Pelham Plaza
Site No. V00110-3
Pelham Manor, New York

SOIL VAPOR AND AIR SAMPLING REPORT

PELHAM PLAZA SHOPPING CENTER

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1.0 EXECUTIVE SUMMARY

On behalf of Levin Management Corporation (Levin), Malcolm Pirnie, Inc. (Malcolm Pirnie) conducted indoor air, outdoor air, and soil vapor sampling at Pelham Plaza, formerly the site of a Consolidated Edison (Con Ed) manufactured gas plant (MGP). This sampling was performed to evaluate if volatile organic compounds (VOCs) associated with the former MGP operations (and discovered in soil and groundwater beneath the site) are affecting indoor air quality in buildings that comprise the retail shopping mall at the site (with the exception of the former Kmart and the A.J. Wright store). Previously, indoor air and soil vapor sampling was completed in the former Kmart and A.J. Wright buildings and results were reported separately.

Soil vapor, outdoor air, and indoor air samples were collected on March 17, 2005. These samples were collected beneath and inside 12 stores, seven of which are currently leased by GNC, Marathon's Gold City, Dress Barn Women, Hallmark, Dress Barn, Nuts About Candy, and Modell's Sporting Goods. Five additional stores are currently vacant and were formerly used as a shoe store (Fabco Shoes), an eye care center (Vision World), a pawn shop, a dentist office, and a nail salon. Heating, ventilation and air conditioning (HVAC) systems in all buildings, including the vacant stores, were operated at least three days prior to and during the sampling. In all stores, heating systems were in operation as normal for outdoor temperatures that ranged from low 30 degrees Fahrenheit (^{o}F) to mid-40s ^{o}F throughout the day.

As summarized herein, VOCs were present at variable concentrations in the soil vapor beneath these stores. In general, soil vapor samples that contained the highest VOC concentrations were collected beneath three stores (GNC, Marathon's Gold City and former Fabco Shoes) in the southern portion of the mall and one store (Modell's) in the northern portion of the mall. Concentrations of acetone, carbon disulfide and benzene, toluene, ethylbenzene, and xylene (BTEX) compounds were one to two orders of magnitude higher in these samples than in the remaining eight soil vapor samples. In addition, the VOCs indane, indene and thiophene, which were specifically added to the analyte list to more broadly assess potential effects from former MGP operations, were present only in soil vapor samples from beneath these four stores. VOCs present at relatively high (one order of magnitude) concentrations in other soil vapor

samples included 2-butanone (methyl ethyl ketone-MEK) beneath the former pawn shop and ethanol beneath Dress Barn Women and Nuts About Candy.

In the majority of stores where VOCs were present at relatively high concentrations in the soil vapor, these VOCs were either not present in the corresponding indoor air samples or were detected in indoor air at concentrations similar to ambient, background results. These include carbon disulfide, which was absent in 11 of the 12 indoor air samples, and benzene, ethyl benzene, and xylenes, which were present in indoor air at concentrations similar to ambient air. In the one indoor air sample (from the former pawn shop) that contained carbon disulfide, the indoor air concentration was more than two times greater than the corresponding soil vapor sample. Based on these results, soil vapor intrusion pathways for these VOCs are not apparent in any of the 12 stores.

Other VOCs that were present in the majority of corresponding indoor air and soil vapor samples (sample pairs) included 2-propanol, ethanol, toluene and acetone. In all sample pairs, ethanol concentrations were greater in indoor air than in soil vapor samples. Indoor air concentrations of 2-propanol were greater than soil vapor results in all but two stores (former pawn shop and Nuts About Candy). These results coupled with the product inventory, which documented the use and storage of alcohol-based cleaners in most stores, indicate that these VOCs are likely from indoor, confounding sources. Similarly, toluene concentrations were higher in indoor air than in corresponding soil vapor samples in six of the 12 stores. In soil vapor samples that contained relatively high toluene concentrations, corresponding indoor air results were generally similar to or slightly greater than toluene concentrations in ambient air. Based on these results, conclusive soil vapor intrusion pathways based on 2-propanol, ethanol and toluene concentrations cannot be determined without confirmation sampling.

Acetone was the only VOC that was present in all soil vapor samples at concentrations greater than indoor air, and for which indoor air concentrations were consistently greater than ambient air results. Acetone is not typically associated with former MGP operations at the site, but is a common solvent found in many building materials and consumer products (California Department of Health Services, 1999). As a result, it is often detected in indoor air in occupational and residential settings. The results of the product inventory for the site indicates that products used for cleaning and as air fresheners contain acetone and ethanol, and may be

contributing sources of elevated concentrations of acetone in indoor air. Another contributing source of acetone in indoor air is from ambient, outdoor sources. The average acetone concentration in the background samples at the site was approximately 7 $\mu g/m^3$ and the range of acetone results in the indoor air samples was 7 to 40 $\mu g/m^3$. The New York State Department of Environmental Conservation (NYSDEC) regards acetone as a low toxicity chemical. As shown in the following table, the acetone, toluene, and ethanol concentrations present in the indoor air samples are considerably less than NYSDEC criteria for ambient air (NYSDEC, 2003) and workplace standards and criteria (OSHA/ACGIH), and within the range of background concentrations in office buildings across the United States (Hadwen, et al. 1997).

	Units	**Acetone**	**Ethanol**	**Toluene**
Maximum Indoor Air Concentration	$\mu g/m^3$	40	130	100
NYSDEC Toxicity Rating	---	Low	Low	Low
NYSDEC SGC	$\mu g/m^3$	180,000	NA	37,000
NYSDEC AGC	$\mu g/m^3$	28,000	45,000	400
OSHA PEL-TWA	$\mu g/m^3$	2,400,000	1,900,000	750,000
ACGIH TLV-TWA	$\mu g/m^3$	1,188,000	1,880,000	188,000
Office Background Concentration	$\mu g/m^3$	12 – 240	1.5 – 300	3.8 - 390
Office Background Frequency of Detection	---	81 – 100%	81 – 100%	81-100%

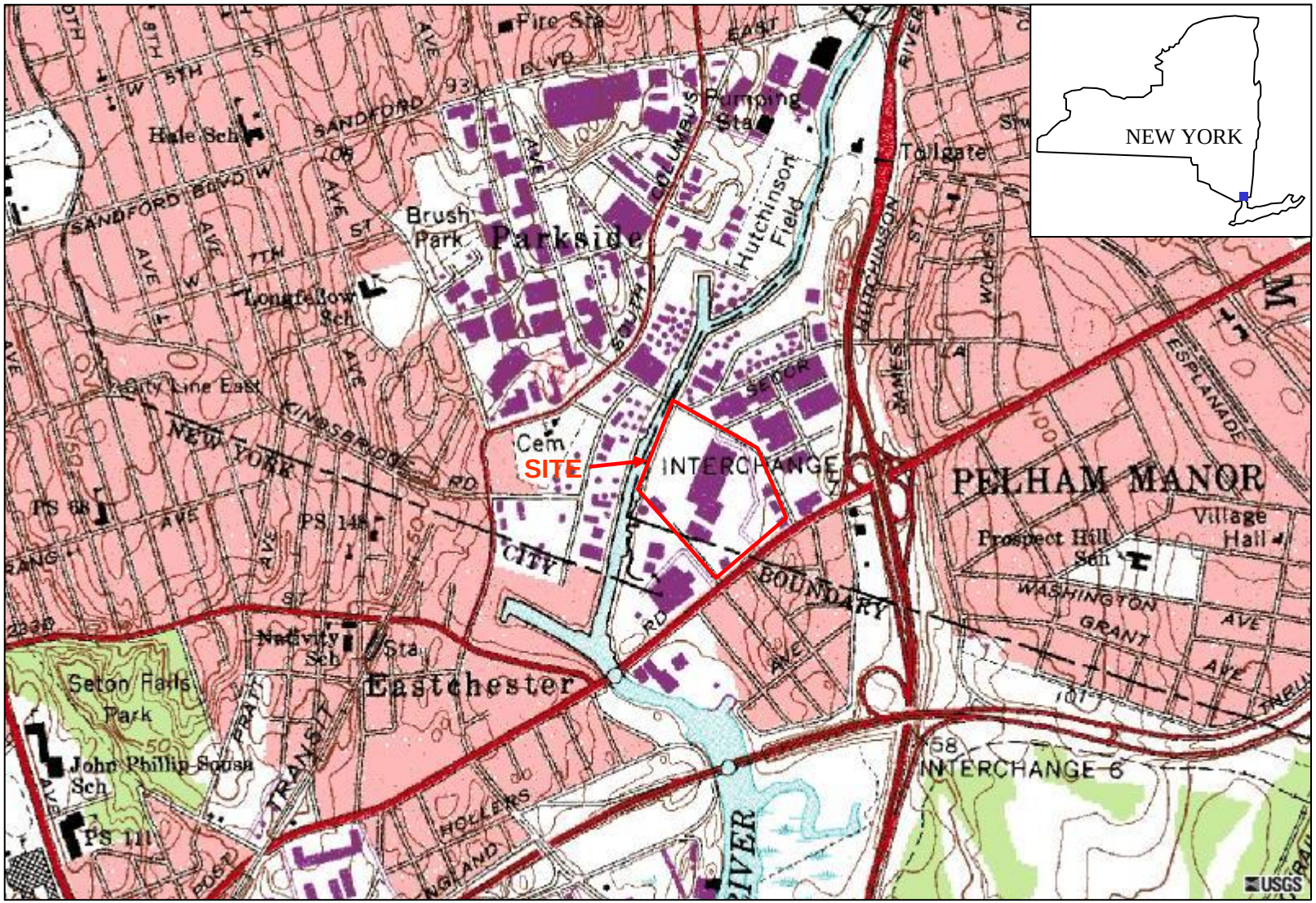
SGC = Short-Term Guidance Concentrations
AGC = Annual Guidance Concentrations
NA = not available

