Village of Sidney
Soil Vapor and Ground Water Survey
Phase 2 Work Plan

Amphenol Corporation

Sidney, New York

March 2005

JTM ASSOCIATES, LLC
environmental consulting

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environmental consulting

March 11, 2005

New York State Department of Health
Attn; Mr. Daniel Geraghty
Frear Building
1 Fulton Street
Troy, NY 12180-3281

Re: Soil Vapor Intrusion Investigation
Phase 2 Work Plan
Sidney, New York

Dear Mr. Geraghty:

On behalf of Amphenol Corporation and Honeywell International, the enclosed document presents the Phase 2 work plan for the referenced project.

Should questions arise, please do not hesitate to contact our offices.

Very truly yours,
JTM Associates, LLC

James T. Mickam, P.G.
President

Cc: W. Wintsch – NYSDEC
J. Bianchi – Amphenol
S. Waldo – Amphenol
R. Galloway – Honeywell

Enclosure

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Village of Sidney
Soil Vapor and Ground Water Survey
Phase 2 work Plan
March 2005

Prepared for

Amphenol Corporation
Sidney, New York

JTM ASSOCIATES, LLC
Liverpool, New York

Village of Sidney
Soil Vapor and Ground Water Survey
Phase 2 Work Plan

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Introduction

Amphenol Corporation manufactures a variety of electrical connectors at its facility in Sidney, New York. Prior to Amphenol assuming responsibility for the operations, the plant was owned and operated by the Bendix Connector Group of Allied-Signal Corporation. Several different business entities have used this site for industrial manufacturing since the early 1900s. Figure 1 illustrates the location of the site.

In some areas of the site, chlorinated volatile organic compounds (VOCs); primarily trichloroethylene (TCE) and its associated degradation products have affected the quality of the on-site shallow ground water. To mitigate these impacts, Amphenol operates two ground water recovery and treatment systems at the facility.

The ground water remedial systems are monitored in accordance with New York State Department of Environmental Conservation (NYSDEC) requirements. Monitoring data from both ground water remediation systems are routinely reported to NYSDEC. Data are collected from on-site and hydraulically downgradient (due northwest of the plant), off-site monitoring wells. Additional background information and monitoring data can be found in West Well and Plating Area Ground Water Monitoring Report – 3rd Quarter 2004; JTM ASSOCIATES, LLC and Boiler Room Site Ground Water Monitoring Report – 2003 Annual Report; July 2004; JTM ASSOCIATES, LLC.

Beginning in the fourth quarter of 2004 Amphenol voluntarily undertook a program to assess the effectiveness of the two ground water remediation systems. Between November 2004 and February 2005 samples of ground water, soil vapor and outdoor ambient air were collected at several locations northwest of the facility. The purpose of these efforts was to assess the presence of site related constitutes, principally TCE, in these environmental media at locations off-site and hydraulically downgradient of the remedial systems referenced above. A secondary objective was to satisfy new initiatives by the New York State Department of Health (NYSDOH) and identify if the potential exists for TCE to volatilize from ground water and migrate into the indoor air of

buildings through a process know as soil vapor intrusion (SVI). The results of these sampling efforts indicate that additional sampling is needed to define if SVI has the potential to affect the indoor air of buildings in areas hydraulically downgradient of the Amphenol site. This document briefly reviews the results of the sampling efforts between November 2004 and February 2005, and describes the proposed scope of work to assess the potential for SVI.

Summary of recently collected data

In November 2004, a work plan was submitted to the NYSDEC and NYSDOH. The work plan described the proposed locations for ground water and soil vapor sampling probes and the method for probe installation, sampling and analysis. In commenting on the work plan, the NYSDOH specified modifications to the soil vapor sampling methodology such that these data would be collected consistent with developing, although at that time unpublished, guidance. The modifications requested by NYSDOH were incorporated into all sample collection protocol.

Figure 2 illustrates the study area and the location of newly installed soil vapor and ground water sampling probes. The locations of existing ground water monitoring wells that are sampled regularly by Amphenol and monitoring wells installed by NYSDEC at the former Oneonta Oil site are also depicted. A total of 35 soil vapor probes (labeled SVP-01 through SVP-03 and SVP-05 through SVP-36) were installed between November 29 and December 9, 2004. During the same period 23 ground water sampling probes (GWP-02, GWP-03, GWP-05 through GWP-14, and GWP-16 through GWP-26) were installed. At 23 locations, both a soil vapor and ground water sampling probe were installed such that the chemistry of the soil vapor and ground water could be directly compared. At locations SVP-1 and SVP-15, existing ground water monitoring wells WW-4 and BR-13 were used as the complementary ground water sampling point, respectively.

Figure 2 also presents a composite of all sampling results for the primary constituent of concern, namely TCE. Soil vapor probes were first sampled between December 3 and 14, 2004. A second set of soil vapor samples at selected locations was collected between February 1 and 3, 2005. Ground water samples were collected between December 8 and 14, 2004. In addition to soil vapor and ground water, outdoor air samples were collected on 3 different dates at a location near the center of the Amphenol facility just north of the northern boundary (A-1) and near the center of the study area (adjacent to SVP-34) a single time. Soil vapor and outdoor air samples were analyzed to a detection limit of 1

micro gram per cubic meter ($\mu g/M^3$); the ground water sample detection limit was 1 part per billion (ppb).

