRIPTION	BY	DATE

SOIL VAPOR INTRUSION ASSESSMENT REPORT - BUILDING 338

SAMPLE LOCATION MAP

PREPARED BY:	PREPARED FOR:		
GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com	I.PARK84, LLC. GREENWICH, CT		
PROJ MGR: BP	REVIEWED BY: BR	CHECKED BY: BP	FIGURE 1
DESIGNED BY: BR	DRAWN BY: MT	SCALE: 1" = 400'	
DATE: JULY, 2019	PROJECT NO. 12.0076252.10	REVISION NO.	SHEET NO.

TABLE 1
ANALYTICAL RESULTS
Building 338 Sub-slab Vapor Investigation
2070 Route 52
Hopewell Junction, New York 12533

SAMPLE ID:	Soil Vapor/Indoor Air Matrix in the State of New York	NYSDOH AGV[1]	Fuel Oil 2003 Upper Indoor[2]	BASE Data 90th[3]	2005 95th Percentile Indoor[4]	SS-04			IA-04			SS-03			IA-03			SS-02			IA-02			SS-01		
LAB ID:						L1926771-01			L1926771-08			L1926771-03			L1926771-07			L1926771-02			L1926771-06			L1926771-04		
COLLECTION DATE:						6/18/2019			6/18/2019			6/18/2019			6/18/2019			6/18/2019			6/18/2019			6/18/2019		
SAMPLE MATRIX:						SOIL_VAPOR			AIR			SOIL_VAPOR			AIR			SOIL_VAPOR			AIR			SOIL_VAPOR		
						Conc	Q	RL	Conc	Q	RL	Conc	Q	RL	Conc	Q	RL	Conc	Q	RL	Conc	Q	RL	Conc	Q	RL
VOLATILE ORGANICS IN AIR																										
Dichlorodifluoromethane			10	16.5		9.25		1.98	5.04		0.989	6.13		0.989	4.92		0.989	4190		0.989	5.09		0.989	72.7		0.989
Chloromethane			4.2	3.7		1.66		0.826	1.51		0.413	2.46		0.413	1.42		0.413	ND		0.413	1.48		0.413	6.03		0.413
Freon-114			0.4			ND		2.8	ND		1.4	ND		1.4	ND		1.4	ND		1.4	ND		1.4	ND		1.4
Vinyl chloride			0.4	1.9		ND		1.02	-	-	-	ND		0.511	-	-	-	ND		0.511	-	-	-	ND		0.511
1,3-Butadiene				3		51.3		0.885	ND		0.442	ND		0.442	ND		0.442	ND		0.442	ND		0.442	4.76		0.442
Bromomethane			0.5	1.7		ND		1.55	ND		0.777	ND		0.777	ND		0.777	ND		0.777	ND		0.777	ND		0.777
Chloroethane			0.4	1.1		ND		1.06	ND		0.528	ND		0.528	ND		0.528	ND		0.528	ND		0.528	0.752		0.528
Ethanol			1300	210		31.1		18.8	ND		9.42	38.3		9.42	ND		9.42	23.9		9.42	12		9.42	11.1		9.42
Vinyl bromide						ND		1.75	ND		0.874	ND		0.874	ND		0.874	ND		0.874	ND		0.874	ND		0.874
Acetone			115	98.9	45.8	71.5		4.75	9.38		2.38	116		2.38	11.6		2.38	30.6		2.38	15.5		2.38	43.2		2.38
Trichlorofluoromethane			12	18.1		10.2		2.25	11.7		1.12	10.5		1.12	10.5		1.12	9.44		1.12	**12**		**1.12**	10.5		1.12
Isopropanol				250		ND		2.46	1.57		1.23	2.75		1.23	1.42		1.23	2.17		1.23	2.15		1.23	1.99		1.23
1,1-Dichloroethene			0.4	1.4		ND		1.59	-	-	-	ND		0.793	-	-	-	ND		0.793	-	-	-	ND		0.793
Tertiary butyl Alcohol						5.18		3.03	ND		1.52	6.03		1.52	ND		1.52	2.6		1.52	ND		1.52	5.12		1.52
Methylene chloride		60	16	10	7.5	ND		3.47	ND		1.74	ND		1.74	ND		1.74	ND		1.74	ND		1.74	ND		1.74
3-Chloropropene						ND		1.25	ND		0.626	ND		0.626	ND		0.626	ND		0.626	ND		0.626	ND		0.626
Carbon disulfide				4.2		8.19		1.25	ND		0.623	9.93		0.623	ND		0.623	4.11		0.623	ND		0.623	22.8		0.623