Based on this evaluation of the March 2005 sampling and product inventory results, no conclusive soil vapor intrusion pathways were determined. An additional round of indoor air sampling in the next heating season is recommended to confirm these results. After this confirmation sampling is completed, the data will be assessed to determine the appropriate course of action (either continued monitoring of indoor air or sub-slab mitigation) for VOCs present in the soil vapor beneath GNC, Marathon's Gold City, former Fabco Shoes, and Modell's. Soil vapor samples beneath these stores contained BTEX, indene, indane, and other VOCs that may be associated with former MGP operations at the site.

2.0 INTRODUCTION AND OBJECTIVE

Pelham Plaza, which is currently owned and managed by Levin, was once the site of a Consolidated Edison (Con Ed) manufactured gas plant. The site is located in Pelham Manor, New York (Figure 1). Under the current redevelopment plan, all buildings at the site will remain, including the 13 buildings that comprise the retail shopping mall and the four buildings currently leased by A.J. Wright, Mandee's, Off-Track Betting (OTB) and Citibank (Figure 2). The analytical results of air and soil vapor samples collected from these latter four buildings in 2004 were presented in previous reports. This report summarizes the analytical results of air and soil vapor samples collected in March 2005 from all buildings in the retail shopping mall, with the exception of the former K-Mart building and A.J. Wright building.

Air and soil vapor (or soil gas) sampling was conducted in cooperation with NYSDEC and the New York State Department of Health (NYSDOH) on Thursday, March 17, 2005 to evaluate potential indoor air quality impacts from MGP-related VOCs present in soil and groundwater at the Pelham Plaza site. Soil vapor and air samples were collected in 12 stores in the retail shopping mall at the site to evaluate potential intrusion pathways of chlorinated and other VOCs from the soil vapor into indoor air in these buildings. In addition to the air and soil vapor sampling, chemicals and cleaning supplies stored and used in each of these stores were inventoried.



APPROXIMATE SCALE IN MILES

0 0.12 0.25 0.5

MALCOLM PIRNIE

PELHAM PLAZA SITE
PELHAM MANOR, NEW YORK

SITE LOCATION

FIGURE 1

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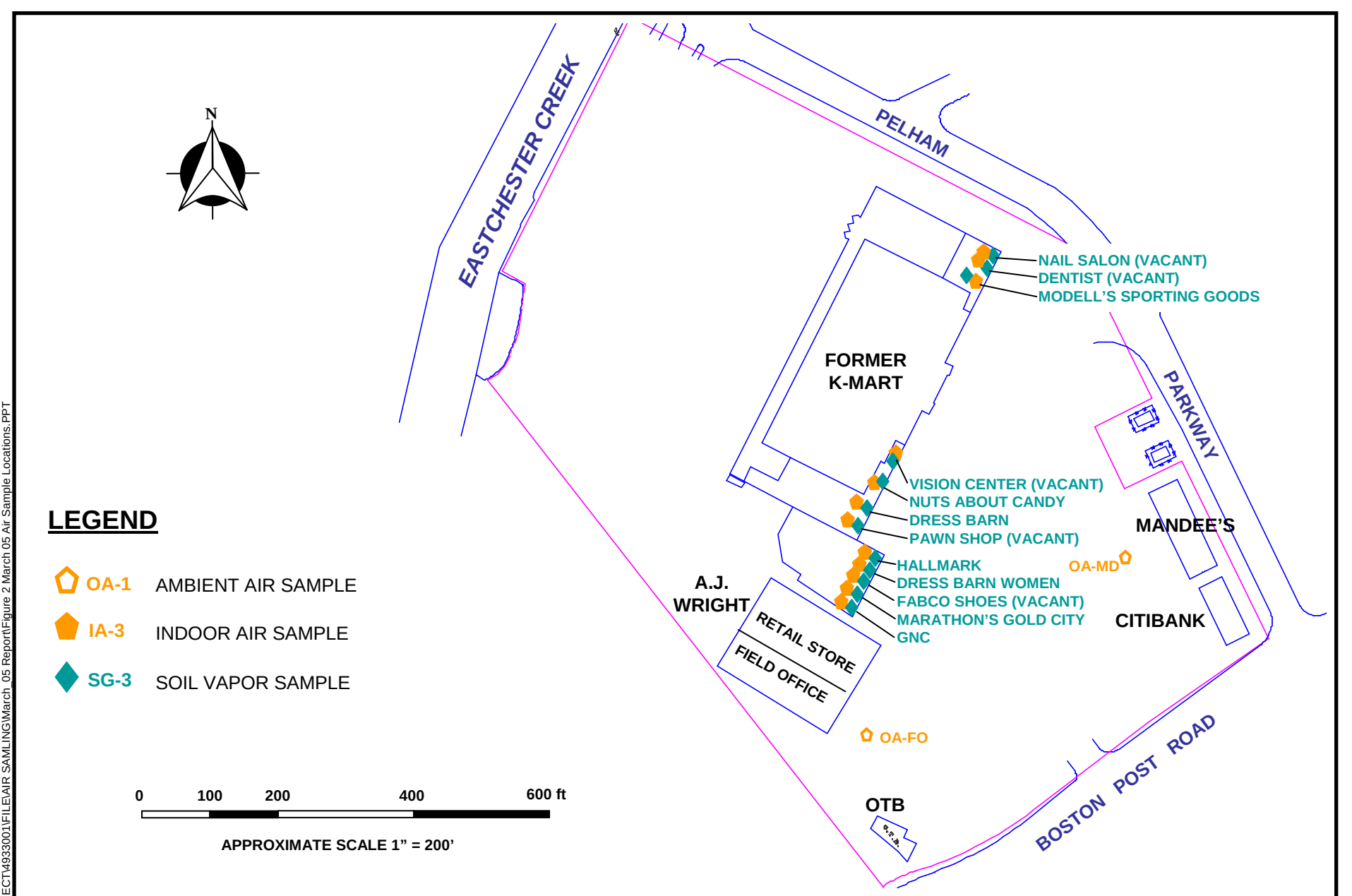


LOCATION: F:\PROJECT\4933001\FILE\AIR SAMLING\March_05 Report\Figure 2 March 05 Air Sample Locations.PPT

MALCOLM PIRNIE

PELHAM PLAZA SITE
PELHAM MANOR, NEW YORK

AIR AND SOIL VAPOR SAMPLE LOCATIONS

FIGURE 2

3.0 INDOOR AND OUTDOOR AIR SAMPLING

As approved by the NYSDEC and NYSDOH, indoor and ambient (outdoor) air samples were collected over a two-hour period during business hours. Ambient air samples were collected concurrently with indoor air samples using similar sampling methods. Analytical results of the ambient air samples were used to assess background air quality at the site. A more detailed description of how these data were used to evaluate indoor air quality is provided in Section 5.0.

3.1 SAMPLE LOCATIONS

Figure 2 shows the locations of the 12 indoor, 12 soil vapor, and two ambient air samples collected on March 17, 2005. In general, indoor air samples were collected in the middle of the open space of each building. One ambient\outdoor air sample (OA-FO) was collected outside of the field office building and the other ambient air sample (OA-MD) was collected outside of the Mandee's building. HVAC systems in all buildings, including the vacant stores, were operated during the sampling. In all stores, heating systems were operated normally for outdoor temperatures that ranged from low 30s ºF to mid-40s ºF throughout the day.