The data presented on Figure 2 reveal the following:

- TCE in soil vapor was either below the detection limit or at a concentration of less than 5 $\mu g/M^3$ at 28 of the 35 (80%) locations sampled, during at least one of the sampling events.
- The highest concentration of TCE in soil vapor was detected at SVP-34 which is located in between the Frontier Telephone and former Oneonta Oil site (now B and M Auto).
- TCE in ground water was below the Maximum Concentration Limit (MCL) of 5 ppb established by the United States Environmental Protection Agency (USEPA) at 21 of 29 (72%) locations sampled.
- The highest concentration of TCE in ground water was detected downgradient and directly adjacent to the former Oneonta Oil site.
- The location where the highest concentration of TCE in both ground water and soil vapor are adjacent to the former Oneonta Oil facility. A review of data collected by NYSDEC between 1995 and 1999 indicates that this parcel likely continues to be a noteworthy source of TCE to ground water and soil vapor. Amphenol has requested that NYSDEC provide any and all data associated with this site and, as necessary, further investigate this source of TCE in the community.
- TCE was detected in outdoor air at both sampling locations. The concentration at A-1, near the Amphenol facility was 6 $\mu g/M^3$; the concentration at A-2 near SVP-34 and Oneonta Oil was 10 $\mu g/M^3$. Amphenol is currently working with NYSDEC to assess TCE emissions associated with the facility.

Proposed soil vapor intrusion potential assessment

In February 2005, the NYSDOH published "Guidance for Evaluating Soil Vapor Intrusion in the State of New York" in draft form for public comment. The purpose of the document is to provide guidance on "identifying and addressing current and potential human exposures to contaminated subsurface vapors associated with known or suspected volatile chemical contamination." The exposure occurs by way of SVI and, according to the draft guidance document, is "the process by which volatile chemicals migrate from a subsurface source into the indoor air of buildings."

Sub-slab sampling program

- General approach

The draft guidance document recognizes sub-slab sampling as an effective means to assess current and potential future exposure. To assess the potential for SVI to create an exposure to TCE that may be present in off-site ground water, a sub-slab sampling program will be completed.

In general, following receipt of an executed access agreement from the respective owner and tenants (if applicable), sub-slab samples will be collected from buildings hydraulically downgradient, northwest of the facility, beginning nearest to the plant boundary and proceeding northwest toward the Susquehanna River. This approach is consistent with the draft guidance (Section 3.3.1). Sampling at greater distances from the plant will stop once a concentration of less than 5 $\mu g/M^3$ has been identified. If the results indicate that sources other than that associated with TCE containing ground water leaving the Amphenol property are the proximate cause of concentrations found to exceed 5 $\mu g/M^3$, sub-slab sampling may also be discontinued.

At those locations where the sub-slab sample has a concentration of 5 $\mu g/M^3$ or greater, a mitigation system will be offered. We feel this conservative approach to deciding whether or not to provide a mitigation system at a given location is the best solution for a party whose building has the potential to be exposed by the SVI route as it:

1. provides the highest degree of certainty that SVI is not affecting indoor air;
2. eliminates the need for an invasive and extensive survey of the interior of private homes and businesses.; and,
3. saves cost by reducing the need for future monitoring.

Since sub-slab vapor samples tend to have less temporal variation that indoor air samples, as provided for in the guidance document (Section 2.2.2), sub-slab sampling could continue outside of the heating season. If a concentration of 5 $\mu g/M^3$ or greater is observed outside of the heating season, a mitigation system would also be installed. If a concentration is less than the action level and it is documented that the building's heating system was operating during the sample collection, a no action decision could be made.

- Area of initial sub-slab sampling

Figure 3 illustrates an aerial photo of the study area and identifies the 24 specific parcels proposed for initial sub-slab sampling. This includes all residential dwellings along West Railroad Street and dwellings on the south side of Oak Street. At 18 West Railroad Street, two sub-slab samples are proposed for this location since visual inspection reveals that an out building, located behind the residence, is used for day care services. The out building does not appear to have a basement and, if upon further inspection this is found to be the case, a sample will be collected from below the surface-slab. It the building is found to have a basement, a conventional sub-slab sample will be collected.

- Sub-slab sample collection and analysis methods

Appendix A provides a detailed, step wise protocol for the collection of sub-slab samples. This has been developed consistent with section 2.7.2 of the draft guidance document. Sub-slab sample probes will be temporary and constructed in the same manner at each location to minimize data discrepancies between locations. Where inspection of the building to be sampled indicates the potential for flooding if the sub-slab is breached, alternatively a sample of the ground water in the sump will be collected. The protocol also provides for a means to collect a soil vapor sample if the basement floor is earthen.

Sub-slab air samples will be analyzed using USEPA Method TO-15 by Centek Laboratories, Inc. Centek participates in the NYSDOH's Environmental Laboratory Approval Program (ELAP) and is certified (#11830) for compounds similar to TCE (i.e. Tetrachloroethene or PCE) as certification for TCE is not presently available. If a sump water sample is collected, it will be analyzed by Adirondack Environmental Services, Inc. (AES). AES is certified by both NYSDEC and NYSDOH.