Freon-113				3.5		ND		3.07	ND		1.53	ND		1.53	ND		1.53	ND		1.53	ND		1.53	3.34		1.53
trans-1,2-Dichloroethene						ND		1.59	2.85		0.793	1.53		0.793	2.7		0.793	1.97		0.793	2.67		0.793	1.09		0.793
1,1-Dichloroethane			0.4	0.7		ND		1.62	ND		0.809	ND		0.809	ND		0.809	ND		0.809	ND		0.809	ND		0.809
Methyl tert butyl ether			14	11.5	36	ND		1.44	ND		0.721	ND		0.721	ND		0.721	ND		0.721	ND		0.721	ND		0.721
2-Butanone				12		14.4		2.95	ND		1.47	21.6		1.47	ND		1.47	6.08		1.47	1.72		1.47	96.1		1.47
cis-1,2-Dichloroethene			0.4	1.9		ND		1.59	-	-	-	ND		0.793	-	-	-	ND		0.793	-	-	-	ND		0.793
Ethyl Acetate				5.4		ND		3.6	ND		1.8	ND		1.8	ND		1.8	ND		1.8	ND		1.8	ND		1.8
Chloroform			1.2	1.1	6.34	6.06		1.95	ND		0.977	36.9		0.977	ND		0.977	17.9		0.977	ND		0.977	130		0.977
Tetrahydrofuran			0.8			19.5		2.95	**1.7**		**1.47**	19.1		1.47	ND		1.47	7.37		1.47	ND		1.47	128		1.47
1,2-Dichloroethane			0.4	0.9		ND		1.62	ND		0.809	ND		0.809	ND		0.809	ND		0.809	ND		0.809	ND		0.809
n-Hexane			14	10.2		ND		1.41	ND		0.705	2.21		0.705	ND		0.705	1.07		0.705	ND		0.705	4.86		0.705
1,1,1-Trichloroethane	100		2.5	20.6		ND		2.18	-	-	-	ND		1.09	-	-	-	ND		1.09	-	-	-	ND		1.09
Benzene			13	9.4	10	1.66		1.28	ND		0.639	1.5		0.639	ND		0.639	0.834		0.639	ND		0.639	2.39		0.639
Carbon tetrachloride	5		1.3	1.3	1.1	ND		2.52	-	-	-	ND		1.26	-	-	-	ND		1.26	-	-	-	ND		1.26
Cyclohexane			6.3			ND		1.38	ND		0.688	1.03		0.688	ND		0.688	ND		0.688	ND		0.688	1.42		0.688
1,2-Dichloropropane			0.4	1.6		ND		1.85	ND		0.924	ND		0.924	ND		0.924	ND		0.924	ND		0.924	ND		0.924
Bromodichloromethane						ND		2.68	ND		1.34	1.63		1.34	ND		1.34	2.72		1.34	ND		1.34	6.24		1.34
1,4-Dioxane						ND		1.44	ND		0.721	ND		0.721	ND		0.721	ND		0.721	ND		0.721	ND		0.721
Trichloroethene	5	2	0.5	4.2	1.36	2.26		2.15	-	-	-	ND		1.07	-	-	-	ND		1.07	-	-	-	ND		1.07
2,2,4-Trimethylpentane			5			ND		1.87	ND		0.934	ND		0.934	ND		0.934	ND		0.934	ND		0.934	2.96		0.934
Heptane						ND		1.64	ND		0.82	2.16		0.82	ND		0.82	ND		0.82	ND		0.82	4.34		0.82
cis-1,3-Dichloropropene			0.4	2.3		ND		1.82	ND		0.908	ND		0.908	ND		0.908	ND		0.908	ND		0.908	ND		0.908
4-Methyl-2-pentanone			1.9	6		ND		4.1	ND		2.05	ND		2.05	ND		2.05	2.72		2.05	ND		2.05	3.28		2.05
trans-1,3-Dichloropropene				1.3		ND		1.82	ND		0.908	ND		0.908	ND		0.908	ND		0.908	ND		0.908	ND		0.908
1,1,2-Trichloroethane			0.4	1.5		ND		2.18	ND		1.09	ND		1.09	ND		1.09	ND		1.09	ND		1.09	ND		1.09
Toluene			57	43	39.8	5.09		1.51	1.77		0.754	5.13		0.754	1.04		0.754	4.33		0.754	1.39		0.754	6.1		0.754
2-Hexanone						ND		1.64	ND		0.82	ND		0.82	ND		0.82	1.27		0.82	ND		0.82	ND		0.82
Dibromochloromethane						ND		3.41	ND		1.7	ND		1.7	ND		1.7	ND		1.7	ND		1.7	1.94		1.7
1,2-Dibromoethane			0.4	1.5		ND		3.07	ND		1.54	ND		1.54	ND		1.54	ND		1.54	ND		1.54	ND		1.54
Tetrachloroethene	100	30	2.5	15.9	6.01	**1010**		2.71	-	-	-	**213**		1.36	-	-	-	**204**		1.36	-	-	-	**104**		1.36