One indoor air sample was collected in each of 12 stores, five of which are currently vacant. These buildings are currently leased by GNC, Marathon's Gold City, Dress Barn Women, Hallmark, Dress Barn, Nuts About Candy, and Modell's. Five additional stores are currently vacant and were formerly leased by Fabco Shoes, a pawn shop, Vision World, a dentist office, and a nail salon.

Indoor air samples were labeled with an "IA" prefix and soil vapor (or soil gas) samples were labeled with an "SG." The following is a summary of the sample identifiers used for the March 2005 samples, from north to south:

SAL - NAIL SALON (VACANT)

DEN - DENTIST (VACANT)

MOD - MODELL'S SPORTING GOODS

VIS - VISION CENTER (VACANT)

NAC - NUTS ABOUT CANDY

DB - DRESS BARN

PS - PAWN SHOP (VACANT)

HAL - HALLMARK

DBW - DRESS BARN WOMEN

FS - FABCO SHOES (VACANT)

MGC - MARATHON'S GOLD CITY

GNC - GNC

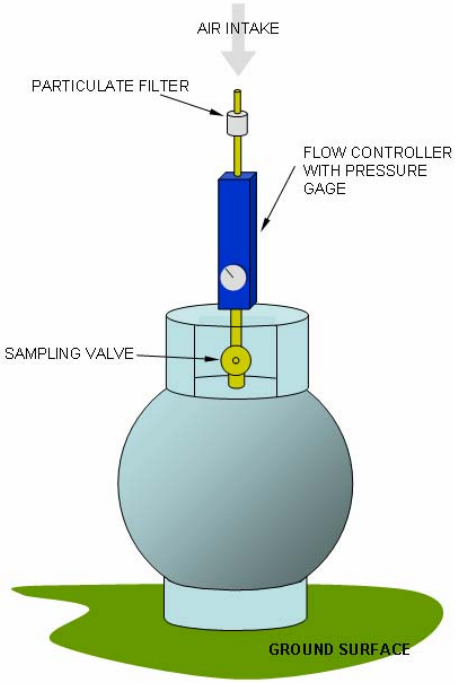
OA-MD - Ambient air sample outside of Mandee's

OA-FO - Ambient air sample outside of Field Office

3.2 SAMPLE COLLECTION

Indoor and ambient air samples were collected in accordance with the procedures described in the NYSDEC-approved Soil Gas and Indoor Air Sampling Plan (AKRF, January 2004) with subsequent revisions (Malcolm Pirnie letter to NYSDEC and NYSDOH dated March 22, 2004). All indoor air and ambient samples were collected using a Summa canister sampling train (Figure 3), which consists of a Summa canister, flow controller, particulate filter, pressure gage, and fittings. A sampling line was used in the soil vapor sampling train but not in the indoor and outdoor air sampling train. At one sampling location (IA-PS2), the sampling train was modified to allow the collection of a field duplicate sample. All canisters were evacuated and certified as analyte-free by the analytical laboratory (Air Toxics, Inc.) prior to use at the site. Flow regulators supplied by the analytical laboratory were used to allow for continuous sampling over the two-hour period. Each flow regulator was equipped with a filter to prevent particulate matter from entering the canister.

FIGURE 3.
Typical Summa Canister Sampling Train
(Ambient Sampling)



3.3 SAMPLE ANALYSIS

Air Toxics, Inc. analyzed soil vapor, indoor air and ambient air samples for the VOCs shown in Table 1 using modified EPA Method TO-15 with a gas chromatograph/mass spectrometer (GC/MS) in full-scan mode. All of these VOCs are included on the standard Air Toxics, Inc. TO-15 list, with the exception of indene, indane, and thiophene, which were added to the analyte list based on site-specific conditions and at the request of the NYSDEC.

Table 1. Modified EPA Method TO-15 GC/MS Full Scan Analyte List.

1,1,1-Trichloroethane	Benzene	Hexane
1,1,2,2-Tetrachloroethane	Bromodichloromethane	Indane
1,1,2-Trichloroethane	Bromoform	Indene
1,1-Dichloroethane	Bromomethane	m,p-Xylene
1,1-Dichloroethene	Carbon Disulfide	Methyl tert-butyl ether
1,2,4-Trichlorobenzene	Carbon Tetrachloride	Methylene Chloride
1,2,4-Trimethylbenzene	Chlorobenzene	Naphthalene
1,2-Dibromoethane (EDB)	Chloroethane	o-Xylene
1,2-Dichlorobenzene	Chloroform	Propylbenzene
1,2-Dichloroethane	Chloromethane	Styrene
1,2-Dichloropropane	cis-1,2-Dichloroethene	Tetrachloroethene
1,3,5-Trimethylbenzene	cis-1,3-Dichloropropene	Tetrahydrofuran
1,3-Butadiene	Cumene	Thiophene
1,3-Dichlorobenzene	Cyclohexane	Toluene
1,4-Dichlorobenzene	Dibromochloromethane	trans-1,2-Dichloroethene
1,4-Dioxane	Ethanol	trans-1,3-Dichloropropene
2-Butanone (Methyl Ethyl Ketone)	Ethyl Benzene	Trichloroethene
2-Hexanone	Freon 11	Vinyl Acetate
2-Propanol	Freon 113	Vinyl Chloride
4-Ethyltoluene	Freon 114	1,2-Dichloroethane
4-Methyl-2-pentanone	Freon 12	4-Bromofluorobenzene
Acetone	Heptane	Toluene
alpha-Chlorotoluene	Hexachlorobutadiene	

4.0 SOIL VAPOR SAMPLING

In accordance with the NYSDEC-approved sampling plan and subsequent revisions and correspondence, sub-slab soil vapor samples were collected over a one-hour period and concurrently with indoor and ambient air samples.

4.1 SAMPLE LOCATIONS

Figure 2 shows the locations of the 12 sub-slab soil vapor samples collected on March 17, 2005. One sub-slab soil vapor sample was collected in each of the 12 stores in which indoor air samples were collected.

4.2 SOIL VAPOR POINT CONSTRUCTION AND SAMPLE COLLECTION

Soil vapor samples were collected using temporary soil vapor probes installed approximately one foot below the concrete slab of each building. Each probe consisted of a six-inch long screen connected to Teflon lined polyethelyene tubing (sampling line) and sealed with concrete grout to prevent entrainment of indoor air. The sampling line was attached to a Summa canister sampling train, which consisted of a Summa canister, flow controller, particulate filter, and pressure gage. At one sampling location (SG-PS), the sampling train was modified to allow the collection of a field duplicate sample. The Teflon-lined polyethylene tubing was connected to stainless steel T-split tubing, the ends of which were attached to separate particulate filters, flow controllers and Summa canisters. The analytical results of the field duplicate sample are summarized in Section 5.2. After the sample was collected the soil vapor collection probes were removed and the holes were filled with concrete.

4.3 SOIL VAPOR SAMPLE ANALYSIS

Air Toxics, Inc. performed the analysis of soil vapor samples. All soil vapor samples were analyzed for the same VOCs as the indoor and ambient air samples (Table 1) using modified EPA Method TO-15 with a GC/MS in full scan mode.

5.0 RESULTS

Ambient and indoor air sampling results are summarized in Table 2 and soil vapor sampling results are summarized in Table 3. A comparison of the soil vapor and corresponding indoor air analytical results in each store is shown in Table 4. VOCs that were not detected in any of the samples were excluded from the table to facilitate evaluation of the data. The parameter thiophene, added to the TO-15 analyte list, was present in one soil vapor sample and none of the indoor air samples collected during this sampling event. The two other parameters added to the TO-15 analyte list (indane and indene) were present in some soil vapor samples collected during this sampling event and indene was present in one indoor air sample. The laboratory narratives are provided in Appendix A.

5.1 AIR SAMPLING RESULTS

5.1.1 Ambient Air Samples

As shown in Table 2, acetone, ethanol, chloromethane, Freon 11 and 12, and BTEX compounds were present in the two ambient air samples. Concentrations of these VOCs were generally similar in the two ambient air samples, with the exception of the results for ethyl benzene, which was not detected in the sample collected outside of the field office but was present at a relatively low concentration (0.76 $\mu g/m^3$) in the sample collected outside of Mandee's. In general, analytical results for these ambient air samples were similar to the 2004 results of ambient air samples collected at the same locations.