Samples will managed in a manner consistent with Section 2.9 of the draft guidance document. All data will be validated consistent with the most current edition of guidance provided by USEPA (Region II SOP HW-18). Sub-slab air samples will be analyzed to a detection limit of $1\mu g/M^3$. Sump water samples will be analyzed to 0.5 parts per billion (ppb).

Optional indoor air sampling

If requested by the owner or tenant of a residential dwelling for which sub-slab sampling is proposed, indoor air sampling will be completed. The initial step will be to schedule a meeting with the owner and/or tenant to discuss the sample collection process and dwelling inhabitant restrictions as discussed in the draft SVI guidance and the supporting document titled "Indoor Air Sampling & Analysis Guidance"; February 1, 2005 published by NYSDOH, Division of Environmental Health Assessment; Center for Environmental Health. A copy of this guidance is provided in Exhibit 1. After the meeting, the owner and tenants (if applicable), will be required to execute an amendment to the access agreement, indicating their desire to have indoor air sampling performed and acknowledging their understanding of the process and restrictions prior to sample collection.

Indoor air samples will be collected and analyzed in a manner consistent with the above referenced guidance documents. Detection limit for TCE in indoor air samples will be $0.25\mu g/M^3$. As with sub-slab samples, all data will be validated per current applicable guidance.

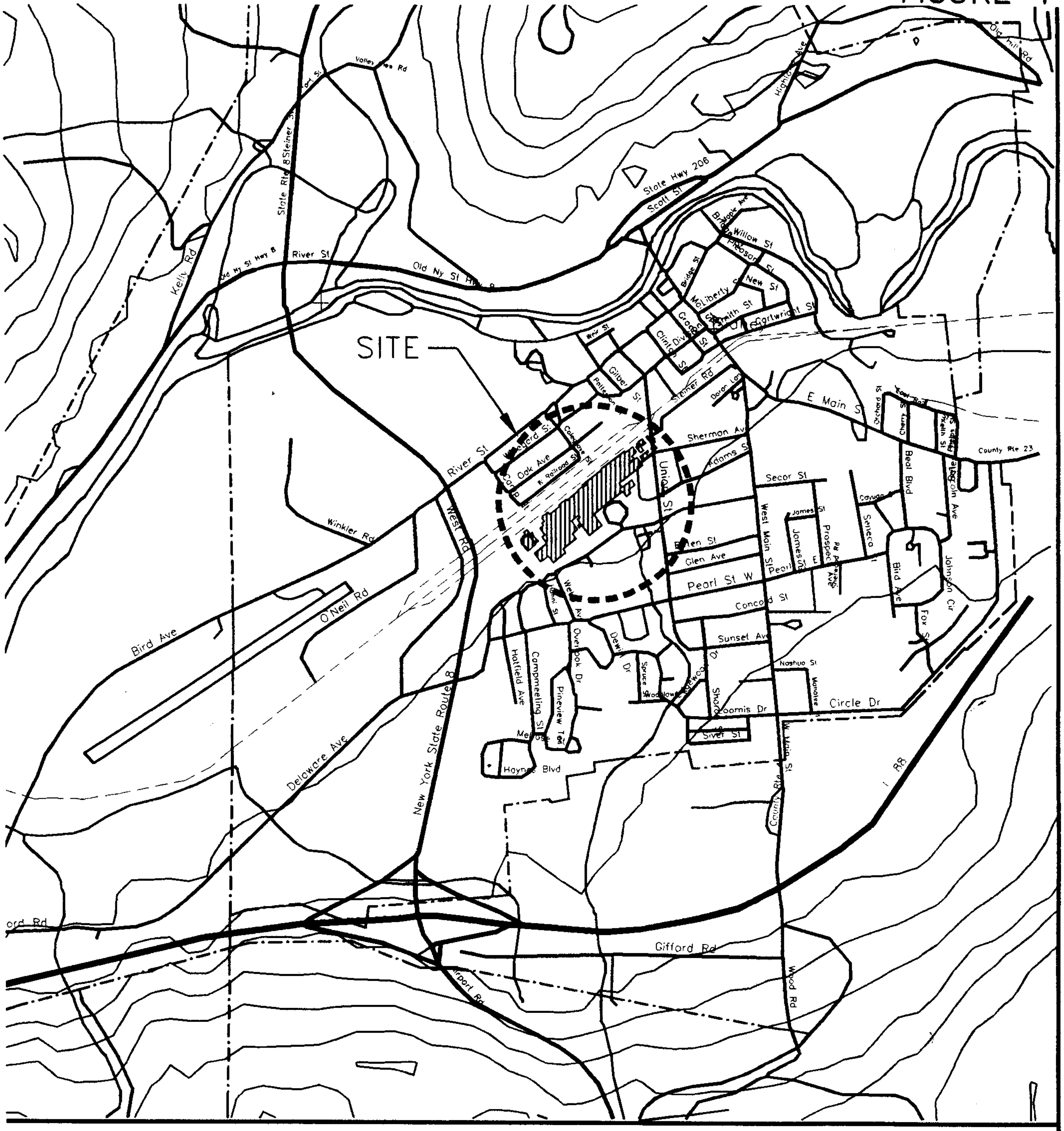
Mitigation system design, installation, monitoring and maintenance

If sub-slab sampling data indicate that a mitigation system is required for a given building, an appropriate system, with the consent of the property owner, will be designed and installed. Mitigation system design and installation will be consistent with the draft guidance document (Section 4.2) and be specific for a given building. Local architechs and contractors, to the extent available, will be engaged to assist the design and construction efforts. A combination of slab sealing and slab depressurization systems will be considered, in consultation with the property owner and regulatory agencies. Post-mitigation system testing will be performed as described in Section 4.3 of the draft guidance. A mitigation system operation, maintenance and monitoring plan will be prepared as prescribed (Section 4.4).