TABLE 1
ANALYTICAL RESULTS
Building 338 Sub-slab Vapor Investigation
2070 Route 52
Hopewell Junction, New York 12533

SAMPLE ID:	Soil Vapor/Indoor Air Matrix in the State of New York	NYSDOH AGV[1]	Fuel Oil 2003 Upper Indoor[2]	BASE Data 90th[3]	2005 95th Percentile Indoor[4]	SS-04			IA-04			SS-03			IA-03			SS-02			IA-02			SS-01		
LAB ID:						L1926771-01			L1926771-08			L1926771-03			L1926771-07			L1926771-02			L1926771-06			L1926771-04		
COLLECTION DATE:						6/18/2019			6/18/2019			6/18/2019			6/18/2019			6/18/2019			6/18/2019			6/18/2019		
SAMPLE MATRIX:						SOIL_VAPOR			AIR			SOIL_VAPOR			AIR			SOIL_VAPOR			AIR			SOIL_VAPOR		
						Conc	Q	RL	Conc	Q	RL	Conc	Q	RL	Conc	Q	RL	Conc	Q	RL	Conc	Q	RL	Conc	Q	RL
Chlorobenzene			0.4	0.9		ND		1.84	ND		0.921	ND		0.921	ND		0.921	ND		0.921	ND		0.921	ND		0.921
Ethylbenzene			6.4	5.7	7.62	10.9		1.74	ND		0.869	2.68		0.869	ND		0.869	2.32		0.869	ND		0.869	6.12		0.869
p/m-Xylene			11	22.2	22.2	8.34		3.47	ND		1.74	5.47		1.74	ND		1.74	6.91		1.74	ND		1.74	9.21		1.74
Bromoform						ND		4.14	ND		2.07	ND		2.07	ND		2.07	ND		2.07	ND		2.07	ND		2.07
Styrene			1.4	1.9	5.13	ND		1.7	ND		0.852	ND		0.852	ND		0.852	ND		0.852	ND		0.852	ND		0.852
1,1,2,2-Tetrachloroethane			0.4			ND		2.75	ND		1.37	ND		1.37	ND		1.37	ND		1.37	ND		1.37	ND		1.37
o-Xylene			7.1	7.9	7.24	3.9		1.74	ND		0.869	2.51		0.869	ND		0.869	2.69		0.869	ND		0.869	3.55		0.869
4-Ethyltoluene				3.6		2.6		1.97	ND		0.983	2		0.983	ND		0.983	2.38		0.983	ND		0.983	2.2		0.983
1,3,5-Trimethylbenzene			3.9	3.7		3.17		1.97	ND		0.983	2.69		0.983	ND		0.983	2.76		0.983	ND		0.983	2.66		0.983
1,2,4-Trimethylbenzene			9.8	9.5		17		1.97	ND		0.983	13.4		0.983	ND		0.983	16.5		0.983	ND		0.983	13.9		0.983
Benzyl chloride				6.8		ND		2.07	ND		1.04	ND		1.04	ND		1.04	ND		1.04	ND		1.04	ND		1.04
1,3-Dichlorobenzene			0.5	2.4		ND		2.4	ND		1.2	ND		1.2	ND		1.2	ND		1.2	ND		1.2	ND		1.2
1,4-Dichlorobenzene			1.2	5.5	344	ND		2.4	ND		1.2	ND		1.2	ND		1.2	ND		1.2	ND		1.2	ND		1.2
1,2-Dichlorobenzene			0.5	1.2		ND		2.4	ND		1.2	ND		1.2	ND		1.2	ND		1.2	ND		1.2	ND		1.2
1,2,4-Trichlorobenzene			0.5	6.8		ND		2.97	ND		1.48	ND		1.48	ND		1.48	ND		1.48	ND		1.48	ND		1.48
Hexachlorobutadiene			0.5	6.8		ND		4.27	ND		2.13	ND		2.13	ND		2.13	ND		2.13	ND		2.13	ND		2.13
VOLATILE ORGANICS IN AIR BY SIM																										
Vinyl chloride			0.4	1.9		*		*	ND		0.051	*		*	ND		0.051	*		*	ND		0.051	*		*
1,1-Dichloroethene			0.4	1.4		*		*	ND		0.079	*		*	ND		0.079	*		*	ND		0.079	*		*
cis-1,2-Dichloroethene			0.4	1.9		*		*	ND		0.079	*		*	ND		0.079	*		*	ND		0.079	*		*
1,1,1-Trichloroethane	100		2.5	20.6		*		*	ND		0.109	*		*	ND		0.109	*		*	ND		0.109	*		*
Carbon tetrachloride	5		1.3	1.3	1.1	*		*	0.503		0.126	*		*	0.604		0.126	*		*	0.503		0.126	*		*
Trichloroethene	5	2	0.5	4.2	1.36	*		*	ND		0.107	*		*	ND		0.107	*		*	ND		0.107	*		*
Tetrachloroethene	100	30	2.5	15.9	6.01	*		*	0.305		0.136	*		*	0.332		0.136	*		*	0.278		0.136	*		*

Notes:

1- NYSDOH Soil Vapor/Indoor Air Matrix in the State of New York (soil vapor only)

2- NYSDOH Air Guidance Value (indoor air samples only)

3 - Table C-1 2003 Upper Fence Study of Volatile Organic Chemicals in air of Fuel Oil Heated Homes for Indoor Air (indoor air samples only)

4 - Table C-2 2001 USEPA BASE 90th Percentile for Indoor Air (indoor air sample only)

5 - Table C-5 2005 Health Effects Institute 95th Percentile for Indoor Air (indoor air samples only)

8	This value exceeds Soil Vapor/Indoor Air Matrix for the State of New York
4	This value exceeds NYSDOH AGV
6	This value exceeds one or more of the Indoor Air Background Values
2	This detection limit exceeds the applicable criteria
-	Compound analyzed by SIM, See "Volatile Organics in Air by SIM" Compound List
*	Compound not analyzed by SIM, See "Volatile Organics in Air" Compound List
Q -	Laboratory data qualifier
ND -	The compound was not detected above the method detection limit
J -	Data indicates the presence of a compound that meets the identification criteria.
	The result is less than the quantitation limit but greater than MDL. The concentration given is an approximate value.

TABLE 1
ANALYTICAL RESULTS
Building 338 Sub-slab Vapor Investigation
2070 Route 52
Hopewell Junction, New York 12533