5.1.2 Indoor Air Samples

As shown in Table 2, chlorinated VOCs were not present in the majority of the indoor air samples. The NYSDOH developed draft decision matrices for three chlorinated VOCs: 1,1,1-trichloroethane (1,1,1-TCA), tetrachloroethene (PCE), and trichloroethene (TCE). TCE was not present in any indoor or ambient air samples.

Table 2
Summary of Detected Indoor and Ambient Air Analytical Results
Pelham Plaza Site
Pelham Manor, New York

CAS Number	Compound	IA-GNC GNC µg/m3 3/17/05	IA-MGC Marathon's Gold City µg/m3 3/17/05	IA-MGC Lab Duplicate Marathon's Gold City µg/m3 3/17/05	IA-FS Fabco Shoes µg/m3 3/17/05	IA-DBW Dress Barn Women µg/m3 3/17/05	IA-HAL Halmark µg/m3 3/17/05	IA-PS2 Pawn Shop µg/m3 3/17/05	IA-PS2 Lab Duplicate Pawn Shop µg/m3 3/17/05	IA-X Field Dup. Pawn Shop µg/m3 3/17/05	IA-DB Dress Barn µg/m3 3/17/05	IA-NAC Nuts About Candy µg/m3 3/17/05	IA-NAC Lab Duplicate Nuts About Candy µg/m3 3/17/05	IA-VIS Vision Center µg/m3 3/17/05	IA-MOD Modell's µg/m3 3/17/05	IA-DEN Dentist µg/m3 3/17/05	IA-SAL Salon µg/m3 3/17/05	OA-FO Field Office µg/m3 3/17/05	OA-MD Mandee's µg/m3 3/17/05
71-55-6	1,1,1-Trichloroethane											1.2	1.2						
120-82-1	1,2,4-Trichlorobenzene	UJ			UJ		UJ	UJ	UJ	UJ		UJ	UJ		UJ		UJ		UJ
95-63-6	1,2,4-Trimethylbenzene		1.0	0.9	0.9	0.83	3	1.2	1.2		2.1	1.2	1.4	0.81 J	1		0.8		
106-46-7	1,4-Dichlorobenzene	1.4													1.4				
78-93-3	2-Butanone (Methyl Ethyl Ketone)		3.8	3.2	2.4 J			3.6	3.1		11.0				2.6	4.8	2.6		
67-63-0	2-Propanol	38	83.0	76.0	14.0	550 E	25	3.8	4.1	3.5	4.6	4.2	4.5	3.0	6.4	7.0	8.0		
67-64-1	Acetone	27	40.0	37.0	22.0	13.0	19	8	8.1	6	22.0	18	18	9.2	7	20.0	9.7	8	6.3
71-43-2	Benzene	1.4	1.5	1.5	1.6	1.3	1.7	2.8	2.6	1.7	1.5	2.2	2.4	1.5	1.3	3.8	1.9	1.7	1.9
75-15-0	Carbon Disulfide							20	21										
75-00-3	Chloroethane						2												
67-66-3	Chloroform		0.8	1.0							0.8			1.4		0.8	0.9		
74-87-3	Chloromethane	0.97	1.2	1.0	1.0	0.95	0.98	0.78	0.94	0.82	0.8	1.1	1.1	0.8	1	0.9	1.1	1	0.88
110-82-7	Cyclohexane					8.0	3.2				6.8								
64-17-5	Ethanol	96	130 E	130 E	47.0	120 E	68	25	27	18	41.0	65	71	17.0	13	17.0	15.0	8.9	7.4
100-41-4	Ethyl Benzene		0.8	0.9		1.3	1.7	0.99	1		2.5	1.3	1.1	0.7	0.8		0.9		0.76
75-69-4	Freon 11	1.3	1.9	1.8	1.6	1.5	2.3	1.3	1.4	1.6	1.6	1.6	1.6	1.5	1.3	1.7	1.2	2.4	1.3
75-71-8	Freon 12	2.4	3.5	3.0	3.5	3.1	4.1	2.5	2.7	2.6	2.7	2.2	2.4	2.8	2.6	2.5	2.5	3.2	2.5
87-68-3	Hexachlorobutadiene	UJ			UJ		UJ	UJ	UJ	UJ		UJ	UJ		UJ		UJ		UJ
110-54-3	Hexane															3.2			
95-13-6	Indene							4.2	4.6										
108-38-3/106-42-3	m,p-Xylene	1.3	2.5	2.5	1.8	2	3.5	2.4	2.5	2.2	4.8	3.8	3.8	1.7	2	1.9	2.8	1.8	1.9
75-09-2	Methylene Chloride		2.3	2.2			2.6												
95-47-6	o-Xylene		0.8	1.0	0.8	0.74	1.5	1.2	1.2		2.2	1.2	1.6	0.7	0.75	0.9	1.2		
100-42-5	Styrene		1.0	0.8		2.8	2.2	0.92	0.99		0.8		0.94						
127-18-4	Tetrachloroethene		4.4	4.7				1.2	1.4		5.8								
108-88-3	Toluene	4.6	7.7	7.9	4.4	5.9	30	22	22	14	100.0	13	13	7.4	9.9	15.0	17.0	4	3.6

Note: E - Exceeds instrument calibration range.
Blank - Not detected.

Table 3
Summary of Detected Soil Vapor Analytical Results
Pelham Plaza Site
Pelham Manor, New York

CAS Number	Compound	SG-GNC GNC µg/m3 3/17/05	SG-MGC Marathon's Gold City µg/m3 3/17/05	SG-FS Fabco Shoes µg/m3 3/17/05	SG-DBW Dress Barn Women µg/m3 3/17/05	SG-HAL Halmark µg/m3 3/17/05	SG-PS Pawn Shop µg/m3 3/17/05	SG-X Field Duplicate Pawn Shop µg/m3 3/17/05	SG-X Lab Duplicate Pawn Shop µg/m3 3/17/05	SG-DB Dress Barn µg/m3 3/17/05	SG-NAC Nuts About Candy µg/m3 3/17/05	SG-VIS Vision Center µg/m3 3/17/05	SG-MOD Modell's µg/m3 3/17/05	SG-DEN Dentist µg/m3 3/17/05	SG-SAL Salon µg/m3 3/17/05
71-55-6	1,1,1-Trichloroethane							1.7 J	1.8	1.3	1.4		4.1		1.1
75-34-3	1,1-Dichloroethane						1.7	1.6	1.7	1.6	4.2	1.4	0.9		
95-63-6	1,2,4-Trimethylbenzene	45.0	13.0	670.0	2.2					1.0	15.0	1.8	4.1		
108-67-8	1,3,5-Trimethylbenzene	19.0	5.3	290.0							4.7		2.2		
106-99-0	1,3-Butadiene	3.2											5.2		
106-46-7	1,4-Dichlorobenzene														
123-91-1	1,4-Dioxane										35.0				
78-93-3	2-Butanone (Methyl Ethyl Ketone)	30.0	14.0	21.0	17.0	4.8	270.0	290.0	300.0	4.2	6.7	3.9	22.0		2.3
67-63-0	2-Propanol	13.0	7.8	7.9	11.0		30.0	33.0	36.0	2.2	33.0		3.5		
622-96-8	4-Ethyltoluene	75.0	12.0	240.0							12.0		53.0		
67-64-1	Acetone	200 E	95.0	220.0	380.0	28.0	93.0	86.0	89.0	34.0	310 E	19.0	120.0	45.0	21.0
71-43-2	Benzene	120.0	79.0	270.0	6.9	1.7	2.0	2.0	2.2	4.4	4.5	12.0	21.0	1.2	1.6
75-15-0	Carbon Disulfide	71.0	190.0	640.0	9.3	3.1	8.1	8.4	8.2	18.0	9.7	3.0	34.0	10.0	3.3
75-00-3	Chloroethane												0.6		
67-66-3	Chloroform	4.6	6.0	30.0	18.0	2.7	6.7	7.0	6.6	4.5	5.0	2.1	9.1		6.5
74-87-3	Chloromethane										0.8		1.0		
110-82-7	Cyclohexane	7.9	6.9												
64-17-5	Ethanol	21.0	16.0	62.0	39.0	7.3	6.8	7.3	6.2	5.2	63.0	3.6	9.2	2.4	6.5
100-41-4	Ethyl Benzene	68.0	8.7	72.0	2.2			1.5	1.7		5.1	2.1	120.0		
75-69-4	Freon 11	1.1				1.6				1.4	1.2	2.1	28.0	1.5	1.7
76-13-1	Freon 113												45.0	12.0	27.0
75-71-8	Freon 12	5.8	3.0	4.2	3.0	3.6	3.3	2.8	3.0	2.9	2.5	4.0	2.5	2.7	
142-82-5	Heptane	7.7													
110-54-3	Hexane	6.2		9.7									4.5		
496-11-7	Indan	13.0		210.0											
95-13-6	Indene	31.0	11.0	570 E									5.6		
108-38-3/106-42-3	m,p-Xylene	140.0	18.0	210.0	4.4	1.3	6.7	5.4	5.9	2.3	20.0	8.3	12.0	1.3	0.9
75-09-2	Methylene Chloride														
91-20-3	Naphthalene		13.0	3700.0									7.7		
95-47-6	o-Xylene	58.0	10.0	150.0	2.1		5.0	4.6	4.5	1.1	11.0	3.0	4.4		
103-65-1	Propylbenzene	6.1		16.0											
100-42-5	Styrene	87.0	12.0	500.0	3.0					0.8			39.0		
127-18-4	Tetrachloroethene	1.4		13.0				2.3		2.5	6.3	2.5	2.3		1.8
110-02-1	Thiophene	2.7													
108-88-3	Toluene	210.0	44.0	220.0	8.7	1.8	1.8	1.8	2.0	4.1	5.6	20.0	25.0	1.6	1.7
79-01-6	Trichloroethene									1.1	2.7	2.7	2.0		