FIGURES

DWG PATH: C:\DWGS\JTM ASSOCIATES\AMPHENOL\OIL STORAGE & HANDLING FAC\002WW-BR.DWG SF 1

FIGURE 1



AMPHENOL CORPORATION
SIDNEY, NEW YORK

SITE LOCATION MAP

2000 0 2000
APPROX. SCALE IN FEET

JTM ASSOCIATES, LLC
environmental consulting

Village of Sidney
Ground Water and Soil Vapor Survey

Ground Water TCE Results (ppb)
Soil Vapor TCE Results ($\mu g/m^3$)
Ambient Air Results ($\mu g/m^3$)

Susquehanna River

RIVER STREET
WINEGARD STREET
WEST RAILROAD STREET
OAK STREET
WEIR STREET
DIVISION STREET
CAMP STREET
COLEGROVE ST
DUNHAM STREET
PATTERSON STREET
GILBERT STREET
UNION STREET

ONEONTA OIL
FRONTIER TELEPHONE
SCOVILLE-MENO AUTO
NYSEG

GWP-23 <1	SVP-23 ND	
GWP-24 3.9	SVP-24 13	
GWP-25 <1	SVP-25 ND	
GWP-26 <1	SVP-26 ND	
SVP-35 ND ND	SVP-18 1 ND	GWP-18 <1
SVP-19 ND ND	GWP-19 <1	
SVP-36 ND ND	BR-17 74 91	
SVP-20 1	GWP-20 120	
GWP-21 4.5	SVP-21 1	
SVP-22 ND	GWP-22 <1	
SVP-12 13 4	GWP-12 <1	
SVP-32 ND 1	GWP-13 <1	
SVP-13 ND ND	SVP-33 ND 1	
GWP-14 1.9	SVP-14 530 10	
SVP-34 820 330	A-2 10	
MW3 240	MW6 130	
MW1 130	MW2 120	
BR-13 34 54	SVP-15 3 4	
GWP-17 <1	SVP-17 2	
GWP-16 1.9	SVP-16 1	
SVP-06 ND ND	GWP-06 <1	
SVP-29 ND 1	GWP-07 1	
SVP-07 ND 1	SVP-30 ND 1	
GWP-08 2.1	SVP-08 39 15	
SVP-31 160	GWP-09 29	
SVP-09 4	GWP-10 <1	
SVP-10 ND	GWP-11 <1	
SVP-11 ND	GWP-05 <1	
SVP-05 ND	BR-19 66 69	
BR-14 130 66	WW-4 <1	
SVP-01 40 3	SVP-27 5 2	
SVP-02 ND 1	GWP-02 1.2	
SVP-28 39 19	A-1 6	
SVP-03 ND 8	GWP-03 13	
BR-20 140	BR-12 4	
BR-3 11		

West Well Remedial System Area

Boiler Room Remedial System Area

TCE AMBIENT AIR RESULTS ($\mu g/m^3$)

SAMPLE ID	CONC.	DATE	WIND DIRECTION	WIND VELOCITY	OBSERVATION	TEMP.
A-1	<1	12/8/04	→	10-15 W/GUSTS	RAIN	35 F
	6	12/2/05	↘	2-4	SUNNY	33 F
	<1	2/3/05	←	5-10	P. CLOUDY	36 F
A-2	10	2/1/05	↘	2-4	SUNNY	31 F

NOTE: Unvalidated Data

SOIL VAPOR SAMPLE
SVP-32
ND December 2004
1 February 2005
AMBIENT AIR SAMPLE (A-2)
GROUND WATER SAMPLE (GWP-2)
EXISTING MONITORING WELL
BR-13
34 December 2003
54 September 1999

0 60 120 240 360 480
Feet

Village of Sidney
Ground Water and Soil Vapor Survey

Susquehanna River

RIVER STREET

WEIR STREET

UNION STREET

DUNHAM STREET

PATTERSON STREET

GILBERT STREET

WINEGARD STREET

CAMP STREET

COLEGROVE ST

DIVISION STREET

OAK STREET

WEST RAILROAD STREET

39 OAK
16 CAMP
18 CAMP
19 CAMP
UNDEV
33 OAK
31 OAK
29 OAK
25 OAK
23 OAK
21 OAK
19 OAK
17 OAK
15 OAK
13 OAK
11 OAK
9 OAK
18 RAILROAD
20 RAILROAD
16 RAILROAD
8 RAILROAD AVE
7 OAK
17 COLEGROVE
19 COLEGROVE
5 OAK
21 COLEGROVE

West Well Remedial System Area

Boiler Room Remedial System Area

PROPOSED SUB-SLAB SAMPLE LOCATION

0 60 120 240 360 480
Feet

APPENDICES

APPENDIX A

Sub-slab Sampling Protocol

A nominal 3/8 inch diameter hole will be drilled through the sub-slab and into the fill or soil material below the slab. A 3/8 OD, ¼ inch ID piece of polyethylene tubing will be inserted into the drilled hole. The hole will be sealed with 100% natural bees wax.