SAMPLE ID:	Soil Vapor/Indoor Air Matrix in the State of New York	NYSDOH AGV[1]	Fuel Oil 2003 Upper Indoor[2]	BASE Data 90th[3]	2005 95th Percentile Indoor[4]	IA-01			AA-01			AA-02			DUP-061819		
LAB ID:						L1926771-05			L1926771-09			L1926771-10			L1926771-11		
COLLECTION DATE:						6/18/2019			6/18/2019			6/18/2019			6/18/2019		
SAMPLE MATRIX:						AIR			AIR			AIR			AIR		
						Conc	Q	RL	Conc	Q	RL	Conc	Q	RL	Conc	Q	RL
VOLATILE ORGANICS IN AIR																	
Dichlorodifluoromethane			10	16.5		3.79		0.989	2.76		0.989	2.71		0.989	3		0.989
Chloromethane			4.2	3.7		2.13		0.413	1.54		0.413	1.85		0.413	1.5		0.413
Freon-114			0.4			ND		1.4	ND		1.4	ND		1.4	ND		1.4
Vinyl chloride			0.4	1.9		-	-	-	-	-	-	-	-	-	-	-	-
1,3-Butadiene				3		ND		0.442	ND		0.442	ND		0.442	ND		0.442
Bromomethane			0.5	1.7		ND		0.777	ND		0.777	ND		0.777	ND		0.777
Chloroethane			0.4	1.1		ND		0.528	ND		0.528	ND		0.528	ND		0.528
Ethanol			1300	210		86.9		9.42	ND		9.42	ND		9.42	ND		9.42
Vinyl bromide						ND		0.874	ND		0.874	ND		0.874	ND		0.874
Acetone			115	98.9	45.8	36.8		2.38	8.22		2.38	25.7		2.38	10		2.38
Trichlorofluoromethane			12	18.1		**16.8**		**1.12**	1.43		1.12	1.45		1.12	1.54		1.12
Isopropanol				250		6.71		1.23	ND		1.23	3.07		1.23	ND		1.23
1,1-Dichloroethene			0.4	1.4		-	-	-	-	-	-	-	-	-	-	-	-
Tertiary butyl Alcohol						ND		1.52	ND		1.52	ND		1.52	ND		1.52
Methylene chloride		60	16	10	7.5	8.62		1.74	ND		1.74	ND		1.74	ND		1.74
3-Chloropropene						ND		0.626	ND		0.626	ND		0.626	ND		0.626
Carbon disulfide				4.2		0.878		0.623	ND		0.623	ND		0.623	ND		0.623
Freon-113				3.5		ND		1.53	ND		1.53	ND		1.53	ND		1.53
trans-1,2-Dichloroethene						1.15		0.793	ND		0.793	ND		0.793	ND		0.793
1,1-Dichloroethane			0.4	0.7		ND		0.809	ND		0.809	ND		0.809	ND		0.809
Methyl tert butyl ether			14	11.5	36	ND		0.721	ND		0.721	ND		0.721	ND		0.721
2-Butanone				12		6.58		1.47	ND		1.47	2.42		1.47	ND		1.47
cis-1,2-Dichloroethene			0.4	1.9		-	-	-	-	-	-	-	-	-	-	-	-
Ethyl Acetate				5.4		ND		1.8	ND		1.8	ND		1.8	ND		1.8
Chloroform			1.2	1.1	6.34	ND		0.977	ND		0.977	ND		0.977	ND		0.977
Tetrahydrofuran			0.8			**79**		**1.47**	2.72		1.47	ND		1.47	ND		1.47
1,2-Dichloroethane			0.4	0.9		ND		0.809	ND		0.809	ND		0.809	ND		0.809
n-Hexane			14	10.2		**20.4**		**0.705**	ND		0.705	ND		0.705	ND		0.705
1,1,1-Trichloroethane	100		2.5	20.6		-	-	-	-	-	-	-	-	-	-	-	-
Benzene			13	9.4	10	2.26		0.639	ND		0.639	ND		0.639	ND		0.639
Carbon tetrachloride	5		1.3	1.3	1.1	-	-	-	-	-	-	-	-	-	-	-	-
Cyclohexane			6.3			1.45		0.688	ND		0.688	ND		0.688	ND		0.688
1,2-Dichloropropane			0.4	1.6		ND		0.924	ND		0.924	ND		0.924	ND		0.924
Bromodichloromethane						ND		1.34	ND		1.34	ND		1.34	ND		1.34
1,4-Dioxane						ND		0.721	ND		0.721	ND		0.721	ND		0.721
Trichloroethene	5	2	0.5	4.2	1.36	-	-	-	-	-	-	-	-	-	-	-	-
2,2,4-Trimethylpentane			5			2.06		0.934	ND		0.934	ND		0.934	ND		0.934
Heptane						2.66		0.82	ND		0.82	ND		0.82	ND		0.82
cis-1,3-Dichloropropene			0.4	2.3		ND		0.908	ND		0.908	ND		0.908	ND		0.908
4-Methyl-2-pentanone			1.9	6		ND		2.05	ND		2.05	ND		2.05	ND		2.05
trans-1,3-Dichloropropene				1.3		ND		0.908	ND		0.908	ND		0.908	ND		0.908
1,1,2-Trichloroethane			0.4	1.5		ND		1.09	ND		1.09	ND		1.09	ND		1.09
Toluene			57	43	39.8	11		0.754	1.54		0.754	1.22		0.754	1.32		0.754
2-Hexanone						ND		0.82	ND		0.82	ND		0.82	ND		0.82
Dibromochloromethane						ND		1.7	ND		1.7	ND		1.7	ND		1.7
1,2-Dibromoethane			0.4	1.5		ND		1.54	ND		1.54	ND		1.54	ND		1.54
Tetrachloroethene	100	30	2.5	15.9	6.01	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 1
ANALYTICAL RESULTS
Building 338 Sub-slab Vapor Investigation
2070 Route 52
Hopewell Junction, New York 12533