Note:
E - Exceeds instrument calibration range.
Blank - Not detected at method detection limit.

Table 4
Summary of Detected Air and Soil Vapor Analytical Results
Pelham Plaza Site
Pelham Manor, New York

CAS Number	Compound	SG-GNC GNC µg/m3 3/17/05	IA-GNC GNC µg/m3 3/17/05	SG-MGC Marathon's Gold City µg/m3 3/17/05	IA-MGC Marathon's Gold City µg/m3 3/17/05	IA-MGC Lab Duplicate Marathon's Gold City µg/m3 3/17/05	SG-FS Fabco Shoes µg/m3 3/17/05	IA-FS Fabco Shoes µg/m3 3/17/05	SG-DBW Dress Barn Women µg/m3 3/17/05	IA-DBW Dress Barn Women µg/m3 3/17/05	SG-HAL Halmark µg/m3 3/17/05	IA-HAL Halmark µg/m3 3/17/05	SG-PS Pawn Shop µg/m3 3/17/05	SG-X Pawn Shop µg/m3 3/17/05	SG-X Lab Duplicate Pawn Shop µg/m3 3/17/05	IA-PS2 Field Dup. Pawn Shop µg/m3 3/17/05	IA-PS2 Lab Duplicate Pawn Shop µg/m3 3/17/05	IA-X Field Dup. Pawn Shop µg/m3 3/17/05
71-55-6	1,1,1-Trichloroethane													1.7 J	1.8			
75-34-3	1,1-Dichloroethane												1.7	1.6	1.7			
95-63-6	1,2,4-Trimethylbenzene	45.0		13.0	1.0	0.9	670.0	0.9	2.2	0.83		3				1.2	1.2	
108-67-8	1,3,5-Trimethylbenzene	19.0		5.3			290.0											
106-99-0	1,3-Butadiene	3.2																
106-46-7	1,4-Dichlorobenzene		1.4															
123-91-1	1,4-Dioxane																	
78-93-3	2-Butanone (Methyl Ethyl Ketone)	30.0		14.0	3.8	3.2	21.0	2.4 J	17.0		4.8		270.0	290.0	300.0	3.6	3.1	
67-63-0	2-Propanol	13.0	38	7.8	83.0	76.0	7.9	14.0	11.0	550 E		25	30.0	33.0	36.0	3.8	4.1	3.5
622-96-8	4-Ethyltoluene	75.0		12.0			240.0											
67-64-1	Acetone	200 E	27	95.0	40.0	37.0	220.0	22.0	380.0	13.0	28.0	19	93.0	86.0	89.0	8	8.1	6
71-43-2	Benzene	120.0	1.4	79.0	1.5	1.5	270.0	1.6	6.9	1.3	1.7	1.7	2.0	2.0	2.2	2.8	2.6	1.7
75-15-0	Carbon Disulfide	71.0		190.0			640.0		9.3		3.1		8.1	8.4	8.2	20	21	
75-00-3	Chloroethane											2						
67-66-3	Chloroform	4.6		6.0	0.8	1.0	30.0		18.0		2.7		6.7	7.0	6.6			
74-87-3	Chloromethane		0.97		1.2	1.0		1.0		0.95		0.98				0.78	0.94	0.82
110-82-7	Cyclohexane	7.9		6.9						8.0		3.2						
64-17-5	Ethanol	21.0	96	16.0	130 E	130 E	62.0	47.0	39.0	120 E	7.3	68	6.8	7.3	6.2	25	27	18
100-41-4	Ethyl Benzene	68.0		8.7	0.8	0.9	72.0		2.2	1.3		1.7		1.5	1.7	0.99	1	
75-69-4	Freon 11	1.1	1.3		1.9	1.8		1.6		1.5	1.6	2.3				1.3	1.4	1.6
76-13-1	Freon 113																	
75-71-8	Freon 12	5.8	2.4	3.0	3.5	3.0	4.2	3.5	3.0	3.1	3.6	4.1	3.3	2.8	3.0	2.5	2.7	2.6
142-82-5	Heptane	7.7																
110-54-3	Hexane	6.2					9.7											
496-11-7	Indan	13.0					210.0											
95-13-6	Indene	31.0		11.0			570 E									4.2	4.6	
108-38-3/106-42-3	m,p-Xylene	140.0	1.3	18.0	2.5	2.5	210.0	1.8	4.4	2	1.3	3.5	6.7	5.4	5.9	2.4	2.5	2.2
75-09-2	Methylene Chloride				2.3	2.2						2.6						
91-20-3	Naphthalene			13.0			3700.0											
95-47-6	o-Xylene	58.0		10.0	0.8	1.0	150.0	0.8	2.1	0.74		1.5	5.0	4.6	4.5	1.2	1.2	
103-65-1	Propylbenzene	6.1					16.0											
100-42-5	Styrene	87.0		12.0	1.0	0.8	500.0		3.0	2.8		2.2				0.92	0.99	
127-18-4	Tetrachloroethene	1.4			4.4	4.7	13.0							2.3		1.2	1.4	
110-02-1	Thiophene	2.7																
108-88-3	Toluene	210.0	4.6	44.0	7.7	7.9	220.0	4.4	8.7	5.9	1.8	30	1.8	1.8	2.0	22	22	14
79-01-6	Trichloroethene																	

Note:
E - Exceeds instrument calibration range.
Blank - Not detected at method detection limit.
S - Saturated peak

Table 4
Summary of Detected Air and Soil Vapor Analytical Results
Pelham Plaza Site
Pelham Manor, New York