The sample tube and probe will be purged of 1 to 3 volumes of air using a low flow pump and captured into a Tedlar™ bag. The tubing will then be capped. The Tedlar™ bag will be screened with a portable PID meter and noted outside of the home. Purging flow rates will not exceed 0.2 liters/minute.

A preset Entech Regulator will be attached to the tubing and clamped in place. Then a 1 liter or 1.4 liter Silonite Lined Summa Canister will be connected to the quick connect portion of the regulator. Time will be noted in the field log. The sub-slab sample will be collected over a 24-hour period. This equates to a flow rate of approximately 0.0007 liters per minute.

If the basement has an earthen floor a soil gas point will be set. This will be accomplished by drilling a 1 ¼ inches (OD) soil auger will be used to obtain a depth of 2-3 feet. The auger will then be extracted. A 6 inch long, double woven stainless steel screen, with a 0.0057 inch pore diameter implant connected to 3/16 (OD) inch Teflon tube will be inserted into the borehole. The annular space will be filled with glass beads to depth of 6 inches above screen. The remainder of annular space will be backfilled with granular bentonite and sealed at the surface with bees wax. At the surface a 4 feet by 4 feet piece of 6 ml poly sheeting will be placed over the bore hole. The sheeting will be cut in the center and the tubing to extend out at least 2 feet out. The hole in the sheeting will be sealed with hydrated bentonite. The sheeting will be covered with silica sand to at least 1 inch from the edges. The edges of the poly sheeting will be sealed to the earth with hydrated bentonite.

The soil probe seal will be tested using a tracer gas (helium) to determine if the seal is in good working order.

The exposed tubing will be feed through a 1 gallon enclosure to a small air pump. The air pump will purge air at approximately .00002 liters/M into a Tedlar™ bag. 1 to 3 volumes of air will be purged from the tube and soil vapor probe. As the pump is purging, 400 cc of pure helium will be injected into the enclosure. The Tedlar™ bag will analyzed outside of the home using a GOW-Mac Helium leak detector.

If there is No helium detected and the seal is in good working order, a preset Entech Regulator will be attached to the tubing and clamped in place. Then a 1 liter Silonite Lined Summa Canister will be connected to the quick connect portion of the regulator. Time will be noted in the field.

At the end of 24 hours of sampling is complete, the tracer gas procedure will be performed again. If there is No helium detected the sample will be shipped to the laboratory.

Sampling activities will be photographically documented.

APPENDIX B

Indoor and outdoor sampling protocol

In addition to the sampling protocol information provided below, indoor and outdoor air samples will be collected in a manner consistent with the New York State Department of Health, Division of Environmental Health Assessment, Center for Environmental Health Indoor Air Sampling & Analysis Guidance dated February 1, 2005 including elements describing:

- Pre-sample inspection
- Preparation of building
- Building occupant behavior restrictions
- Collection of samples
- Quality assurance / quality control
- Sampling information
- Sample analysis
- Use of the indoor air quality questionnaire and building inventory

Basement air
A 1 liter or 1.4 liter Silonite lined Summa Canister will be connected to a preset Entech Regulator. The canister will be placed in the breathing zone. The sample location will be centrally located and away from volatile organic compound sources. Sample collection duration will be 24 hours at a collection rate of approximately 0.0007 liter per minute.

Living space air
A 1 liter or 1.4 liter Silonite lined Summa Canister will be connected to a preset Entech Regulator. The sample location will be centrally located in a primary living space and away from any volatile organic compound sources. The canister will be placed in the breathing zone at 3 – 5 feet up from the ground. Sample collection duration will be 24 hours at a collection rate of approximately 0.0007 liter per minute.

Outdoor ambient air (AA)- A 1 liter or 1.4 liter Silonite lined Summa Canister will connected to a preset Entech Regulator. The canister will hung 3 to 5 feet above the ground, in an upwind, open area away from any obstructions and sources of volatile organic compounds (e.g. car ports, gas stations, chemical storage sheds) on the outside of the property. These samples will be collected simultaneously with the indoor and sub-slab samples. Sample collection duration will be 24 hours at a collection rate of approximately 0.0007 liter per minute.

Digital Photographs will be taken at each location.

EXHIBITS

NEW YORK STATE DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH ASSESSMENT
CENTER FOR ENVIRONMENTAL HEALTH

INDOOR AIR SAMPLING & ANALYSIS GUIDANCE
February 1, 2005

SCOPE

Air testing for specific chemical compounds is an investigative tool used to characterize the nature and extent of contaminants in air and to determine whether contaminant sources affect indoor air quality. The purpose of this document is to outline the recommended procedure for testing indoor air for volatile chemicals.

This document provides guidance for preparing sampling locations and collecting samples for laboratory analysis to ensure the integrity of the test results and allow for meaningful interpretation of the data. The steps discussed include; pre-sampling inspection and preparation of buildings, product inventories, and the collection and analysis of samples.