SAMPLE ID:	Soil Vapor/Indoor Air Matrix in the State of New York	NYSDOH AGV[1]	Fuel Oil 2003 Upper Indoor[2]	BASE Data 90th[3]	2005 95th Percentile Indoor[4]	IA-01			AA-01			AA-02			DUP-061819		
LAB ID:						L1926771-05			L1926771-09			L1926771-10			L1926771-11		
COLLECTION DATE:						6/18/2019			6/18/2019			6/18/2019			6/18/2019		
SAMPLE MATRIX:						AIR			AIR			AIR			AIR		
						Conc	Q	RL	Conc	Q	RL	Conc	Q	RL	Conc	Q	RL
Chlorobenzene			0.4	0.9		ND		0.921	ND		0.921	ND		0.921	ND		0.921
Ethylbenzene			6.4	5.7	7.62	1.08		0.869	ND		0.869	ND		0.869	ND		0.869
p/m-Xylene			11	22.2	22.2	3.58		1.74	ND		1.74	ND		1.74	ND		1.74
Bromoform						ND		2.07	ND		2.07	ND		2.07	ND		2.07
Styrene			1.4	1.9	5.13	ND		0.852	ND		0.852	ND		0.852	ND		0.852
1,1,2,2-Tetrachloroethane			0.4			ND		1.37	ND		1.37	ND		1.37	ND		1.37
o-Xylene			7.1	7.9	7.24	1.39		0.869	ND		0.869	ND		0.869	ND		0.869
4-Ethyltoluene				3.6		ND		0.983	ND		0.983	ND		0.983	ND		0.983
1,3,5-Trimethylbenzene			3.9	3.7		ND		0.983	ND		0.983	ND		0.983	ND		0.983
1,2,4-Trimethylbenzene			9.8	9.5		1.82		0.983	ND		0.983	ND		0.983	ND		0.983
Benzyl chloride				6.8		ND		1.04	ND		1.04	ND		1.04	ND		1.04
1,3-Dichlorobenzene			0.5	2.4		ND		1.2	ND		1.2	ND		1.2	ND		1.2
1,4-Dichlorobenzene			1.2	5.5	344	ND		1.2	ND		1.2	ND		1.2	ND		1.2
1,2-Dichlorobenzene			0.5	1.2		ND		1.2	ND		1.2	ND		1.2	ND		1.2
1,2,4-Trichlorobenzene			0.5	6.8		ND		1.48	ND		1.48	ND		1.48	ND		1.48
Hexachlorobutadiene			0.5	6.8		ND		2.13	ND		2.13	ND		2.13	ND		2.13
VOLATILE ORGANICS IN AIR BY SIM																	
Vinyl chloride			0.4	1.9		ND		0.051	ND		0.051	ND		0.051	ND		0.051
1,1-Dichloroethene			0.4	1.4		ND		0.079	ND		0.079	ND		0.079	ND		0.079
cis-1,2-Dichloroethene			0.4	1.9		0.19		0.079	ND		0.079	ND		0.079	ND		0.079
1,1,1-Trichloroethane	100		2.5	20.6		ND		0.109	ND		0.109	ND		0.109	ND		0.109
Carbon tetrachloride	5		1.3	1.3	1.1	0.503		0.126	0.484		0.126	0.491		0.126	0.51		0.126
Trichloroethene	5	2	0.5	4.2	1.36	0.279		0.107	ND		0.107	ND		0.107	ND		0.107
Tetrachloroethene	100	30	2.5	15.9	6.01	0.305		0.136	0.278		0.136	0.298		0.136	0.305		0.136

Notes:

1- NYSDOH Soil Vapor/Indoor Air Matrix in the State of New York (soil vapor only)

2- NYSDOH Air Guidance Value (indoor air samples only)

3 - Table C-1 2003 Upper Fence Study of Volatile Organic Chemicals in air of Fuel Oil Heated Homes for Indoor Air (indoor air samples only)

4 - Table C-2 2001 USEPA BASE 90th Percentile for Indoor Air (indoor air sample only)

5 - Table C-5 2005 Health Effects Institute 95th Percentile for Indoor Air (indoor air samples only)

8	This value exceeds Soil Vapor/Indoor Air Matrix for the State of New York
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2	This detection limit exceeds the applicable criteria
-	Compound analyzed by SIM, See "Volatile Organics in Air by SIM" Compound List
*	Compound not analyzed by SIM, See "Volatile Organics in Air" Compound List
Q -	Laboratory data qualifier
ND -	The compound was not detected above the method detection limit
J -	Data indicates the presence of a compound that meets the identification criteria.
	The result is less than the quantitation limit but greater than MDL. The concentration given is an approximate value.

Appendix B
Indoor air quality questionnaire and building inventory

As discussed in Section 2.11, products in buildings should be inventoried every time indoor air is sampled to provide an accurate assessment of the potential contribution of volatile chemicals. In addition, the type of structure, floor layout and physical conditions of the building being studied should be noted to identify (and minimize) conditions that may interfere with the proposed testing.

Toward this end, a blank copy of the NYSDOH Center for Environmental Health's Indoor Air Quality Questionnaire and Building Inventory is provided in this appendix. Also provided is an example that demonstrates how the form should be completed properly.

NEW YORK STATE DEPARTMENT OF HEALTH
INDOOR AIR QUALITY QUESTIONNAIRE AND BUILDING INVENTORY
CENTER FOR ENVIRONMENTAL HEALTH

This form must be completed for each residence involved in indoor air testing.

Preparer's Name Ben Romagnolo Date/Time Prepared 6/17/19

Preparer's Affiliation GZA GeoEnvironmental Phone No. 973-774-3300

Purpose of Investigation SUI Assessment.

1. OCCUPANT:

Interviewed: Y / (N)

Last Name: _____ First Name: _____

Address: _____

County: _____

Home Phone: _____ Office Phone: _____

Number of Occupants/persons at this location _____ Age of Occupants _____

2. OWNER OR LANDLORD: (Check if same as occupant ___)

Interviewed: Y / (N)

Last Name: _____ First Name: _____

Address: _____

County: _____

Home Phone: _____ Office Phone: _____

3. BUILDING CHARACTERISTICS

Type of Building: (Circle appropriate response)

Residential	School	Commercial/Multi-use
(Industrial)	Church	Other: _____

5. BASEMENT AND CONSTRUCTION CHARACTERISTICS (Circle all that apply)

a. Above grade construction:	wood frame	(concrete)	stone	brick
b. Basement type:	full	crawlspace	slab	other N/A
c. Basement floor:	concrete	dirt	stone	other N/A
d. Basement floor:	uncovered	covered	covered with N/A	
e. Concrete floor:	(unsealed)	sealed	sealed with _____	
f. Foundation walls:	(poured)	block	stone	other _____
g. Foundation walls:	unsealed	sealed	sealed with N/A Unknown	
h. The basement is:	wet	damp	dry	moldy N/A
i. The basement is:	finished	unfinished	partially finished	N/A
j. Sump present?	(Y) / N → on 1st floor			
k. Water in sump?	Y / (N) not applicable			

Basement/Lowest level depth below grade: N/A (feet)

Identify potential soil vapor entry points and approximate size (e.g., cracks, utility ports, drains)

Mulple cracks observed throughout Building, Trench drains, grates

6. HEATING, VENTING and AIR CONDITIONING (Circle all that apply)

Type of heating system(s) used in this building: (circle all that apply – note primary)

Hot air circulation	Heat pump	Hot water baseboard	
Space Heaters	Stream radiation	Radiant floor	
Electric baseboard	Wood stove	Outdoor wood boiler	Other High temp air circulation.

The primary type of fuel used is:

Natural Gas	Fuel Oil	Kerosene
Electric	Propane	Solar
Wood	Coal	

Domestic hot water tank fueled by: _____

Boiler/furnace located in:	Basement	Outdoors	Main Floor	Other_____
Air conditioning:	Central Air	Window units	Open Windows	None

j. Has painting/staining been done in the last 6 months? Y / (N) Where & When? _____

k. Is there new carpet, drapes or other textiles? Y / (N) Where & When? _____

l. Have air fresheners been used recently? Y / (N) When & Type? _____

m. Is there a kitchen exhaust fan? Y / (N) If yes, where vented? _____

n. Is there a bathroom exhaust fan? Y / (N) If yes, where vented? _____

o. Is there a clothes dryer? Y / (N) If yes, is it vented outside? Y / N

p. Has there been a pesticide application? Y / (N) When & Type? _____

Are there odors in the building? Y / (N)
If yes, please describe: _____

Do any of the building occupants use solvents at work? Y / (N)
(e.g., chemical manufacturing or laboratory, auto mechanic or auto body shop, painting, fuel oil delivery, boiler mechanic, pesticide application, cosmetologist

If yes, what types of solvents are used? _____

If yes, are their clothes washed at work? Y / (N)

Do any of the building occupants regularly use or work at a dry-cleaning service? (Circle appropriate response)

Yes, use dry-cleaning regularly (weekly)
Yes, use dry-cleaning infrequently (monthly or less)
Yes, work at a dry-cleaning service
No
(Unknown)

Is there a radon mitigation system for the building/structure? Y / (N) Date of Installation: _____
Is the system active or passive? Active/Passive

9. WATER AND SEWAGE

Water Supply:	Public Water	Drilled Well	Driven Well	Dug Well	Other: _____
Sewage Disposal:	Public Sewer	Septic Tank	Leach Field	Dry Well	Other: _____

10. RELOCATION INFORMATION (for oil spill residential emergency) N/A

a. Provide reasons why relocation is recommended: _____

b. Residents choose to: remain in home relocate to friends/family relocate to hotel/motel

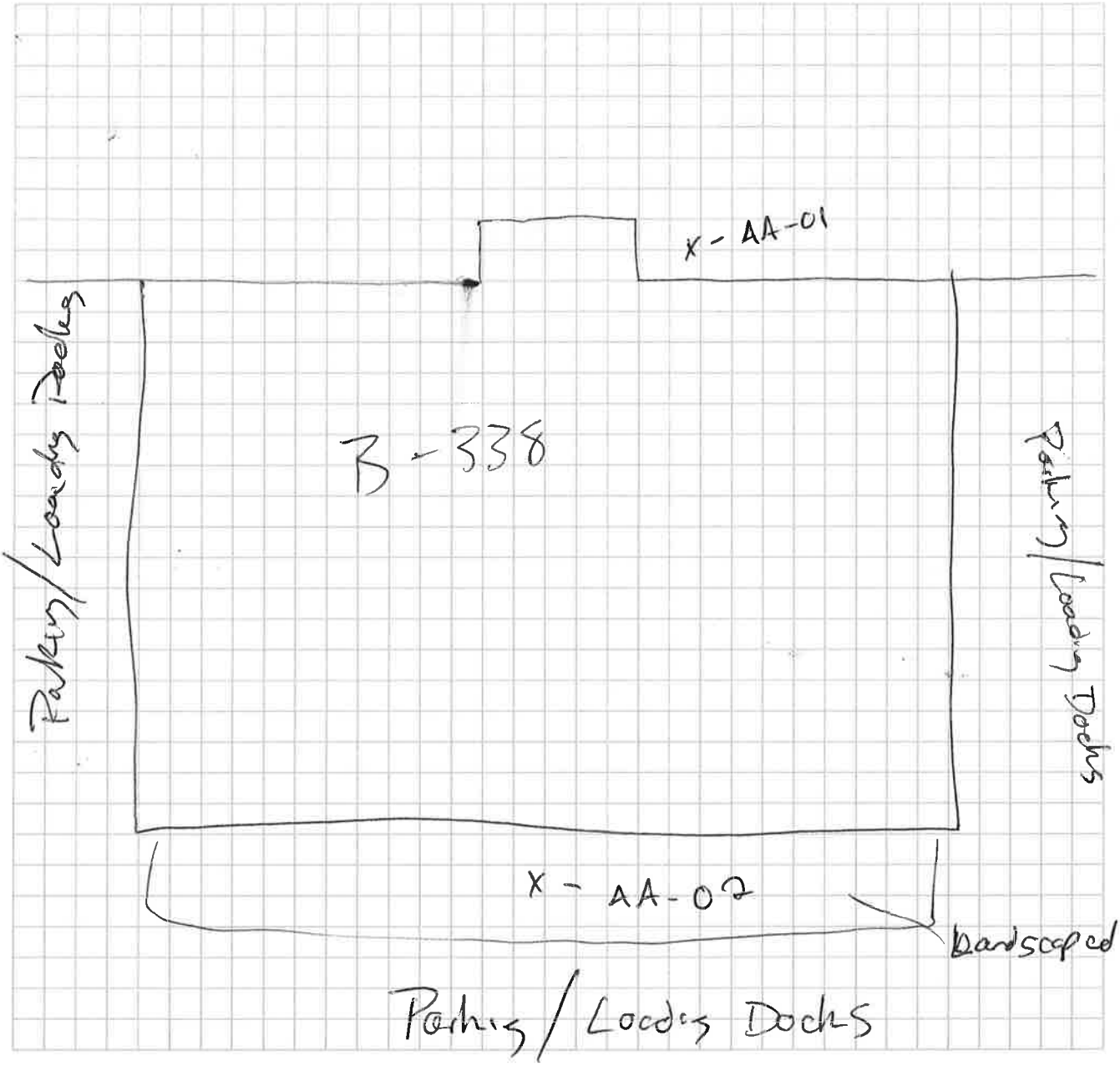
c. Responsibility for costs associated with reimbursement explained? Y / N

d. Relocation package provided and explained to residents? Y / N

12. OUTDOOR PLOT

Draw a sketch of the area surrounding the building being sampled. If applicable, provide information on spill locations, potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s) and PID meter readings.

Also indicate compass direction, wind direction and speed during sampling, the locations of the well and septic system, if applicable, and a qualifying statement to help locate the site on a topographic map.



OSR – 3 Example 1 Correct

NEW YORK STATE DEPARTMENT OF HEALTH
INDOOR AIR QUALITY QUESTIONNAIRE AND BUILDING INVENTORY
CENTER FOR ENVIRONMENTAL HEALTH

This form must be completed for each residence involved in indoor air testing.

Preparer's Name Mary Jones Date/Time Prepared 10/22/04 10:00am

Preparer's Affiliation XYZ Consulting Phone No. 518-555-1212

Purpose of Investigation Thomasville Soil Vapor Intrusion Investigation (Site #32141)

1. OCCUPANT:

Interviewed: (Y)/ N

Last Name: Smith First Name: Carol

Address: 25 Main Street Thomasville, New York 25230

County: Albany

Home Phone: 518-556-2222 Office Phone: 518-556-2400

Number of Occupants/persons at this location 2 Age of Occupants 36, 10

2. OWNER OR LANDLORD: (Check if same as occupant ___)

Interviewed: Y (N)

Last Name: White First Name: Frank

Address: 64 Mountain Road Bainbridge, New York 26390

County: Dutchess

Home Phone: 845-876-1301 Office Phone: 845-227-2430

3. BUILDING CHARACTERISTICS

Type of Building: (Circle appropriate response)

(Residential) School Commercial/Multi-Use
Industrial Church Other: _____

Example Correct 3

5. BASEMENT AND CONSTRUCTION CHARACTERISTICS (Circle all that apply)

a. Above grade construction:	(wood frame)	concrete	stone	brick
b. Basement type:	(full)	crawlspace	slab	other _____
c. Basement floor:	(concrete)	dirt	stone	other _____
d. Basement floor:	(uncovered)	covered	covered with _____	
e. Concrete floor:	(unsealed)	sealed	sealed with _____	
f. Foundation walls:	(poured)	block	stone	other _____
g. Foundation walls:	(unsealed)	sealed	sealed with _____	
h. The basement is:	wet	damp	(dry)	moldy
i. The basement is:	finished	(unfinished)	partially finished	
j. Sump present?	Y (N)			
k. Water in sump?	Y / N / (not applicable)			

Basement/Lowest level depth below grade: 6 (feet)

Identify potential soil vapor entry points and approximate size (e.g., cracks, utility ports, drains)

Floor drain in laundry area

6. HEATING, VENTING and AIR CONDITIONING (Circle all that apply)

Type of heating system(s) used in this building: (circle all that apply – note primary)

(Hot air circulation)	Heat pump	Hot water baseboard	
Space Heaters	Stream radiation	Radiant floor	
Electric baseboard	Wood stove	Outdoor wood boiler	Other _____

The primary type of fuel used is:

Natural Gas	(Fuel Oil)	Kerosene
Electric	Propane	Solar
Wood	Coal	

Domestic hot water tank fueled by: gas

Boiler/furnace located in:	(Basement)	Outdoors	Main Floor	Other _____
Air Conditioning:	Central Air	(Window units)	Open Windows	None

Example Correct

j. Has painting/staining been done in the last 6 months? Y / (N) Where & When? _____

k. Is there new carpet, drapes or other textiles? (Y) / N Where & When? carpet in dining room

l. Have air fresheners been used recently? Y / (N) When & Type? _____

m. Is there a kitchen exhaust fan? (Y) / N If yes, where vented? outside

n. Is there a bathroom exhaust fan? Y / (N) If yes, where vented? _____

o. Is there a clothes dryer? (Y) / N If yes, is it vented outside? (Y) N

p. Has there been a pesticide application? Y / (N) When & Type? _____

Are there odors in the building? Y / (N)
If yes, please describe: _____

Do any of the building occupants use solvents at work? (Y) / N
(e.g., chemical manufacturing or laboratory, automechanic or autobody shop, painting, fuel oil delivery, boiler mechanic, pesticide application, cosmetologist etc.)

If yes, what types of solvents are used? hair salon dyes, alcohols, peroxides, acetone

If yes, are their clothes washed at work? Y / (N)

Do any of the building occupants regularly use or work at a dry-cleaning service? (Circle appropriate response)

Yes, use dry-cleaning regularly (weekly) — No
(Yes, use dry-cleaning infrequently (monthly or less)) — Unknown
Yes, work at a dry-cleaning service

Is there a radon mitigation system for the building/structure? (Y) / N Date of Installation: June 2000
Is the system active or passive? (Active)/Passive

9. WATER AND SEWAGE

Water Supply:	Public Water	(Drilled Well)	Driven Well	Dug Well	Other: _____
Sewage Disposal:	Public Sewer	(Septic Tank)	Leach Field	Dry Well	Other: _____

10. RELOCATION INFORMATION (for oil spill residential emergency)

a. Provide reasons why relocation is recommended: not applicable

b. Residents choose to: remain in home relocate to friends/family relocate to hotel/motel

c. Responsibility for costs associated with reimbursement explained? Y / N

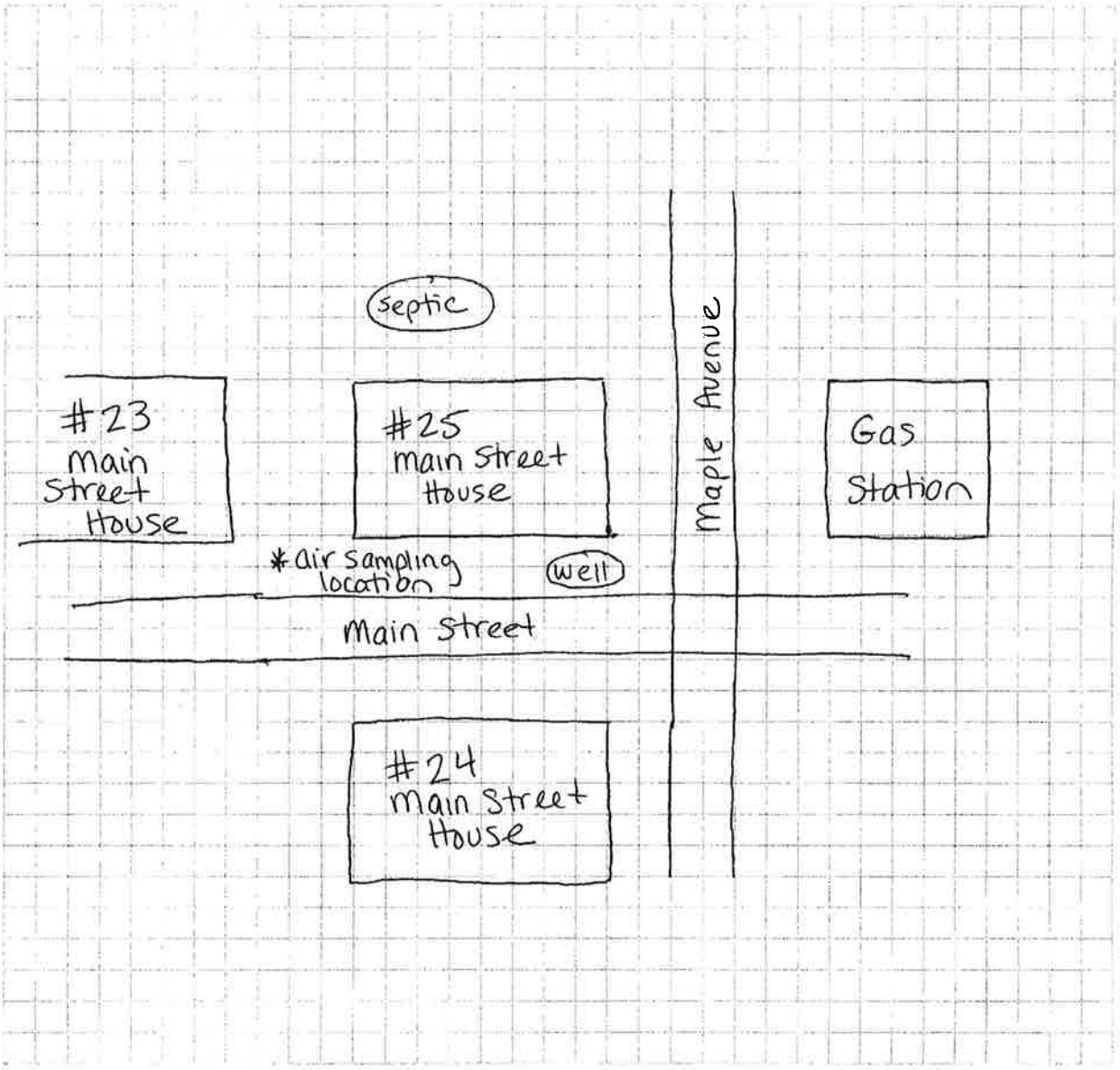
d. Relocation package provided and explained to residents? Y / N

Example Correct 7

12. OUTDOOR PLOT

Draw a sketch of the area surrounding the building being sampled. If applicable, provide information on spill locations, potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s) and PID meter readings.

Also indicate compass direction, wind direction and speed during sampling, the locations of the well and septic system, if applicable, and a qualifying statement to help locate the site on a topographic map.

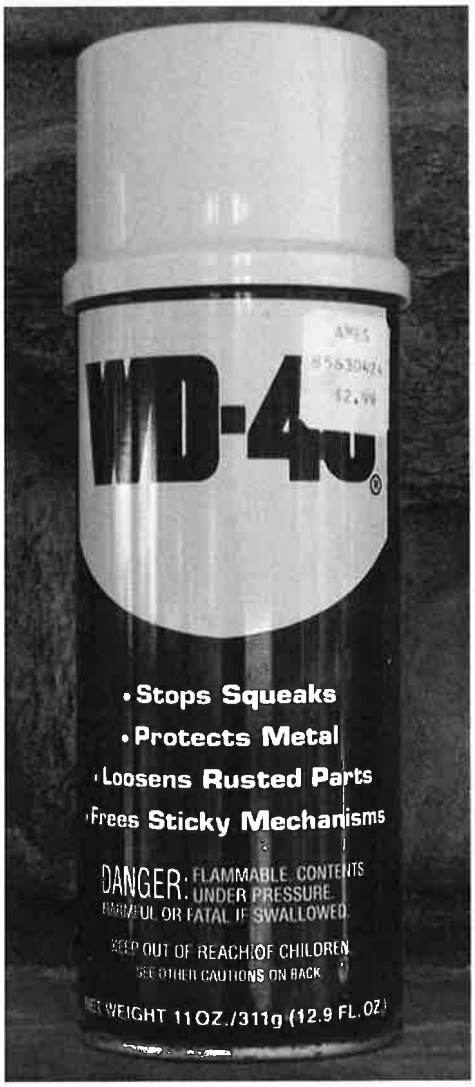


↑ N

Wind direction = NE

Product Inventory Attachment — 25 Main Street, City

WD-40 FRONT



WD-40 INGREDIENTS