CAS Number	Compound	SG-DB Dress Barn µg/m3 3/17/05	IA-DB Dress Barn µg/m3 3/17/05	SG-NAC Nuts About Candy µg/m3 3/17/05	IA-NAC Nuts About Candy µg/m3 3/17/05	IA-NAC Lab Duplicate Nuts About Candy µg/m3 3/17/05	SG-VIS Vision Center µg/m3 3/17/05	IA-VIS Vision Center µg/m3 3/17/05	SG-MOD Modell's µg/m3 3/17/05	IA-MOD Modell's µg/m3 3/17/05	SG-DEN Dentist µg/m3 3/17/05	IA-DEN Dentist µg/m3 3/17/05	SG-SAL Salon µg/m3 3/17/05	IA-SAL Salon µg/m3 3/17/05	OA-FO Field Office µg/m3 3/17/05	OA-MD Mandee's µg/m3 3/17/05
71-55-6	1,1,1-Trichloroethane	1.3		1.4	1.2	1.2			4.1				1.1			
75-34-3	1,1-Dichloroethane	1.6		4.2			1.4		0.9							
95-63-6	1,2,4-Trimethylbenzene	1.0	2.1	15.0	1.2	1.4	1.8	0.81 J	4.1	1				0.8		
108-67-8	1,3,5-Trimethylbenzene			4.7					2.2							
106-99-0	1,3-Butadiene								5.2							
106-46-7	1,4-Dichlorobenzene									1.4						
123-91-1	1,4-Dioxane			35.0												
78-93-3	2-Butanone (Methyl Ethyl Ketone)	4.2	11.0	6.7			3.9		22.0	2.6		4.8	2.3	2.6		
67-63-0	2-Propanol	2.2	4.6	33.0	4.2	4.5		3.0	3.5	6.4		7.0		8.0		
622-96-8	4-Ethyltoluene			12.0					53.0							
67-64-1	Acetone	34.0	22.0	310 E	18	18	19.0	9.2	120.0	7	45.0	20.0	21.0	9.7	8	6.3
71-43-2	Benzene	4.4	1.5	4.5	2.2	2.4	12.0	1.5	21.0	1.3	1.2	3.8	1.6	1.9	1.7	1.9
75-15-0	Carbon Disulfide	18.0		9.7			3.0		34.0		10.0		3.3			
75-00-3	Chloroethane								0.6							
67-66-3	Chloroform	4.5	0.8	5.0			2.1	1.4	9.1			0.8	6.5	0.9		
74-87-3	Chloromethane		0.8	0.8	1.1	1.1		0.8	1.0	1		0.9		1.1	1	0.88
110-82-7	Cyclohexane		6.8													
64-17-5	Ethanol	5.2	41.0	63.0	65	71	3.6	17.0	9.2	13	2.4	17.0	6.5	15.0	8.9	7.4
100-41-4	Ethyl Benzene		2.5	5.1	1.3	1.1	2.1	0.7	120.0	0.8				0.9		0.76
75-69-4	Freon 11	1.4	1.6	1.2	1.6	1.6	2.1	1.5	28.0	1.3	1.5	1.7	1.7	1.2	2.4	1.3
76-13-1	Freon 113								45.0		12.0		27.0			
75-71-8	Freon 12	2.9	2.7	2.5	2.2	2.4	4.0	2.8	2.5	2.6	2.7	2.5		2.5	3.2	2.5
142-82-5	Heptane															
110-54-3	Hexane								4.5			3.2				
496-11-7	Indan															
95-13-6	Indene								5.6							
108-38-3/106-42-3	m,p-Xylene	2.3	4.8	20.0	3.8	3.8	8.3	1.7	12.0	2	1.3	1.9	0.9	2.8	1.8	1.9
75-09-2	Methylene Chloride															
91-20-3	Naphthalene								7.7							
95-47-6	o-Xylene	1.1	2.2	11.0	1.2	1.6	3.0	0.7	4.4	0.75		0.9		1.2		
103-65-1	Propylbenzene															
100-42-5	Styrene	0.8	0.8			0.94			39.0							
127-18-4	Tetrachloroethene	2.5	5.8	6.3			2.5		2.3				1.8			
110-02-1	Thiophene															
108-88-3	Toluene	4.1	100.0	5.6	13	13	20.0	7.4	25.0	9.9	1.6	15.0	1.7	17.0	4	3.6
79-01-6	Trichloroethene	1.1		2.7			2.7		2.0							

Note:
E - Exceeds instrument calibration range.
Blank - Not detected at method detection limit.
S - Saturated peak

1,1,1-TCA was present in one indoor air sample (Nuts About Candy) at a concentration of 1.2 $\mu g/m^3$ and PCE was detected in indoor air samples collected from three stores (Marathon's Gold City, Pawn Shop, and Dress Barn) at concentrations ranging from 1.2 to 5.8 $\mu g/m^3$. An evaluation of chlorinated VOC results is provided in Section 6.0.

As shown in Table 2, acetone, toluene, 2-propanol and ethanol were the primary constituents present in the indoor air samples. Toluene concentrations in indoor air ranged from 4.4 $\mu g/m^3$ to 100 $\mu g/m^3$ with a mean concentration of 18.4 $\mu g/m^3$. The concentration of toluene in the indoor air sample collected from Dress Barn (100 $\mu g/m^3$) was more than three times greater than the second highest concentration detected in indoor air during this sampling event. Acetone concentrations in indoor air ranged from 6 $\mu g/m^3$ to 40 $\mu g/m^3$, ethanol concentrations ranged from 13 $\mu g/m^3$ to 130 $\mu g/m^3$, and 2-propanol concentrations ranged from 3 $\mu g/m^3$ to 550 $\mu g/m^3$. The second highest 2-propanol concentration (83 $\mu g/m^3$), detected in Marathon's Gold City, was one order of magnitude less than in Dress Barn Women (550 $\mu g/m^3$).

5.2 SOIL VAPOR SAMPLING RESULTS

As shown in Table 3, no chlorinated VOCs were present in approximately half of the soil vapor samples. Of the three VOCs with draft NYSDOH decision matrices, the highest concentration in the soil vapor samples was 13 $\mu g/m^3$ of PCE in the sample collected beneath the former Fabco Shoes store. As shown in Table 3, the highest concentrations of chlorinated and non-chlorinated VOCs in sub-slab soil vapor samples were from Fabco Shoes (currently vacant) and GNC, located just north of the A.J. Wright Building in the southern portion of the mall. The sample collected beneath Fabco Shoes contained naphthalene at a concentration of 3,700 $\mu g/m^3$. Naphthalene was only detected in two other soil vapor samples (at significantly lower concentrations) and in none of the indoor air samples. Several other VOCs were present in the sample collected from beneath Fabco Shoes that were at least one order of magnitude higher than in any other soil vapor sample, including 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, 4-ethyltoluene, indane, indene, o-xylene, and styrene. Soil vapor samples from

Marathon's Gold City, Dress Barn Women, pawn shop (vacant), Nuts About Candy, and Modell's also contained VOC concentrations that were generally higher than beneath the other stores.

Table 3 also shows the results of the laboratory duplicate and field duplicate samples. Both of these quality assurance/quality control (QA/QC) samples were collected from the former pawn shop and analyzed for the VOCs listed in Table 1. In general, the differences in concentrations between the field sample SG-PS, the field duplicate, and the laboratory duplicate were no more than 10 percent, which indicated good correlation and laboratory precision. The only exceptions were PCE, which was detected in only one of these three analyses, and ethylbenzene and 1,1,1-trichlorethane (1,1,1-TCA), which were not detected in the sample SG-PS.

5.3 PRODUCT INVENTORY RESULTS

The products identified during the inventory are summarized in Table 5. Workers at Dress Barn and Dress Barn Women indicated that the carpets had been cleaned five days prior to performing the indoor air sampling in both of these stores. Elevated concentrations of VOCs present in the indoor air samples collected in these stores may have been caused by the carpet cleaning or other products. In general, products stored and used in these buildings were alcohol- and ammonia-based cleaners, fragrances, paints and sealers, adhesives, carpet cleaners, and detergents.

Table 5
Levin Management
Pelham Plaza
Pelham Manor, New York
March 2005 Air Sampling Event
Product Inventory Results

Location	Description
Hallmark	20-30 Sharpie Markers in packaging
	20-30 rolls Scotch tape
	Candle Corp. of America Candles
	Xerox copier ink powder
	Windex window cleaner with Ammonia D, 20 fluid ounces
	6 ft. cylinder of helium
	Fire extinquisher
	Fantastic orange all-purpose cleaner, 0.5 gallons
	WD-40 Rust Inhibitor
GNC	Antibacterial lotion, skin cleaner, Apter Industries, 1 pint, Triclosan, cocamide, surfactant blend propandiol-1,2, sodium laryrl ether sulfate cocoamidopropyl betaine, tetasodium ethene-dicumine tetraccatate, pink dye, sodium nitrate, citric acid.
	Curfew Scents body mist, 0.5 fl. ounces
	Apter Industries all purpose cleaner concentrate, 11 fluid ounces, triethaholamine, ethoxylate nonionic surfactants, tetrasodium theybenediane tetracetate, (2-Pyrrolielinone, 1 octyl) lemon fragrance, and yellow dye.
	Apter Industries glass cleaning concentrate, 0.5 fluid ounces, monoethanolamine, 2 butoxyethanol isopropyl alcohol, sodium lauryl sulfate, and red dye.
	Apter Industries no strip floor care, 12 fluid ounces, acrylic polymers, etholine glycol, tributoxyethylphosphate, ammonium perfluoralkyl sulfonates, aqua ammonia, silicone defocmers, formaldehyde.
	Husky 1270 residual insecticide, 16 ounces, tetramethrin, pemethrin, piperonyl butoxide technical, 1 cyclohexene 1-2 dicarboximidomethyl, 2-2 dimethyl-3 (2 methyl-propenyl), cyclopropane carboxylate (3-phenoxyphenyl), methyl cis/trans 3-(2,2 dichloroethenyl), 2,2-dimethyl-cyclopropane carboxylate.
	Klien and Company, Inc. Water base penentrating sealer for brick and porous surfaces, 0.75 gal.
	Vaseline lotion, 400 ml.
	Fire extinguisher
Dentist	Sporicidin disinfectant spray, 1 pint, 100% hospital (eve) disinfectant
	Miracle floor/tile adhesive latex emullsion, 2 gal.,
	Henry, Cove base adhesive, 0.5 gal.
	Glidden latex white wall paint, 5 gal.
	Fine-arts Dux semi gloss enamel, 1 gal.
	Benjamin Moore Alcylide china white enamel, 1 gal.
	Chemicoat, Acrylic latex, 1 gal.
	Red latex paint, 0.5 gal.
Modell's	Chemical Service, Pine odor disinfectant QP6, 2.5 gal., pine oil, alkyl dimethol benxyl ammonia chloride
	Pronto glass cleaner, 1 quart
	Restorer Maintenance Systems, Nutech beach, 1 quart.
	Dutchboy white latex paint, 1 gal.
	Sheetrock all purpose joint compound, 1 gal.
	DNTAC all purpose tile and floor adhesive, 2 gal.
	Penguin sneaker deoderizer, 9 oz.