Forms (attached) - Indoor Air Quality Questionnaire and Building Characteristics Form
- Product Inventory Form

GUIDANCE

1. Pre-Sampling Inspection:

A pre-sampling inspection should be performed prior to each sampling event to identify conditions that may affect or interfere with the proposed testing. The inspection should evaluate the type of structure, floor layout, physical conditions, and airflows of the building(s) being studied. The inspection information should be identified on the attached Indoor Air Quality Questionnaire and Building Characteristics form. In addition, potential sources of chemicals of concern should be evaluated within the building by conducting a product inventory. The primary objective of the product inventory is to identify potential air sampling interference by characterizing the occurrence and use of chemicals and products throughout the building, keeping in mind the goal of the investigation and site specific contaminants of concern. For example, it is not necessary to provide detailed information for each individual container of like items. However it is necessary to indicate that "20 bottles of perfume" or "12 cans of latex paint" were present with containers in good condition. This information is used to help formulate the indoor environment profile.

Each room on the floor of the building being tested and on lower floors, if possible, should be inspected and an inventory provided. This is important because even products stored in another area of a building can affect the air of the room being tested.

For example, when testing for a petroleum spill, all indoor sources of petroleum hydrocarbons should be scrutinized. These can include household and commercial products containing volatile organic compounds (VOCs), petroleum products including fuel from gasoline-operated equipment, unvented space heaters and heating oil tanks, storage and/or recent use of petroleum-based finishes and paints or products containing petroleum distillates. This information should be detailed on the Product Inventory Form.

The presence and description of odors (e.g. solvent, moldy) and portable vapor monitoring equipment readings (e.g., photoionization detectors [PIDs] for VOCs, Jerome Mercury Vapor Analyzer for mercury) should be used to help evaluate potential sources. This includes taking readings near products stored or used in the building. Products in buildings should be inventoried **every time** air is tested to provide an accurate assessment of the potential contribution of volatile chemicals. If available, chemical ingredients of interest should be recorded for each product. If the ingredients are not listed on the label, record the product's exact and full name, and the manufacturer's name, address and phone number, if available. In some cases, Material Safety Data Sheets may be useful for identifying confounding sources

of volatile chemicals in air. Adequately documented photographs of the products and their labeled ingredients can supplement the inventory and facilitate recording the information.

2. Preparation of Building

Potential interference from products or activities releasing volatile chemicals may need to be controlled. Removing the source from the indoor environment prior to testing is the most effective means of reducing the interference. Ensuring that containers are tightly sealed may be acceptable. When testing for volatile chemicals, containers should be tested with a PID to determine whether VOCs are leaking. The inability to eliminate potential interference may be justification for not testing, especially when testing for similar compounds at low levels. The investigator should consider the possibility that chemicals may adsorb onto porous materials and may take time to dissipate.

In some cases, the goal of the testing is to evaluate the impact fromproducts used or stored in the building (e.g., pesticide misapplications, school renovation projects). If the goal of testing is to determine whether products are an indoor volatile chemical contaminant source, then removing these sources does not apply.

Once interfering conditions are corrected (if applicable), ventilation may be needed prior to testing to eliminate residual contamination in the indoor air. If ventilation is appropriate, it should be completed 24 hours or more prior to the scheduled sampling time. Where applicable, ventilation can be accomplished by operating the building's heating ventilation and air conditioning (HVAC) system to maximize outside air intake. Opening windows and doors and operating exhaust fans may also help or may be needed if the building has no HVAC system.

Air samples are sometimes designed to representtypical exposure in a mechanically ventilated building, and the operation of HVAC systems during sampling should be noted (see HVAC section on the attached indoor air quality questionnaire). In general, the building's HVAC system should be operating under normal conditions. Unnecessary building ventilation should be avoided within the 24 hours prior to and during testing. During colder months, heating systems should be operating under normal occupied conditions (i.e., 65°-75° F) for at least 24 hours prior to and during the scheduled sampling time.

Depending on the goal of the indoor air sampling, some situations may warrant deviation from the above protocol regarding building ventilation. In such instances, building conditions and sampling efforts should be understood and noted within the framework and scope of the investigation.

FOR 24 HOURS PRIOR TO SAMPLING, ALL REASONABLE MEASURES SHOULD BE TAKEN TO AVOID

- Opening any windows, fireplace dampers, openings, or vents
- Operating ventilation fans unless special arrangements are made
- Smoking in the house
- Painting
- Using wood stoves, fireplaces or other auxiliary heating equipment (e.g., kerosene heaters)
- Operating or storing automobiles in an attached garage
- Allowing containers of gasoline or oil to remain within the house, except for fuel oil tanks
- Cleaning, waxing, or polishing furniture or floors with petroleum- or oil-based products
- Using air fresheners or odor eliminators
- Engaging in any hobbies that use materials containing volatile organic chemicals
- Using cosmetics, including hairspray, nail polish, nailpolish removers, perfume/cologne, etc.
- Applying pesticides

3. Collection of Samples

An adequate number of air samples should be collected from locations in order to understand likely sources of volatile chemicals and to assess potential exposure to occupants in various locations. In private residences, air samples should be collected from the basement, first floor living space, and from outdoors. In settings with diurnal occupancy patterns such as schools and office buildings, samples should be collected during normally occupied periods to be representative of typical exposure. However, in special circumstances it may be necessary to collect air samples at other times in order to minimize disruptions to normal building activities. Sample collection intakes should be located to approximate the breathing zone for building occupants (i.e., three feet above the floor level where occupants are normally seated or sleep). To ensure that air is representative of the locations sampled and to avoid undue influence from sampling personnel, samples should be collected for at least a one-hour period, and personnel should avoid lingering in the immediate area of the sampling device while samples are being collected. If the goal of the sampling is to represent average concentrations over longer time periods then longer duration sampling periods may be appropriate. The sampling team members should avoid actions (e.g., fueling vehicles, using permanent marking pens) that can cause sample interference in the field.

Sample collection techniques vary depending on the analytical method(s) being used, and sample flow rates must conform to the specifications in the sample collection method. Some methods specify collecting samples in duplicate (e.g., Passive Sampling Devices fortetrachloroethene). Sampling personnel should be completely familiar with the sampling protocol for the particular method being used.

a. Quality Assurance/Quality Control

Extreme care should be taken during all aspects of sample collection to ensure that high-quality data are obtained. Appropriate QA/QC measures must be followed for sample collection and laboratory analysis. Items that should be addressed in sampling protocols include sampling techniques, certified-clean sampling apparatus, appropriate sample holding times, temperatures, and pressures. In addition, laboratory accession procedures must be followed including; field documentation (sample collection information and locations), chain of custody, field blanks, field sample duplicates and laboratory duplicates, as appropriate.

b. Sampling Information

Detailed information must be gathered at the time of sampling to document conditions prior to and during sampling to aid in interpretation of the test results. The information should be recorded on the building inventory form along with the date and the investigator's initials. Floor plan sketches (section 11) should be drawn for each floor and should include the floor layout with sample locations, chemical storage areas, garages, doorways, stairways, location of basement sumps, HVAC systems including air supplies and returns, compass orientation (north) and any other pertinent information. In addition, observations such as odors, PID readings, and airflow patterns should be recorded on the building inventory form. Smoke tubes or other devices are helpful and should be used to confirm pressure relationships and air flow patterns, especially between floor levels and between suspected contaminant sources and other areas. The NYSDOH Wadsworth Laboratories requires that information on odors and PID readings also be recorded on the associated sample accession forms for VOC analyses.

Outdoor plot sketches (section 12) should include the building site, area streets, outdoor sample location, the location of potential interference (e.g., gas stations, factories, lawn mowers), wind direction and compass orientation (north).

c. Sample Analysis

New York State Law requires laboratories analyzing environmental samples from New York State to have current Environmental Laboratory Approval Program (ELAP) certification for the appropriate analyte/matrix combinations. Samples must be analyzed by methods that can achieve minimum reporting limits to allow for comparison to background levels (halogenated VOCs are typically 1 microgram per cubic meter ($\mu g/m^3$) or less). The laboratory should verify that they are capable of detecting the appropriate target compounds (see below) and can report them at the appropriate reporting limit (typically 1 $\mu g/m^3$ or less). You should check with an ELAP representative at 518-485-5570 or by e-mail at elap@health.state.ny.us if you have questions about a laboratory's current certification status.

Indoor air sampling to evaluate potential impacts from chemical contaminant sources (i.e., old spills, soil vapor, groundwater) should generally include the contaminant(s) of concern and potential breakdown products (e.g., 1,1,1-trichloroethane analysis should also include 1,1-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, chloroethane and vinyl chloride).

Petroleum products are often a mixture of many individual compounds. Specific aromatic and aliphatic compounds can be good indicators for individual petroleum products (e.g., gasoline, diesel, fuel oil, and kerosene). The primary aromatic compounds benzene, toluene, ethylbenzene, xylenes (BTEX), and trimethylbenzenes should be included in all analyses. Analytical methods using a mass spectrometer detector allow for the identification and quantitation of aromatic and aliphatic hydrocarbons and for oxygenated compounds such as ethanol and methyl tertiary butyl ether (MTBE). Identifying specific petroleum vapor sources may require evaluating additional indicator compounds as suggested below.

Indicator compounds for gasoline may include BTEX, trimethylbenzene isomers, the appropriate oxygenate additives (MTBE, ethanol, etc.), and the individual C-4 to C-8 aliphatics (e.g., hexane, cyclohexane, dimethylpentane, and 2,2,4-trimethylpentane [iso-octane]).

Indicator compounds for middle distillate fuels (#2 fuel oil, diesel, and kerosene) may include n-nonane, n-decane, n-undecane, n-dodecane, ethylbenzene, xylenes, trimethylbenzene isomers, tetramethylbenzene isomers, naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene.

Indicator compounds for manufactured gas plant (MGP) wastes may include ethylbenzene, xylenes, trimethylbenzene isomers, tetramethylbenzene isomers, thiophenes, indane, indene and naphthalene.

Indicator compounds for natural gas or liquefied petroleum (LP) gas may include propane, propene, butane, iso-butane, iso-pentane and n-pentane. Natural gas and LP gas also contain higher molecular weight aliphatic, olefinic, and some aromatic compounds, but at levels much lower than the listed indicator compounds.

In some cases, a more comprehensive list of compounds may be necessary that includes indicator compounds of different petroleum mixtures to help identify sources and potential interferences. For additional information on sampling and appropriate target compounds, contact the Indoor Health Assessment Section of the Bureau of Toxic Substance Assessment (BTSA) at (518) 402-7810 or the appropriate Bureau of Environmental Exposure (BEEI) project manager (518) 402-7850.