Table 5
Levin Management
Pelham Plaza
Pelham Manor, New York
March 2005 Air Sampling Event
Product Inventory Results

Location	Description
Dress Barn Women	Carpets were cleaned five days prior to sampling
	Touch of Glass glass cleaner, spray bottle
	Swiss pine cleaner, spray bottle
	Wizard air freshener, lilac, spray can
Dress Barn	Carpets were cleaned five days prior to sampling
	Swiss pine cleaner, spray bottle
	Touch of glass with ammonia
	Rubbing alcohol, 50% by volume
	Quick stuff brand carpet cleaner
	Nylic carpet cleaner
	Captain Shine cleaner
	Fresh Breeze air freshener spray
	Quality care Spray disinfectant
	Hydrogen peroxide
	First aid kit
	Quality care multi surface and glass cleaner
	Magic Fragrance
	AJAX laundry detergent
	Pull out 2 Dri white powder spot remover
	Raid and and roach killer spray
Marathon's Gold City	Sparex #2 Dry acid, 16 oz.
	Rubbing Alcohol, 1 gal.
Nuts about Candy	Copier toner in copier
	Clorox bleach, 6 gal.
	~60 disposable butane lighters on the counter

6.0 EVALUATION OF SOIL VAPOR AND AIR SAMPLING RESULTS

6.1 SITE-BACKGROUND AIR QUALITY

Concentrations of VOCs in the ambient air samples were generally similar to the concentrations of the same VOCs in the indoor air samples collected in four of the five vacant stores (pawn shop, a vision center, dentist, and nail salon) and Modell's. These results indicate that many of the VOCs present in the indoor air in these stores are indicative of background air quality at the site. The indoor air samples collected in the remaining seven stores contained concentrations of VOCs greater than those in ambient air samples. Therefore, sources other than site background appear to be affecting indoor air quality in these seven stores.

6.2 INDOOR CONFOUNDING SOURCES

The presence of 2-propanol, ethanol, toluene and acetone in the indoor air samples from many of the stores appears to be from indoor confounding sources. The results of the product survey (Table 5) show that the cleaning products stored and used in many of the stores are alcohol-based and may contain acetone. In addition, recent carpet cleaning in two stores (Dress Barn and Dress Barn Women) may have also affected indoor air concentrations. Toluene is a common ingredient in carpet cleaners and spot removers (USEPA, 1994).

Concentrations of 2-propanol and ethanol were greater in indoor air than corresponding soil vapor samples in nearly all stores. Six of the 12 indoor air samples contained toluene at concentrations greater than in the corresponding soil vapor samples. Where toluene results were greater in soil vapor than indoor air, concentrations in indoor air were not significantly greater than ambient air concentrations. Acetone concentrations in indoor air may have been affected by indoor confounding sources. Although soil vapor samples beneath all 12 stores contained acetone at concentrations greater than

indoor air results, acetone was present at similar concentrations in many stores, regardless of corresponding soil vapor results. These indoor confounding sources were considered when evaluating potential soil vapor intrusion pathways in these stores.

Chlorinated VOCs for which decision matrices have been drafted by the NYSDOH include TCE, PCE, and 1,1,1-TCA. Based on a comparison of the March 2005 data to these draft matrices, only two samples (from Dress Barn and Marathon Gold City) contained concentrations (of PCE only) that would indicate the possible need for further evaluation. The PCE results in these indoor air samples (5.8 and 4.7 $\mu g/m^3$, respectively) were greater than the corresponding soil vapor results (2.5 $\mu g/m^3$ and not detected, respectively), indicating likely indoor confounding sources of PCE. Because of these observations and the relatively low concentrations (compared to a NYSDOH threshold for PCE in indoor air of 3 $\mu g/m^3$), confirmatory sampling is recommended before reaching conclusions on possible sources of PCE in these stores.

6.3 EVALUATION OF POTENTIAL SOIL VAPOR INTRUSION PATHWAYS

In five of the 12 stores investigated, concentrations of VOCs in indoor air samples were generally similar to ambient air sample results. This indicates that indoor air quality was not materially different than background air quality in these five stores, which include four vacant stores (former pawn shop, vision center, dentist, and nail salon) and one active store, Modell's. Although VOCs were present beneath these stores at varying concentrations, soil vapor intrusion pathways were not apparent in these five stores. Individual evaluations in these and the remaining stores investigated in March 2005 are provided below.

6.3.1 GNC

Ethanol and 2-propanol were present in the indoor air sample at concentrations greater than the soil vapor sample, indicating a possible indoor confounding source for these compounds. The remaining VOCs detected in both the soil vapor and indoor air samples include acetone, Freon 11 and 12, benzene, m,p-xylene, and toluene. Results of these VOCs in the soil vapor sample were greater than the corresponding indoor air

sampling results; however, benzene, toluene, m,p-xylene, and Freon 11 and 12 concentrations were similar to or less in the indoor air than in the ambient air samples. Acetone was the only VOC present at concentrations materially greater in indoor air than ambient air and also greater in soil vapor than in indoor air.

6.3.2 Marathon's Gold City

Acetone, 2-propanol, and ethanol were the primary VOCs present in the indoor air sample. The concentrations of 2-propanol and ethanol in indoor air were greater than in the soil vapor sample, indicating a likely indoor source for these compounds. The VOCs present at the highest concentrations in the soil vapor sample were carbon disulfide, acetone, benzene, and toluene. Carbon disulfide was present in the soil vapor sample at a concentration of 190 $\mu g/m^3$ but was not present in the indoor air sample. Benzene results in indoor air were less than the ambient air result. Soil vapor intrusion pathways for 2-propanol, ethanol, carbon disulfide, and benzene are not apparent in this store.

VOCs with indoor air concentrations less than soil vapor sample results and greater than ambient air results include 1,2,4-trimethylbenzene, 2-butanone (methyl ethyl ketone or MEK), acetone, chloroform, m,p-xylene, o-xylene, styrene, and toluene. With the exceptions of acetone and toluene, these VOC results were slightly greater than laboratory detection limits. Acetone and toluene are common ingredients in cleaning supplies, perfumes and fragrances, so their presence in the indoor air in this store is not conclusively from soil vapor intrusion. Additional indoor air data are needed to better evaluate potential vapor intrusion pathways in this store.

6.3.3 Former Fabco Shoes

As discussed in Section 5.2, the highest VOC concentrations in soil vapor during this sampling event were in the sample collected beneath the former Fabco Shoes store. Table 3 shows that these VOCs included BTEX and related compounds such as trimethylbenzenes, naphthalene, indane and indene. Many of these VOCs were either not present in, or were detected at relatively low concentrations in the corresponding indoor air sample. Acetone, ethanol, and 2-propanol were the only VOCs present in the indoor air sample at concentrations materially greater than in ambient air. As discussed above,

these VOCs could be from indoor confounding sources and a conclusive soil vapor intrusion pathway could not be determined.

6.3.4 Dress Barn Women

Ethanol and 2-propanol were present in the Dress Barn Women indoor air sample at concentrations approximately one order of magnitude greater than in the corresponding soil vapor sample. Acetone and toluene were also present at concentrations slightly greater than ambient air results. As discussed in Section 5.3, the carpets had been cleaned five days prior to performing the indoor air sampling in Dress Barn Women. The concentrations of VOCs present in the indoor air sample may have been influenced by the carpet cleaning or other cleaning products. Additional indoor air data are needed to better evaluate potential vapor intrusion pathways in this store.

6.3.5 Hallmark

Ethanol and toluene were present at higher concentrations in the indoor air sample than in the soil vapor sample and chloroethane, 2-propanol, chloromethane, cyclohexane, ethyl benzene, methylene chloride, o-xylene and styrene were present in the indoor air but not detected in the soil vapor sample. Indoor air concentrations of several of these VOCs were also greater than ambient air. Therefore, sources other than site background and soil vapor appear to be affecting indoor air quality in this store. Acetone was the only VOC present in the indoor air at a concentration less than in the soil vapor sample. A conclusive soil vapor pathway cannot be determined based on acetone alone.

6.3.6 Former Pawn Shop

Concentrations of benzene, 1,2,4-trimethylbenzene, ethanol, ethyl benzene, carbon disulfide, indene, styrene, PCE, and toluene in the former pawn shop indoor air sample were greater than the concentrations in both the soil vapor and ambient air samples. MEK and 2-propanol were present in the indoor air sample at concentrations less than the soil vapor result and materially greater than the ambient air result. The concentrations of these VOCs in indoor air were no greater than 4.1 $\mu g/m^3$, indicating the

need for additional indoor air sampling to further evaluate potential soil vapor intrusion pathways in this store.

6.3.7 Dress Barn

Concentrations of 1,2,4-trimethylbenzene, MEK, 2-propanol, ethanol, m,p-xylene, o-xylene, PCE, and toluene were present at higher concentrations in the indoor air sample than in the soil vapor sample or the ambient air samples. The toluene result (100 $\mu g/m^3$) in this sample was the highest present in the March 2005 indoor air samples, but the corresponding soil vapor result was approximately 25 times lower (4.1 $\mu g/m^3$). Acetone was the only VOC present in indoor air at concentrations less than soil vapor results and greater than the ambient air concentrations. The possible presence of acetone in confounding, indoor air sources complicates the evaluation of a soil vapor intrusion pathway in this store.

6.3.8 Nuts About Candy

Ethanol and toluene concentrations in indoor air were greater than the corresponding soil vapor concentrations in the samples collected in Nuts About Candy, indicating possible indoor confounding sources of these VOCs. Concentrations of 1,1,1-TCA, 1,2,4-trimethylbenzene, 2-propanol, acetone, benzene, ethylbenzene, m,p-xylene, and o-xylene in indoor air were less than in the soil vapor sample and greater than in the ambient air samples. The concentrations of these VOCs in indoor air were slightly greater than ambient air results or laboratory detection limits. Thus, additional indoor air sampling is warranted to further evaluate potential soil vapor intrusion pathways in the Nuts About Candy store.

6.3.9 Former Vision Center

The VOCs with the highest concentrations in the soil vapor sample collected in the former Vision Center were toluene and acetone (20 and 19 $\mu g/m^3$, respectively). Of all soil vapor samples collected during this sampling event, this sample contained the lowest VOC concentrations. Ethanol was present in the indoor air sample at a concentration five times greater than in the soil vapor sample and twice as much as in the

ambient air samples. 2-propanol and chloromethane were both present in the indoor air sample but not in the soil vapor or ambient air samples, indicating that there is likely an indoor source of these VOCs in this store. Chloroform, 1,2,4-trimethylbenzene, o-xylene, and toluene were present in the indoor air at concentrations greater than in the ambient air samples and less than in the soil vapor sample. The concentrations of these VOCs in indoor air were slightly greater than ambient air results or laboratory detection limits. Thus, additional indoor air sampling is warranted to further evaluate potential soil vapor intrusion pathways in the former Vision Center store.

6.3.10 Modell's Sporting Goods

Chloromethane, Freon 12, and ethanol were each present at similar concentrations in the indoor air, soil vapor, and ambient air samples and 1,4-dichlorobenzene was present in the indoor air sample (1.4 $\mu g/m^3$) but not in the ambient air or soil vapor samples. 2-propanol was detected in the indoor air sample (6.4 $\mu g/m^3$) at a concentration twice that of soil vapor sample (3.5 $\mu g/m^3$). Concentrations of 1,2,4-trimethylbenzene, MEK, o-xylene, and toluene in the indoor air sample were greater than in the ambient air samples and less than in the soil vapor sample. These concentrations were relatively low compared to ambient air results and laboratory detection limits and additional sampling is warranted. VOC concentrations in the soil vapor beneath Modell's were consistently higher than soil vapor results in other stores in the northern portion of the mall, the former dentist office and former nail salon.

6.3.11 Former Dentist Office

MEK, 2-propanol, chloroform, hexane, and o-xylene were present in the indoor air sample in the former dentist office but not in the ambient air or corresponding soil vapor sample, indicating an indoor source of these compounds. Ethanol, benzene, and toluene were present at higher concentrations in the indoor air than in the ambient air and soil vapor, indicating indoor sources for these compounds as well. The only VOC for which a soil vapor intrusion pathway could not be ruled out was acetone. Additional indoor air sampling is warranted to confirm these results.

6.3.12 Former Nail Salon

The VOCs 1,2,4-trimethylbenzene, 2-propanol, and o-xylene were present in the indoor air sample in the former nail salon but not in the ambient air or corresponding soil vapor sample, indicating an indoor source of these compounds. Ethanol, m,p-xylene, and toluene were detected at higher concentrations in the indoor air than in the soil vapor or ambient air samples, indicating indoor sources for these compounds as well. Acetone was the only VOC present in soil vapor at a concentration greater than the indoor air, and for which the indoor air result was greater than the ambient air results. Additional indoor air sampling is warranted to confirm these results.

7.0 CONCLUSIONS AND RECOMMENDATIONS

In general, VOCs were present at variable concentrations in the sub-slab vapor samples, but conclusive soil vapor intrusion pathways could not be determined because corresponding VOC concentrations of indoor air samples were in many cases similar to ambient, background concentrations or could be influenced by confounding sources. In many sample pairs, certain VOCs were higher in indoor air than in corresponding soil vapor samples, indicating possible non-sub slab sources.

The primary VOCs present in soil vapor were acetone, ethanol, 2-butanone, carbon disulfide and BTEX compounds. Carbon disulfide and BTEX results were highest in samples beneath four stores (GNC, Marathon Jewelry, former Fabco Shoes, and Modell's). In the corresponding indoor air samples, carbon disulfide was not present and benzene, ethylbenzene and xylene concentrations were similar to ambient results. Thus, a soil vapor intrusion pathway for these VOCs is not conclusive in these stores. Toluene was the only one of these VOCs present at effectively higher concentrations in the indoor air than in ambient, background air. Background concentrations of toluene were 3.6 to 4 $\mu g/m^3$ and indoor air results in these four stores ranged from 4.4 to 9.9 $\mu g/m^3$. A determination of vapor intrusion based on these toluene results alone is problematic, especially considering that in many other stores, toluene was present at concentrations greater in indoor air than in corresponding sub-slab soil vapor. Considering these observations and the product inventory results, the possible presence of toluene in indoor sources interferes with making a conclusive determination on soil vapor intrusion of toluene in these stores.

In soil vapor samples beneath Nuts About Candy and the former Pawn Shop, acetone and 2-butanone, respectively, were distinctly higher than other VOCs beneath these stores. Corresponding indoor air samples also contained these VOCs but at relatively low concentrations that were not distinctly different from other stores, regardless of the corresponding soil vapor results. These data, combined with the product inventory information on the storage and use of alcohol-based and other cleaning products, indicate that confounding sources could be contributing to indoor air

concentrations of these VOCs. Like BTEX compounds, an additional source of these VOCs could be from ambient background sources as well. Thus, distinct soil vapor intrusion pathways for these VOCs are inconclusive.

As indicated in the individual evaluations in Section 6.0, additional indoor air sampling is recommended in these stores to verify the March 2005 results. VOCs possibly related to former MGP operations, including BTEX, indane, indene, and naphthalene were present at variable concentrations beneath four of the 12 stores. Although conclusive soil vapor intrusion pathways could not be determined based on a single round of indoor air sampling, the presence of these VOCs beneath these four stores may warrant continued indoor air monitoring or mitigation. It is recommended, however, that the assessment of the most appropriate course of action for all 12 stores be conducted after performing a confirmatory round of indoor air sampling during the next heating season. Results of this and the March 2005 sampling will be combined and used to evaluate possible corrective or monitoring measures in consultation with NYSDEC and NYSDOH.

8.0 REFERENCES

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