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 _____ Date/Time Prepared _____

Preparer's Affiliation _____ Phone No._____

Purpose of Investigation_____

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: _____

If the property is residential, type? (Circle appropriate response)

Ranch	2-Family	3-Family
Raised Ranch	Split Level	Colonial
Cape Cod	Contemporary	Mobile Home
Duplex	Apartment House	Townhouses/Condos
Modular	Log Home	Other:_____

If multiple units, how many? _____

If the property is commercial, type?

Business Type(s) _____

Does it include residences (i.e., multi-use)? Y / N If yes, how many? _____

Other characteristics:

Number of floors_____ Building age_____

Is the building insulated? Y / N How air tight? Tight / Average / Not Tight

4. AIRFLOW

Use air current tubes or tracer smoke to evaluate airflow patterns and qualitatively describe:

Airflow between floors

_____

_____

_____

Airflow near source

_____

_____

_____

Outdoor air infiltration

_____

_____

_____

Infiltration into air ducts

_____

_____

_____

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: _____(feet)

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

_____

_____

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: _____

Boiler/furnace located in: Basement Outdoors Main Floor Other_____

Air conditioning: Central Air Window units Open Windows None

Are there air distribution ducts present? Y / N

Describe the supply and cold air return ductwork, and its condition where visible, including whether there is a cold air return and the tightness of duct joints. Indicate the locations on the floor plan diagram.

_____

_____

_____

_____

7. OCCUPANCY

Is basement/lowest level occupied? Full-time Occasionally Seldom Almost Never

Level	**General Use of Each Floor (e.g., familyroom, bedroom, laundry, workshop, storage)**
Basement	_____
1st Floor	_____
2nd Floor	_____
3rd Floor	_____
4th Floor	_____

8. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY

a. Is there an attached garage? Y / N

b. Does the garage have a separate heating unit? Y / N / NA

c. Are petroleum-powered machines or vehicles stored in the garage (e.g., lawnmower, atv, car) Y / N / NA
Please specify_____

d. Has the building ever had a fire? Y / N When?_____

e. Is a kerosene or unvented gas space heater present? Y / N Where?_____

f. Is there a workshop or hobby/craft area? Y / N Where & Type? _____

g. Is there smoking in the building? Y / N How frequently? _____

h. Have cleaning products been used recently? Y / N When & Type? _____

i. Have cosmetic products been used recently? Y / N When & Type? _____

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) 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: _____
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: _____

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

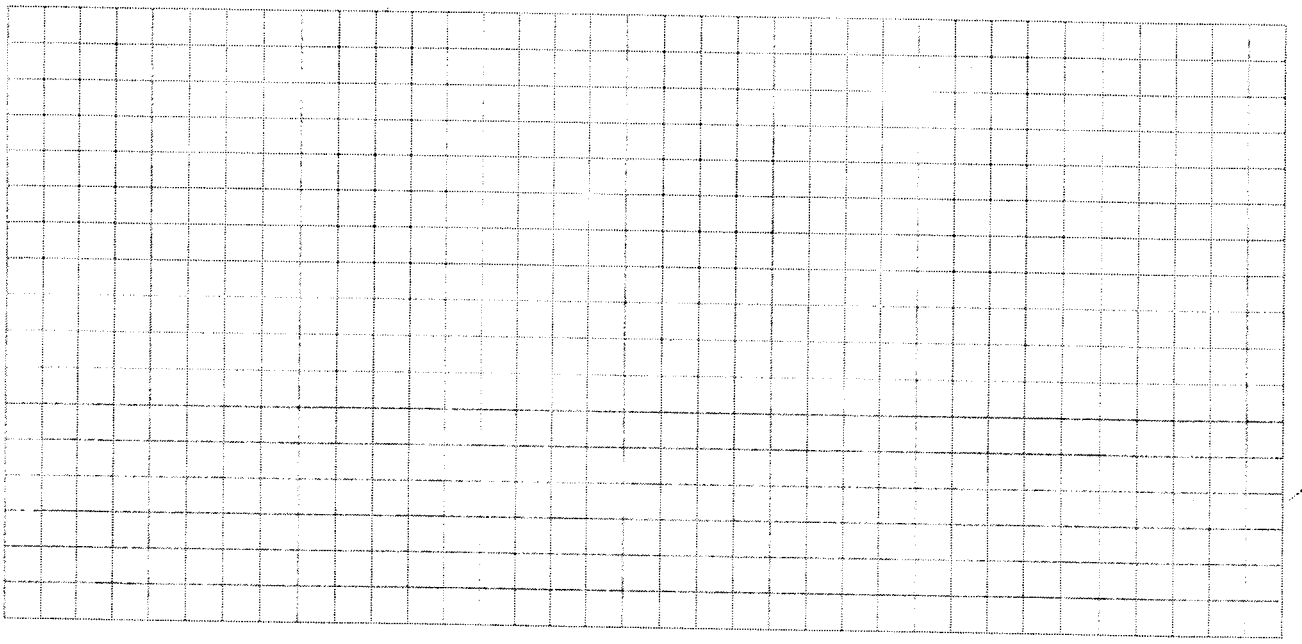
c. Responsibility for costs associated with reimbursement explained? Y / N

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

11. FLOOR PLANS

Draw a plan view sketch of the basement and first floor of the building. Indicate air sampling locations, possible indoor air pollution sources and PID meter readings. If the building does not have a basement, please note.

Basement:



First Floor: