# NJDEP – GOLDER SUBSURFACE VAPOR INTRUSION RESEARCH PROJECT

Report on:

## Year One Soil Vapor Intrusion Research Study at Stafford Township and Egg Harbor Sites, New Jersey

Submitted to
New Jersey Department of
Environmental Protection

Golder Associates

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NJDEP

Golder Associates

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**REPORT ON**

# YEAR ONE SOIL VAPOR INTRUSION RESEARCH STUDY AT STAFFORD TOWNSHIP AND EGG HARBOR SITES, NEW JERSEY

Submitted to:

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## SUMMARY

This report, prepared by Golder Associates Inc. (Golder Associates) for the New Jersey Department of Environmental Protection (NJDEP), describes the results of our "Year One" research study of soil vapor intrusion titled "*Investigation of Indoor Air Quality in Structures Located Above VOC-Contaminated Groundwater*". The purpose of the research program was to evaluate soil vapor intrusion into buildings through field measurements, comparison to existing guidance, and site-specific mathematical modeling of vapor intrusion. An important objective of this study was to obtain supporting information that would assist NJDEP in developing guidance on soil vapor intrusion relevant to conditions in New Jersey. As part of Year One, field monitoring programs were completed at two sites in New Jersey, the Stafford Township ("Stafford") site, where subsurface contamination consists of petroleum hydrocarbons, and the Egg Harbor, Atlantic County site in New Jersey, where contamination consists of chlorinated solvents. This report provides a comprehensive description of the field testing programs conducted at the Stafford and Egg Harbor sites, and presents information previously documented in three separate reports. The field investigation at the Stafford site was conducted in three distinct phases between September 2002 and January 2004. The Egg Harbor field program was conducted in December 2003 and January 2004.

## STAFFORD SITE

### General

The Stafford site is located in the Coastal Plain area of southern New Jersey. The area under study is near a gasoline station, where removal of a gasoline tank confirmed the presence of soil and groundwater contamination. The neighborhood down gradient from the source consists of a mixture of small commercial and residential structures, with several types of foundations including basements (extending to a depth of 1.7 m below the ground surface), slab-on-grade construction, and crawlspaces. Soil borings indicated the presence of unconsolidated sand throughout the entire vadose zone.

The primary objective of the investigation at the Stafford site was to provide information that could be used to evaluate vapor attenuation factors for various media, specifically the groundwater-to-indoor air, soil vapor-to-indoor air, and subslab vapor-to-indoor air factors. The vapor attenuation factor ("alpha") is defined as the indoor air concentration divided by the vapor concentration at the point of interest. Secondary objectives were to provide information on spatial and temporal (seasonal) variation in groundwater, soil vapor and indoor air concentrations, evaluate vadose zone bioattenuation of hydrocarbon vapors, investigate factors affecting soil vapor intrusion through ancillary testing of environmental and building related conditions, and develop and refine methods for investigation of soil vapor intrusion into buildings.

## Methods

Soil vapor intrusion at the Stafford site was evaluated using a staged investigation approach, as follows:

- ***Stage One***: Groundwater and deep soil vapor investigation to delineate the groundwater plume and evaluate the potential for soil vapor intrusion (September 2002).

- ***Stage Two***: Groundwater, soil vapor and indoor air investigation, and ancillary testing, conducted at five buildings to investigate indoor air quality and vapor attenuation factors (October to November 2002).

- ***Stage Three***: Supplementary testing to further investigate attenuation factors and processes at one house where vapor intrusion was reported as part of Stage Two (January 2004).

***Stage One*** consisted of groundwater and deep soil vapor sampling and analysis at seven locations. Collection of shallow groundwater and soil samples for analysis of volatile organic compounds (VOCs), and the installation of soil vapor probe implants were accomplished using the Geoprobe® system. Groundwater samples were analyzed for BTEX and MTBE using a mobile laboratory supplied by NJDEP. Soil vapor samples were analyzed on-site using a field GC and for light gases using a multi-gas detector. Additional soil vapor samples were collected using 6-litre Summa canisters and analyzed for VOCs (USEPA Method TO-15).

***Stage Two*** was a coordinated program of groundwater, soil, soil vapor, subslab vapor, indoor air, and outdoor air sampling for three homes (14, 18 and 22 Park Avenue) and two small commercial buildings (63 and 73 East Bay Avenue) located above the contaminated groundwater plume. One of the commercial buildings was a house converted to an antique shop (73 East Bay Avenue, henceforth referred to as 73 Bay Avenue).

The collection and analysis of groundwater, soil and soil vapor samples followed similar protocols to Stage One, except that groundwater and soil vapor (obtained using Summa canisters) were only analyzed by a fixed laboratory (i.e., no mobile laboratory was used). The differential pressure between either the building and outdoor air, or building and subslab soil was measured using a highly sensitive pressure transducer and data logger. Continuous meteorological data, including atmospheric pressure, temperature, wind velocity, wind direction and precipitation were also obtained.

The building construction was as follows:

- 63 Bay Avenue: slab-at-grade
- 73 Bay Avenue: basement with partial crawlspace, plastic sheet on soil
- 14 Park Avenue: basement
- 18 Park Avenue: basement with partial unlined crawlspace
- 22 Park Avenue: complete unlined crawlspace

***Stage Three*** was a coordinated program of groundwater, soil, soil vapor, subslab vapor and indoor air sampling for one house (73 Bay Avenue). To evaluate concentration variability, groundwater and soil vapor samples were obtained on opposite sides of the building perpendicular to the plume axis and direction of groundwater flow. As for Stage 2, differential pressure and meteorological data was obtained. In addition, a ventilation tracer test conducted using carbon dioxide was used to estimate the air change rate in the basement of 73 Bay Avenue.

**Results and Discussion**

*Stage 1*

The total BTEX and MTBE concentrations in groundwater at the Geoprobe® location adjacent to 73 Bay Avenue were 68 mg/L and 520 mg/L, respectively. Groundwater concentrations decreased with increasing distance from 73 Bay Avenue. The dissolved oxygen (DO) concentrations were at low or non-detect levels within the plume area. Highly elevated hydrocarbon and MTBE concentrations were obtained in deep soil vapor near 73 Bay Avenue. For example, the MTBE vapor concentration was 1,500,000 parts per billion (ppbV) while the benzene and cyclohexane concentrations were both 350,000 ppbV.

A preliminary screening evaluation of the potential for significant indoor air concentrations (i.e., above typical background concentrations) from soil vapor intrusion was completed using the measured deep soil vapor concentration. The indoor air concentrations were estimated using the measured soil vapor concentrations and an empirical vapor attenuation factor (alpha) of 0.001. An alpha value of 0.001 is considered to be conservative (high). The results suggested that elevated indoor air concentrations were possible for 63 and 73 Bay Avenue, but unlikely for other structures.

*Stage 2*

The *soil* characterization results suggested the presence of residual NAPL above the water table near 63 and 73 Bay Avenue. Soil above the NAPL zone has a low fraction organic carbon, and low moisture-holding capacity. The implication of these results is that relatively high mobility for VOC vapors would be expected, in the absence of biodegradation.

The *groundwater* monitoring results indicated elevated BTEX and MTBE concentrations at Geoprobe® locations near 63 and 73 Bay Avenue. The maximum total BTEX (82.5 mg/L) and MTBE concentrations (590 mg/L) were measured west of 73 Bay Avenue. The extent of the MTBE plume was similar to that observed for BTEX, based on the available data.

The *deep soil vapor* monitoring results indicated similar concentrations as Stage 1 above the inferred NAPL zone. For example, the MTBE, benzene, cyclohexane, and 2,2,4-trimethylpentane concentrations were 1,600,000 ppbV, 200,000 ppbV, 300,000 ppbV and 400,000 ppbV, respectively. The *soil vapor vertical profiles* above the area of inferred residual NAPL indicated slight attenuation in concentrations between the deep and mid-depth probes, and significant attenuation between the mid-depth and shallow probes (reduction of between 50 and 1,000 times). The oxygen concentrations in the inferred residual NAPL area were low in deep soil gas (less than 1 percent), slightly higher in mid-depth soil gas, and at moderate levels in shallow soil gas. The vapor attenuation between the mid-depth and shallow probe is inferred to be a result of aerobic biodegradation and is consistent with the observed oxygen levels. The subslab vapor concentrations were at concentrations between the mid-depth and shallow vapor concentrations.

The *vapor concentration attenuation* for the BTEX compounds was significantly greater than for cyclohexane and 2,2,4-trimethylbenzene. This is believed to be, in part, due to the higher solubility of BTEX, which results in greater bioavailability to microorganisms. Reported aqueous phase biodegradation rates for cyclohexane and 2,2,4-trimethylpentane are also lower than for the BTEX compounds.

The *indoor* air monitoring indicated that the MTBE, cyclohexane, and 2,2,4-trimethylpentane concentrations were elevated at 73 Bay Avenue, relative to concentrations measured in other buildings, and ranged between 14 ppbV and 150 ppbV for these three compounds. Numerous alkane hydrocarbons were also measured in indoor air at 73 Bay Avenue. The BTEX concentrations in indoor air at all buildings, including 73 Bay Avenue, were relatively low and within reported background levels for indoor air.

The *meteorological* data indicated the temperature ranged between 30°F and 60°F and barometric pressure variations were moderate (1010-1030 mbar) during the few days prior to and during indoor air sampling. All buildings were occupied during the sampling, so doors were periodically opened. Due to the cool weather, windows were largely, but not entirely, closed, and heating systems (natural gas-fueled forced air or oil-fueled hot water radiant) were under moderate use.

The differential *pressure* measurements indicate the basements at 73 Bay Avenue (average of - 0.6 Pa) and 14 Park Avenue (average of – 4.1 Pa) were under negative pressure relative to atmospheric pressure, indicating an inward (to the structure) gradient for soil gas advection. At 22 Park Avenue, the crawlspace was negatively pressurized relative to indoor air. There was significant variability in differential pressure measurements and no apparent correlation between pressure and meteorological conditions.

Vapor attenuation factors for 73 Bay Avenue calculated using the sampling probes immediately west of this house are presented below:

- Groundwater-to-indoor air:
    - MTBE: $1.1x10^{-5}$
    - cyclohexane: $1.3x10^{-6}$ (one half the detection limit was used for this calculation)
    - BTEX: less than $4.1x10^{-7}$ to $4.9x10^{-6}$
- Soil vapor-to-indoor air:
    - MTBE : $2.2x10^{-5}$
    - cyclohexane: $1.2x10^{-4}$
    - 2,2,4-trimethylpentane: $3.6x10^{-4}$
    - BTEX: less than $4.3x10^{-6}$ to $6.3x10^{-6}$
- Subslab vapor-to-indoor air:
    - cyclohexane: $8.4x10^{-3}$
    - 2,2,4-trimethylpentane: $7.3x10^{-3}$

The measured vapor attenuation ratios are compared to the relevant semi-site specific attenuation factors (Question 5) in the draft USEPA Subsurface Vapor Intrusion Guidance (USEPA Guidance), which are $1.2x10^{-3}$ for the groundwater-to-indoor air pathway, and $2.2x10^{-3}$ for the soil vapor-to-indoor air pathway. The comparisons indicate that the measured alpha's values are 6X to over 100X less than the USEPA values, for compounds that are relatively recalcitrant to biodegradation (cyclohexane, 2,2,4-trimethylpentane).

The Stage 2 program highlighted the effectiveness of volatile tracers such as 2,2,4-trimethylpentane and cyclohexane in evaluating potential vapor intrusion. For the BTEX compounds, there was significant vapor bioattenuation and no measurable vapor intrusion. The conclusions drawn are for limited data comprised of testing for one house, and one monitoring round.

*Stage 3*

A comparison of the October 2002 and January 2004 groundwater concentrations measured at nearby locations west of 73 Bay Avenue indicate similar BTEX and MTBE concentrations. A comparison of the deep vapor results indicated the 2004 concentrations were both higher and lower than those measured in 2002, depending on the compound.

A comparison of groundwater measurements from opposite sides of the house indicated a lateral decrease in BTEX and MTBE concentrations from west to east that ranged from 60X to 3,750X for shallow groundwater samples, and 1.2X to 64X for deep samples. There was also a significant difference in the vapor concentrations, with high concentrations west of 73 Bay Avenue and background levels to the east.

The 2004 vapor attenuation factors were calculated using the west sampling probes ("minimum" alpha's) and average of the west and east sampling probes ("average" apha's):

- Groundwater-to-indoor air:
  - Cyclohexane: $8.3x10^{-6}$ (min); $1.7x10^{-5}$ (avg) (one half the detection limit was used for this calculation).
  - BTEX: less than $1.0x10^{-6}$ to $9.5x10^{-6}$ (min); $1.5x10^{-6}$ to $1.4x10^{-5}$ (avg).
- Soil vapor-to-indoor air:
  - Cyclohexane: $8.0x10^{-5}$ (min); $1.4x10^{-4}$ (avg)
  - 2,2,4-trimethylpentane: $3.4x10^{-4}$ (min); $6.7x10^{-4}$ (avg)
  - BTEX: less than $2.7x10^{-6}$ to $4.1x10^{-5}$ (min); $5.3x10^{-6}$ to $8.0x10^{-5}$ (avg).
- Subslab vapor-to-indoor air:
  - Cyclohexane: $3x10^{-2}$
  - 2,2,4-trimethylpentane: $4x10^{-2}$

The building ventilation test was successful and indicated that a $CO_2$ tracer test can be readily implemented to estimate building air change rates. While not expected to become a routine test for vapor intrusion studies, it could provide useful information when a more precise estimate of ventilation rate is required.

The deep vapor measurements are considered the most reliable data for evaluating vapor intrusion since they avoid the partitioning step from groundwater. The subslab vapor alpha's provided above may be biased high as a result of sampling issues, as described in the report. The 2004 soil vapor measurements west of 73 Bay Avenue were similar to those in 2002. In addition, the vapor alpha's using the west vapor probe data were similar for cyclohexane and 2,2,4-trimethylpentane indicating repeatable results were obtained for these compounds, even through the January 2004 monitoring was conducted under colder conditions (13 to 40$^{o}$F) compared to October 2002 (30 to 60$^{o}$F).

The groundwater and deep vapor measurements indicate significant lateral variability. The implication is that an evaluation of vapor intrusion potential and health risk could be quite different depending on where samples are obtained. The results indicate the importance of a sound conceptual site model (CSM) for spatial distribution of contamination. One measurement point beside a building may be reasonable if one is relatively certain that the maximum concentrations are determined; however, multiple data points are preferable to characterize concentration variability.

The 2004 light gas monitoring results are consistent with the 2002 results indicating significant BTEX vapor biodegradation within the unsaturated zone as a result of aerobic biodegradation, which reduces BTEX concentrations below the building to low levels.

### Site-Specific Modeling Assessment Using Johnson and Ettinger Model

A site-specific modeling assessment of soil vapor intrusion was conducted for the building located at 73 Bay Avenue using the USEPA spreadsheet version of the Johnson and Ettinger (J&E model). The purpose of the assessment was to calculate predicted vapor attenuation factors (alpha's) using input parameters based on site specific measurements and estimated values for the Stafford site, for comparison to measured alpha's and default USEPA semi-site specific alpha's (Question 5, USEPA Guidance).

There is little difference between the alpha's predicted by the J&E model and the semi-site specific Question 5 alpha's (less than factor of 2.3). The reason, in this case, was that there was little difference between the site-specific model inputs and US EPA Guidance default model assumptions. However, the J&E alpha's were about ½ to 1 order-of-magnitude greater than the measured average alpha's (for non-degrading tracers) based on January 2004 data. Although the model comparisons are limited in scope, they suggest for this site that the J&E model would result in slightly conservative predictions. This is consistent with findings presented by Hers et al. (2003).

## EGG HARBOR SITE

### General

The Egg Harbor site is located in Atlantic County in the Coastal Plain area of southern New Jersey. A dissolved chlorinated solvent plume in groundwater extends below a residential area in Egg Harbor. The source of the chlorinated solvents were releases from a former clothing and glass/mirror making facility. The neighborhood down gradient from the source consists of single family houses and townhouses. Soil borings indicate the presence of unconsolidated sand, silt and clay throughout the entire vadose zone. The depth to the water table in the study area was approximately 7 to 9 feet below ground surface.

**NJDEP Study**

NJDEP completed two investigations in 2003 at the Egg Harbor site to characterize the contamination source area and to delineate the dissolved plume in groundwater. In the residential area, the main focus of this program was to delineate the vertical and lateral distribution of chlorinated solvents in groundwater through use of the Geoprobe® system of sampling. Chemical analyses of groundwater indicated that the main contaminants of potential concern (COPCs) were tetrachloroethene (PCE) and trichloroethene (TCE). Below the residential area, the maximum measured concentrations of PCE and TCE in groundwater were 41,731 µg/L (45 to 48 feet) and 300 µg/L (18 to 20 feet).

Important findings of the NJDEP program were as follows:

- The presence of approximately 6 feet of shallow groundwater near to the water table surface with PCE concentrations that were near to or below the analytical reporting limit in the residential area;

- Significant vertical concentration variability suggesting a relatively complex layered geology which influences groundwater flow and chemical transport, and;

- Possible evidence for a freshwater wedge based on near water table concentrations that decreased with increasing distance from the contamination source.

**Golder Study**

A groundwater and soil vapor monitoring program was completed by Golder in December 2003 and January 2004 at the Egg Harbor site. The objective of the program was to determine the potential for cross-media transfer of volatiles (primarily PCE) from groundwater to soil vapor, and soil vapor intrusion into homes. The groundwater program consisted of Geoprobe® sampling of groundwater from multiple depths, installation of one monitoring well, collection and analysis of groundwater samples from multiple depths within this well, and monitoring of the depth to groundwater over a several week period. The soil vapor program consisted of installation of soil gas sampling implants near to the water table to obtain samples for characterization of deep soil vapor quality. Soil vapor samples were obtained using Summa canisters (USEPA Method TO-15).

The Golder study indicated the presence of near-surface interlayered coarse- and fine-grained soil up to 8 feet to 10 feet depth below ground surface underlain by sand and silty sand. The groundwater monitoring at three sites indicated that there was about 6 feet of groundwater (from about 8 to 14 feet bgs) near the water table surface with non-detect or low PCE concentrations (less than 1.2 mg/L). The maximum measured PCE concentration (2,600 μg/L) was in groundwater from 18 to 20 feet bgs. All PCE concentrations obtained from the monitoring well were below the analytical reporting limit. The PCE concentrations in soil vapor near the water table were low (non-detect to 2.5 ppbV) confirming low vapor source strength.

### Discussion and Conclusions

The December 2003/January 2004 groundwater concentration trends were similar to those measured by NJDEP earlier in 2003, and suggest there is a layer of non-contaminated groundwater (i.e., fresh-water wedge) that increases in thickness with increasing distance down-gradient from the contamination source.

As was discussed for Stafford, the Egg Harbor case study highlights the importance of a sound CSM and site characterization when evaluating the potential for soil vapor intrusion since significantly different interpretations will result depending on the input groundwater concentrations. This is illustrated through reference to the USEPA Vapor Intrusion Guidance. A groundwater screening level of 11 μg/L is obtained for the Egg Harbor site using the USEPA Guidance, based on a semi-site specific alpha of $1x10^{-4}$ and a target incremental lifetime cancer risk of $1x10^{-6}$ (Table 3 in Guidance). The measured PCE concentrations in shallow groundwater were less than this screening value, whereas, in deeper groundwater below 15 feet bgs, they were several orders-of-magnitude greater. It would have been interesting to have a thinner wedge of groundwater with low groundwater concentrations (e.g., 2 to 4 feet). In this case, there would have been significant implications for site characterization methodology and interpretation of results. For example, the PCE concentrations in a well with a 10 foot long screen may have shown elevated concentrations compared to a shorter screen positioned higher in the groundwater column.

Although it appears that the potential for soil vapor intrusion into houses from the Egg Harbor chlorinated solvent plume is low, the results for this site highlight the importance of characterization of hydrological conditions, hydrostratigraphic units and vertical groundwater concentration profiles.

## ACKNOWLEDGEMENTS

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## 1.0 INTRODUCTION

Golder Associates Inc. (Golder Associates) is pleased to provide the New Jersey Department of Environmental Protection (NJDEP) with this "Year One" report documenting the results of the site investigation programs at the Stafford Township and Egg Harbor, Atlantic County sites in New Jersey, conducted as part of the NJDEP-Golder research study on "*Investigation of Indoor Air Quality in Structures Located Above VOC-Contaminated Groundwater*".

The purpose of the Year One program was to evaluate the potential for soil vapor intrusion into buildings at sites underlain by groundwater impacted with petroleum hydrocarbons (Stafford Township) and chlorinated solvents (Egg Harbor). Evaluations were made using field measurements, comparison to existing guidance, and site-specific mathematical modeling of vapor intrusion. An important objective of this study was to obtain supporting information that would assist NJDEP in developing guidance on soil vapor intrusion relevant to conditions in New Jersey.

This report provides a comprehensive description of the field testing programs conducted at both sites between 2002 and 2004, and presents information previously documented in three separate reports (Golder 2003, Golder 2005a, Golder 2005b). This report is separated into two main parts presenting the results for the Stafford site (Part I: Sections 2 to 5) and Egg Harbor (Part II: Section 6). Since the field investigation at the Stafford site was conducted in three distinct phases with different objectives for each phase, the complete results for each phase are presented as separate sections of the report. The Phase 1 results are presented in Section 2.0, the Phase 2 results in Section 3.0 and Phase 3 results in Section 4.0. A technical paper summarizing the Phase 1 and 2 study results for the Stafford site is attached in Appendix IX of this report. Laboratory chemistry reports are not included as part of this document, having been previously provided to NJDEP as part of the above-referenced reports.

The "Year Two" research program is in-progress, and currently is comprised of additional field-based research at one new site where there is the potential for vapor intrusion into buildings, and mathematical modeling of vapor intrusion.

# PART I: STAFFORD SITE

## 2.0 STAFFORD STAGE ONE PROGRAM

### 2.1 Stage One Objectives

The objectives of the Stage One program were to:

1. Obtain information on groundwater flow direction and hydraulic gradient.

2. Delineate the dissolved BTEX and MTBE concentrations in shallow groundwater downgradient from the source. Obtain information on both the lateral and vertical distribution of dissolved chemicals in groundwater.

3. Characterize soil vapor samples directly above the tension-saturated zone (capillary fringe).

4. Obtain information that would enable evaluation of whether groundwater and deep soil vapor concentrations are sufficiently elevated to represent a significant source for intrusion of vapors into buildings.

### 2.2 Stage One Methods

The Stage One program scope was as follows:

- Soil sampling and analysis (two samples);
- Groundwater sampling and analysis (fourteen samples at seven locations), and;
- Soil vapor sampling and analysis (seven samples at seven locations).

The field program was conducted by NJDEP in September 2002. Golder Associates provided input on field methods and sampling locations, and coordinated the collection of soil vapor samples using Summa canisters.

#### 2.2.1 Soil Sampling and Analysis

At seven sampling locations (Figures 2-1 and 2-2), a 1.5-inch diameter soil core was obtained using a "Geoprobe" sampler. Two soil samples were collected using the EnCore™ method (www.ennovativetech.com), and submitted for BTEX and MTBE analysis (USEPA Method 8260B) by STL Laboratories in Edison, NJ.

#### 2.2.2 Groundwater Sampling and Analysis

Groundwater samples were obtained on September 9 to 12, 2002 from seven temporary groundwater probes installed using a Geoprobe sampling system (Figures 2-1 and 2-2). The groundwater sampling and analysis program followed the same methods used by NJDEP on other similar projects.

The groundwater sampling system consisted of 1 ¾ inch ID steel rods (manufactured by Maverick), ⅞ inch PVC slotted screen (manufactured by Geoscreen), which was protected by a steel sleeve. When the desired depth was reached, the sleeve was withdrawn to expose the 41-inch long screen. The Geoprobe was advanced until the top of the screen approximately coincided with the water table. At each location, a groundwater sample was obtained from 0 to 2 ft below the water table, and from 2 to 4 feet below the water table.

A peristaltic pump was used to purge water from the probe. Groundwater samples were collected manually using a Waterra check valve and tubing. The intake point of the Teflon tubing used for groundwater sampling was set near the middle of the screen. The purging and groundwater sampling rate was approximately 450 ml/minute. During purging, the pH, conductivity, turbidity, dissolved oxygen (DO) and oxidation-reduction potential (ORP) were measured using a Horiba U-22 field meter. Groundwater samples were analyzed for BTEX and MTBE using a mobile laboratory supplied by NJDEP. The analytical method was similar to USEPA Method 524.

#### 2.2.3 Soil Vapor Sampling and Analysis

Soil vapor samples were obtained on September 9-12, 2002 from seven temporary hollow steel probes installed within 3 feet of the borehole locations (Figures 2-1 and 2-2). Soil vapor samples were obtained within 1.5 ft of the water table. The soil vapor sampling and analysis program followed the same methods used by NJDEP on other similar projects.

The soil vapor probes were approximately ½ inch diameter ID hollow steel rods with detachable tip. Prior to installation the rods were thoroughly cleaned using a high pressure, hot-water wash. After cleaning, the outside of rod joints were sealed with Teflon tape. The soil vapor probe was pushed to the desired depth, the tip was detached, and the rods were pulled back 4 to 6 inches. The ground surface around the soil vapor probe was sealed using bentonite. A barbed fitting was connected to the rods, which in turn connected to flexible medical-grade sylastic tubing. The flexible tubing was connected to an air-sampling pump.

The probe was purged of two standing air volumes at a rate of 100 to 200 ml/min. Immediately after completion of purging, a soil vapor sample was obtained using a 250 µl to 500 µl syringe that was inserted through tubing that was bent over at the top of the probe. The syringe sample was analyzed in the field for BTEX and MTBE using a Photovac 1050 Gas Chromatograph (GC)/Photoionization Detector (PID).

After syringe sampling, a second sample was obtained for laboratory analysis for volatile organic compounds (VOCs). This sampling was coordinated by Golder. A six-litre Summa canister was connected to the probe and filled over a one-hour period, which corresponds to a flow rate of 100 ml/min. Teflon-lined tubing was used to connect the probe to the Tedlar bag. Summa samples were analyzed by ATL Laboratories (Folsom, California) for VOCs by USEPA Method TO-15 (GC/Mass Spectroscopy (MS)).

After obtaining a canister sample, a soil gas sample was collected for field light gas testing at each probe, as follows. A one-litre Tedlar bag was connected to the probe and filled at a rate of 100 ml/min. Teflon-lined tubing was used to connect the probe to the Tedlar bag. The light gas concentrations were measured using a Landtec GEM-2000.

## 2.3 Stage One Results

### 2.3.1 Soil Sampling and Analysis

The BTEX concentrations in the soil sample from BH-2 (9 to 9.5 ft depth) were below the analytical reporting limit of between 0.0015 mg/kg and 0.0074 mg/kg, while the MTBE concentration was 0.2 mg/kg (Table 2-1). The benzene and total xylene concentrations in the soil sample from BH-3 (11.5 to 12 ft depth) were 0.68 mg/kg and 0.52 mg/kg, respectively, while the MTBE concentration was 63 mg/kg.

The BTEX concentrations in groundwater at Borehole BH-2 were highly elevated suggesting the presence of a residual NAPL zone at the water table. Concentrations in the soil sample tested from BH-2 were low since the sample was likely collected above the residual NAPL zone.

### 2.3.2 Groundwater Sampling and Analysis

Groundwater samples were collected from seven locations (Table 2-2). The highest concentrations were measured at BH-2 where the total BTEX and MTBE concentrations were 68 mg/L and 520 mg/L, respectively. The next highest concentrations were measured a short distance down-gradient at BH-3 (total BTEX and MTBE equal to 9.4 mg/L and 238 mg/L, respectively). The BTEX and MTBE concentrations decreased sharply at the monitoring wells located further down-gradient (BH-5 and BH-6).

The hydrocarbon concentrations at BH-6 were higher than at BH-5. This was expected since BH-6 is closer to the hydrocarbon source than BH-5. Also noted for BH-6 was that the hydrocarbon concentrations in the deeper groundwater sample (2 to 4 feet below water table) were about one order-of-magnitude higher than the concentrations in the shallow sample (0 to 2 feet below water table).

The hydrocarbon concentrations at wells BH-1, BH-4 and BH-7, inferred to be cross-gradient to the plume based on inferred groundwater flow direction, were low and near to, or below, the analytical laboratory reporting limits.

The dissolved oxygen (DO) concentrations were non-detect at all locations except BH-7 where the DO concentration was 0.79 mg/L. Non-detect DO concentrations were expected at wells within the plume. At wells that are cross-gradient to the plume (BH-1, BH-4, BH-7) detectable DO concentrations were expected since hydrocarbon concentrations were low. However, it is possible that the zone of oxygen depletion extends somewhat further laterally than the zone of hydrocarbon-contaminated groundwater. The ORP results indicated reducing conditions at wells within the plume, as expected.

### 2.3.3 Soil Vapor Sampling and Analysis

Highly elevated hydrocarbon and MTBE concentrations were obtained at BH-2 (several hundred thousand to million $\mu g/m^3$). The compound with the highest concentration was iso-pentane (15,000,000 $\mu g/m^3$). At BH-6, moderate BTEX concentrations were measured (toluene was highest at 1,400 $\mu g/m^3$). Low $ug/m^3$ concentrations were measured at the remaining locations.

The Summa canister concentrations were higher than the syringe concentrations (between 2 and 16 times). The difference in concentrations between the two methods was relatively consistent. The reason for the shift in concentrations is not known. The syringe sampling and field GC/PID analysis is a screening method that is probably less reliable than the Summa analysis, which involves a larger volume sample, GC/MS analysis and a fixed laboratory.

The hydrocarbon vapor concentrations at BH-5 were higher than at BH-6 (i.e., in contrast to the trend observed in groundwater). This was unexpected since borehole BH-5 is located further down-gradient than BH-6.

The light gas results indicate that the oxygen concentrations ranged between 9.8 and 21.4 percent at soil gas samples obtained from directly above the water table. The oxygen concentration in the gas sample at BH-2 was 16.1 percent. The oxygen concentration at BH-2 was higher than expected since the consumption of oxygen through biodegradation near the NAPL zone would be expected.

### 2.4 Stage One Data Analysis

As part of Stage One, preliminary analysis of data was conducted, as described below:

1. **Groundwater Flow Direction and Hydraulic Gradient**: These parameters could not be determined based on information collected. The inferred groundwater flow direction is toward the southwest based on surface topography (Figure 2-2).

2. **NAPL Extent**: Based on chemistry results and visual indications of hydrocarbon contamination (staining of instruments and well), residual NAPL is likely present at or near borehole BH-2.

3. **Dissolved Plume Extent**: The dissolved hydrocarbon plume extends southwest from BH-2. The dissolved concentrations at BH-3, located approximately 150 feet from BH-2, are almost as high as those measured at BH-2. There is a significant decline in concentrations at BH-5 and BH-6. Borehole BH-5 is located approximately 260 feet from BH-2. The dissolved plume appears to be relatively narrow in that hydrocarbon concentrations at wells located east of Park Avenue were near to, or below, the analytical reporting limit.

4. **Comparison Predicted Soil Vapor based on Groundwater to Measured Soil Vapor**: When comparing predicted deep soil vapor concentrations to measured concentrations, it is important that these comparisons are based on an appropriate conceptual site model and partitioning model. When there is NAPL present above the water table, as is likely the case at BH-2, a NAPL to vapor partitioning model should be used. In the absence of NAPL, the Henry's Law Constant can be used to predict the soil vapor concentration; however, the measured concentrations will always be lower than predicted as a result of concentration attenuation through the capillary transition zone. In addition, lower measured than predicted concentrations are expected due to non-equilibrium conditions for partitioning.

   In areas with dissolved contamination, the ratio between measured and predicted values obtained using the Henry's Law Constant ranged between $1.5 \times 10^{-4}$ and $5.0 \times 10^{-2}$ for the BTEX compounds and MTBE (BH-6, Table 2-3). At BH-2, the ratio between measured and predicted values ranged between 0.1 and 0.55 for the BTEX compounds and MTBE. The better agreement between measured and predicted concentrations at BH-2 may be due to the presence of NAPL at this location that provides a consistent source concentration.

   It is not possible to quantitatively use a NAPL to vapor partitioning model since the mole fraction is not known for individual chemicals. Nevertheless, an approximate calculation is provided for benzene to provide insight on possible partitioning. It is assumed that the mole fraction of benzene in the NAPL mixture is one percent. This is a reasonable estimate based on the composition of gasoline. The benzene solubility multiplied by the mole fraction provides an estimate of the local equilibrium aqueous benzene concentration based on partitioning from NAPL. The predicted aqueous benzene concentration is 17.5 mg/L. The measured benzene concentration at BH-2 was 12.3 mg/L. Using a NAPL to vapor partitioning model and mole fraction of one percent, the predicted equilibrium vapor concentration is about $4.0 \times 10^6$ μg/m3. The measured vapor concentration was $2.8 \times 10^6$. The calculations for BH-2 suggest near equilibrium conditions.

5. **Potential for Significant Indoor Air Concentrations from Vapor Intrusion**: A preliminary evaluation of the potential for significant vapor-derived indoor air concentrations was conducted using the measured deep soil vapor concentration. Indoor air concentrations were estimated using the measured soil vapor concentrations and an empirical vapor attenuation factor (alpha) of 0.001 (dilution factor of 1,000) (Table 2-4). An alpha value of 0.001 is considered to be conservative (high). The results suggest that elevated indoor air concentrations could be measured at the house located near BH-2 (73 East Bay Avenue, henceforth referred to as 73 Bay Avenue). However, vapor-derived indoor concentrations at other locations were estimated at below background VOC levels. There is some uncertainty in this prediction for BH-3 because relatively high concentrations were measured in groundwater suggesting the potential for vapor intrusion. However, relatively low concentrations were measured in the soil vapor sample obtained directly above the water table at this location.

The implication of the above analysis is that there may only be significant (measurable) vapor intrusion at one building at the Stafford site (73 Bay Avenue).

## 3.0 STAFFORD STAGE TWO PROGRAM

### 3.1 Stage Two Objectives

The objectives of the Stage Two work program were to:

1. Evaluate whether significant vapor intrusion into homes is occurring.

2. Obtain information (soil vapor, indoor air) that would be enable comparisons to screening model predictions.

3. Obtain additional information on deep soil vapor concentrations near the water table to assess cross-media transfer between groundwater and deep soil vapor.

4. Obtain information on vertical hydrocarbon and light gas concentration profiles to enable evaluation of biodegradation.

5. At selected homes, collect comprehensive data on soil vapor concentration profiles adjacent to homes, below homes, and indoor air quality ("*vapor pathway analysis*"). This information is needed to more rigorously evaluate the potential for vapor intrusion.

6. Collect ancillary information on house construction, house conditions at the time of sampling (e.g., depressurization), and weather information. This information will enable evaluation of factors that could be affecting vapor intrusion, and assessment of the significance of background sources of VOCs.

## 3.2 Stage Two Methods

The Stage Two program scope was as follows:

- Pre-sampling house survey;
- Soil sampling and analysis (two samples);
- Soil vapor sampling and analysis (nine samples);
- Subslab vapor sampling and analysis (four samples);
- Crawlspace sampling and analysis (one sample);
- Indoor air sampling and analyses (nine samples plus two field duplicates);
- Outdoor air sampling and analysis (two samples);
- Monitoring of differential pressure between house and outdoor air (three houses); and
- Obtaining weather data.

### 3.2.1 Pre Sampling House Survey

A house reconnaissance was conducted by a NJDEP and a Golder representative two to five days before the collection of indoor air samples using the survey form developed by NJDEP. The purpose of the pre-sampling house survey was as follows:

1. Obtain permission for indoor air and subslab vapor sampling from owner;
2. Inspect home for the storage and use of petroleum products, solvents and other chemicals; and,
3. Inspect home for foundation conditions including foundation type, drains, cracks, and other openings.

Photographs of the inside and outside of the house were taken.

### 3.2.2 Soil Sampling and Analysis

Soil samples were collected using a Geoprobe sampler. Soil cores (1.5 inch diameter) were obtained in 24-inch lengths to minimize the effect of core compression and moisture re-distribution within the sample.

Two soil samples were collected on October 28, 2003 using the EnCore™ method and analyzed for VOCs (EPA Method 8260B) and MTBE. Soil samples were analyzed by STL Laboratories (Edison, NJ).

The samples were obtained from:

- Borehole VP-9 10.8 to 11.2 ft
- Borehole VP-13 10.3 to 10.7 ft

Several samples per borehole were screened for volatile hydrocarbon contamination using a dry headspace vapor test conducted in the field using a photoionization detector (PID). The test method involved placing about 100 ml of soil in a clean 250-ml jar. The jar was covered with aluminum foil and briefly shaken. After 3 to 5 minutes the peak headspace vapor reading was taken by puncturing the foil with the PID tip.

The samples selected for VOC analyses were obtained from the contaminated soil zone inferred to have highest hydrocarbon concentrations. Additional soil samples were collected and placed in plastic sample bags. The soil samples were sent to the Golder Cherry Hill laboratory for possible geotechnical analysis.

Soil samples collected during Stage One from borehole BH-2 were tested for organic matter by loss on ignition (LOI) (four samples) and six-point water retention (two samples) by Soilcon Laboratories of Richmond, BC. The water retention testing was conducted on compacted soil samples place within standard proctor test moulds.

### 3.2.3 Groundwater Sampling and Analysis

Groundwater samples were obtained on October 28, 2002 from five locations using a Geoprobe sampler. The Geoprobe groundwater sampling system consisted of a ¾ inch PVC slotted screen, protected by a steel sleeve. When the desired depth was reached, the sleeve was withdrawn to expose the 41-inch long screen. The Geoprobe was advanced until the top of the screen approximately coincided with the water table.

A peristaltic pump was used to purge water from the well. Groundwater samples were collected manually using a Waterra check valve and tubing. The intake point of the Teflon tubing using for groundwater sampling was set near the middle of the screen. The purging and groundwater sampling rate was approximately 450 ml/minute. During purging, the pH, conductivity, turbidity, dissolved oxygen and oxidation-reduction potential were measured using a Horiba U-22 field meter. After the above field parameters had stabilized, groundwater samples were collected in laboratory-supplied glass vials and bottles, and placed in a chilled cooler.

Groundwater samples were analyzed by STL Laboratories (Edison, NJ) for VOCs by USEPA Method 8260B.

### 3.2.4 Soil Vapor Sampling and Analysis

Geoprobe soil vapor sampling implants (Model AT86) were installed on October 28, 2002. At two locations (VP-9S, 9M, 9D and VP-10S, 10M, 10D), a cluster of three nearby boreholes (within 1 m area) were drilled to facilitate the installation of a deep, mid and shallow soil vapor implant. At three additional locations (VP-11, VP-12 and VP-13), just a deep soil vapor implant was installed above the water table.

The Geoprobe implants were inserted down the bore of the hollow Geoprobe rods once the desired depth had been reached. The implant was rotated to attach it to the anchor point used during driving of the Geoprobe rods. The Geoprobe rods were then removed from the hole leaving the implant and drive point in place. The annulus surrounding the implant was backfilled with clean silica sand. The remainder of the borehole was backfilled with bentonite chips.

The Geoprobe Model AT86 implants are 6 inches long and approximately ½ inch in diameter and have a pore diameter of 0.0057 inch (0.145 mm). High density polyethylene (3/8 inch diameter) tubing extends from the implant to ground surface. The tubing at ground surface was clamped. The end of the tubing was covered by a four inch diameter PVC screw cap and short piece of pipe that was driven into the ground over top of the tubing. The cap was buried just below ground surface using sod. The implant location was surveyed.

Soil gas samples were collected for VOC analyses on October 28, 2002. Soil gas samples were collected for field light gas analyses on October 29, 2002, and November 5, 11 and 22, 2002. Each probe was purged prior to sampling by removing 1.5 probe volumes at a rate of 100 ml/min using a Gillian GilAir sampling pump with low-flow module. Prior to purging, the volume of the soil gas probe (implant and tubing) was estimated.

Samples collected for VOC analyses were obtained as follows. A six-litre Summa canister was connected to the probe and filled over a one-hour period, which corresponds to a flow rate of 100 ml/min. Teflon-lined tubing was used to connect the probe to the Tedlar bag. Summa samples were analyzed by STL Laboratories (Burlington, Vermont) for VOCs by USEPA Method TO-15.

Samples collected for field light gas analyses were obtained as follows. A one-litre Tedlar bag was connected to the probe and filled at a rate of 100 ml/min. Teflon-lined tubing was used to connect the probe to the Tedlar bag. The light gas concentrations were measured using a VRAE Model L-R070406. This instrument measures carbon monoxide, % lower explosive limit (LEL) calibrated to methane (5 percent in air), hydrogen sulfide and oxygen.

The soil vapor sampling was scheduled such that no sampling was performed during and within 12 hours of heavy rainfall.

### 3.2.5 Subslab Vapor Sampling and Analysis

Subslab vapor probes were installed below four buildings on the following dates:

| | |
|---|---|
| 63 Bay Avenue: | November 4, 2002 |
| 73 Bay Avenue: | October 23, 2002 |
| 14 Park Street: | October 29, 2002 |
| 18 Park Street: | October 23, 2002 |

The subslab probe was installed near the center of the house. An approximate 3/8 inch diameter hole was drilled through the concrete floor slab using an electric drill. A short length of 3/8 inch diameter Teflon tubing was then inserted to the base of the concrete. The outside of the tubing was wrapped with Teflon tape to create a snug fit when the tubing was twisted into the hole.

Samples were collected over an approximate 24-hour period (over same time period as indoor air samples) using Summa canisters and were analyzed by STL Laboratories (Burlington, Vermont) for VOCs by USEPA Method TO-15.

### 3.2.6 Indoor Air Sampling and Analysis

Indoor air samples were collected from five buildings on the following dates:

| | |
|---|---|
| 73 Bay Avenue: | October 23, 2002 (basement and first floor) |
| 18 Park Street: | October 23, 2002 (basement and first floor) |
| 22 Park Street: | October 23, 2002 (crawlspace and first floor) |
| 14 Park Street: | October 29, 2002 (basement and first floor) |
| 63 Bay Avenue: | November 4, 2002 (ground floor, building is slab-on-grade) |

Samples were collected over an approximate 24-hour period using Summa canisters and were analyzed by STL Laboratories (Burlington, Vermont) for VOCs by USEPA Method TO-15. The samples were collected about 18 inches above ground surface.

At 73 Bay Avenue and 14 Park Street, duplicate Summa canister samples were collected. The duplicates were collected approximately 2 feet from each other. The duplicates were submitted "blind" to the laboratory.

### 3.2.7 House Conditions during Sampling

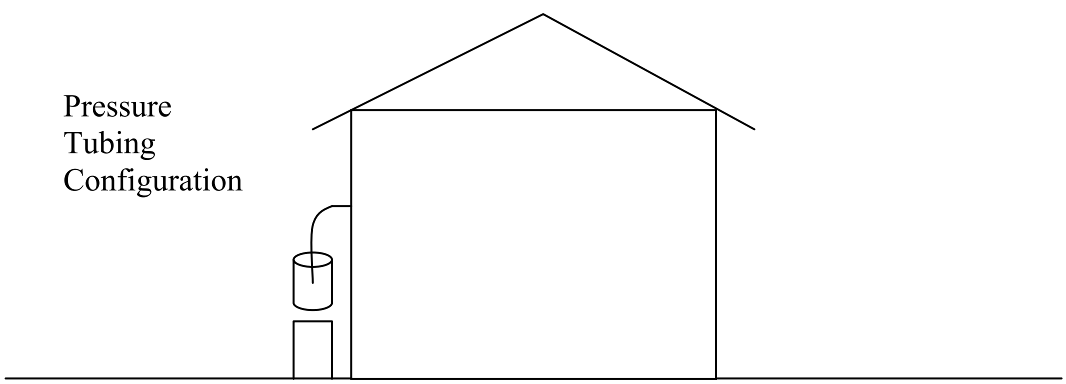
General house conditions during sampling were noted. This included notation of whether the house was occupied and a qualitative indication of the degree to which windows and doors were open.

The differential pressure between indoor and outdoor air was measured in three homes using an Engineering Solutions Model Omniguard III Differential Pressure Sensor:

| | |
|---|---|
| 73 Bay Avenue: | October 23, 2002 |
| 22 Park Street: | October 23, 2002 |
| 14 Park Street: | October 29, 2002 |

The Omniguard differential pressure transducer has data logging capabilities and can measure differential pressure to 0.5 Pascal. One port of the differential pressure transducer was connected to ¼ inch diameter rigid polyethylene tubing that was threaded outside through a small crack in an almost closed window. The tubing end was situated about 2 feet above ground and about one foot away from the house wall. Since wind can effect pressure readings, the end of the tubing was shielded using an approximate 2-foot long 4 inch diameter PVC pipe (open at both ends), as shown below.

Pressure Tubing Configuration



### 3.2.8 Outdoor Air Monitoring

Two outdoor air samples were collected using Summa canisters. The first sample was obtained over a 24-hour period from the back porch at 22 Park Avenue starting on October 22, 2002. The second sample was obtained over a 24-hour period from about 1 m northwest of the house at 73 Bay Avenue starting on November 14, 2002. The samples were collected about 18 inches above ground surface. The above house locations are shown on Figure 3-1.

Samples were analyzed by STL Laboratories (Burlington, Vermont) for VOCs by USEPA Method TO-15.

#### 3.2.9 Weather Data

Weather data (temperature, barometric pressure, wind speed, wind direction and qualitative description of precipitation) for the Atlantic City weather station was obtained on a hourly basis (with a few exceptions) between October 20 and November 5, 2002. The Atlantic City weather station is located approximately 24 miles south of the Stafford site. The Atlantic City weather station is located approximately 10 miles inland from the ocean while the Stafford site is located approximately 6 miles inland from the ocean. The U.S. Department of Energy National Renewable Energy Laboratory (NREL) wind speed map suggests that the Stafford and Atlantic City sites are in the same wind speed regime.

### 3.3 Stage Two Results

#### 3.3.1 Pre Sampling House Survey

The results of the pre-sampling house survey are attached as Appendix I. House properties and chemical storage and use is summarized in Table 3-1. The key findings of the survey are summarized below:

**Address:** 63 Bay Avenue

**Use:** Bike Shop

**Construction:** Slab at grade

**Foundation Base:** Concrete slab

**Chemical Storage and Use:** Use of various chemicals associated with repair and maintenance of bicycles (e.g., oil, kerosene to clean parts)

**Address:** 73 Bay Avenue

**Use:** Antique shop

**Construction:** Approximately 50 % basement and 50 % crawlspace

**Foundation Base:** Concrete slab (except approximately 2 ft by 2 ft hole in floor); crawlspace about 3 ft high (partial plastic cover on soil), crawlspace open to basement

**Foundation Walls:** Concrete block

**Chemical Storage and Use:** Oil tank in basement, some paints and thinners stored in basement.

**Address:** 14 Park Avenue

**Use:** Residence

**Construction:** Basement

**Foundation Base:** Concrete slab (partially covered with carpet), no significant cracking, openings or drains observed in concrete floor slab

**Foundation Walls:** Concrete block

**Chemical Storage and Use:** Some paints, thinners and cleaning solvents stored basement.

**Address:** 18 Park Avenue

**Use:** Residence

**Construction:** Approximately 80 % basement and 20 % crawlspace

**Foundation Base:** Concrete slab (painted), no significant cracking, openings or drains observed in concrete floor slab; unlined crawlspace about 3 ft high, crawlspace open to basement

**Foundation Walls:** Concrete block

**Chemical Storage and Use:** Some paints and thinners stored first floor, recently painted first floor.

**Address:** 22 Park Avenue

Use**:** **Residence**

**Construction:** Crawlspace under the entire house

**Foundation Base:** Wood floor; unlined crawlspace about 4 ft high, several vents to outside in crawlspace, no significant openings observed in floor between crawlspace and first floor

**Foundation Walls:** Concrete block

**Chemical Storage and Use:** Some paints, thinners and cleaning solvents stored first floor, some hobbies which involve use of glues and paints conducted on second floor.

Photographs of the inside and outside of the houses are provided in Appendix II.

### 3.3.2 Soil Sampling and Analysis

The results of the field headspace vapor tests on soils are presented in Table 3-2 and Figure 3-2. The headspace vapor tests can not be directly related to hydrocarbon concentrations in soil, but provide a relative indication of hydrocarbon concentrations. Elevated headspace vapor concentrations were measured at borehole locations VP-9, VP-10 and VP-13. The highest concentrations were obtained at VP-9. Of note is that relatively high headspace concentrations were measured at VP-9 between about 9 and 12 feet depth. At VP-10 and VP-13, the highest headspace concentrations were between 11 and 12 feet depth. Based on the approximate depth to the water table (see below), the headspace test results suggest that there is a residual non-aqueous phase liquid (NAPL) smear zone that extends 2 feet above the water table at VP-9, based on the water table level on October 28, 2002. However, at VP-10 and VP-13, the residual NAPL smear zone appears to be limited to just above and below the water table based on headspace test results.

The VOC analysis results for soil samples are presented in Table 3-3. The individual BTEX concentrations at VP-9 (10.8 to 11.2 ft) were between 6.4 mg/kg and 360 mg/kg and are indicative of residual NAPL. The MTBE concentration at VP-9 was 18 mg/kg. Several other VOCs, including cyclohexane and methylcyclohexane, were also present in the sample from VP-9. The VOC concentrations in soil at VP-13 (10.3 to 10.7 ft) were significantly lower than at VP-9.

As part of the Stage One program, soil samples were collected from borehole BH-2 for organic matter content analyses (four samples) and six-point water retention (two samples). The measured total organic matter content was divided by a factor of two to obtain the estimated fraction organic carbon (foc) content. The results are provided in Appendix III and are summarized below:

> **foc**: Ranged between 0.0004 and 0.0068 (i.e., 0.04 to 0.68 percent), and decreased with increasing depth.
>
> **Total porosity**: Ranged between 0.351 and 0.405.
>
> **Water-Filled porosity at field capacity (33 J/kg)**: Ranged between 0.043 and 0.047 (water filled porosity is volume water divided volume soil).
>
> **Water-filled porosity at residual water saturation (1500 J/kg)**: Ranged between 0.005 and 0.017.

The results indicate low fraction organic carbon, and low moisture-holding capacity for soil. The implication of these results is that relatively high mobility for VOC vapors would be expected, in the absence of biodegradation.

### 3.3.3 Groundwater Sampling and Analysis

Groundwater samples were collected from five locations from just below the water table. The approximate depth to the water table and screened sampling interval is given below:

| Location | Depth to Water Table | Screened Interval |
|---|---|---|
| VP-9 | 11.5 ft | 11.5-15 ft |
| VP-10 | 10.5 ft | 10.5-14 ft |
| VP-11 | 10.5 ft | 10.5-15 ft |
| VP-12 | 10.5 ft | 10.5-13 ft |
| VP-13 | 10.5 ft | 10.5-15 ft |

The results of groundwater field testing is provided in Table 3-4. The results indicate slightly acidic groundwater. Low dissolved oxygen concentrations (less than 1 mg/L), indicative of anaerobic conditions, were measured in groundwater samples from sampling points within or near to the residual NAPL zone (VP-10 and VP-13).

Field observations indicated that the bailer used to collect groundwater samples was coated with hydrocarbon product upon removal from sampling points VP-9 and VP-13, suggesting the presence of a thin product layer within these wells (see photograph showing brown NAPL staining of the well screen in Appendix II).

The groundwater chemistry results are provided in Table 3-5. The maximum total BTEX concentration (82.5 mg/L) was measured at VP-9, located northwest of 73 Bay Avenue. The BTEX and MTBE groundwater results for September and October 2002 are provided in Figures 3-3 to 3-6. During September a slightly lower total BTEX concentration (68 mg/L) was measured at BH-2, which was located within 1 m of VP-9. Of note is that the BTEX concentrations decreased two orders of magnitude between VP-10 and VP-11, which are located relatively close to each other on the north and south side of 14 Park Avenue, respectively.

The maximum MTBE concentration was also measured at VP-9 (590 mg/L). The extent of the MTBE plume was similar to that observed for BTEX, based on the available data.

The BTEX concentrations in groundwater measured at VP-9 were slightly higher (up to about 2X) than those expected based on solubility limits using a co-solubility model and expected mole fractions for a gasoline source. This may have resulted from small globules of product in the sample, although none were observed during sampling. Possible elevated BTEX concentrations in groundwater due to product would bias vapor attenuation factors downward; however, the magnitude of a possible bias (up to 2X based on solubility limits), is considered low relative to other sources of uncertainty for soil vapor intrusion. In addition, as discussed in subsequent sections of this report, the focus of the attenuation factor analysis were less degradable chemicals with significant indoor air concentrations (e.g., cyclohexane, 2,2,4-trimethylpentane) and not BTEX; therefore, the above groundwater sampling issues are not addressed as part of the discussion on attenuation factors.

### 3.3.4 Soil Vapor Sampling and Analysis

The light gas concentrations are presented in 3-6. Low oxygen concentrations and high % LEL values were measured in deep soil gas at VP-9D and VP-13. These probes are in areas of residual NAPL and elevated hydrocarbon concentrations in groundwater; therefore low oxygen concentrations were expected. The oxygen concentrations increased with decreasing depth at VP-9M (0.4 to 1.6 %) and VP-9S (7.4 to 10.2 %). Oxygen readings were not taken for the subslab gas samples.

An elevated oxygen concentration (19.9 %) was measured at VP-10D, which was unexpected based on the likely biogeochemical conditions near the leading edge of the hydrocarbon plume. Since hydrocarbon concentrations were relatively high, a low oxygen concentration at VP-10D was expected. It is possible that the elevated oxygen could have resulted from dilution by ambient air caused by the difficulty in drawing a soil gas sample due to elevated soil moisture content near the water table, although reasonable pre-cautions (low flow sampling, tight fittings) were taken to prevent this from occurring. The oxygen levels at VP-10M and VP-10S were near atmospheric levels, as expected. Further downgradient, the oxygen levels at VP-11 and VP-12 were also near atmospheric levels, which is consistent with low hydrocarbon concentrations measured in groundwater at these locations.

The VOC concentrations in soil vapor samples are provided in Table 3-7. A list of all Summa samples collected at the site is provided in Table 3-8. A conversion factor table ($\mu g/m^3$ to ppbV) is provided in Table 3-9. The results reflect the same trends observed for the oxygen test data. In inferred NAPL source zones (VP-9 and VP-13), the soil vapor concentrations were high (several hundred thousand ppbV). At probe cluster VP-9, the mid-depth VOC vapor concentrations at VP-9M were only slightly lower than those measured in the deep probe (VP-9D); however, the VOC vapor concentrations in the shallow probe, and below the house at 73 Bay Avenue were much lower.

### 3.3.5 Subslab Vapor Sampling and Analysis

The results of subslab vapor analyses are presented in Table 3-10. The MTBE, cyclohexane, and 2,2,4-trimethylpentane concentrations were elevated in subslab vapor below 73 Bay Avenue (ppmV range). Numerous alkane hydrocarbon compounds were also detected at elevated levels at this location. However, individual BTEX concentrations in 73 Bay subslab vapor were below the reporting limit (300 ppbV). The reporting limits for BTEX were raised (diluted sample) since other VOC concentrations were high.

The subslab VOC vapor concentrations at other houses were much lower and were similar to or only slightly higher than the VOC concentrations measured indoors. Subslab vapor concentrations are discussed in greater detail in the analysis section of this report.

### 3.3.6 Indoor Air Sampling and Analysis

The results of the indoor air analyses are presented in Table 3-10. The MTBE, cyclohexane, and 2,2,4-trimethylpentane concentrations were elevated at 73 Bay Avenue, relative to concentrations measured in other homes, and ranged between 14 ppbV and 150 ppbV for these three compounds. Numerous alkane hydrocarbons were also measured in indoor air at 73 Bay Avenue.

The individual BTEX concentrations in indoor air at 73 Bay Avenue ranged between <0.5 ppbV and 12 ppbV (toluene). The BTEX concentrations at other homes were marginally lower and ranged between <0.5 ppbV and 8.7 ppbV (toluene), measured at 18 Park Avenue.

Methylene chloride and dichlorodifluoromethane were also detected in indoor air in several homes. For example, the methylene chloride concentration was 29 ppbV at 73 Bay Avenue (first floor sample). Based on groundwater and soil sampling, the source of these chlorinated solvents is not believed to be subsurface contamination.

The quality assurance/quality control (QA/QC) testing included analyses of two field duplicate samples. The relative percent difference (RPD) between duplicate concentrations is provided in Table 3-11. For the duplicate from 73 Bay Avenue, the RPD's were less than 17 percent, which indicates a relatively high level of precision in the sampling and analysis. For the duplicate from 14 Park Avenue, the RPD's ranged between 10 and 107 percent. While the variability is somewhat higher than expected, the concentrations were low and close to the detection limit. Analytical results are typically less precise close to the detection limit.

### 3.3.7 House Conditions During Sampling

All homes were occupied during sampling. A qualitative description of the degree to which doors and windows were open during sampling is provided below for each house:

**63 Bay**: Outside doors were opened often during daytime hours.

**73 Bay**: Outside door likely opened a few times during day time hours. Windows in basement were closed.

**14 Park Avenue**: Outside door likely opened a few times during sampling, and some first floor windows were partially open. It is not known whether the basement windows were closed.

**18 Park Avenue**: Outside door likely opened a few times during sampling, and some first floor windows were partially open. It is not known whether the basement windows were closed.

**22 Park Avenue**: Outside door likely opened a few times during sampling, and some first floor windows were partially open. The crawlspace vents were open.

The differential pressure measurements, together with weather data, are presented for 73 Bay Avenue and 14 and 22 Park Avenue in Figures 3-7 through 3-10. The measured high and low range differential pressure reading was recorded every 15 minutes. There was a relatively large difference between the high and low readings and considerable data variability for differential pressure measurements made between the basement and outdoor air at 73 Bay and 14 Park Avenue. Part of this variability is due to pressure fluctuations caused by wind. In contrast, the difference between the high and low readings and the temporal variability in pressure was much lower for the pressure data from 22 Park Avenue. This is likely a result of the relatively stagnant air inside the crawlspace and house. A summary of the results for each house is provided below:

**73 Bay Avenue**: The averaged high and low pressure readings indicate the basement was generally slightly depressurized relative to outdoor air. The average pressure differential ($\Delta P_{basement\text{-}outdoor}$) was approximately -0.6 Pa. This suggests that there was a small positive pressure gradient between the subslab soil and basement, which could cause soil gas advection into the house. There does not appear to be any correlation between weather conditions and pressure readings.

**14 Park Avenue**: The averaged high and low pressure readings indicate the basement was depressurized relative to outdoor air. The average pressure differential ($\Delta P_{basement\text{-}outdoor}$) was approximately -4.1 Pa. At 14 Park Avenue, differential pressure measurements were also made between the basement and subslab soil. The average pressure differential between the basement and subslab ($\Delta P_{basement\text{-}subslab}$) was approximately –0.8 Pa meaning that the pressure below the foundation slab is slightly higher than in the basement. Qualitatively, the data also suggests a possible weak positive correlation between wind speed and depressurization.

**22 Park Avenue**: The averaged high and low pressure readings indicate the crawlspace was negatively pressurized relative to indoor air. The positive gradient between indoor air and the crawlspace means that indoor air would have a tendency to migrate into the crawlspace. The average pressure differential ($\Delta P_{indoor\text{-}crawlspace}$) was approximately 0.6 Pa.

### 3.3.8 Outdoor Air Monitoring

The outdoor air concentrations are presented in Table 3-12. The results indicate that the dichlorodifluoromethane and chloromethane concentrations were 0.58 ppmV and 0.62 ppmV, respectively, in the sample obtained from beside 73 Bay Avenue on November 14, 2002. The toluene and m&p-xylene concentrations were 1.0 ppmV and 1.1 ppmV in the sample obtained from beside 14 Park Avenue on October 23, 2002. All other concentrations were below the analytical laboratory reporting limit.

### 3.3.9 Weather Data

The weather conditions during soil vapor and indoor air sampling (October 23, 28, 29 and November 4, 2002) can be summarized as follows:

- The daily low temperature ranged between about 30 and 40°F while the daily highs ranged between about 49 and 62°F, except on October 28 when the low and high temperature was 45 and 52°F, respectively.

- The winds were generally light (maximum wind speed recorded at Atlantic City was 15 mph, although locally wind speeds may have been higher).

- The barometric pressure between October 23 and November 4, 2002 ranged between 1010 and 1030 mbar. A pressure variation of 20 mbar is approximately 2 kPA or 2,000 Pa.

- There was significant rainfall (greater than 0.3 inch per day) on October 25 and 26, and on October 29 and 30. During the summer and early fall prior to October 25, there was very little rainfall in the southeast New Jersey area.

The implications of the weather data is that the temperature difference between indoor and outdoor air was likely sufficient to cause some stack effect, which results in the basement (or ground floor level of houses without basements) being depressurized relative to atmospheric air. The rainfall is unlikely to have had adverse effects on the soil vapor survey (conducted on October 28) since heavy rainfall stopped two days before sampling.

## 3.4 Stage Two Data Analysis

### 3.4.1 Comparison of Measured to Background Indoor Air VOC Concentrations

A comprehensive compilation of background indoor air quality data for BTEX, n-hexane and n-heptane is provided in Table 3-13 ($\mu g/m^3$) and Table 3-14 (ppbV). Comparison to this background data set indicates that the measured indoor BTEX concentrations at the Stafford site were not elevated above typical background levels.

Based on our review, there is little, if any, data on background MTBE, cyclohexane and 2,2,4-trimethylpentane concentrations in indoor air. However, the NJDEP has recently reviewed data from a number of sources including several studies not included in Table 3-13. There is one study (RIOPA) involving 100 urban homes in NJ where the median MTBE concentration in indoor air was 6 µg/m3. Edwards (2001) reported that indoor cyclohexane concentrations measured in Helsinki Finland (183 samples) were below the detection limit 80 percent of the time (<2 $\mu g/m^3$), and the 90$^{th}$ percentile concentration was 2.73 $\mu g/m^3$.

### 3.4.2 Comparison of Measured to Predicted Source Soil Vapor Concentrations

A comparison of measured and predicted source soil vapor concentrations (near water table) is provided in Table 3-15. The predicted soil vapor concentrations are obtained using the Henry's Law constant. Physical-chemical parameters used for the analysis are provided in Table 3-16. As indicated below, the predicted concentration obtained using the Henry's Law Constant is calculated for both monitoring wells within the dissolved plume area and within the inferred NAPL area. It is noted that the vapor partitioning model based on Henry's Law applies to dilute dissolved concentrations, and is less accurate when there are high dissolved concentrations or non-aqueous phase liquid (NAPL). Nevertheless, the Henry's Law constant model is used for this analysis since it is commonly used for regulatory guidance.

**Monitoring Well Locations within Dissolved Plume**

**VP-10D**: The measured toluene and MTBE vapor concentrations were 0.2 and 1.7 percent, respectively, of the predicted concentrations.

**VP-11**: The measured benzene and toluene vapor concentrations were 0.04 and 0.2 percent, respectively, of the predicted concentrations.

**VP-12**: Comparisons can not be directly made since vapor concentrations were below the reporting limit. If half the detection limit is used for the vapor concentrations, the measured MTBE and benzene concentrations were about 0.0.8 percent of the predicted concentrations.

**Monitoring Well Locations within NAPL Zone**

**VP-9D**: The measured benzene, toluene and MTBE vapor concentrations were 1 to 50 percent of the predicted concentrations.

**VP-13**: The measured benzene, toluene and MTBE vapor concentrations were 4 to 23 percent of the predicted concentrations.

When evaluating comparisons between predicted deep vapor concentrations and measured concentrations, it is important to recognize that the measured concentrations will always be lower than predicted as a result of concentration attenuation through the capillary transition zone, as discussed in Section 2.4 of this report. The concentration attenuation would tend to be least for coarse soils with small capillary fringes and greatest for fine-grained soils. In addition, lower measured than predicted concentrations are expected due to non-equilibrium conditions for partitioning.

For the dissolved plume area, the ratio of the measured to predicted vapor concentrations appear to decrease with increasing distance from the contamination source along the flow path. This may be a result of the formation of a fresh-water wedge on top of the water table and absence of contamination in the capillary fringe.

There is little published data comparing measured deep vapor concentrations with predicted concentrations. At one site in Canada with coarse sand and gravel deposits, the measured to predicted ratio for TCE varies widely but is typically between 10 and 25 percent. At the Lowry Air Force Base, where soil at the water table consists primarily of silty sand, there is limited data for TCE and PCE indicating the range in ratio ranges from 8 to 77 percent, with an average ratio of 17 percent.

Since NAPL is present at the water table at VP-9 and VP-13, for comparison purposes the vapor concentrations are also predicted using a NAPL to vapor partitioning model, which utilizes the vapor pressure and mole fraction to estimate the equilibrium vapor concentration. It is not possible to quantitatively use a NAPL to vapor partitioning model since the mole fraction is not known for individual chemicals. Nevertheless, approximate calculations are provided below based on typical gasoline composition. According to Johnson et al. (2000), conventional gasoline contains about one percent benzene and five percent toluene. In the State of New Jersey, the MTBE content in recent years has been about 11 percent. The vapor concentrations estimated using the NAPL to vapor model are compared below to those predicted using the Henry's Law constant for VP-9, based on October 2002 groundwater data (Table 3-15).

| | **Vapor Pressure (mm Hg)** | **Molecular Weight (g/mole)** | **% Compo -sition** | **Mole Frac- tion** | **NAPL Model Vapor Conc. ($mg/m^3$)** | **Dissolved Model Vapor Conc. from Henry's Constant (VP-9 (Oct-02 data) ($mg/m^3$)** | **Measure d Vapor Conc. at VP-9D ($mg/m^3$)** |
|---|---|---|---|---|---|---|---|
| MTBE | 250 | 88.2 | 11 | 13.3 | 163,300 | 12,000 | 5,900 |
| Benzene | 95 | 78 | 1 | 1.4 | 5,800 | 2,700 | 660 |
| Toluene | 28 | 92.1 | 5 | 5.8 | 8,300 | 11,700 | 1,100 |

The measured vapor concentrations were between 4 and 13 percent of those predicted using the NAPL to vapor model.

### 3.4.3 Soil Vapor Attenuation

The vapor pathway assessment is summarized for each house in Table 3-15, and in Figures 3-11 through 3-15 for 73 Bay Avenue. Additional details are provided in Appendix IV.

The measured vapor concentration profile at VP-9 indicates only slight attenuation between the deep (D) and mid-depth (M) probe (generally by a factor of two); however, there is significant attenuation between the mid-depth (M) and shallow (S) probe (generally by a factor between 50 and 1,000) (Table 3-15). The attenuation between the mid-depth and shallow probe is inferred to be a result of aerobic biodegradation and is consistent with the observed oxygen levels. The subslab vapor concentrations were at concentrations between the mid-depth and shallow vapor concentrations.

The concentration attenuation for the BTEX compounds was significantly greater than for cyclohexane and 2,2,4-trimethylbenzene. This is believed to be, in part, due to the higher solubility of BTEX, which results in greater bioavailability to microorganisms (Table 3-16). Additionally, reported aqueous phase biodegradation rates are less for cyclohexane and 2,2,4-trimethylpentane. For example, Kjeldsen et al. (2003) report first order biodegradation rates measured for column experiments (at 26$^{o}$C) were 0.2 day$^{-1}$ for isooctane (2,2,4-trimethylpentane), compared to 0.25 day$^{-1}$ for benzene, 0.8 day$^{-1}$ for toluene and 1.95 day$^{-1}$ for m-xylene. Hohener et al. (2003) report first order biodegradation rates measured as part of vapor transport through column tests (at 23$^{o}$C) of 0.07 day$^{-1}$ for cyclohexane and 0.09 day$^{-1}$ for isooctane, compared to 1.31 day$^{-1}$ for toluene and 3.28 day$^{-1}$ for m-xylene. Olson et al. (1999) report batch test results where the relative degradation rate were n-alkanes > aliphatics (composite solution light fraction) > aromatics > branched and cyclic alkanes > aromatics (composite solution heavier fraction).

The source (deep) vapor concentrations at VP-10 were relatively low; therefore, evaluation of concentration attenuation is not meaningful for this location.

At VP-13, the source (deep) vapor concentrations were similar to those measured at VP-9. The attenuation between deep and subslab vapor concentrations at 63 Bay Avenue is four to five orders of magnitude. Aerobic biodegradation is the likely reason for the significant attenuation and low vapor concentrations below the building. Several site-specific conditions make it relatively easy for air to migrate below 63 Bay Avenue: (i) slab-at-grade construction, (ii) small building size, and (iii) gravel parking lot beside building.

### 3.4.4 Comparison of Subslab Vapor to Indoor Air Concentrations

The subslab vapor and indoor air concentrations are compared for each home.

**63 Bay**: The m&p-xylene concentration in subslab vapor was 12 ppbV, compared to 0.65 ppbV in indoor air. The MTBE concentration in subslab vapor was 0.71 ppbV, compared to 0.77 ppbV in indoor air. The subslab concentrations were below the analytical laboratory reporting limit for most other VOCs.

**73 Bay**: The MTBE, cyclohexane, 2,2,4-trimethylpentane and several alkane compound concentrations were significantly higher in subslab vapor than indoor air. The indoor air concentrations for these compounds were also elevated relative to levels measured in other homes at the Stafford site indicating the indoor air at 73 Bay was impacted by soil vapor. The attenuation factors between subslab vapor and indoor air for the above compounds varied between $3.9 \times 10^{-3}$ to $8.4 \times 10^{-3}$ (average of $6.1 \times 10^{-3}$). The fact that the range in attenuation factor was fairly small is further corroborating evidence that soil vapor intrusion is the cause of the elevated indoor air concentrations.

**14 Park Avenue**: The BTEX concentrations in subslab vapor were consistently about four times higher than in indoor air. For example, the toluene concentration in subslab vapor was 9.4 ppbV, compared to 2.4 ppbV in indoor air. The m&p-xylene concentration in subslab vapor was 12 ppbV, compared to 3.1 ppbV in indoor air. The subslab concentrations were below the reporting limit for most other VOCs. The subslab vapor concentrations for several BTEX compounds appear to be elevated relative to indoor air concentrations; however, since the indoor VOC concentrations are within reported background limits it is not possible to determine whether vapor intrusion is occurring, and it is not meaningful to estimate vapor attenuation factors.

**18 Park Avenue**: The benzene, toluene, MTBE, n-hexane, n-heptane, cyclohexane and 2,2,4-trimethylpentane concentrations in subslab vapor and indoor air were at similar levels. In contrast, the m&p-xylene and o-xylene concentrations in subslab vapor appear to be elevated relative to indoor air. For example, the m&p-xylene concentration in subslab vapor was 16 ppbV, compared to 4.4 ppbV in indoor air. Since the indoor VOC concentrations are within reported background limits it is not possible to determine whether vapor intrusion is occurring, and it is not meaningful to estimate vapor attenuation factors.

**22 Park Avenue**: The VOC concentrations in crawlspace and indoor air were at similar levels.

### 3.4.5 Comparison of Basement to First Floor Indoor Air Concentrations

There was a consistent decrease in the MTBE, cyclohexane, 2,2,4-trimethylpentane and alkane concentrations between the basement and first floor at 73 Bay Avenue. The average ratio between the basement and indoor air concentrations was 3.2 (Table 3-15).

### 3.4.6 Comparison of Measured Vapor Attenuation Factors to Regulatory Guidance

Three different vapor attenuation factors were estimated based on the data for 73 Bay Avenue (Table 3-15):

1. **Groundwater to Indoor Air**: The deep soil vapor concentration was predicted using the measured groundwater concentration and Henry's Law Constant.

2. **Soil Vapor to Indoor Air**: The source (deep) soil vapor concentration was directly used to estimate the vapor attenuation ratio.

3. **Subslab Vapor to Indoor Air**: The subslab vapor concentration was used to estimate the vapor attenuation ratio.

The measured vapor attenuation ratios are compared to the draft USEPA Subsurface Vapor Intrusion Guidance (2003) Question 5 semi-site specific attenuation factors for a depth to vapor source of 5 feet (this is the approximate distance between the underside of the 73 Bay foundation to water table) and US SCS Sand soil (this the type of soil at the Stafford site). The comparisons are provided in the table below.

| Vapor Attenuation Ratio | Measured Values | USEPA Values |
|---|---|---|
| Groundwater to Indoor Air | $1.3x10^{-6}$ to $1.1x10^{-5}$ (avg. $6.1x10^{-6}$) | $1.2x10^{-3}$ |
| Soil Vapor to Indoor Air | $2.2x10^{-5}$ to $3.6x10^{-4}$ (avg. $1.3x10^{-4}$) | $2.2x10^{-3}$ |
| Subslab Vapor to Indoor Air | $3.9x10^{-3}$ to $8.4x10^{-3}$ (avg. $6.1x10^{-3}$) | $1x10^{-1}$ |

The comparisons indicate that the average measured values are at least one order-of-magnitude less than the USEPA values, for compounds that are relatively recalcitrant to biodegradation (in contrast there did not appear to be vapor intrusion for BTEX). It should be cautioned that the above comparisons are for limited data (one house, one monitoring round).

# 4.0 STAFFORD STAGE THREE PROGRAM

## 4.1 Stage Three Objectives

The objectives of the Stage Three program were to:

1. Monitor vapor intrusion under winter conditions;
2. Obtain additional data on vertical attenuation of hydrocarbon vapors;
3. Obtain data on the lateral variation in groundwater and vapor hydrocarbon concentrations;
4. Obtain data on the spatial variability of subslab vapor concentrations
5. Compare subslab vapor concentrations to vapor samples adjacent to a house, obtained at same elevation;
6. Obtain soil moisture data to enable input into models, as needed;
7. Develop methods for measurement of air change rate inside building; and,
8. Develop methods for measuring differential pressure between house and ambient air, and obtain additional data from Stafford site.

It is noted that approximately two days after completion of the Stage Three field program, a subslab depressurization (SSD) system was installed at 73 Bay Avenue to mitigate soil vapor intrusion. Golder Associates was not involved in any aspects relating to the installation of the SSD system.

## 4.2 Stage Three Methods

The Stage Three program consisted of testing in and nearby the antique shop (converted house) at 73 Bay Avenue. The scope was as follows:

- Soil testing for moisture content and grain size distribution (five samples);
- Soil vapor sampling and analysis (four samples);
- Subslab vapor sampling and analysis (three samples);
- Indoor air sampling and analyses (two samples plus one field duplicate);
- Conduct carbon dioxide ($CO_2$) tracer test to measure air change rate (ventilation rate) inside basement of house;
- Monitoring of differential pressure between basement and subslab soil, and basement and outdoor air; and,
- Obtaining weather data.

### 4.2.1 Soil Sampling and Analysis

One soil boring (BH-EAST) was advanced on January 19, 2004 to a depth of 12 feet below ground surface (ft-bgs) on the eastern side of the house (Figure 4-1). The soil boring was advanced using a direct-push technology (DPT) rig. Continuous 4-foot long soil samples were collected from the ground surface to the bottom of the boring using a nominal 2-inch outer-diameter Geoprobe steel macro-core sampler with dedicated inner polyethylene sleeves. After removal of the macro-core sampler from the ground, the dedicated inner polyethylene sleeve with the soil core was extracted from the steel sampler. The polyethylene tube was cut lengthwise to expose the soil core for lithologic description and collection of field screening or laboratory samples.

Soil samples above the water table were screened every 6 inches for the presence of VOCs using a dry headspace vapor test conducted in the field using a photoionization detector (PID). The headspace test involved placing about 100 ml of soil in a clean 250-ml jar. The jar was covered with aluminum foil and briefly shaken. After 3 to 5 minutes, the peak headspace vapor reading was taken by puncturing the foil with the PID tip. The PID, a Photovac MiniRae 2000, was calibrated in accordance with the manufacturer's specifications to a 100 parts per million (ppm) isobutylene reference gas. Soil samples were not submitted for chemical analysis as no elevated PID readings and/or visual or olfactory indications of contamination were observed. Several soil samples were collected for possible geotechnical analysis.

Four samples obtained from borehole BH-EAST, and one near-surface sample obtained from the crawlspace (i.e., below the plastic sheet) beside the basement at 73 Bay Avenue, were analyzed for moisture content and grain size distribution.

#### 4.2.2 Groundwater Sampling and Analysis

Groundwater samples were obtained on January 19, 2004 from two temporary groundwater probes installed using a "Geoprobe" sampling system on the eastern and western sides of 73 Bay Avenue (Figure 4-1). The groundwater sampling system consisted of 1 ¾ inch ID steel rods (manufactured by Maverick), ⅞ inch PVC slotted screen (manufactured by Geoscreen), which was protected by a steel sleeve. The Geoprobe was advanced until the top of the screen approximately coincided with the water table. When the desired depth was reached, the sleeve was withdrawn to expose the 41-inch long screen.

A peristaltic pump was used to purge water from the probe and obtain groundwater samples for chemical analyses. The polytheylene tubing used for groundwater sampling was threaded down through the PVC screen and the intake point was set near the middle of the screen. The purging and groundwater sampling rate was approximately 250 ml/minute. Since the depth to groundwater was only about 11 feet, peristaltic sampling at low flows should not have introduced air bubbles in the sample. During purging, the pH, conductivity, turbidity, dissolved oxygen and oxidation-reduction potential were measured using a Horiba U-22 field meter.

Severn Trent Laboratories of Edison, New Jersey (STL-E) supplied Golder Associates with certified clean sample bottles, blank bottle labels, custody seals, coolers, and chain-of-custody documents for the investigation. The bottles were labeled prior to sample collection using a permanent-marking pen. Once purging was completed, samples were collected for volatile organic compounds (VOCs) analysis. Sampling was conducted by stopping the pump and removing the intake line from the screened interval, while leaving the discharge attached to the pump. Groundwater was then forced back through the tubing by reversing the pump flow direction. This way, the groundwater never passed through the silicon tubing at the peristaltic pump. Bottles were filled by allowing the water to flow gently down the inside of the bottle with minimal agitation. Each bottle was capped as it was filled taking steps to eliminate all headspace in the vials. The samples were preserved according to method-specific requirements, carefully packed into standard sample coolers with ice at approximately 4 degrees Celsius, and couriered under chain-of-custody procedures by Golder field personnel to STL Laboratories (Edison, New Jersey) for VOC analysis by USEPA Method 8260B.

#### 4.2.3 Soil Vapor Sampling and Analysis

Geoprobe soil gas sampling implants (Model AT86) were installed on January 21, 2004 east and west of the house as shown on Figure 4-1. A shallow (2.5-3 feet), mid (6-6.5 feet) and deep (9 to 9.5 feet) probe were installed east of 73 Bay Avenue since no soil gas probes were previously installed east of the house. Only a deep probe was installed west of the house since multiple depth probes (VP-9S, M, D) were previously installed at this location (see Section 3.0).

The implants were attached to the drive point prior to pushing of the rods. Once the desired depth was reached, tubing was lowered to the bottom of the rod, and the tubing was attached to the implant by rotating the tubing. The Geoprobe rods were then removed from the hole leaving the implant and drive point in place. After rod extraction, high density polyethylene (⅜ inch diameter) tubing was installed to the surface and connected to a short piece of silicon tubing that was clamped to pinch off the tubing. The annulus surrounding the implant was backfilled with clean silica sand to six inches above the screen, and the remainder of the annulus was filled with a bentonite slurry.

Soil vapor samples were collected for VOC analyses on January 22, 2004 using evacuated six-litre Summa canisters. Prior to sampling, each probe was purged by removing 1.5 probe volumes at a rate of 100 ml/min using a Gillian GilAir sampling pump with low-flow module. The volume of the soil gas probe (implant and tubing) was calculated based on field measurements. The canister was then connected to each probe. The canisters were filled over a one-hour period, which corresponds to a flow rate of 100 ml/min. Teflon-lined tubing was used to connect the probe to the canister. Summa canister samples were sent under chain-of-custody procedures by via courier to STL Laboratories (Burlington, Vermont) for VOC analysis by USEPA Method TO-15.

Samples were collected for field light gas analyses on January 23, 2004 after removal of 1.5 probe volumes from each implant following procedures outlined above. A one-liter Tedlar bag was connected to the probe and filled at a rate of 100 ml/min. Teflon-lined tubing was used to connect the probe to the Tedlar bag. The light gas concentrations were measured using a Landtec GEM-2000, which measures methane, oxygen and carbon dioxide.

The soil vapor sampling was scheduled such that no sampling was performed during or within 12 hours of heavy rainfall.

#### 4.2.4 Subslab Vapor Sampling and Analysis

Subslab vapor samples were obtained from three locations on January 22, 2004 (Figure 4-1). Sample Subslab #1 was obtained near the center of basement within one foot of the location of the subslab sample collected in October 2002. Consistent with procedures used in October 2002, subslab vapor samples were collected by drilling a ⅜-inch hole through the subslab, then connecting a ⅜-inch OD piece of Teflon-lined tubing from a six-liter Summa canister through the hole in the concrete. The outside of the tubing was wrapped with Teflon tape to create a snug fit when the tubing was twisted into the hole. The canisters were filled over a 24-hour period. Summa canister samples were sent under strict chain-of-custody procedures by via courier to STL Laboratories (Burlington, Vermont) for VOC analysis by USEPA Method TO-15.

#### 4.2.5 Indoor Air Sampling and Analysis

Indoor air samples were obtained from the basement and first floor (bathroom) of 73 Bay Avenue on January 22, 2004. Two basement air samples (primary and field duplicate) were obtained from near to the center of the room within two feet of sample Subslab #1. The two basement Summa canisters were placed beside each other. The first floor sample was obtained in the bathroom. The canisters were filled over a 24-hour period. Summa canister samples were sent under chain-of-custody procedures by via courier to STL Laboratories (Burlington, Vermont) for VOC analysis by USEPA Method TO-15.

#### 4.2.6 Weather Data

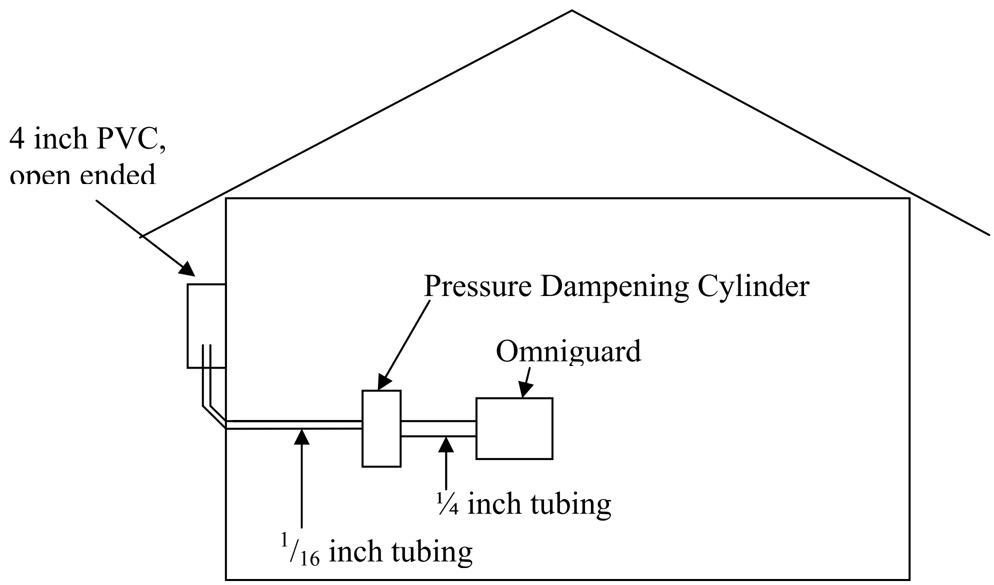
Weather data (temperature, barometric pressure, wind speed, wind direction and qualitative description of precipitation) for the Atlantic City Airport weather station was obtained on an approximate hourly basis between January 15 and 24, 2004.

#### 4.2.7 House Conditions during Sampling

General house conditions during sampling were noted. This included notation of whether the house was occupied and a qualitative indication of the degree to which windows and doors were open.

The differential pressures between indoor and outdoor air, and indoor and subslab air were measured in the basement of 73 Bay Avenue using an Engineering Solutions Model Omniguard III Differential Pressure Sensors (Omniguard), which has data logging capabilities and can measure differential pressure to 0.5 Pascal.

The first differential pressure sensor was set up with one port connected to ¼-inch diameter tubing which led to a "dampening" device, which in turn was connected to tubing that was threaded through a crack in the window. The design of the dampening device followed recommendations in CGSB (1986). The purpose of the dampening device was to reduce variation in pressure caused by wind and consisted of a 3-foot long, 4-inch diameter PVC tube with sealed end caps. Two holes were drilled into each side of the cylinder. Quarter-inch ID tubing was used between the Omniguard and dampening cylinder, and $^{1}/_{16}$ inch ID tubing was used from the dampening tube to outside. The small diameter tubing is used to minimize the volume of air, which according to CGSB (1986) will dampen small variations in pressure. Normally, tubing will extend from the dampening cylinder to all four sides of the house to obtain a more precise estimate of the mean difference in pressure between indoor and outdoor air. However, at 73 Bay Avenue, there were only windows along the east wall of the basement; therefore, only one tube was extended outside.




The second differential pressure sensor was connected to tubing inserted into a drilled hole located two feet from Subslab #1. A pressure dampening device was not used at this location since no tubing is subject to forces caused by wind.

#### 4.2.8 Basement Air Exchange Determination

On January 22, 2004, the air change rate of the basement at 73 Bay Avenue was estimated using carbon dioxide as a tracer in accordance with the test procedure described in ASTM E 741-00. The test involves measuring the decline in carbon dioxide concentration over a several hour period.

The basement windows and doors were closed, with the exception of one window that was opened a crack to enable the pressure monitoring tubing to go outside. Starting at about 16:00 on January 22, carbon dioxide from a tank was released into the basement. To disperse carbon dioxide evenly throughout the basement, the field technician walked around the basement holding the tank. Carbon dioxide was released until the concentration reached about 2,000 ppm. The Golder field technician then left the basement. No one entered the house until the next morning. The test was not conducted in the first floor of the house due to time constraints and occupant concerns.

Two air quality monitoring instruments (AQ-5000 by Quest Technologies Inc., Wisconsin) were set-up in the north and south half of the basement. These instruments measured concentrations of carbon dioxide and carbon monoxide, along with temperature and relative humidity over time.

#### 4.2.9 Summa Canister Sampling Issues

A list of all Summa samples collected at the Site and the pressures measured in the canisters, upon receipt by STL, are provided in Table 4-1. During and shortly after deployment of some Summa canisters, it was noted that the connection between the canister and pressure regulator was not completely tight. Normal practice is for STL to provide canisters with a tight-fitting connection. Once noted, the nut between the canister and flow regulator was tightened; however, for canisters used for subslab vapor, the mid-depth vapor, and indoor air sampling, a portion of the sample may have been collected without a tight fitting. The implication is that the subslab vapor samples may have been diluted by indoor air. For the indoor air samples, the canisters may have filled over a shorter duration. Due to scheduling constraints, it was not possible to re-sample the indoor air and subslab vapor probes.

The pressures measured in canisters ranged from -7.4 in Hg to 0.4 in Hg. Typically, a negative pressure is measured in the canister upon completion of sampling and receipt by the laboratory. Neutral pressure could be a result of a leak in the connection between the canister and flow regulator. However, a positive pressure is unusual. STL was requested to comment on acceptable criteria for canister pressures and why there were positive pressures measured in some canisters. Aside from possible differences between the temperature during sampling and measurement in the laboratory, STL could not identify possible causes for the positive pressures measured. STL indicated that there is no criteria in USEPA Method TO-15 for acceptable pressures, although STL uses a range of -1 in. Hg to -5 in. Hg as a guide. Temperature changes are unlikely to be a cause for the positive pressures since samples collected from inside the building at room temperature were also positively pressured.

Other quality control indicators (duplicate sample, blanks) indicated acceptable data quality.

### 4.3 Stage Three Results

#### 4.3.1 Soil Sampling and Analysis

There were no indications of hydrocarbon staining or odors noted in soil samples obtained from borehole BH-EAST. The results of the headspace vapor tests indicated all PID concentrations were below the instrument detection limit (1 ppm). Borehole BH-EAST was located east of 73 Bay Avenue, and laterally further away from the center-line of the hydrocarbon plume than previous boreholes completed on the west side of 73 Bay Avenue.

Five soil samples were analyzed for moisture content and grain size distribution (Appendix V, Table 4-2). Using the measured gravimetric moisture contents, the water-filled porosity was estimated, as follows:

$$\theta_w = M_c * B / \rho_w$$

where $\theta_w$ is the water-filled porosity, $M_c$ is the moisture content, B is the dry bulk density and $\rho_w$ is the density of water. The dry bulk density used for the calculation was 1648 kg/m$^3$, which was the average bulk density measured as part of the Stage 2 program. (see Section 3.0)

**Table 4-2. Soil Moisture Contents January 22, 2004**

| | BH-EAST (0-4') | BH-EAST (4-8') | BH-EAST (8-11.4') | BH-EAST (11.4-12') | 73 Bay Avenue Dirt Floor Crawlspace TP-1 (0-0.3') |
|---|---|---|---|---|---|
| Moisture Content (%) | 9.68 | 3.14 | 7.02 | 15 | 0.4 |
| Water-filled Porosity (-) | 0.159 | 0.052 | 0.116 | 0.247 | 0.007 |

The grain size distributions for the samples from BH-EAST indicated sandy soil, with decreasing fines (i.e., silt or clay) content with increasing depth. The grain size distributions are similar to those measured for Stage 2 samples.

Two water retention tests were conducted as part of the Stage 2 program using samples with similar grain size gradation to those obtained for BH-EAST (4-8') and BH-EAST (8-11.4'). The water retention tests indicated the field capacities in two Stage 2 samples were 0.043 to 0.047. The estimated water-filled porosity in the four samples obtained on January 22, 2004 exceeded the field capacity.

The default water-filled porosity used to develop the Draft USEPA Vapor Intrusion Guidance (2003) semi-site specific attenuation charts (Figure 3 in USEPA guidance) for unsaturated zone sand is 0.055. The January 2004 water-filled porosities exceeded the USEPA default value in samples collected from adjacent to the building, which is likely a result of surface water infiltration. The water-filled porosity in one sample collected below the crawlspace below a plastic sheet was much lower; however, this sample was obtained from near the ground surface. Considerable drying of this soil would be expected.

### 4.3.2 Groundwater Sampling and Analysis

Groundwater samples were collected from two Geoprobe locations from just below the water table. The approximate depth to the water table and screened sampling interval is given below:

| Location | Depth to Water Table | Screened Interval |
|---|---|---|
| EAST-S | 11 ft. | 11 - 13 ft. |
| EAST-D | 11 ft. | 13 - 15 ft. |
| WEST-S | 11 ft. | 11 - 13 ft. |
| WEST-D | 11 ft. | 13 - 15 ft. |

The results of groundwater field testing is provided in Table 4-3.

**Table 4-3. Groundwater Field Parameter Readings January 19, 2004**

| Location | Date | Sample Collection Time | Temp. | pH | Specific Conductance | Dissolved Oxygen | Redox Potential | Turbidity | Volume Purged | Depth Interval |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | [$^o$C] | [std] | [ms/cm] | [mg/L] | [mV] | [ntu] | [gal] | [ft-bgs] |
| EAST-S | 1/19/2004 | 1150 | 11.2 | 5.76 | 0.251 | 0.68 | 2 | 600 | 1 | 11-13' |
| EAST-D | 1/19/2004 | 1210 | 11.7 | 5.88 | 0.544 | 0 | -80 | >999 | 1 | 13-15' |
| WEST-S | 1/19/2004 | 1100 | 10.1 | 6.39 | 1.45 | 0 | -107 | 546 | 1 | 11-13' |
| WEST-D | 1/19/2004 | 1125 | 11.8 | 5.68 | 0.551 | 0 | -27 | 442 | 1 | 13-15' |

The results indicate slightly acidic groundwater. Low dissolved oxygen concentrations (less than 1 mg/L), indicative of anaerobic conditions, were measured in all groundwater samples.

The groundwater chemistry results are provided in Table 4-4. The results are summarized as follows:

- VOCs measured in groundwater, including compounds with detectable concentrations less than the quantification limit (J-flag samples), were BTEX, cyclohexane, isopropylbenzene, methylcyclohexane, and MTBE;

- The maximum total BTEX and MTBE concentrations in groundwater were 57.5 mg/L and 140 mg/L, respectively;

- Comparison of the groundwater quality west and east of 73 Bay Avenue indicated:
    - (i) Shallow sample – the western well concentrations were between 600 and 3,160 times higher than eastern well;

- (ii) Deeper sample – the western well concentrations were between 1.2 and 64 times higher than eastern well;

- Comparison of the shallow (11-13 feet) and deeper (13-15 feet) groundwater samples indicated that similar concentrations were measured west of 73 Bay Avenue, but east of 73 Bay, the concentrations in the deeper sample were much higher.

The groundwater quality results indicated that there was a lateral decrease in concentration from west to east of 73 Bay Avenue; however, the decline in concentration varied depending on the sample depth and compound. The largest decline was observed for toluene and MTBE, while the smallest decline was observed for benzene, ethylbenzene and xylenes.

The lateral decrease in concentration from west to east reflects transverse dispersion and attenuation along the edges of the plume (i.e., the plume centerline is off-set and located west of 73 Bay Avenue).

### 4.3.3 Soil Vapor Sampling and Analysis

The light gas concentrations are presented in Table 4-5. At the West VP-D probe, the oxygen concentration was depleted (4.6 percent) while the carbon dioxide concentration was elevated (10.8 percent) indicating hydrocarbon biodegradation. At the East VP probes, the light gas concentrations were close to atmospheric levels.

**Table 4-5. Light Gas Testing Results January 19, 2004**

| | Location | | | | |
|---|---|---|---|---|---|
| **Parameter** | Background | EAST VP-S | EAST VP-M | EAST VP-D | WEST VP-D |
| | | 2.5-3’ | 6-6.5’ | 9.5-10’ | 9.5-10’ |
| **$CO_2$ (%)** | 0.1 | 0.7 | 1.3 | 1.4 | 10.8 |
| **$CH_4$ (%)** | 0 | 0.3 | 0.2 | 0.2 | N/A |
| **$O_2$ (%)** | 21.8 | 22 | 21.4 | 21.3 | 4.6 |

The oxygen concentration at West VP-D (4.6 percent) was slightly higher than that measured in October 2002 at VP-9D (1 percent), which was located about 1 m from West VP-D. The oxygen concentration at the West VP-D was higher than expected based on typical levels in soil where active biodegradation is occurring, although it is noted that the West VP-D probe (9.5 to 10 feet) was slightly shallower than VP-9D (10.5 to 11 feet).

The VOC concentrations measured in soil vapor samples are provided in Table 4-6. The vapor concentrations at the WEST VP-D (deep) were relatively high. The 2,2,4-trimethylpentane concentration at 890,000 ppbV followed by toluene at 700,000 ppbV were the maximum concentrations. In contrast, the vapor concentrations in the EAST vapor probes were low. Even in EAST VP-D (deep), the vapor concentrations appear to be near to or slightly above background levels. For example, the cyclohexane and 2,2,4-trimethylpentane concentrations at EAST VP-D were 18 ppbV and less than 2.3 ppbV, respectively. As indicated earlier, the 90$^{th}$ percentile cyclohexane concentration in residential indoor air for one study was reported to be 2.73 µg/m3 (0.77 ppbV) (Edwards et al., 2001).

### 4.3.4 Subslab Vapor Sampling and Analysis

Three subslab vapor samples were obtained from below the basement slab concurrent with indoor air sampling (Figure 4-1). The results are presented in Table 4-7. The maximum subslab vapor concentrations were measured at Subslab #3, located near the north end of the building. The cyclohexane and 2,2,4-trimethylpentane concentrations at this location were 1,550 ppbV and 7,500 ppbV, respectively. The subslab vapor concentration at samples Subslab #2 and #3 were significantly lower than at Subslab #1 (about 50 times for cyclohexane and 2,2,4-trimethylpentane). This may have been caused by non-compliant Summa canisters provided by STL. Since the Subslab #3 result is more consistent with expected results based on previous testing, it is used for subsequent analysis in this report, recognizing that the result is approximate based on sampling issues described in Section 2.9 of this report.

### 4.3.5 Indoor Air Sampling and Analysis

The indoor air testing results are presented in Table 4-7. The cyclohexane and 2,2,4-trimethylpentane concentrations were elevated in basement air (47 ppbV and 300 ppbV, respectively). Slightly lower concentrations were measured in first floor air (39 ppbV and 190 ppbV). With the exception of toluene, which was detected at low levels, the benzene, ethylbenzene and xylenes concentrations were below the detection limit in air samples.

### 4.3.6 Weather Data

The weather conditions between January 14 and 23, 2004 at the Atlantic City Airport are provided in Table 4-8. The weather conditions on January 22 and 23 (IAQ sampling dates) can be summarized as follows:

- The temperature ranged between about 13 and 40$^{o}$F;
- The winds were moderate to strong (8 to 25 MPH), and;

- The barometric pressure was relatively static (about 1005 mbar) on January 22 until about 6 PM, and then rose steadily to about 1015 mbar by 7 AM on January 23. A pressure variation of 10 mbar is approximately 1 kPa or 1,000 Pa.

There was no precipitation between January 19 and 23.

#### 4.3.7 House Conditions

During sampling, the antique shop at 73 Bay Avenue was occupied between about 10 AM and 4 PM. During this time, doors were periodically opened and closed. One window in the basement was opened a crack.

The differential pressure measurements and weather monitoring results are presented in Figures 4-2 and 4-3. The results presented are the average differential pressure readings recorded every 15 minutes. The pressure in the basement was, on average, 0.67 Pascal lower than the pressure in soil below the slab. As indicated in Figure 4-2, there are variations in pressure that span both positive and negative pressures. The cause for the pressure fluctuations are not known but may be related to operation of the building heating system (hot-water radiant heat) or meteorological conditions (wind, temperature, barometric pressure). The difference between the indoor and outdoor temperature was 25 to 30$^{o}$F; therefore, a negative pressure in the basement relative to atmospheric air and subslab soil would be expected due to the stack effect. The barometric pressure began to steadily rise near the end of the pressure monitoring period. Since rapid pressure equilibration between pressure outside, inside and below the house would be expected (on the order of a few minutes), it is unlikely that barometric pressure changes had a significant effect on the differential pressures. A rise in barometric pressure would tend to result in downward movement of soil gas, although analysis using the ideal gas law indicates such movement would be limited to a few centimeters, at most, based on the relatively small depth to water table (about 11 feet).

The pressure monitoring results indicate a lower pressure in the basement than in subslab soil. However, no discernable pressure difference was measured between the basement and outdoor air. This is not consistent with the expected pressure difference based on the pressure gradient between subslab soil and the basement. The results suggest that the dampening cylinder, as implemented (see Section 2.7), was not effective. A possible cause could have been a leak in the cylinder. Even a very small leak would result in pressure differences being dissipated. As indicated in Section 5.0 of this report, additional testing of the pressure dampening concept is recommended as part of future field work.

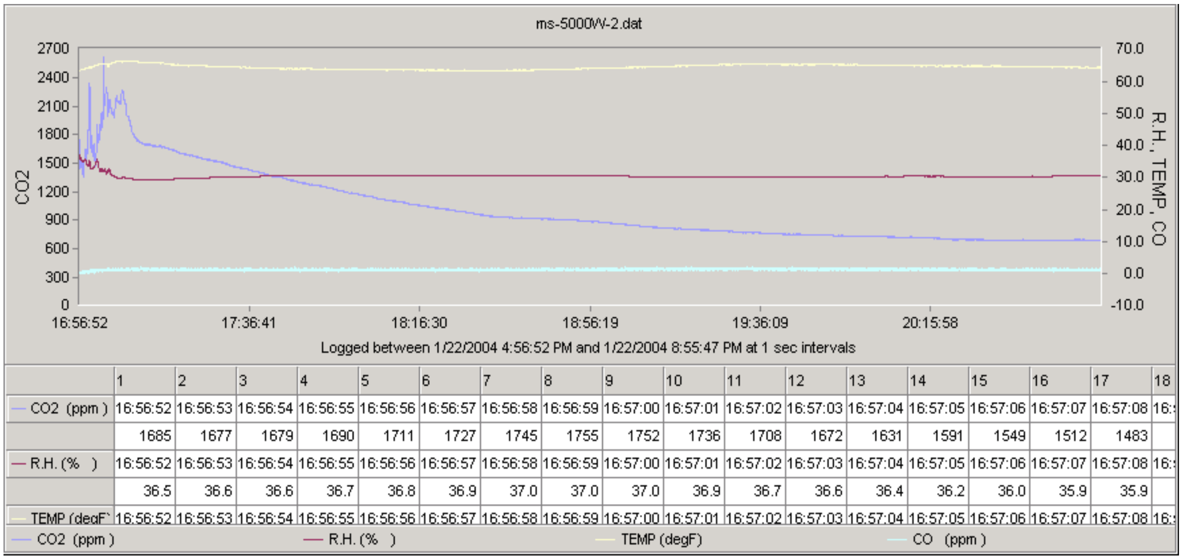
#### 4.3.8 Basement Air Change Determination

The carbon dioxide ($CO_2$) monitoring results are provided in Figure 4-4. One data logger (No. 1) collected data over a 4 hour period, while the second (No. 2) was limited to 34 minutes. Since the data from logger No. 1 was collected over a longer time span, it was used for the estimation of air change rate.

The data analysis involved smoothing $CO_2$ concentrations obtained for data logger No.1 (Figure 4-5). The smoothing was conducted by hand-plotting the data. Next, the smoothed $CO_2$ concentrations were corrected by subtracting the background $CO_2$ concentration, which was estimated to be 650 ppm (see Figure 4-5). The natural logarithm of the $CO_2$ was plotted against time, and the air change rate (0.59 air changes per hour (ACH)) was estimated from the slope (Figure 4-6).

The estimate of air change rate for the basement represents ventilation and infiltration with outside air and soil gas, and also mixing of air within the house (i.e., between basement and first floor). Since a tracer test was not performed in the first floor of the house, it is not possible to separate out natural ventilation and infiltration, from mixing or exchange of air within the house. During the test, the door at the top of the basement stairs was closed. Since the stairs are the only direct connection between the basement and first floor, most of the air change was likely due to ventilation from outdoor air.

## DATA LOGGER ONE




## DATA LOGGER TWO

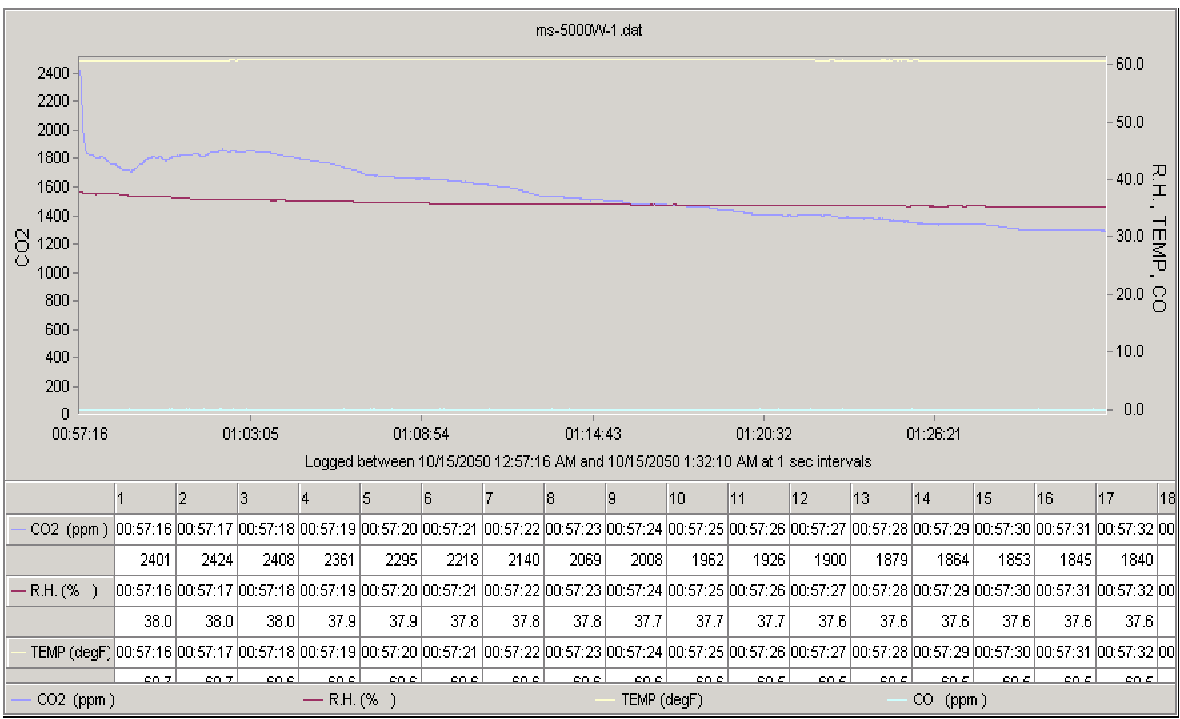



**Figure 4-4. Results of $CO_2$ Monitoring Ventilation Tracer Test**

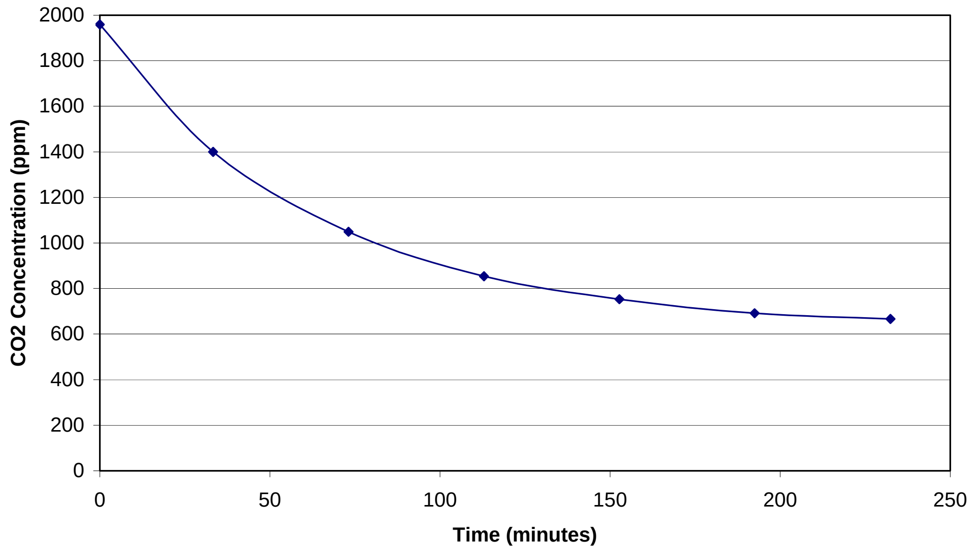



**Figure 4-5. Smoothed $CO_2$ Concentrations for Data Logger No. 1**

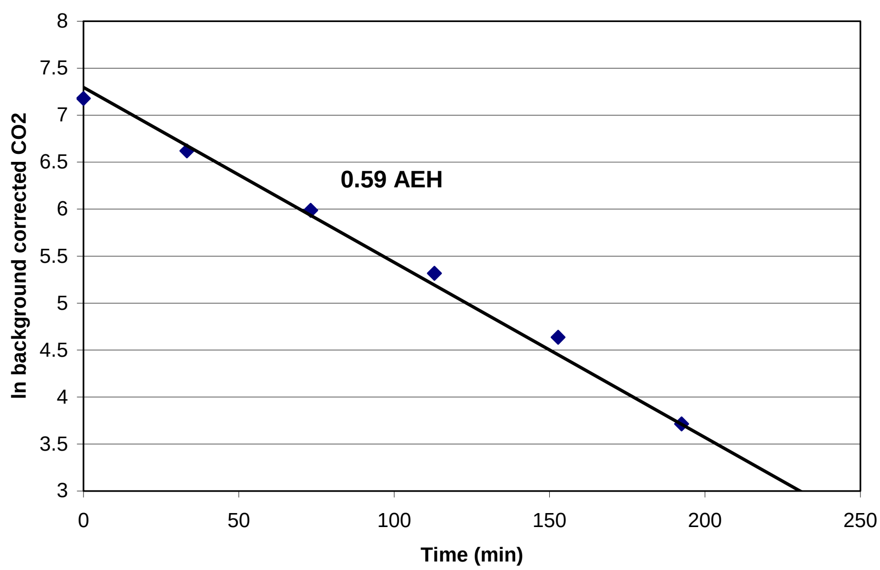



**Figure 4-6. $CO_2$ Ventilation Test Background Corrected Concentrations**

## 4.4 Stage Three Discussion

### 4.4.1 Comparison of 2002 and 2004 Monitoring Results

#### Groundwater

The total BTEX and MTBE concentrations in groundwater have been measured at nearby locations west of 73 Bay Avenue on three occasions:

| | | |
|---|---|---|
| September 2002: | Total BTEX: | 68 mg/L |
| | MTBE: | 521 mg/L |
| October 2002: | Total BTEX: | 82.5 mg/L |
| | MTBE: | 590 mg/L |
| January 2004: | Total BTEX: | 57.5 mg/L |
| | MTBE: | 140 mg/L |

The groundwater monitoring results indicate similar BTEX concentrations, but a slight decline in the MTBE concentration (about 3X) between 2002 and 2004.

#### Vapor West of 73 Bay Avenue

For most compounds, the January 2004 concentrations at the WEST-VP were variable and within one order-of-magnitude from those measured at VP-D in October 2002. For example, the cylcohexane concentrations were 300,000 ppbV (2002) and 590,000 ppbV (2004), the 2,2,4-trimethylpentane concentrations were 400,000 ppbV (2002) and 890,000 ppbV (2004) and benzene concentrations were 200,000 ppbV (2002) and 53,000 ppbV[1] (2004).

However, the 2004 MTBE vapor concentration (56,000 ppbV) was significantly (28X) lower than the 2002 concentration (1,600,000 ppbV).

#### Subslab Vapor

The maximum January 2004 subslab vapor concentrations (Subslab #3) were lower than those measured in October 2002. For example, the cylcohexane concentrations were 4,300 ppbV (2002) and 1,550 ppbV (2004), while the 2,2,4-trimethylpentane

[1] The benzene concentration in WEST VP-D were 61,000 ppbV and 45,000 ppbV (diluted sample). Since both sample results were within the calibration range, the average concentration is provided. The average concentration was taken whenever there were two valid results for a single sample (i.e., initial test run and test run on diluted sample).

concentrations were 20,000 ppbV (2002) and 7,500 (2004). However, Subslab #3 was located near the north east corner of the building, whereas the 2002 subslab location was near the center of the basement. Higher concentrations near the center of the basement would be expected based on concentration variability observed in vapor probes adjacent to the house, as described in Section 3.3.

#### Indoor Air

The 2004 indoor air testing indicated similar results to 2002. The 2,2,4-trimethylpentane concentration in basement air was about 2X higher in 2004 (300 ppbV compared to 145 ppbV), while the cyclohexane concentration was only slightly higher (47 ppbV compared to 36 ppbV).

The ratio of 2004 to 2002 deep vapor concentrations (at west probe) and ratio of 2004 to 2002 indoor air concentrations were similar for 2,2,4-trimethylpentane (2.22 for vapor and 2.07 for indoor air). This indicates similar vapor intrusion rates and mixing inside the building.

### 4.4.2 Concentration Variability

The January 2004 groundwater results indicated a lateral decrease in BTEX concentrations from west to east 73 Bay Avenue that ranged from 60X to 3,750X for shallow samples (i.e., for individual BTEX compounds), and 1.2X to 64X for deep samples. It is not known why there was such significant chemical-dependent variation in the west to east concentration ratios. One possibility is that differences in biodegradability and chemical solubility contributed to this difference.

There was also a significant difference in the vapor concentrations, with high concentrations west of 73 Bay Avenue and background levels to the east. The results highlight the importance of adequate site characterization when evaluating the vapor intrusion pathway.

### 4.4.3 Vapor Attenuation Ratios

#### Groundwater to Indoor Air (Basement)

The vapor attenuation ratios are presented in Tables 4-9 (summary) and 4-10 (details). The groundwater to indoor air vapor attenuation factor (alpha) was calculated using the vapor concentration predicted using the Henry's Law constant. The groundwater alpha for cyclohexane was calculated using half the detection limit at the west groundwater monitoring well. Both a minimum alpha (using just the concentration for the west well) and an average alpha (average of east and west wells) were calculated for cyclohexane, and were as follows:

- Minimum alpha: $8.3 \times 10^{-6}$
- Average alpha: $1.7 \times 10^{-5}$

The upper bound alpha's for BTEX ranged from $1.0 \times 10^{-6}$ to $9.5 \times 10^{-6}$ (minimum) and $1.5 \times 10^{-6}$ to $1.4 \times 10^{-5}$ (average).

Soil Vapor to Indoor Air (Basement)

The soil vapor alpha's obtained using measured soil vapor concentrations were also calculated both using the vapor concentration at the west vapor probe, and the average of the east and west probes. The alpha's were as follows:

- Minimum alpha: $8.0 \times 10^{-5}$ (cyclohexane) and $3.4 \times 10^{-4}$ (2,2,4-trimethylpentane), and;

- Average alpha: $1.6 \times 10^{-4}$ (cyclohexane) and $6.7 \times 10^{-4}$ (2,2,4-trimethylpentane).

The upper bound alpha's for BTEX ranged from $2.7 \times 10^{-6}$ to $4.1 \times 10^{-5}$ (minimum) and $5.3 \times 10^{-6}$ to $8.0 \times 10^{-5}$ (average).

Measured Subslab to Indoor Air (Basement)

The subslab to indoor air alpha's were calculated using the maximum subslab vapor concentration (Subslab #3), and were $3 \times 10^{-2}$ (cyclohexane) and $4 \times 10^{-2}$ (2,2,4-trimethylpentane).

Comparison 2002 and 2004 Alpha's

The comparisons below are for cyclohexane and 2,2,4-trimethylpentane:

1. The groundwater alpha calculated based on 2004 data was 5X (using west well) to 10X (using average east and west well) higher than the 2002 alpha's; however, the 2004 analysis used an estimated concentration of half the detection limit for cyclohexane.

2. The 2004 vapor alpha's were similar to the 2002 alpha's, when only the west vapor probe data was used. When the average vapor concentrations was used, the 2004 alpha's were slightly higher.

3. The 2004 subslab alpha's are about 4X to 5X higher than those obtained in 2002.

Comparison of Basement to First Floor Indoor Air Concentrations

The 2004 monitoring indicated that the first floor concentrations were 1.2X to 1.6X lower than basement concentrations, for cyclohexane and 2,2,4-trimethylpentane, respectively. A larger decline was observed in 2002 where the basement to first floor ratios were 4.7 and 4.3 for these chemicals.

### 4.5 Stage Three Conclusions

In January 2004, additional monitoring was conducted at 73 Bay Avenue to further investigate vapor intrusion processes and address data gaps in the 2002 program. Although not all the 2004 program objectives could be met due to unavoidable scheduling constraints and sample collection issues, the 2004 program results were useful.

The building ventilation test was successful and indicated that a $CO_2$ tracer test can be readily implemented to estimate building air change rates. While not expected to become a routine test for vapor intrusion studies, it could provide useful information when a more precise estimate of ventilation rate is required. This information is used as input to site specific modeling in Section 5 of this report.

The building depressurization monitoring indicating that the 73 Bay Avenue basement was likely under negative pressure during the January 2004 sampling. As for 2002, there again was significant short-term temporal variability in the pressure data. There was no significant difference between the indoor and outdoor air pressures; however, the readings may have been affected by the pressure dampening cylinder. Further testing of the pressure dampening device is recommended as part of future field research studies.

The 2004 vapor measurements west of 73 Bay Avenue were similar to those in 2002. In addition, the vapor alpha’s using the west vapor probe data were similar for cyclohexane and 2,2,4-trimethylpentane indicating repeatable results were obtained and little difference between October and January conditions. The deep soil vapor measurements are considered the most reliable data for evaluating vapor intrusion since they avoid the partitioning step from groundwater, and are close to the contamination source. Subslab vapor concentrations are taken closer to the receptor and therefore can also be useful for evaluating vapor intrusion, but there were sampling issues that may have affected results for the Stafford program. There can also be greater variation in subslab vapor concentrations as a result of the influence of the building and foundation subsoil variability on vapor transport.

The groundwater and deep vapor measurements indicate significant lateral variability. The implication is that evaluation of vapor intrusion potential and health risk could be quite different depending on where samples are obtained. The results indicate the importance of a sound conceptual site model for contamination distribution. One measurement point adjacent to a building may be reasonable if one is relatively certain that the maximum concentrations are determined; however, multiple data points are preferable to characterize concentration variability.

The 2004 light gas monitoring results are consistent with the 2002 results indicating significant BTEX vapor biodegradation within the unsaturated zone as a result of aerobic biodegradation, which reduces BTEX concentrations below the building to non-significant levels.

## 5.0 STAFFORD STAGE FOUR PROGRAM: SITE SPECIFIC ASSESSMENT USING JOHNSON AND ETTINGER MODEL

A site-specific modeling assessment of vapor intrusion was conducted for the building located at 73 Bay Avenue using the Johnson and Ettinger (J&E model). The purpose of the assessment was to calculate vapor attenuation factors (alpha's) using input parameters based on site specific measurements and estimated values for the Stafford site, for comparison to measured alpha's and default USEPA Vapor Intrusion Guidance semi site specific alpha's (Question 5 charts).

The site specific modeling was conducted for MTBE (groundwater-to-indoor air pathway) and 224-trimethylpentane and cyclohexane (soil vapor-to-indoor air pathway). The USEPA Superfund spreadsheet (version 031403) was used to calculate the alpha's (selected print-outs are included in Appendix IV).

The input parameters used for the modeling exercise are provided in Table 5-1. The rationale for key input parameters are provided below:

1. The soil between the base of the building foundation and water table was divided into two equal thickness layers (each 0.84 m) for estimation of soil moisture. For the top layer (Layer One), the water-filled porosity was the mid-point between the measured residual saturation and field capacity from water retention tests (consistent with US EPA default value). A relatively low water-filled porosity was also considered reasonable based on the low soil moisture content measured in the sample obtained from below the crawlspace. For the bottom layer (Layer Two), the water-filled porosity was assumed to be equivalent to the field capacity. The rationale for the higher deep water-filled porosity is the lateral migration of soil moisture will be significant within the lower portion of the unsaturated zone since the building footprint is relatively small.

2. The air exchange rate input in the model (0.47/hr) was based on the results of the January 2004 ventilation tracer test using carbon dioxide ($CO_2$). The apparent measured air exchange rate for the basement was 0.59/hr; however, some of this exchange was likely due to migration of $CO_2$ to the rest of the house. It was arbitrarily assumed that 80 percent of the apparent exchange rate was due to air

exchange with outside air, which is the relevant input parameter for the box mixing model used for the J&E model. A more precise measurement of air exchange rate would have required additional $CO_2$ measurements throughout the house.

3. The building crack ratio was estimated by combining the area of an assumed 1 mm wide edge crack and the approximately 2 foot by 2 foot dirt opening in the concrete floor slab.

4. The soil gas advection rate into the building was estimated using two different methods. The first method involved adjusting the $Q_{soil}$ (2 L/min) such that the $Q_{soil}/Q_{build}$ ratio was equivalent to the default US EPA ratio (0.0033) used to develop the Question 5 charts. Since the 73 Bay Avenue basement is relatively small, it would not have been appropriate to use a $Q_{soil}$ of 5 L/min. The second method involved the use of the Perimeter Crack Model and measured depressurization (0.6 Pa) to calculate the $Q_{soil}$ (0.6 L/min). The corresponding $Q_{soil}/Q_{build}$ was 0.001. Although the $Q_{soil}$ is uncertain, based on the measured basement depressurization, the lower $Q_{soil}$ value may be the more accurate value.

The use of the default $Q_{soil}/Q_{build}$ ratio to scale $Q_{soil}$ is conceptually correct when the building volume to subsurface foundation area and ventilation rate of the building under consideration is similar to the default building assumed for the USEPA defaults. For the 73 Bay Avenue building, these parameters are reasonably close to the defaults, considering the overall uncertainty in estimation of $Q_{soil}$. It is noted that there are other, potentially more robust scaling methods, which under some scenarios should be considered. These methods include the ratio of the building perimeter crack length to the default perimeter length, or ratio of the building subsurface area to default area. If, for example, $Q_{soil}$ was estimated based on scaling of perimeter crack length, a $Q_{soil}$ of 3.2 L/min would have resulted.

The results of the site-specific modeling are presented in Table 5-2. As shown, there is little difference between the site specific and USEPA semi-site specific alpha's. The reason, in this case, was that there was little difference between the site-specific model inputs and USEPA Guidance default model assumptions, and since chemical-specific physico-chemical properties have little effect on the calculated alpha's. A limited sensitivity analysis (not shown) suggests that alpha is most sensitive to $Q_{soil}$ for the soil vapor-to-indoor air pathway.

The "best estimate" alpha's predicted using the J&E model were about ½ to 1 order-of-magnitude greater than the measured average alpha's based on January 2004 data. The measured average alpha's were based on the deep soil vapor concentrations on both sides of the building, and are considered appropriate values to use for site-specific comparison purposes. Although the model comparisons are limited in scope, they suggest for this site the J&E model would result in slightly conservative predictions. This is consistent with findings presented by Hers et al. (2003).

# PART II: EGG HARBOR SITE

## 6.0 EGG HARBOR PROGRAM

### 6.1 Background Information

The purpose of the background section is to provide an overview of the investigation conducted by NJDEP at the site. For additional information, the reader is referred to a report by NJDEP Bureau of Environmental Measurements and Site Assessment (BEMSA) "*Site Investigation Pembroke Clothing, 801 Atlantic Avenue, Egg Harbor City, Atlantic County, New Jersey*" (no date given in report provided), henceforth referred to as the BEMSA report.

#### 6.1.1 Overview

A dissolved chlorinated solvent plume in groundwater extends below a residential area in Egg Harbor (Figure 6-1). The source of the chlorinated solvents were releases from a former clothing and glass/mirror making facility known as the Pembroke Clothing site. There is a second groundwater plume, located a short distance west of the chlorinated solvent plume, comprised of monocyclic aromatic hydrocarbons (MAH) (primarily benzene) and polycyclic aromatic hydrocarbons (PAH). This MAH plume appears to be separate from the chlorinated solvent plume in the study area, which is between White Horse Pike (Route 30) (Agassiz Street) and Beethoven Street.

In March 2003, NJDEP investigated groundwater quality at the Egg Harbor site using a Geoprobe sampler. Groundwater samples were obtained for VOC analyses from multiple depths at eight locations (Figure 6-1). Three Geoprobe sampling locations were in the chlorinated solvent contamination source area while five were in the residential area. In general, groundwater samples were obtained over 3 foot intervals.

In June 2003, NJDEP completed an additional investigation of groundwater quality in the contamination source area that consisted of collection of Geoprobe groundwater samples from nine locations, irrigation well water from one location, and building drain water from two locations. In addition, soil samples from nine boreholes in the source area were obtained for chemical analysis.

There is also information on soil and groundwater quality from other investigations where wells were installed on private property including the Cumberland Farms site (corner White Horse Pike and Chicago Avenue), the South Jersey Gas Site (corner of White Horse Pike and Buffalo), and wells installed at the Fleet Bank site (near Arago Street and Cincinnati Avenue).

### 6.1.2 Summary of NJDEP Program Results

The NJDEP program chemistry results (March and June 2003) are provided in Appendix VI. Chemical analyses of groundwater indicate that the main contaminants of potential concern (COPCs) are tetrachloroethene (PCE) and trichloroethene (TCE). The maximum PCE and TCE concentrations measured in groundwater, as documented in the BEMSA report, are summarized below:

- In the contamination source area near the former Pembroke Clothing site, the maximum measured concentrations of PCE and TCE in groundwater were 84,000 µg/L (15 to 18 feet) and 1,717 µg/L (15 to 18 feet), respectively.

- Below the residential area, the maximum measured concentrations of PCE and TCE in groundwater were 41,731 µg/L (45 to 48 feet) and 300 µg/L (18 to 20 feet) (Figure 6-2).

For comparison, the solubility of PCE in water is approximately 150,000 µg/L. There is significant vertical concentration variability suggesting a relatively complex layered geology which influences groundwater flow and chemical transport.

Based on a qualitative evaluation, there appears to be a correlation between PCE and TCE concentrations in shallow groundwater. In the deep groundwater, the ratio of TCE to PCE concentrations decrease. Cis-1,2-Dichloroethene (cis-DCE) was detected at concentrations up to 133 µg/L below the residential area. Trace levels of other chlorinated solvents were also detected in groundwater.

At Geoprobe location AT-2 (contamination source area), the first groundwater sample was collected from 4 feet to 7 feet suggesting that the water table was about 4 feet below ground surface in this area. At locations BF-1 through BF-4, the first groundwater sample was obtained from 9 feet to 12 feet. An e-mail from Ms. Lynn Vogel of NJDEP, dated January 12, 2004, indicated that during the March 2003 sampling program, the depth to the water table was approximately 8 feet below ground surface, and that the first sample was collected at 9 feet for ease of sample collection.

At AT-2, the PCE concentrations in groundwater from 4 to 7 feet and 9 to 12 feet were below 5 µg/L. At 15 to 18 feet, the PCE concentration was 19,716 µg/L. At BF-2, the PCE in groundwater from 9 to 12 feet was non-detect, while from 15 to 18 feet was 1,945 µg/L. At BF-3, the PCE in groundwater from 9 to 12 feet was non-detect, while from 15 to 18 feet was 159 µg/L. There is some evidence that, as one moves further away from the contamination source, the near water table groundwater concentrations decrease (i.e., increased thickness of a possible freshwater wedge). However, this interpretation could be affected by the wells proximity to the plume centerline, since the plume is relatively narrow.

### 6.1.3 Preliminary Hydrogeological Evaluation

A preliminary hydrogeological assessment was performed for the Egg Harbor Site.

#### Groundwater Flow Velocity

New Jersey Geological Survey (NJGS) hydrogeologists have estimated hydraulic conductivities and the average linear groundwater velocity for a number of aquifers and regions in New Jersey. For the Egg Harbor area, there are two estimates of groundwater velocity:

- ***Estimate #1***: A groundwater velocity of 1.5 meter/year was obtained using new NJGS hydraulic conductivity estimates, and hydraulic gradients based on measured and interpolated water table elevations. This estimate takes aquifer pumping into account, but the data is collected over many years. The measurement time span brings into question the consistency between measurements at different locations.

- ***Estimate #2***: A groundwater velocity of 19 meter/year was obtained using new hydraulic conductivity estimates, and assuming the hydraulic gradient (aquifer slope) is equal to ½ of the ground surface gradient. This is a rule of thumb that NJGS employs for the coastal plain. This estimate does not take groundwater pumping into account.

Estimate #1 seems very low since this at this groundwater velocity it would take about 1,000 years to result in a mile-long plume (assuming no retardation). This estimate is not consistent with the plume length observed in Egg Harbor. Therefore, Estimate #2 is more reasonable.

#### Recharge to Groundwater

Dr. Paul Sanders conducted preliminary modeling of recharge using the NJGS model. The following inputs were entered into the NJGS worksheet:

| | |
|---|---|
| Land-use: | 2 |
| Soil: 97: | Klej (same as Galloway loamy sand) |
| Municipality: | 7 (Egg Harbor City) |

Land use 2 corresponds to 1/8 - ½ acre lots, single units, and medium density, which corresponds to 2 - 5 units per acre. The estimated recharge, based on the above, is 9.1 inches/year. If lower density housing, or unpaved surfaces are assumed, the recharge goes up to 11 to 14 inches per year. A GIS map of groundwater recharge for New Jersey counties indicates 10.5 inches/year recharge for the Buffalo Avenue area. This estimate appears to assume a low density development (lots between ½ - 1 acre). NJGS geologists note that recharge can be affected to a significant degree by extreme weather events (e.g., tropical storms) when there can be several inches of rainfall in a day.

### 6.1.4 Information For Other Sites

#### Cumberland Farms

The Cumberland Farms study is documented in a report by the Environmental Evaluation Group (EEG) (1995). Regionally, the site is located within the Cohansey Formation of the Outer Coastal Plain Physiographic Province. According to EEG, soils in this area of Egg Harbor City consist of fine to medium grained sand, coarse sand, and clayey silt, in stratigraphic order. The water table is perched over the clay, and the water table rises readily during periods of abnormally heavy rainfall. The depth to groundwater on May 2, 1995 ranged from 4.71 to 7.3 feet below ground surface. Low concentrations of PCE were detected in groundwater, the maximum concentration being 16 μg/L at MW-4, located near the southwest corner of the Cumberland Farms site (Appendix VI). The wells at the Cumberland Farms sites were decommissioned.

#### South Jersey Gas (SJG)

The SJG site information (NJDEP Division of Water Resources Permit 36-14527) obtained for this study consisted of a well log for well P3, located near the northeast corner of the site, and water levels for a number of monitoring wells (Appendix VI). The driller's well log for P3 indicates the following: 0-2 ft silty sand; 2-6.6 ft medium sand, some gravel; 6.6-8 ft coarse sandy clay, some gravel; 8-9 ft silty sand; 9-11 ft sandy clay; 11-14 ft fine to medium sand. The static water level after drilling at this location on April 17, 1991 was 4 feet below ground surface.

#### Fleet National Bank

The Fleet National Bank site information is reported in Groundwater and Environmental Services, Inc. (GESI) (2002). Well logs, water levels and groundwater chemistry is available in this report (Appendix VI). Dr. Paul Sanders of NJDEP indicates wells MW-4 and MW-5 are accessible. The boring logs for this site indicate soils consist predominantly of sand with some clay or clayey sand layers. On March 2, 2001, the depth to groundwater ranged between 5.55 and 8.29 ft below ground. One February 15, 2002, the depth to groundwater ranged between 10.7 and 12.82 ft below ground surface.

### 6.2 Rationale and Approach

Available information for the Egg Harbor site indicates that PCE and TCE concentrations in groundwater near to the water table are relatively low. Consequently, the PCE and TCE concentrations in soil vapor will also likely be relatively low resulting in a vapor source strength that is insufficient to affect indoor air quality in homes. It is anticipated that the cross-media transfer between groundwater and soil vapor, and more specifically, the VOC mass flux rate through groundwater near the water table and capillary fringe will be critical in terms of whether there is a significant vapor source. Geological information indicates interlayered coarse and fine-grained soil deposits. There may be perched water during relatively wet periods, which would have a significant impact on vapor transport.

The approach was to conduct a relatively detailed investigation of groundwater and deep soil vapor concentrations. Sampling was performed at a number of locations where dissolved groundwater concentrations were expected to be at their highest levels. Precipitation and groundwater levels in wells were monitored over a several month period. The work scope included re-sampling of soil vapor above the water table if there were indications of a dropping water table. However, monitoring indicated only small fluctuations in groundwater levels and therefore no additional soil vapor testing was conducted. Since chlorinated solvent concentrations in soil vapor near the water table were low, no indoor air quality testing was performed, as discussed with NJDEP.

The groundwater characterization program was designed to compare the results of Geoprobe sampling over short intervals to sampling from a conventional monitoring well screened over a longer vertical interval. The purpose of this testing was to evaluate whether different sampling methods might bias the results of vapor intrusion risk assessment.

### 6.3 Program Objectives

The objectives of the Egg Harbor program were to:

1. Characterize the vertical profile of the groundwater concentrations.

2. Obtain additional information to delineate the lateral extent of the groundwater plume.

3. Evaluate whether deep vapor concentrations above the water table are significant.

4. Compare different methods for the characterization of dissolved groundwater concentrations.

5. Obtain information on seasonal water table fluctuations and weather, and investigate whether water table changes affect the groundwater and soil vapor regime.

## 6.4 Program Scope and Methods

The field investigation consisted of sampling from three locations (Figure 6-1):

Site 1: Near 124 Buffalo Avenue;

Site 2: Near corner of Buffalo Avenue and Arago Street (near 205 Buffalo), and;

Site 3: Beethovan Street near lane between Buffalo and Cincinnati Avenue.

The sampling locations were influenced by access considerations and the objective of being close to the plume centerline. The plume centerline cuts across Buffalo Street and therefore the houses are located at varying distances from the plume centerline.

The field investigation scope was as follows:

- Geoprobe groundwater testing (12 samples);
- Installation of one monitoring well (Site 1);
- Groundwater level monitoring at monitoring wells and nearby wells installed by others;
- Soil testing for moisture content and grain size distribution (two samples);
- Installation of soil vapor probes and soil vapor sampling and analysis (two samples);
- Obtain weather data.

All field work was monitored by a Golder field technician (Ms. Marie Lewis or Mr. Jim McLauglin).

### 6.4.1 Soil Sampling and Analysis

Three soil borings (GP-Site 1, 2 and 3) were advanced on December 2, 2003 to depths of 16 to 20 feet below ground surface (ft-bgs) (Figure 6-1). The soil boring was advanced using a direct-push technology (DPT) rig. Continuous 4-foot long soil samples were collected from the ground surface to the bottom of the boring using a nominal 2-inch outer-diameter Geoprobe steel macro-core sampler with dedicated inner polyethylene sleeves. After removal of the macro-core sampler from the ground, the dedicated inner polyethylene sleeve with the soil core was extracted from the steel sampler. The polyethylene tube was cut lengthwise to expose the soil core for lithologic description and collection of field screening or laboratory samples.

Soil samples above the water table were screened every 2 to 3 feet for the presence of VOCs using a dry headspace vapor test conducted in the field using a photoionization detector (PID). The headspace test involved placing about 100 ml of soil in a clean 250-ml jar. The jar was covered with aluminum foil and briefly shaken. After 3 to 5 minutes, the peak headspace vapor reading was taken by puncturing the foil with the PID tip. The PID, a Photovac MiniRae 2000, was calibrated in accordance with the manufacturer’s specifications to a 100 parts per million (ppm) isobutylene reference gas. Soil samples were not submitted for chemical analysis since PID readings were either relatively low or below the instrument detection limit, and no visual or olfactory indications of contamination were observed. Several soil samples were collected for possible geotechnical analysis.

Two samples obtained from borehole GP-Site 1 were tested for moisture content and grain size distribution.

#### 6.4.2 Monitoring Well Installation and Groundwater Level Measurements

One soil boring was advanced using a Mobile B61 auger drill rig on January 12, 2004. At the completion of drilling, a monitoring well (MW-Site 1) was installed within the township right-of-way (ROW) between the street and the sidewalk (Figure 6-1). Drilling was conducted using 6-inch diameter hollow stem augers (HSAs). Split spoon soil samples were collected on a continuous basis from the ground surface to the total depth of the borehole, and the soil logged by the Golder field staff. The well was constructed to 14 feet below ground surface (ft bgs) and consisted of a 10-foot length of 2-inch diameter schedule 40 PVC with 0.010-inch slot screen, set at 4 feet bgs to 14 feet bgs. A sand (filter) pack, comprised of clean quartz sand, was placed in the annulus from 6 inches below to approximately 2 foot above the well screen interval. A primary sandpack of Morie #1 Sand was installed from the bottom of the borehole to 2 feet above the top of the well screen. The primary sandpack was topped with one foot of a finer-grained (Morie #00 Sand) secondary sandpack. A 2 foot seal of bentonite powder was placed above the secondary sandpack. Grout was placed above the bentonite seal to the ground surface. The well was completed with a flush mount box having a locking inner cap and brass padlock. The monitoring well log is provided in Appendix VII.

The monitoring well was developed prior to the initiation of groundwater chemistry sampling and hydraulic testing. The well was developed using a surge block and continuous cycles of over-pumping and recovery. Development continued until relatively clear water was produced, and field parameters (pH, specific conductance and turbidity) stabilized, indicating good hydraulic communication with the surrounding water bearing zone. Well development forms are included in Appendix VII.

The depth to the groundwater in the well was measured on January 12, 2004. To measure groundwater levels over time, a SP-4000 Minitroll (In-situ Inc.) pressure transducer was placed in the well between January 12 and March 4, 2004. The pressure transducer has a vent tube for pressure compensation.

### 6.4.3 Groundwater Sampling and Analysis

Groundwater samples were obtained on December 2, 2003 from three temporary groundwater probes installed using a Geoprobe sampling system at Sites 1, 2 and 3 (Figure 6-1). The groundwater sampling system consisted of 1 ¾ inch ID steel rods (manufactured by Maverick), ⅞ inch PVC slotted screen (manufactured by Geoscreen), which was protected by a steel sleeve. When the desired depth was reached, the sleeve was withdrawn to expose the 41-inch long screen. The Geoprobe was advanced until the top of the screen approximately coincided with the water table.

Groundwater samples were also obtained from monitoring well MW-Site 1 on January 12, 2004. Three groundwater samples were obtained from different depths within this well. The well at MW-Site 1 was developed only a few hours before sampling. Fast-tracking of sampling was conducted for initial screening purposes, but it is recognized that this does not meet requirements documented in the NJDEP Field Sampling Procedures Manual. Consideration could be given to re-sampling of groundwater from this well, if desired, as discussion in Section 6.7 of this report.

A peristaltic pump was used to purge water from the well and obtain groundwater samples. Polytheylene tubing was used to collect groundwater samples. For geoprobe samples, the tubing was threaded down through the PVC screen and the intake point was set near the middle of the Geoprobe screen. For the monitoring well, samples were obtained with the tubing intake point set at 9 feet, 11 feet and 13 feet below ground surface. The purging and groundwater sampling rate was approximately 250 ml/minute. Since the depth to groundwater was only about 8 to 10 feet, peristaltic sampling at low flows should not have introduced air bubbles in the sample. During purging, the pH, conductivity, turbidity, dissolved oxygen and oxidation-reduction potential were measured using a Horiba U-22 field meter.

Severn Trent Laboratories of Edison, New Jersey (STL-E) supplied Golder with certified clean sample bottles, blank bottle labels, custody seals, coolers, and chain-of-custody documents for the investigation. The bottles were labeled prior to sample collection using a permanent-marking pen. Once purging was completed, samples were collected for volatile organic compounds (VOCs) analysis. Sampling was conducted by stopping the pump and removing the intake line from the screened interval, while leaving the discharge attached to the pump. Groundwater was then forced back through the tubing through the original inlet by reversing the pump flow direction. This way, the groundwater never passed through the silicon tubing at the peristaltic pump. Bottles were filled by allowing the water to flow gently down the inside of the bottle with minimal agitation. Each bottle was capped as it was filled taking steps to eliminate all headspace in the vials. The samples were preserved according to method-specific requirements, carefully packed into standard sample coolers with ice at approximately 4 degrees Celsius, and couriered under strict chain-of-custody procedures by Golder field personnel to STL Laboratories (Edison, New Jersey) for VOC analysis by USEPA Method 8260B.

### 6.4.4 Soil Vapor Sampling and Analysis

Geoprobe soil gas sampling implants (Model AT86) were installed on December 2, 2003 at Sites 1, 2 and 3 (Figure 6-1). The probes were installed between 6.5 and 7 feet below ground surface. The implants were attached to the drive point during pushing of the rods. Once the desired depth was reached, tubing was lowered to the bottom of the rod, and the tubing was attached to the implant by rotating the tubing. The Geoprobe rods were then removed from the hole leaving the implant and drive point in place. High density polyethylene (⅜ inch diameter) tubing was installed to the surface and connected to a short piece of silicon tubing that was clamped to pinch off the tubing. The annulus surrounding the implant was backfilled with clean silica sand to six inches above the screen, and the remainder of the annulus was filled with a bentonite slurry.

Soil vapor samples were collected for VOC analyses on December 4, 2003 using evacuated six-litre Summa canisters. Prior to sampling, each probe was purged by removing 1.5 probe volumes at a rate of 100 ml/min using a Gillian GilAir sampling pump with low-flow module. The volume of the soil gas probe (implant and tubing) was calculated based on field measurements. The canister was then connected to each probe. The canisters were filled over a one-hour period, which corresponds to a flow rate of 100 ml/min. Teflon-lined tubing was used to connect the probe to the canister. Summa canister samples were sent under strict chain-of-custody procedures by via courier to STL Laboratories (Burlington, Vermont) for VOC analysis by USEPA Method TO-15.

Samples were collected for field light gas analyses on December 3, 2003 after removal of 1.5 probe volumes from each implant following procedures outlined above. A one-liter Tedlar bag was connected to the probe and filled at a rate of 100 ml/min. Teflon-lined tubing was used to connect the probe to the Tedlar bag. The light gas concentrations were measured using a VRAE multi-gas detector, which measures combustible gas levels, oxygen, hydrogen sulfide and carbon monoxide.

The soil vapor sampling was scheduled such that no sampling was performed during and within 12 hours of heavy rainfall.

### 6.4.5 Weather Data

Weather data was obtained for NOAA National Weather Service station at the Atlantic City International Airport. Egg Harbor City is located approximately 6 miles from the Atlantic City Airport. The weather data obtained consisted of precipitation data for selected dates in December 2003 and January 2004, and the daily average barometric pressure for January, February and March 2004. The precipitation data was used to evaluate possible trends in groundwater depths since the potential for cross-media transfer of volatiles from groundwater to soil vapor could increase if the water table decreased, although as described in subsequent sections of this report, there is a significant thickness of non-contaminated groundwater near the surface of the water table, which reduces the potential for water table variation to affect volatilization.

## 6.5 Field Investigation Results

### 6.5.1 Soil Sampling and Analysis

The borehole logs for GP-Site 1, 2 and 3, including headspace vapor test results, are provided in Appendix VII. There were no indications of chlorinated solvent odours noted in soil samples obtained from boreholes. The results of the headspace vapor tests indicated PID concentrations were all less than 3.1 ppm.

Two soil samples were analyzed for moisture content and grain size distribution (Appendix VII, Table 6-1). Due to poor soil core recovery, the second sample was a composite sample from 7.5 to 16 feet depth bgs. Using the measured gravimetric moisture contents, the water-filled porosity was estimated, as follows:

$$\theta_w = M_c * B / \rho_w$$

where $\theta_w$ is the water-filled porosity, $M_c$ is the moisture content, B is the dry bulk density and $\rho_w$ is the density of water. The dry bulk density used for the calculation was 1600 kg/m$^3$, which is an assumed value.

**Table 6-1. Soil Moisture Contents December 2, 2003**

| | GP-Site 1 (5-6’) | GP-Site 1 (7.5-16’) |
|---|---|---|
| Moisture Content (%) | 8.1 | 16 |
| Water-filled Porosity (-) | 0.130 | 0.256 |

The grain size distributions for the samples from GP-Site 1 indicated the following:

- 5-6 feet: poorly graded sand, with silt (11 percent)
- 7.5-16 feet: fine sand, some fines (clay and silt comprised of 23 percent), trace gravel

Detailed examination of the soil core from Site 1 indicated significant heterogeneity and layering in soil. The grain size distributions therefore represent the approximate average soil properties over the depth interval.

Only samples from Site 1 were tested for the above geotechnical parameters.

### 6.5.2 Soil and Groundwater Conditions

The borehole logs are provided in Appendix VII. The generalized stratigraphic profile at Sites 1, 2 and 3 consists of interlayed near-surface sand, silty sand to sandy clay to 8 to 10 feet depth bgs, underlain by a somewhat more uniform silty sand to sand unit that extended to the base of the boreholes (16 to 20 feet bgs). The surface soils between ground surface and 10 feet below ground surface are highly variable.

Observations during drilling at Sites 1, 2 and 3 suggest that soils were saturated below about 8 feet below ground surface.

The measured depths to groundwater from the top of well casings (TOC) (approximate ground surface) on January 12, 2004 are presented in Table 6-2.

**Table 6-2. Groundwater Levels Egg Harbor Monitoring Wells**

| Monitoring Well ID | Reference Elevation (feet MSL) | Depth to Ground water from TOC Jan. 12, 2004 (feet bgs) | Groundwater Elevation (feet MSL) |
|---|---|---|---|
| Fleet Bank MW-2 | 54.43 | 6.74 | 47.69 |
| Fleet Bank MW-3 | 54.87 | 7.34 | 47.53 |
| Fleet Bank MW-4 | 54.27 | 6.60 | 47.67 |
| Fleet Bank MW-5 | 54.54 | 6.97 | 47.57 |
| South Jersey Gas Site P-3 | 53.80 | 4.84 | 48.96 |
| Golder MW-Site 1 | | 5.26 | |

TOC = Top of casing

The completion interval for monitoring well MW-Site 1 was 4 to 14 feet below ground surface. The depth to groundwater from the TOC (approximate ground surface) was 5.26 feet. However, during drilling, saturated soil was not encountered until about 8 feet depth bgs at this location.

### 6.5.3 Groundwater Sampling and Analysis

Groundwater samples were collected from three Geoprobe locations (Sites 1, 2 and 3) and from one monitoring well (Site 1). The results of field testing of groundwater samples is provided in Table 6-3.

**Table 6-3**

**Groundwater Field Parameter Readings**

| Location | Temperature | pH | Specific Conductance | Dissolved Oxygen | Redox Potential | Turbidity | Approximate Boring Volume [1] | Volume Purged | Depth Interval |
|---|---|---|---|---|---|---|---|---|---|
| | [$^{o}$C] | [std] | [ms/cm] | [mg/L] | [mV] | [ntu] | [liters] | [liters] | [ft-bgs] |
| Site 1A | 9.9 | 4.48 | 1.59 | 1.56 | 131 | >999 | 0.71 | 0.95 | 12-14 |
| Site 1B | 11.5 | 4.59 | 0.39 | 7.8 | 164 | >999 | 0.95 | 0.95 | 14-16 |
| Site 1C | 9.4 | 4.61 | 0.281 | 12.6 | 174 | >999 | 1.18 | 0.95 | 16-18 |
| Site 1D | 16.3 | 4.75 | 0.431 | 4.09 | 176 | >999 | 1.42 | 0.95 | 18-20 |
| Site 2A | 11.5 | 4.51 | 0.676 | 4.32 | 198 | >999 | 0.24 | 0.95 | 8-10 |
| Site 2B | 11.2 | 4.6 | 0.704 | 4.07 | 223 | >999 | 0.47 | 0.95 | 10-12 |
| Site 2C | 11 | 4.81 | 0.256 | 5.57 | 183 | 156 | 0.71 | 0.95 | 12-14 |
| Site 2D | 11.7 | 4.76 | 0.321 | 4.09 | 182 | >999 | 0.95 | 0.95 | 14-16 |
| Site 2E | 10.9 | 4.48 | 0.51 | 4.02 | 225 | >999 | 1.18 | 0.95 | 16-18 |
| Site 3A | 7.8 | 6.24 | 0.427 | 0.4 | 110 | NT | 0.24 | 0.95 | 8-10 |
| Site 3B | 9.9 | 4.5 | 0.362 | 5 | 250 | 36.6 | 0.47 | 0.95 | 10-12 |
| Site 3C | 11.2 | 4.49 | 0.303 | 6.52 | 267 | 880 | 0.71 | 0.95 | 12-14 |
| Site 3D | 10.5 | 4.43 | 0.159 | 4.26 | 276 | >999 | 0.95 | 0.95 | 14-16 |
| MW-Site 1 | 11.0 | 4.3 | 0.145 | 0 | 269 | NT | N/A | N/A | N/A |

Notes:

1. Boring volume calculated using $V=\pi r^2 h$, assuming that depth to groundwater = 96 inches-bgs, h=Bottom Depth interval in inches, and r=0.875".

2. Although Sites 1C, 1D, and 2E have greater approximate boring volumes than purged volumes, the upper interval boring samples were purged prior to these. Therefore, the real volume purged for deeper intervals is the sum of all lesser depth intervals and that interval.

The results indicate acidic groundwater. The dissolved oxygen concentrations range between 0.4 mg/L and 12.6 mg/L while the redox potential was between 110 mV and 276 mV. The dissolved oxygen levels and redox potential indicate generally aerobic groundwater conditions.

The Geoprobe obtained groundwater chemistry results are provided in Table 6-4. The results are summarized as follows:

- VOCs measured (via Geoprobe) in groundwater, including compounds with detectable concentrations less than the quantification limit (J-flag samples), were tetrachloroethene or perchloroethylene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-DCE), chloroform and MTBE;

- The PCE, TCE and cis-DCE concentrations in shallow groundwater (less than 14 feet depth) were close to or less than the reporting limit. The maximum PCE concentration in shallow groundwater was 1.2 µg/L;

- At Site 1, the PCE concentrations increased with increasing depth. The maximum PCE concentration was 2,600 µg/L measured in the 18 to 20 foot depth sample. At Site 2, a slight increase in the PCE concentration was observed.

The groundwater results, obtained as part of this investigation, are inconclusive as to whether there is an increasing thickness of groundwater along the flow path with low or non-detect PCE concentrations since deeper samples were not analyzed. It is noted that the objective of this program was to characterize groundwater concentrations near the water table to evaluate vapor intrusion potential. However, the results of shallow and deeper groundwater analyses conducted by NJDEP in March 2003 suggest a possible increasing thickness of the fresh-water wedge.

**Table 6-4**
**Groundwater Chemistry Results – Egg Harbor**

| Sample ID | Sample Interval | Tetrachloro ethene | Trichloroe thene | cis-1,2-Dichloroe thene | Choloro-form | MTBE |
|---|---|---|---|---|---|---|
| **Geoprobe Sampling Results** | | | | | | |
| GP-Site-1A | 12-14' bgs | ND | ND | ND | ND | ND |
| GP-Site 1B | 14-16' bgs | 19 | 3.2 | 2.3 J | ND | ND |
| GP-Site-1C | 16-18' bgs | 28 | 4.7 | 3.1 | ND | ND |
| GP-Site-1D | 18-20' bgs | 2600 | 300 | 170 | ND | ND |
| GP-Site-2A | 8-10' bgs | 0.5 J | ND | ND | ND | ND |
| GP-Site-2B | 10-12' bgs | ND | ND | ND | ND | ND |
| GP-Site-2C | 12-14' bgs | 0.6 J | ND | ND | ND | ND |
| GP-Site-2D | 14-16' bgs | 0.4 J | ND | ND | ND | ND |
| GP-Site-2E | 16-18' bgs | 9.1 | 1 | 0.6 J | ND | ND |
| GP-Site-3A | 8-10' bgs | 1.2 | ND | ND | 1.1 J | ND |
| GP-Site-3B | 10-12' bgs | 0.6 J | ND | ND | ND | ND |
| GP-Site-3C | 12-14' bgs | 0.9 J | ND | ND | ND | ND |
| GP-Site-3D | 14-16' bgs | 0.5 J | ND | ND | ND | 1.2 J |
| **Monitoring Well Sampling Results** | | | | | | |
| MW-Site-1 | intake @ 9' | ND | ND | ND | ND | ND |
| MW-Site-1 | intake @ 11' | ND | ND | ND | ND | ND |
| MW-Site-1 | intake @ 13' | ND | ND | ND | ND | ND |

Notes:
1. Results as reported by STL-Edison. Data not validated by Golder Associates.
2. All results in ug/L, only detectable results reported for Geoprobe sampling, for monitoring well samples, all concentrations were below the detection limit
3. Geoprobe samples collected December 2-3, 2003; monitoring well samples collected January 12, 2004.
3. ND = Non Detect
4. J = Mass spectral data indicates presence compounds that meets identification criteria. Result is less than specified detection limit but greater than zero. The concentration is approximate.

The VOC concentrations in the samples from the monitoring well were all below the analytical reporting limit.

### 6.5.4 Soil Gas Sampling and Analysis

The light gas concentrations are presented in Table 6-5. The oxygen concentrations at all three locations were near atmospheric levels. The percent lower explosive level (LEL) concentrations ranged from non-detect levels to 2 percent.

**Table 6-5**
**Light Gas Testing Results December 3 and 4, 2003**

| Parameter | Location | | | |
|---|---|---|---|---|
| | Site 1 12/3/2003 6.5-7 ft | | Site 2 12/3/2003 6.5-7 ft | Site 3 12/3/2003 6.5-7 ft |
| **CO (ppm)** | 8 | | 504 | 30 |
| **% LEL** | 1 | | 2 | 0 |
| **$H_2S$ (ppm)** | 0 | | 0 | 0 |
| **$O_2$ (%)** | 19.1 | | 21.3 | 21.8 |

Notes:
1. All gas readings measured using a VRAE model PGM7800

The VOC concentrations measured in soil vapor samples are provided in Table 6-6. A conversion factor table (µg/m$^3$ to ppbV) is provided in Table 3-9. Chlorinated solvent concentrations in vapors were low. PCE was only detected in the sample from VP-Site 1 (2.5 ppbV).

**Table 6-6**
**Soil Vapor Chemistry Results – Egg Harbor**

| Chemical | VP-Site 1 | VP-Site 2 |
|---|---|---|
| Chloroform | < 0.58 | 0.74 |
| Methylene Chloride | 2.6 | 2 |
| Benzene | 0.74 | < 0.58 |
| Toluene | 10 | 0.75 |
| Tetrachloroethene | 2.5 | < 0.58 |
| Ethylbenzene | 2.2 | < 0.58 |
| m&p-xylene | 7.5 | < 0.58 |
| o-xylene | 3.2 | < 0.58 |
| 1,3,5-trimethylbenzene | 0.85 | < 0.58 |
| 1,2,4-trimethylbenzene | 1 | < 0.58 |
| Acetone | 13 | 17 |
| Cyclohexane | 33 | 19 |
| Methyl ethyl ketone | 1.2 | 0.89 |
| 4-Ethyltoluene | 2.1 | < 0.58 |
| n-Hexane | 2.3 | < 0.58 |
| n-Heptane | 2.4 | 4.1 |
| MTBE | 87 | < 0.58 |

Note: All results in ppbV, only detectable concentrations reported

### 6.5.5 Weather Data

The monthly precipitation data for 2003 and 2004 at the Atlantic City Airport is provided in Table 6-7. The data indicates that 2003 was wetter than normal while to-date, 2004 has been slightly dryer than normal.

**Table 6-7**
**Measured Precipitation Atlantic City Airport**

| | 2003 Precipitation (inches) | 2004 Precipitation (inches) | Normal Precipitation (inches) | 2003 Departure (inches) | 2004 Departure (inches) |
|---|---|---|---|---|---|
| January | 3.01 | 1.55 | 3.60 | -0.59 | -2.05 |
| February | 5.39 | 2.15 | 2.85 | 2.54 | -0.70 |
| March | 3.96 | 3.45 | 4.06 | -0.10 | -0.61 |
| April | 2.79 | 4.71 | 3.45 | -0.66 | 1.26 |
| May | 2.58 | 3.31 | 3.38 | -0.80 | -0.07 |
| June | 6.99 | 1.81 | 2.66 | 4.33 | -0.85 |
| July | 4.06 | 5.31 | 3.86 | 0.20 | 1.45 |
| August | 1.68 | 3.82 | 4.32 | -2.64 | |
| September | 2.95 | | 3.14 | -0.19 | |
| October | 4.82 | | 2.86 | 1.96 | |
| November | 4.39 | | 3.26 | 1.13 | |
| December | 5.74 | | 3.15 | 2.59 | |
| **Total** | **48.36** | **26.11** | **40.59** | **7.77** | **-1.57** |

Note: August 2004 data to August 17

### 6.5.6 Groundwater Level Data from Pressure Transducer

The groundwater level data is shown in Figure 6-3. The depth to the apparent groundwater level ranged between about 3.6 feet and 5.5 feet below top of casing (approximate ground surface). The apparent groundwater levels indicate variability that that may be related to barometric pressure (Figure 6-3). For example, between January 30 and February 2 the barometric pressure rose about 10 inches (equivalent water column). During this time period, there was an apparent 7 inch decrease in the depth to groundwater, which in part could be attributed to increased barometric pressure. As expected, the apparent groundwater levels also appear to be influenced by precipitation. For example, the groundwater depth in February decreased after heavy rainfall events in early February.

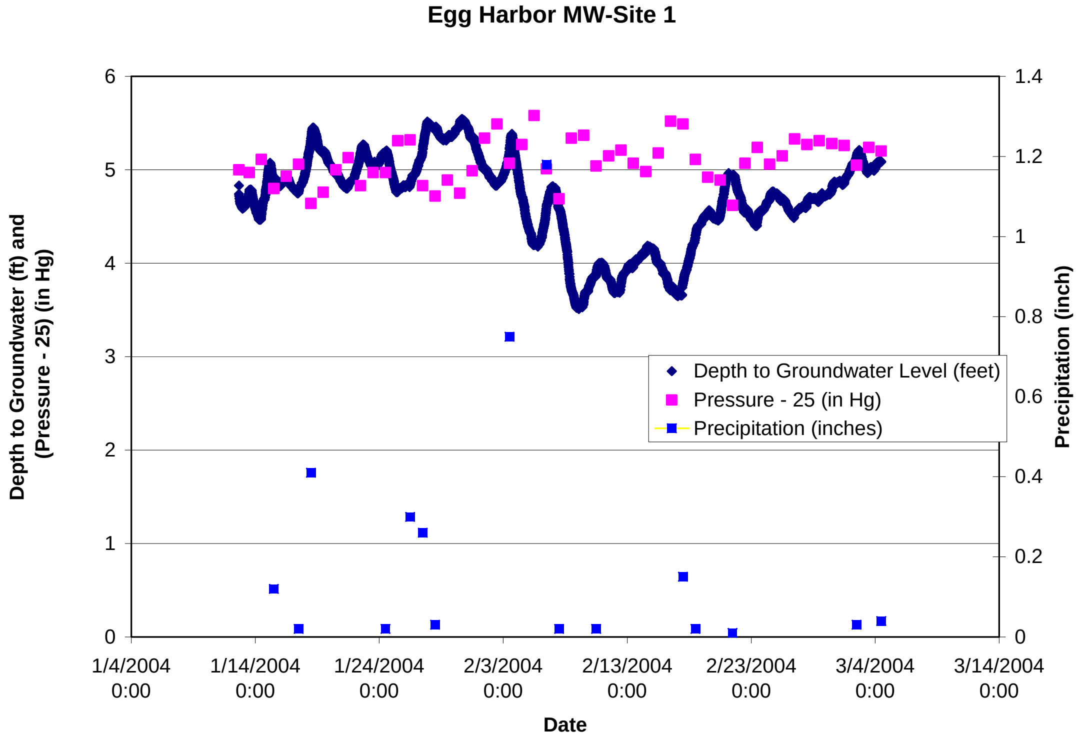



Figure 6-3. Groundwater Level Data for MW-Site 1

## 6.6 Discussion

The groundwater monitoring at Sites 1, 2 and 3 indicated that there was about 6 feet of groundwater near the water table surface with non-detect or low PCE concentrations (less than 1.2 mg/L). The Golder December 2003 and NJDEP March 2003 program results are compared below:

- Golder Site 1 is located near NJDEP Geoprobe location BF-1. Measured PCE concentrations were similar at both locations (BF-1 at 2,011 µg/L, Site 1 at 2,600 µg/L) for groundwater samples collected from similar depths (BF-1 21-24 feet bgs, Site 1 – 18 to 20 feet).

- Golder Site 2 and NJDEP Geoprobe location BF-2 are located near to the plume centerline. A comparison of groundwater quality from these two locations indicates the measured PCE concentrations were higher at BF-2 for groundwater samples collected from similar depths (BF-2 - 15 to 18 feet at 4,000 µg/L:, Site 2 - 16 to 18 feet at 9.1 µg/L).

- Golder Site 3 is situated near NJDEP location BF-4. PCE was not detected in the NJDEP samples until 29 to 32 feet bgs where the concentration was 1,693 µg/L. The PCE concentrations at Site 3 were low; however, the maximum sampling depth was 14 to 16 feet.

The comparison between the NJDEP and Golder program results for BF-2 and Site 2 indicated that the depth to elevated groundwater concentrations at Site 2 was somewhat greater than that at BF-2. This may be a result of a thicker freshwater lens in December 2003 due to greater than normal rainfall in 2003. Alternately, BF-2 may have been located closer to the centre-line of the PCE plume. Although the distribution of PCE in the contamination source area and the plume geometry has not been accurately mapped, there may be variation in vertical concentrations based on the location within the plume.

The soil vapor monitoring indicated several VOCs were detected in samples obtained from near to the water table. The concentrations of VOCs detected, including PCE, were similar to background VOC concentrations. For example, the maximum PCE concentration (2.5 ppbV, 17.4 μg/$m^3$) is within the range of reported background PCE concentrations in indoor air (Hers *et al*., 2001, USEPA, 2003, Kurtz and Folkes, 2003, Foster *et al*., 2003).

The Egg Harbor case study highlights the importance of a sound conceptual site model (CSM) and site characterization when evaluating the vapor intrusion potential. Significantly different interpretation results depending on the input groundwater concentrations used for the vapor intrusion evaluation. This is illustrated through reference to the Draft USEPA Vapor Intrusion (VI) Guidance. For PCE, the groundwater screening levels for a $1x10^{-6}$ incremental cancer risk (Table 3 in Guidance) are given in Table 6-8.

**Table 6-8. Groundwater Screening Levels for PCE**

| Alpha | Groundwater Screening Level for PCE (μg/L) |
|---|---|
| $1x10^{-3}$ | $5^t$ |
| $7x10^{-4}$ | $5^t$ |
| $5x10^{-4}$ | $5^t$ |
| $3x10^{-4}$ | $5^t$ |
| $2x10^{-4}$ | 5.4 |
| $1x10^{-4}$ | 11 |

t = Groundwater screening level for vapor intrusion less than MCL of 5 μg/L

While concentrations in groundwater obtained from less than 14 feet bgs were less than the USEPA groundwater screening levels, they were much higher in groundwater below 15 feet bgs. It would have been interesting to have a thinner wedge of groundwater with low groundwater concentrations (e.g., 2 to 4 feet). In this case, there would have been significant implications for site characterization methodology and interpretation of results. For example, it is likely that the PCE concentrations in a well with a 10 foot long screen may have shown elevated concentrations compared to a shorter screen positioned higher in the groundwater column.

### 6.7 Conclusions

A groundwater and soil vapor monitoring program was implemented in December 2003 and January 2004 at the Egg Harbor site. The objective of the program was to determine the potential for cross-media transfer of volatiles (primarily PCE) from groundwater to soil vapor, and soil vapor intrusion into homes. As discussed with NJDEP, as the data review and investigation process proceeded, the work scope was reduced since initial data indicated low potential for vapor intrusion. The December 2003/January 2004 monitoring program indicated the presence of near-surface interlayered coarse and fine-grained soil up to 8 feet to 10 feet depth bgs, underlain by a possibly semi-confined aquifer consisting of sand to silty sand. Groundwater monitoring in the residential area (Sites 1, 2 and 3) indicated there was at least 6 feet of groundwater (from about 8 to 14 feet bgs) with low or non-detect PCE groundwater concentrations. Previous data obtained by NJDEP suggested there is an increasing thickness of non-contaminated groundwater (e.g., fresh-water wedge) with increasing down-gradient distance from the contamination source. The PCE concentrations in soil vapor near the water table were low (non-detect to 2.5 ppbV) confirming low vapor source strength.

Although the December 2003 monitoring was conducted at the end of a year with higher than normal precipitation, it is unlikely that there will be water table fluctuations sufficient to cause significant cross-media volatilization even during extended dry periods. Therefore, no further monitoring is recommended at the Egg Harbor site for the purposes of this research program.

Although it appears that the potential for soil vapor intrusion into houses from the Egg Harbor chlorinated solvent plume is low, the results for this site highlight the importance of characterization of hydrological conditions, hydrostratigraphic units and vertical groundwater concentration profiles.

The relative potential for soil vapor intrusion is likely highest in commercial buildings located near to the contamination source area and residences located near the corner of Buffalo Avenue and White Horse Pike (Route 30). Further investigation at these buildings may be warranted, but is beyond the scope of this research program. In addition, consideration could be given to re-sampling of groundwater at MW-Site 1, and soil vapor at MW-Sites 1 and 2.

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**Table 2-1**
**EnCore$^{TM}$ Test Results for Soil Samples**
**Stafford Site**

| | BH-2 9 - 9.5' | | BH-3 11.5 - 12' | |
|---|---|---|---|---|
| **Parameter** | **Analytical Resluts Units: ug/kg (Dry Weight)** | **Quantitation Limit Units: ug/kg** | **Analytical Results Units: ug/kg (Dry Weight)** | **Quantitation Limit Units: ug/kg** |
| Benzene | ND | 1.5 | 680 | 480 |
| Toluene | ND | 7.4 | ND | 2400 |
| Ethylbenzene | ND | 6.0 | ND | 1900 |
| Xylene (Total) | ND | 7.4 | 520 J | 2400 |
| TBA | NT | NT | ND | 48000 |
| MTBE | 200 | 7.4 | 63000 | 2400 |

Notes:
NT = Not tested
ND = Not detected

# Table 2-2
## Groundwater and Soil Vapor Test Results
## Stafford Site, September 9-12, 2002

| Location | SOIL VAPOR CONCENTRATION | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BH-1 (10.5-11') (ppbV) | BH-1 (10.5-11') (ug/m3) | BH-2 (11-11.5') (ppbV) | BH-2 (11-11.5') (ug/m3) | BH-3 (11-11.5') (ppbV) | BH-3 (11-11.5') (ug/m3) | BH-4 (9-9.5') (ppbV) | BH-4 (9-9.5') (ug/m3) | BH-5 (5-5.5') (ppbV) | BH-5 (5-5.5') (ug/m3) | BH-6 (9.5-10') (ppbV) | BH-6 (9.5-10') (ug/m3) | BH-7 (9.5-10.3') (ppbV) | BH-7 (9.5-10.3') (ug/m3) |
| **Soil Vapor Syringe Sample & Field GC (NJDEP Photovac 10S50)** | | | | | | | | | | | | | | |
| Benzene | ND | ND | BR | BR | 109.3 | 347.8 | ND | ND | 15.6 | 49.6 | 0.325 | 1.03 | 0.54 | 1.72 |
| Toluene | ND | ND | BR | BR | ND | ND | ND | ND | 73.31 | 285 | 6.24 | 24.3 | 5.63 | 21.9 |
| Ethylbenzene | 33.65 | 145 | BR | BR | ND | ND | ND | ND | 31.31 | 135 | 2.99 | 12.9 | 5.81 | 25.1 |
| O-Xylene | ND | ND | BR | BR | ND | ND | ND | ND | 102.4 | 452 | 1.96 | 8.66 | ND | ND |
| **Soil Vapor Summa Canister Sample & GC/MS (Air Toxics Ltd.)** | | | | | | | | | | | | | | |
| Benzene | NT | NT | 350000 | 1100000 | NT | NT | NT | NT | 44 | 140 | 5.1 | 17 | NT | NT |
| Toluene | NT | NT | 1200000 | 4800000 | NT | NT | NT | NT | 360 | 1400 | 43 | 160 | NT | NT |
| Ethylbenzene | NT | NT | 49000 | 22000 | NT | NT | NT | NT | 51 | 220 | 7.4 | 33 | NT | NT |
| O-Xylene | NT | NT | 43000 | 190000 | NT | NT | NT | NT | 86 | 380 | 13 | 58 | NT | NT |
| M&P-Xylene | NT | NT | 180000 | 800000 | NT | NT | NT | NT | 240 | 1100 | 32 | 140 | NT | NT |
| MTBE | NT | NT | 1500000 | 5500000 | NT | NT | NT | NT | 70 | 260 | 8.1 | 130 | NT | NT |
| Isopentane | NT | NT | 5200000 | 15000000 | NT | NT | NT | NT | 65 | 190 | ND | ND | NT | NT |
| Pentane | NT | NT | 3100000 | 9300000 | NT | NT | NT | NT | 26 | 78 | ND | ND | NT | NT |
| Hexane | NT | NT | 2100000 | 7600000 | NT | NT | NT | NT | 41 | 150 | 4.8 | 17 | NT | NT |
| Cyclohexane | NT | NT | 350000 | 1200000 | NT | NT | NT | NT | 14 | 48 | ND | ND | NT | NT |
| Heptane | NT | NT | 540000 | 2200000 | NT | NT | NT | NT | 22 | 91 | 3.2 | 14 | NT | NT |
| Octane | NT | NT | ND* | ND* | NT | NT | NT | NT | 9.1 | 43 | ND | ND | NT | NT |
| Nonane | NT | NT | ND* | ND* | NT | NT | NT | NT | ND* | ND* | ND | ND | NT | NT |
| Decane | NT | NT | ND* | ND* | NT | NT | NT | NT | ND* | ND* | ND | ND | NT | NT |
| 1,3,5 TMB | NT | NT | ND* | ND* | NT | NT | NT | NT | 18 | 88 | 2.7 | 13 | NT | NT |
| 1,2,4 TMB | NT | NT | ND* | ND* | NT | NT | NT | NT | 56 | 280 | 12 | 61 | NT | NT |
| Acetone | NT | NT | ND* | ND* | NT | NT | NT | NT | 21 | 52 | 36 | 86 | NT | NT |
| MEK | NT | NT | ND* | ND* | NT | NT | NT | NT | ND* | ND* | 6 | 18 | NT | NT |
| Methylene Chloride | NT | NT | ND* | ND* | NT | NT | NT | NT | ND* | ND* | 0.9 | 3.2 | NT | NT |
| 4-Ethyltoluene | NT | NT | ND* | ND* | NT | NT | NT | NT | 49 | 240 | 7.8 | 39 | NT | NT |
| Ethanol | NT | NT | ND* | ND* | NT | NT | NT | NT | ND* | ND* | 4.6 | 8.9 | NT | NT |

| Location | GROUNDWATER CONCENTRATION (NJDEP Mobile Laboratory GC/MS EPA 524) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GW1 (BH-1) 11.0 - 13.0 (ug/L) | GW2 (BH-1) 13.0 - 15.0 (ug/L) | GW3 (BH-2) 11.5 - 13.5 (ug/L) | GW4 (BH-2) 13.5 - 15.5 (ug/L) | GW5 (BH-3) 11.5 - 13.5 (ug/L) | GW6 (BH-3) 13.5 - 15.5 (ug/L) | GW7 (BH-4) 10.0 - 12.0 (ug/L) | GW8 (BH-4) 12.0 - 14.0 (ug/L) | GW9 (BH-5) 5.5 - 7.5 (ug/L) | GW10 (BH-5) 7.5 - 9.5 (ug/L) | GW11 (BH-6) 10.5 - 12.5 (ug/L) | GW12 (BH-6) 12.5 - 14.5 (ug/L) | GW13 (BH-7) 11.0 - 13.0 (ug/L) | GW14 (BH-7) 13.0 - 15.0 (ug/L) |
| Benzene | ND | ND | 12286 | 8720 | 4518 | 2786 | 0.39 J | ND | ND | 21.76 | 498 | 4771.89 | 29 | 30.81 |
| Toluene | ND | ND | 31981 | 4008 | 301 | 20.97 J | ND | ND | ND | 0.44 | 17 | 79.9 | ND | 0.26 J |
| Ethyl-benzene | ND | ND | 2869 | 1159 | 1597 | 130.7 | ND | ND | ND | 1.78 | 51 | 606.91 | ND | 0.74 |
| o-Xylene | ND | ND | 6118 | 780 | 20 | 0.24 J | ND | ND | ND | ND | 4 | 43.65 | ND | 0.82 |
| m,p-Xylene | ND | ND | 14,629 | 5,306 | 2970 | 58 | ND | ND | ND | ND | 68 | 605.65 | ND | 0.54 |
| MTBE | ND | ND | 520086 | 314142 | 237563 | 1267 | 112 | ND | 0.35 J | 11.36 | 16885 | 171678 | 17 | 175.2 |
| Naphthalene | ND | ND | 997 | 445 | 485 | 192.9 | ND | ND | ND | 0.23 J | 9 | 209.67 | ND | 0.85 |
| 1,3,5 TMB | ND | ND | 965.71 | 379.9 J | 301.06 | 46.4 | ND | ND | ND | ND | ND | 42.76 | ND | ND |
| 1,2,4 TMB | ND | ND | 3552.54 | 1190 | 1483.42 | 328.3 | ND | ND | ND | 0.81 | 29.65 | 436.38 | 0.28 J | 1.66 |
| isopropylbenzene | ND | ND | 255.47 | 49.5 | 93.3 | 13.3 | ND | ND | ND | ND | 2.92 J | 29.78 | ND | 0.87 |
| n-propylbenzene | ND | ND | 364.9 | 85.2 | 227.51 | 36.14 | ND | ND | ND | ND | 3.42 J | 21.42 | ND | ND |
| n-butylbenzene | ND | ND | 289.33 | 86.1 | ND | 5.64 | ND | ND | ND | ND | 0.31 J | 3.79 | ND | ND |

Notes:
BR = Beyond Range    MEK = Methyl Ethyl Ketone    NT = not tested    ND* = raised detection limit
Groundwater not analyzed for aliphatics (iso-pentane through decane), MEK, 4-Ethyltoluene, Ethanol

# Table 2-3
## Predicted Deep Soil Vapor Using Groundwater Concentrations
## Stafford Site, September 9-12, 2002

| Location | MEASURED SOIL VAPOR BH-1 (10.5-11') (ug/m3) | BH-2 (11-11.5') (ug/m3) | BH-3 (11-11.5') (ug/m3) | BH-4 (9-9.5') (ug/m3) | BH-5 (5-5.5') (ug/m3) | BH-6 (9.5-10') (ug/m3) | BH-7 (9.5-10.3') (ug/m3) |
|---|---|---|---|---|---|---|---|
| **Measured Soil Vapor Syringe Sample & Field GC (NJDEP Photovac 10S50)** | | | | | | | |
| Benzene | ND | BR | 3.48E+02 | ND | 4.96E+01 | 1.03E+00 | 1.72E+00 |
| Toluene | ND | BR | ND | ND | 2.85E+02 | 2.43E+01 | 2.19E+01 |
| Ethylbenzene | 1.45E+02 | BR | ND | ND | 1.35E+02 | 1.29E+01 | 2.51E+01 |
| O-Xylene | ND | BR | ND | ND | 4.52E+02 | 8.66E+00 | ND |
| **Measured Soil Vapor Summa Canister Sample & GC/MS (Air Toxics Ltd.)** | | | | | | | |
| Benzene | NT | 1.10E+06 | NT | NT | 1.40E+02 | 1.70E+01 | NT |
| Toluene | NT | 4.80E+06 | NT | NT | 1.40E+03 | 1.60E+02 | NT |
| Ethylbenzene | NT | 2.20E+04 | NT | NT | 2.20E+02 | 3.30E+01 | NT |
| O-Xylene | NT | 1.90E+05 | NT | NT | 3.80E+02 | 5.80E+01 | NT |
| M&P-Xylene | NT | 8.00E+05 | NT | NT | 1.10E+03 | 1.40E+02 | NT |
| MTBE | NT | 5.50E+06 | NT | NT | 2.60E+02 | 1.30E+02 | NT |
| Isopentane | NT | 1.50E+07 | NT | NT | 1.90E+02 | ND | NT |
| Pentane | NT | 9.30E+06 | NT | NT | 7.80E+01 | ND | NT |
| Hexane | NT | 7.60E+06 | NT | NT | 1.50E+02 | 1.70E+01 | NT |
| Cyclohexane | NT | 1.20E+06 | NT | NT | 4.80E+01 | ND | NT |
| Heptane | NT | 2.20E+06 | NT | NT | 9.10E+01 | 1.40E+01 | NT |
| Octane | NT | ND* | NT | NT | 4.30E+01 | ND | NT |
| Nonane | NT | ND* | NT | NT | ND* | ND | NT |
| Decane | NT | ND* | NT | NT | ND* | ND | NT |
| 1,3,5 TMB | NT | ND* | NT | NT | 8.80E+01 | 1.30E+01 | NT |
| 1,2,4 TMB | NT | ND* | NT | NT | 2.80E+02 | 6.10E+01 | NT |
| Acetone | NT | ND* | NT | NT | 5.20E+01 | 8.60E+01 | NT |
| MEK | NT | ND* | NT | NT | ND* | 1.80E+01 | NT |
| Methylene Chloride | NT | ND* | NT | NT | ND* | 3.20E+00 | NT |
| 4-Ethyltoluene | NT | ND* | NT | NT | 2.40E+02 | 3.90E+01 | NT |
| Ethanol | NT | ND* | NT | NT | ND* | 8.90E+00 | NT |

| Location | MEASURED GROUNDWATER GW1 (BH-1) 11.0 - 13.0 (ug/L) | GW3 (BH-2) 11.5 - 13.5 (ug/L) | GW5 (BH-3) 11.5 - 13.5 (ug/L) | GW7 (BH-4) 10.0 - 12.0 (ug/L) | GW9 (BH-5) 5.5 - 7.5 (ug/L) | GW11 (BH-6) 10.5 - 12.5 (ug/L) | GW13 (BH-7) 11.0 - 13.0 (ug/L) |
|---|---|---|---|---|---|---|---|
| Benzene | ND | 12286 | 4518 | 0.39 J | ND | 498 | 29 |
| Toluene | ND | 31981 | 301 | ND | ND | 17 | ND |
| Ethyl-benzene | ND | 2869 | 1597 | ND | ND | 51 | ND |
| o-Xylene | ND | 6118 | 20 | ND | ND | 4 | ND |
| m,p-Xylene | ND | 14,629 | 2970 | ND | ND | 68 | ND |
| MTBE | ND | 520086 | 237563 | 112 | 0.35 J | 16885 | 17 |
| Naphthalene | ND | 997 | 485 | ND | ND | 9 | ND |
| 1,3,5 TMB | ND | 965.71 | 301.06 | ND | ND | ND | ND |
| 1,2,4 TMB | ND | 3552.54 | 1483.42 | ND | ND | 29.65 | 0.28 J |
| isopropylbenzene | ND | 255.47 | 93.3 | ND | ND | 2.92 J | ND |
| n-propylbenzene | ND | 364.9 | 227.51 | ND | ND | 3.42 J | ND |
| n-butylbenzene | ND | 289.33 | ND | ND | ND | 0.31 J | ND |

| Location | Henry's Law Constant (-) | PREDICTED SOIL VAPOR CONCENTRATIONS NEAR WATER TABLE (USING HENRY'S LAW) BH-1 (10.5-11') (ug/m3) | BH-2 (11-11.5') (ug/m3) | BH-3 (11-11.5') (ug/m3) | BH-4 (9-9.5') (ug/m3) | BH-5 (5-5.5') (ug/m3) | BH-6 (9.5-10') (ug/m3) | BH-7 (9.5-10.3') (ug/m3) |
|---|---|---|---|---|---|---|---|---|
| Benzene | 2.28E-01 | N/A | 2.80E+06 | 1.03E+06 | N/A | N/A | 1.14E+05 | 6.61E+03 |
| Toluene | 2.72E-01 | N/A | 8.70E+06 | 8.19E+04 | N/A | N/A | 4.62E+03 | N/A |
| Ethyl-benzene | 3.23E-01 | N/A | 9.27E+05 | 5.16E+05 | N/A | N/A | 1.65E+04 | N/A |
| o-Xylene | 2.90E-01 | N/A | 1.77E+06 | 5.80E+03 | N/A | N/A | 1.16E+03 | N/A |
| m,p-Xylene | 2.90E-01 | N/A | 4.24E+06 | 8.61E+05 | N/A | N/A | 1.97E+04 | N/A |
| MTBE | 2.04E-02 | N/A | 1.06E+07 | 4.85E+06 | 2.28E+03 | N/A | 3.44E+05 | 3.47E+02 |
| Naphthalene | 1.98E-02 | N/A | 1.97E+04 | 9.60E+03 | N/A | N/A | 1.78E+02 | N/A |
| 1,3,5 TMB | 3.20E-01 | N/A | 3.09E+05 | 9.63E+04 | N/A | N/A | N/A | N/A |
| 1,2,4 TMB | 2.30E-01 | N/A | 8.17E+05 | 3.41E+05 | N/A | N/A | 6.82E+03 | N/A |
| isopropylbenzene | 4.90E+01 | N/A | 1.25E+07 | 4.57E+06 | N/A | N/A | N/A | N/A |
| n-propylbenzene | 5.40E-01 | N/A | 1.97E+05 | 1.23E+05 | N/A | N/A | N/A | N/A |
| n-butylbenzene | 5.40E-01 | N/A | 1.56E+05 | N/A | N/A | N/A | N/A | N/A |

| | RATIO MEASURED SUMMA SOIL VAPOR/PREDICTEDCONCENTRATIONS AT WATER TABLE BH-1 (10.5-11') | BH-2 (11-11.5') | BH-3 (11-11.5') | BH-4 (9-9.5') | BH-5 (5-5.5') | BH-6 (9.5-10') | BH-7 (9.5-10.3') |
|---|---|---|---|---|---|---|---|
| Benzene | N/A | 3.9E-01 | N/A | N/A | N/A | 1.5E-04 | N/A |
| Toluene | N/A | 5.5E-01 | N/A | N/A | N/A | 3.5E-02 | N/A |
| Ethyl-benzene | N/A | 2.4E-02 | N/A | N/A | N/A | 2.0E-03 | N/A |
| o-Xylene | N/A | 1.1E-01 | N/A | N/A | N/A | 5.0E-02 | N/A |
| m,p-Xylene | N/A | 1.9E-01 | N/A | N/A | N/A | 7.1E-03 | N/A |
| MTBE | N/A | 5.2E-01 | N/A | N/A | N/A | 3.8E-04 | N/A |

# Table 2-4
## Predicted Indoor Air Concentrations Using Soil Vapor and Alpha Equal to 0.001
## Stafford Site, September 9-12, 2002

| Location | BH-1 (10.5-11') (ug/m3) | BH-2 (11-11.5') (ug/m3) | BH-3 (11-11.5') (ug/m3) | BH-4 (9-9.5') (ug/m3) | BH-5 (5-5.5') (ug/m3) | BH-6 (9.5-10') (ug/m3) | BH-7 (9.5-10.3') (ug/m3) |
|---|---|---|---|---|---|---|---|
| **Measured Soil Vapor - Syringe Sample & Field GC (NJDEP Photovac 10S50)** | | | | | | | |
| Benzene | ND | BR | 347.8 | ND | 49.6 | 1.03 | 1.72 |
| Toluene | ND | BR | ND | ND | 285 | 24.3 | 21.9 |
| Ethylbenzene | 145 | BR | ND | ND | 135 | 12.9 | 25.1 |
| O-Xylene | ND | BR | ND | ND | 452 | 8.66 | ND |
| **Predicted Indoor Air Concentration Using Field GC Results (ug/m3) (using alpha = 0.001)** | | | | | | | |
| Benzene | N/A | N/A | 0.35 | N/A | 0.050 | 0.001 | 0.002 |
| Toluene | N/A | N/A | N/A | N/A | 0.285 | 0.024 | 0.022 |
| Ethylbenzene | 0.15 | N/A | N/A | N/A | 0.135 | 0.013 | 0.025 |
| O-Xylene | N/A | N/A | N/A | N/A | 0.452 | 0.009 | N/A |
| **Measured Soil Vapor - Summa Canister Sample & GC/MS (Air Toxics Ltd.)** | | | | | | | |
| Benzene | NT | 1100000 | NT | NT | 140 | 17 | NT |
| Toluene | NT | 4800000 | NT | NT | 1400 | 160 | NT |
| Ethylbenzene | NT | 22000 | NT | NT | 220 | 33 | NT |
| O-Xylene | NT | 190000 | NT | NT | 380 | 58 | NT |
| M&P-Xylene | NT | 800000 | NT | NT | 1100 | 140 | NT |
| MTBE | NT | 5500000 | NT | NT | 260 | 130 | NT |
| Isopentane | NT | 15000000 | NT | NT | 190 | ND | NT |
| Pentane | NT | 9300000 | NT | NT | 78 | ND | NT |
| Hexane | NT | 7600000 | NT | NT | 150 | 17 | NT |
| Cyclohexane | NT | 1200000 | NT | NT | 48 | ND | NT |
| Heptane | NT | 2200000 | NT | NT | 91 | 14 | NT |
| Octane | NT | ND* | NT | NT | 43 | ND | NT |
| Nonane | NT | ND* | NT | NT | ND* | ND | NT |
| Decane | NT | ND* | NT | NT | ND* | ND | NT |
| 1,3,5 TMB | NT | ND* | NT | NT | 88 | 13 | NT |
| 1,2,4 TMB | NT | ND* | NT | NT | 280 | 61 | NT |
| Acetone | NT | ND* | NT | NT | 52 | 86 | NT |
| MEK | NT | ND* | NT | NT | ND* | 18 | NT |
| Methylene Chloride | NT | ND* | NT | NT | ND* | 3.2 | NT |
| 4-Ethyltoluene | NT | ND* | NT | NT | 240 | 39 | NT |
| Ethanol | NT | ND* | NT | NT | ND* | 8.9 | NT |
| **Predicted Indoor Air Concentration Using Summa Results (ug/m3) (using alpha = 0.001)** | | | | | | | |
| Benzene | NT | **1100** | NT | NT | 0.14 | 0.017 | NT |
| Toluene | NT | **4800** | NT | NT | 1.4 | 0.16 | NT |
| Ethylbenzene | NT | 22 | NT | NT | 0.22 | 0.033 | NT |
| O-Xylene | NT | **190** | NT | NT | 0.38 | 0.058 | NT |
| M&P-Xylene | NT | **800** | NT | NT | 1.1 | 0.14 | NT |
| MTBE | NT | **5500** | NT | NT | 0.26 | 0.13 | NT |
| Isopentane | NT | **15000** | NT | NT | 0.19 | N/A | NT |
| Pentane | NT | **9300** | NT | NT | 0.078 | N/A | NT |
| Hexane | NT | **7600** | NT | NT | 0.15 | 0.017 | NT |
| Cyclohexane | NT | **1200** | NT | NT | 0.048 | N/A | NT |
| Heptane | NT | **2200** | NT | NT | 0.091 | 0.014 | NT |
| Octane | NT | N/A | NT | NT | 0.043 | N/A | NT |
| Nonane | NT | N/A | NT | NT | N/A | N/A | NT |
| Decane | NT | N/A | NT | NT | N/A | N/A | NT |
| 1,3,5 TMB | NT | N/A | NT | NT | 0.088 | 0.013 | NT |
| 1,2,4 TMB | NT | N/A | NT | NT | 0.28 | 0.061 | NT |
| Acetone | NT | N/A | NT | NT | 0.052 | 0.086 | NT |
| MEK | NT | N/A | NT | NT | N/A | 0.018 | NT |
| Methylene Chloride | NT | N/A | NT | NT | N/A | 0.0032 | NT |
| 4-Ethyltoluene | NT | N/A | NT | NT | 0.24 | 0.039 | NT |
| Ethanol | NT | N/A | NT | NT | N/A | 0.0089 | NT |

Note:
1. Bolded indoor air concentration are above typical background.

# Table 3-1
## Summary of House Characteristics, Stafford Site



| Location | Type of Building | Number Levels | Base-ment? | Crawl-space? | Depth bgs base founda-tion slab (m) | Height crawl-space (m) | Foundation base con-struction | Subsurface foundation walls con-struction | Type fuel used | Type heating system | Summary foundation conditions[4] | Summary chemical use and storage[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 63 E. Bay Avenue | Bike Shop | 1 | NO | NO | 1.68 | N/A | Concrete[3] | N/A | Natural Gas | Forced Air | Concrete slab on grade | Use kerosene and oil as part of bicycle maintenance |
| 73 E. Bay Avenue | Antique Store[1] | 2 ½ | YES[2] | YES[2] | 1.68 | Variable | Concrete[3] | Concrete Block | Oil Furnace | Hot water radiant | Approximately 50% basement concrete slab, 50% raised crawlspace with dirt floor partially covered with plastic, approximately 2 ft by 2 ft hole in concrete floor exposed to dirt | Some paints and thinners stored in basement, fuel oil tank in basement |
| 14 Park Avenue | House | 2 | YES | NO | 1.68 | N/A | Concrete[3] | Concrete Block | Oil Furnace | Hot water radiant | Concrete basement foundation, floor mostly covered, concrete in uncovered areas appears uncracked | Some paints, thinners and cleaning solvents stored basement, occupants have noticed diesel odour |
| 18 Park Avenue | House | 2 | YES | NO | 1.68 | N/A | Concrete[3] | Concrete Block | Natural Gas | Forced air | Approximately 80% basement concrete slab, 20% raised crawlspace with dirt floor, concrete appears uncracked | Some paints and thinners stored first floor, recently painted first floor |
| 22 Park Avenue | House | 2 | NO | YES | 1.68 | ~1.2 | Concrete[3] | Concrete Block | Oil Furnace | Hot water radiant | Crawlspace below entire house, dirt floor, several vents in crawlspace to outside, no gaps observed in floor separating crawlspace & first floor | Some paints, thinners and cleaning solvents stored first floor, some hobbies which involve use of glues and paints second floor |

Notes:

1 Converted house

2 Partial basement and crawlspace, see report for additional details

3 Poured concrete

4 See questionaires for additional information

# Table 3-2
## Results of October 2002
## Field Headspace Vapour Tests, Stafford Site

| Location | VP-9 | VP-10 | VP-11 | VP-12 | VP-13 |
|---|---|---|---|---|---|
| Date | 10/28/2002 | 10/28/2002 | 10/28/2002 | 10/28/2002 | 10/28/2002 |
| Depth | (ppm) | (ppm) | (ppm) | (ppm) | (ppm) |
| 0-1 | 1.6 | 9 | 0.4 | 0.4 | 1.3 |
| 1-2 | 1.2 | 9.1 | 0.4 | 0.4 | 0.6 |
| 2-3 | 2.5 | 9.2 | 0.4 | 0.2 | 1.6 |
| 3-4 | 32 | 2.2 | 0.4 | 0.5 | 89.2 |
| 4-5 | 56 | 3.9 | 0.4 | 0.5 | 8.3 |
| 5-6 | 75 | 16.7 | 0.5 | 0.6 | 28 |
| 6-7 | 33.1 | 10.5 | 0.4 | 0.4 | 88.6 |
| 7-8 | 289 | 11.8 | 0.4 | 0.6 | 3.8 |
| 8-9 | 420 | 7.9 | 0.8 | 0.3 | 94.6 |
| 9-10 | 3928 | 6.9 | 0.5 | 0.5 | 116 |
| 10-11 | 1017 | 3.3 | 1.3 | 0.8 | 248 |
| 11-12 | 3398 | 1045 | 0.8 | 0.8 | 3305 |

Note: All headspace vapour readings obtained using PID with 10.2 eV lamp

# Table 3-3
## Results of October 2002 Soil Analyses, Stafford Site

| Sample ID | VP-9 | | VP-13 | |
|---|---|---|---|---|
| Sample Date | 10/28/2002 | | 10/28/2002 | |
| Laboratory ID | 386890 | | 386894 | |
| Method | 8260B | | 8260B | |
| Depth | 10.8 to 11.2 ft | | 10.3 to 10.7 ft | |
| Analysis Date | 10/28/2002 | 11/1/2002 | 10/28/2002 | 10/30/2002 |
| | Concentration (ug/kg) | Reporting Limit | Concentration (ug/kg) | Reporting Limit |
| Chloromethane | U | 7500 | U | 18 |
| Bromomethane | U | 7500 | U | 18 |
| Vinyl Chloride | U | 7500 | U | 18 |
| Chloroethane | U | 7500 | U | 18 |
| Methylene Chloride | U | 4500 | U | 11 |
| Acetone | U | 7500 | U | 18 |
| Carbon Disulfide | U | 7500 | U | 18 |
| Trichlorofluoromethane | U | 7500 | U | 18 |
| 1,1-Dichloroethene | U | 3000 | U | 7.2 |
| 1,1-Dichloroethane | U | 7500 | U | 18 |
| trans-1,2-Dichloroethene | U | 7500 | U | 18 |
| cis-1,2-Dichloroethene | U | 7500 | U | 18 |
| Chloroform | U | 7500 | U | 18 |
| 1,2-Dichloroethane | U | 3000 | U | 7.2 |
| 2-Butanone | U | 7500 | U | 18 |
| 1,1,1-Trichloroethane | U | 7500 | U | 18 |
| Carbon Tetrachloride | U | 3000 | U | 7.2 |
| Bromodichloromethane | U | 1500 | U | 3.6 |
| 1,2-Dichloropropane | U | 1500 | U | 3.6 |
| cis-1,3-Dichloropropene | U | 7500 | U | 18 |
| Trichloroethene | U | 1500 | U | 3.6 |
| Dibromochloromethane | U | 7500 | U | 18 |
| 1,1,2-Trichloroethane | U | 4500 | U | 11 |
| Benzene | 6400 | 1500 | U | 3.6 |
| trans-1,3-Dichloropropene | U | 7500 | U | 18 |
| Bromoform | U | 6000 | 4.0 J | 14 |
| 4-Methyl-2-Pentanone | U | 7500 | U | 18 |
| 2-Hexanone | U | 7500 | U | 18 |
| Tetrachloroethene | U | 1500 | U | 3.6 |
| 1,1,2,2-Tetrachloroethane | U | 1500 | U | 3.6 |
| Toluene | 150000 | 7500 | 2.2 J | 18 |
| Chlorobenzene | U | 7500 | U | 18 |
| Ethylbenzene | 56000 | 6000 | 3.4 J | 14 |

# Table 3-3
## Results of October 2002 Soil Analyses, Stafford Site

| Sample ID | VP-9 | | VP-13 | |
|---|---|---|---|---|
| Sample Date | 10/28/2002 | | 10/28/2002 | |
| Laboratory ID | 386890 | | 386894 | |
| Method | 8260B | | 8260B | |
| Depth | 10.8 to 11.2 ft | | 10.3 to 10.7 ft | |
| Analysis Date | 10/28/2002 | 11/1/2002 | 10/28/2002 | 10/30/2002 |
| | Concentra-tion (ug/kg) | Reporting Limit | Concentra-tion (ug/kg) | Reporting Limit |
| Styrene | U | 7500 | U | 18 |
| Xylene (Total) | 360000 | 7500 | 18 J | 18 |
| Freon TF | U | 7500 | U | 18 |
| MTBE | 18000 | 7500 | 63 | 18 |
| Cyclohexane | 39000 | 7500 | U | 18 |
| 1,2-Dibromoethane | U | 7500 | U | 18 |
| 1,3-Dichlorobenzene | U | 7500 | U | 18 |
| 1,4-Dichlorobenzene | U | 7500 | U | 18 |
| 1,2-Dichlorobenzene | U | 7500 | U | 18 |
| Dichlorodifluoromethane | U | 7500 | U | 18 |
| 1,2,4-Trichlorobenzene | U | 7500 | U | 18 |
| 1,2-Dibromo-3-chloropropane | U | 7500 | U | 18 |
| Isopropylbenzene | 13000 | 7500 | U | 18 |
| Methyl acetate | U | 7500 | U | 18 |
| Methylcyclohexane | 34000 | 7500 | U | 18 |

J=Quantiation is approximate due to limitations identified during the quality assurance review (data validation)
U=Compound was not detected

# Table 3-4
## Field Groundwater Testing October 2002
## Stafford Site

| Location | Temperature [$^{o}$ C] | pH [std] | Specific Conductance [ms/cm] | Dissolved Oxygen [mg/L] | Redox Potential [mV] | Turbidity [ntu] |
|---|---|---|---|---|---|---|
| VP-9 | 15.60 | 6.55 | 0.901 | Note 1 | -59 | 990 |
| VP-10 | 17.60 | 6.54 | 0.664 | 0.43 | -107 | 990 |
| VP-11 | 17.00 | 6.04 | 0.635 | 2.27 | 32 | 100 |
| VP-12 | 16.40 | 6.67 | 0.166 | 2.00 | -54 | 630 |
| VP-13 | 20.00 | 6.23 | 0.547 | 0.63 | -78 | 290 |

Notes:
1. Insufficient recharge to purge using low flow method.
Dissolved oxygen value invalid due to aeration of flow cell.

**Table 3-5**
**Results of September and October 2002 Groundwater Testing**
**Stafford Site**

| Sample ID | GW1 (BH-1) | GW2 (BH-1) | GW3 (BH-2) | GW4 (BH-2) | GW5 (BH-3) | GW7 | GW6 (BH-3) | GW7 (BH-4) |
|---|---|---|---|---|---|---|---|---|
| Sample Date | 9/9/2002 | 9/9/2002 | 10/9/2002 | 10/9/2002 | 10/9/2002 | | 10/9/2002 | 11/9/2002 |
| Laboratory | NJDEP Mobile | NJDEP Mobile | NJDEP Mobile | NJDEP Mobile | NJDEP Mobile | NJDEP Mobile | NJDEP Mobile | NJDEP Mobile |
| Laboratory ID | BAY108.D | BAY109.D | BAY115.D, 189.D, 173.D | BAY114.D, 188.D, 174.D | BAY 132.D, 154.D, 187.D, 172.D | | BAY 177.D, 136.D, 190.D | 09240226.D, BAY135.D |
| Method | GC/MS EPA 524 | GC/MS EPA 524 | GC/MS EPA 524 | GC/MS EPA 524 | GC/MS EPA 524 | GC/MS EPA 524 | GC/MS EPA 524 | GC/MS EPA 524 |
| Analysis Date | 17/9/2002 | 17/9/2002 | 17/9/2002 | 21/9/2002 | 19/9/2002 | | 18/9/2002 | 25/9/2002 |
| Depth | | | | | | | | |
| Benzene | ND | ND | 12286 | 8720 | 4518 | 0.39 J | 2786 | 0.39 J |
| Toluene | ND | ND | 31981 | 4008 | 301 | ND | 20.97 J | ND |
| Ethylbenzene | ND | ND | 2869 | 1159 | 1597 | ND | 130.7 | ND |
| o-Xylene | ND | ND | 6118 | 780 | 20 | ND | 0.24 J | ND |
| m,p-Xylene | ND | ND | 14,629 | 5,306 | 2970 | ND | 58 | ND |
| Xylenes | NT | NT | NT | NT | NT | NT | NT | NT |
| MTBE | ND | ND | 520086 | 314142 | 237563 | 112 | 1267 | 112 |
| Naphthalene | ND | ND | 997 | 445 | 485 | ND | 192.9 | ND |
| 1,3,5 TMB | ND | ND | 965.71 | 379.9 J | 301.06 | ND | 46.4 | ND |
| 1,2,4 TMB | ND | ND | 3552.54 | 1190 | 1483.42 | ND | 328.3 | ND |
| isopropylbenzene | ND | ND | 255.47 | 49.5 | 93.3 | ND | 13.3 | ND |
| n-propylbenzene | ND | ND | 364.9 | 85.2 | 227.51 | ND | 36.14 | ND |
| n-butylbenzene | ND | ND | 289.33 | 86.1 | ND | ND | 5.64 | ND |
| Chloromethane | NT | NT | NT | NT | NT | NT | NT | NT |
| Bromomethane | NT | NT | NT | NT | NT | NT | NT | NT |
| Vinyl Chloride | NT | NT | NT | NT | NT | NT | NT | NT |
| Chloroethane | NT | NT | NT | NT | NT | NT | NT | NT |
| Methylene Chloride | NT | NT | NT | NT | NT | NT | NT | NT |
| Acetone | NT | NT | NT | NT | NT | NT | NT | NT |
| Carbon Disulfide | NT | NT | NT | NT | NT | NT | NT | NT |
| Trichlorofluoromethane | NT | NT | NT | NT | NT | NT | NT | NT |
| 1,1-Dichloroethene | NT | NT | NT | NT | NT | NT | NT | NT |
| 1,1-Dichloroethane | NT | NT | NT | NT | NT | NT | NT | NT |
| trans-1,2-Dichloroethene | NT | NT | NT | NT | NT | NT | NT | NT |
| cis-1,2-Dichloroethene | NT | NT | NT | NT | NT | NT | NT | NT |
| Chloroform | NT | NT | NT | NT | NT | NT | NT | NT |
| 1,2-Dichloroethane | NT | NT | NT | NT | NT | NT | NT | NT |
| 2-Butanone | NT | NT | NT | NT | NT | NT | NT | NT |
| 1,1,1-Trichloroethane | NT | NT | NT | NT | NT | NT | NT | NT |
| Carbon Tetrachloride | NT | NT | NT | NT | NT | NT | NT | NT |
| Bromodichloromethane | NT | NT | NT | NT | NT | NT | NT | NT |
| 1,2-Dichloropropane | NT | NT | NT | NT | NT | NT | NT | NT |
| cis-1,3-Dichloropropene | NT | NT | NT | NT | NT | NT | NT | NT |
| Trichloroethene | NT | NT | NT | NT | NT | NT | NT | NT |
| Dibromochloromethane | NT | NT | NT | NT | NT | NT | NT | NT |
| 1,1,2-Trichloroethane | NT | NT | NT | NT | NT | NT | NT | NT |
| trans-1,3-Dichloropropene | NT | NT | NT | NT | NT | NT | NT | NT |
| Bromoform | NT | NT | NT | NT | NT | NT | NT | NT |
| 4-Methyl-2-Pentanone | NT | NT | NT | NT | NT | NT | NT | NT |
| 2-Hexanone | NT | NT | NT | NT | NT | NT | NT | NT |
| Tetrachloroethene | NT | NT | NT | NT | NT | NT | NT | NT |
| 1,1,2,2-Tetrachloroethane | NT | NT | NT | NT | NT | NT | NT | NT |
| Chlorobenzene | NT | NT | NT | NT | NT | NT | NT | NT |
| Styrene | NT | NT | NT | NT | NT | NT | NT | NT |
| Freon TF | NT | NT | NT | NT | NT | NT | NT | NT |
| 1,2-Dibromoethane | NT | NT | NT | NT | NT | NT | NT | NT |
| 1,3-Dichlorobenzene | NT | NT | NT | NT | NT | NT | NT | NT |
| 1,4-Dichlorobenzene | NT | NT | NT | NT | NT | NT | NT | NT |
| 1,2-Dichlorobenzene | NT | NT | NT | NT | NT | NT | NT | NT |
| Dichlorodifluoromethane | NT | NT | NT | NT | NT | NT | NT | NT |
| 1,2,4-Trichlorobenzene | NT | NT | NT | NT | NT | NT | NT | NT |
| 1,2-Dibromo-3-chloropropane | NT | NT | NT | NT | NT | NT | NT | NT |
| Isopropylbenzene | NT | NT | NT | NT | NT | NT | NT | NT |
| Methyl Acetate | NT | NT | NT | NT | NT | NT | NT | NT |
| Methyl Cyclohexane | NT | NT | NT | NT | NT | NT | NT | NT |
| Total BTEX | ND | ND | 67883 | 19973 | 9406 | ND | 2975 | ND |

J=Quantiation is approximate due to limitations identified during the quality assurance review (data validation)
U=Compound was not detected ND = Not detected NT = Not tested
All concentrations in ug/L

**Table 3-5**
**Results of September and October 2002 Groundwater Testing**
**Stafford Site**

| Sample ID | GW8 (BH-4) | GW9 (BH-5) | GW10 (BH-5) | GW11 (BH-6) | GW12 (BH-6) | GW13 (BH-7) | GW14 (BH-7) |
|---|---|---|---|---|---|---|---|
| Sample Date | 11/9/2002 | 11/9/2002 | 11/9/2002 | 12/9/2002 | 12/9/2002 | 12/9/2002 | 12/9/2002 |
| Laboratory | NJDEP Mobile | NJDEP Mobile | NJDEP Mobile | NJDEP Mobile | NJDEP Mobile | NJDEP Mobile | NJDEP Mobile |
| Laboratory ID | HAR105.D | BAY110.D | BAY111.D | BAY112.D, 151.D, 175.D | BAY113.D, 152.D, 191.D, 171.D | BAY148.D, 134.D | BAY149.D |
| Method | GC/MS EPA 524 | GC/MS EPA 524 | GC/MS EPA 524 | GC/MS EPA 524 | GC/MS EPA 524 | GC/MS EPA 524 | GC/MS EPA 524 |
| Analysis Date | 23/9/2002 | 17/9/2002 | 17/9/2002 | 17/9/2002 | 17/9/2002 | 19/9/2002 | 19/9/2002 |
| Depth | | | | | | | |
| Benzene | ND | ND | 21.76 | 498 | 4771.89 | 29 | 30.81 |
| Toluene | ND | ND | 0.44 | 17 | 79.9 | ND | 0.26 J |
| Ethylbenzene | ND | ND | 1.78 | 51 | 606.91 | ND | 0.74 |
| o-Xylene | ND | ND | ND | 4 | 43.65 | ND | 0.82 |
| m,p-Xylene | ND | ND | ND | 68 | 605.65 | ND | 0.54 |
| Xylenes | NT | NT | NT | NT | NT | NT | NT |
| MTBE | ND | 0.35 J | 11.36 | 16885 | 171678 | 17 | 175.2 |
| Naphthalene | ND | ND | 0.23 J | 9 | 209.67 | ND | 0.85 |
| 1,3,5 TMB | ND | ND | ND | ND | 42.76 | ND | ND |
| 1,2,4 TMB | ND | ND | 0.81 | 29.65 | 436.38 | 0.28 J | 1.66 |
| isopropylbenzene | ND | ND | ND | 2.92 J | 29.78 | ND | 0.87 |
| n-propylbenzene | ND | ND | ND | 3.42 J | 21.42 | ND | ND |
| n-butylbenzene | ND | ND | ND | 0.31 J | 3.79 | ND | ND |
| Chloromethane | NT | NT | NT | NT | NT | NT | NT |
| Bromomethane | NT | NT | NT | NT | NT | NT | NT |
| Vinyl Chloride | NT | NT | NT | NT | NT | NT | NT |
| Chloroethane | NT | NT | NT | NT | NT | NT | NT |
| Methylene Chloride | NT | NT | NT | NT | NT | NT | NT |
| Acetone | NT | NT | NT | NT | NT | NT | NT |
| Carbon Disulfide | NT | NT | NT | NT | NT | NT | NT |
| Trichlorofluoromethane | NT | NT | NT | NT | NT | NT | NT |
| 1,1-Dichloroethene | NT | NT | NT | NT | NT | NT | NT |
| 1,1-Dichloroethane | NT | NT | NT | NT | NT | NT | NT |
| trans-1,2-Dichloroethene | NT | NT | NT | NT | NT | NT | NT |
| cis-1,2-Dichloroethene | NT | NT | NT | NT | NT | NT | NT |
| Chloroform | NT | NT | NT | NT | NT | NT | NT |
| 1,2-Dichloroethane | NT | NT | NT | NT | NT | NT | NT |
| 2-Butanone | NT | NT | NT | NT | NT | NT | NT |
| 1,1,1-Trichloroethane | NT | NT | NT | NT | NT | NT | NT |
| Carbon Tetrachloride | NT | NT | NT | NT | NT | NT | NT |
| Bromodichloromethane | NT | NT | NT | NT | NT | NT | NT |
| 1,2-Dichloropropane | NT | NT | NT | NT | NT | NT | NT |
| cis-1,3-Dichloropropene | NT | NT | NT | NT | NT | NT | NT |
| Trichloroethene | NT | NT | NT | NT | NT | NT | NT |
| Dibromochloromethane | NT | NT | NT | NT | NT | NT | NT |
| 1,1,2-Trichloroethane | NT | NT | NT | NT | NT | NT | NT |
| trans-1,3-Dichloropropene | NT | NT | NT | NT | NT | NT | NT |
| Bromoform | NT | NT | NT | NT | NT | NT | NT |
| 4-Methyl-2-Pentanone | NT | NT | NT | NT | NT | NT | NT |
| 2-Hexanone | NT | NT | NT | NT | NT | NT | NT |
| Tetrachloroethene | NT | NT | NT | NT | NT | NT | NT |
| 1,1,2,2-Tetrachloroethane | NT | NT | NT | NT | NT | NT | NT |
| Chlorobenzene | NT | NT | NT | NT | NT | NT | NT |
| Styrene | NT | NT | NT | NT | NT | NT | NT |
| Freon TF | NT | NT | NT | NT | NT | NT | NT |
| 1,2-Dibromoethane | NT | NT | NT | NT | NT | NT | NT |
| 1,3-Dichlorobenzene | NT | NT | NT | NT | NT | NT | NT |
| 1,4-Dichlorobenzene | NT | NT | NT | NT | NT | NT | NT |
| 1,2-Dichlorobenzene | NT | NT | NT | NT | NT | NT | NT |
| Dichlorodifluoromethane | NT | NT | NT | NT | NT | NT | NT |
| 1,2,4-Trichlorobenzene | NT | NT | NT | NT | NT | NT | NT |
| 1,2-Dibromo-3-chloropropane | NT | NT | NT | NT | NT | NT | NT |
| Isopropylbenzene | NT | NT | NT | NT | NT | NT | NT |
| Methyl Acetate | NT | NT | NT | NT | NT | NT | NT |
| Methyl Cyclohexane | NT | NT | NT | NT | NT | NT | NT |
| Total BTEX | ND | ND | 24 | 638 | 6108 | 29 | 33 |

J=Quantiation is approximate
U=Compound was not detecte
All concentrations in ug/L

**Table 3-5**
**Results of September and October 2002 Groundwater Testing**
**Stafford Site**

| Sample ID | VP-9 | | VP-10 | | VP-11 | | VP-12 | | VP-12 Lab Dup | | VP-13 | | Trip_Blank | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | 10/28/2002 | | 10/28/2002 | | 37557 | | 37557 | | 37557 | | 10/28/2002 | | 10/28/2002 | |
| Laboratory | STL | | STL | | STL | | STL | | STL | | STL | | STL | |
| Laboratory ID | 386861 | | 386858 | | 386859 | | 386860 | | 386862 | | 386861 | | 386863 | |
| Method | 8260B | | 8260B | | 8260B | | 8260B | | 8260B | | 8260B | | 8260B | |
| Analysis Date | 11/1/2002 | | 10/31/2002 | | 10/31/2002 | | 10/31/2002 | | 10/31/2002 | | 11/1/2002 | | 11/5/2002 | |
| Depth | 11.5-15' | | 10.5-14' | | 10.5-15' | | 10.5-13' | | 10.5-13' | | 10.5-15' | | N/A | |
| | Concen- tration | Reporting Limit | Concen- tration | Reporting Limit | Concen- tration | Reporting Limit | Concen- tration | Reporting Limit | Concen- tration | Reporting Limit | Concen- tration | Reporting Limit | Concen- tration | Reporting Limit |
| Benzene | 12000 | 5000 | 6000 | 2500 | 100 | 10 | 26 | 5 | 28 | 5 | 7500 | 1000 | U | 1 |
| Toluene | 43000 | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | 14000 | 5000 | U | 5 |
| Ethylbenzene | 3500 J | 20000 | 2200 J | 10000 | U | 40 | U | 20 | U | 20 | 4200 | 4000 | U | 4 |
| o-Xylene | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT |
| m,p-Xylene | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT |
| Xylenes | 24000 J | 25000 | 3300 J | 12000 | U | 50 | U | 25 | U | 25 | 20000 | 5000 | U | 5 |
| MTBE | 590000 | 25000 | 310000 | 12000 | 1300 | 50 | 340 | 25 | 400 | 25 | 190000 | 5000 | U | 5 |
| Naphthalene | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT |
| 1,3,5 TMB | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT |
| 1,2,4 TMB | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT |
| isopropylbenzene | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT |
| n-propylbenzene | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT |
| n-butylbenzene | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT |
| Chloromethane | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| Bromomethane | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| Vinyl Chloride | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| Chloroethane | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| Methylene Chloride | U | 15000 | U | 7500 | U | 30 | U | 15 | U | 15 | U | 3000 | U | 3 |
| Acetone | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| Carbon Disulfide | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| Trichlorofluoromethane | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| 1,1-Dichloroethene | U | 10000 | U | 5000 | U | 20 | U | 10 | U | 10 | U | 2000 | U | 2 |
| 1,1-Dichloroethane | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| trans-1,2-Dichloroethene | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| cis-1,2-Dichloroethene | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| Chloroform | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| 1,2-Dichloroethane | U | 10000 | U | 5000 | U | 20 | U | 10 | U | 10 | U | 2000 | U | 2 |
| 2-Butanone | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| 1,1,1-Trichloroethane | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| Carbon Tetrachloride | U | 10000 | U | 5000 | U | 20 | U | 10 | U | 10 | U | 2000 | U | 2 |
| Bromodichloromethane | U | 5000 | U | 2500 | U | 10 | U | 5 | U | 5 | U | 1000 | U | 1 |
| 1,2-Dichloropropane | U | 5000 | U | 2500 | U | 10 | U | 5 | U | 5 | U | 1000 | U | 1 |
| cis-1,3-Dichloropropene | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| Trichloroethene | U | 5000 | U | 2500 | U | 10 | U | 5 | U | 5 | U | 1000 | U | 1 |
| Dibromochloromethane | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| 1,1,2-Trichloroethane | U | 15000 | U | 7500 | U | 30 | U | 15 | U | 15 | U | 3000 | U | 3 |
| trans-1,3-Dichloropropene | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| Bromoform | U | 20000 | U | 10000 | U | 40 | U | 20 | U | 20 | U | 4000 | U | 4 |
| 4-Methyl-2-Pentanone | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| 2-Hexanone | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| Tetrachloroethene | U | 5000 | U | 2500 | U | 10 | U | 5 | U | 5 | U | 1000 | U | 1 |
| 1,1,2,2-Tetrachloroethane | U | 5000 | U | 2500 | U | 10 | U | 5 | U | 5 | U | 1000 | U | 1 |
| Chlorobenzene | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| Styrene | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| Freon TF | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| 1,2-Dibromoethane | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| 1,3-Dichlorobenzene | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| 1,4-Dichlorobenzene | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| 1,2-Dichlorobenzene | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| Dichlorodifluoromethane | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| 1,2,4-Trichlorobenzene | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| 1,2-Dibromo-3-chloropropane | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| Isopropylbenzene | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| Methyl Acetate | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| Methyl Cyclohexane | U | 25000 | U | 12000 | U | 50 | U | 25 | U | 25 | U | 5000 | U | 5 |
| Total BTEX | 82500 | | 17500 | | 170 | | 61 | | 63 | | 45700 | | | |

J=Quantiation is approximate
U=Compound was not detecte
All concentrations in ug/L

All concentrations in ug/L

# Table 3-6
## Results of Light Gas Analyses - October to November 2002
## Stafford Site

| Location | Interval | Date | CO | % LEL | $H_2S$ | $O_2$ |
|---|---|---|---|---|---|---|
| VP-9S | 2.5-3 | 29-Oct-02 | 0 | 35 | 0 | 10.2 |
| | | 5-Nov-02 | 0 | 1 | 0 | 8.3 |
| | | 11-Nov-02 | 15 | 37 | 0 | 8.3 |
| | | 26-Nov-02 | 1 | 18 | 9 | 7.4 |
| VP-9M | 6.5-7 | 29-Oct-02 | 0 | 100 | 3 | 1.6 |
| | | 5-Nov-02 | 2 | 20 | 9 | 0.4 |
| | | 11-Nov-02 | 126 | 25 | 3 | 0.9 |
| VP-9D | 10.5-11 | 29-Oct-02 | 31 | 100 | 7 | 1.0 |
| | | 26-Nov-02 | | Could not draw sample | | |
| VP-10S | 2.5-3 | 29-Oct-02 | 0 | 55 * | 0 | 20.6 |
| | | 5-Nov-02 | 2 | 0 | 0 | 20.5 |
| | | 26-Nov-02 | 0 | 1 | 0 | 21.5 |
| VP-10M | 6.5-7 | 29-Oct-02 | 0 | 33 * | 0 | 19.8 |
| | | 26-Nov-02 | 0 | 2 | 0 | 20.4 |
| VP-10D | 10.5-11 | 29-Oct-02 | 3 | 21 | 0 | 19.9 ** |
| | | 26-Nov-02 | | Could not draw sample | | |
| VP-11 | 10.5-11 | 29-Oct-02 | 0 | 14 | 0 | 20.3 |
| | | 26-Nov-02 | | Could not draw sample | | |
| VP-12 | 10.5-11 | 29-Oct-02 | 0 | 9 | 0 | 19.8 |
| | | 26-Nov-02 | | Could not draw sample | | |
| VP-13 | 10.5-11 | 29-Oct-02 | 2 | 100 | 2 | 0.5 |
| | | 5-Nov-02 | 2 | 12 | 23 | 0.2 |
| | | 11-Nov-02 | 144 | 100 | 3 | 3.8 ** |
| | | 26-Nov-02 | | Could not draw sample | | |

Notes
1. All gas readings taken using VRAE Model X. The %LEL reading was taken using a VRAE calibrate to methane in air.
2. * - Reading suspect, higher than anticipated for expected biogeochemical conditions
3. ** - Reading suspect, higher than anticipated for expected biogeochemical conditions could be caused by difficulty in drawing sample and dilution by ambient air.

# Table 3-7
# October 2002 Soil Vapor Test Results, Stafford Site

| Sample ID | VP-9D | | | | | |
|---|---|---|---|---|---|---|
| Depth | 10.5-11' | | | | | |
| Sample Date | 10/28/2002 | | | | | |
| Laboratory ID | 507875 and 507875R1 | | | | | |
| Method | TO-15 | | | | | |
| Analysis Date | 11/09/2002 and 11/13/2002 | | | | | |
| Chemical | CAS # | | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | A | 1600000 | | PQL | 33000 |
| BUTANE, 2-METHYL- 6.74 | 78-78-4 | T | 840000 | NJ | N/A | N/A |
| PENTANE 7.20 | 109-66-0 | T | 540000 | NJ | N/A | N/A |
| CYCLOPROPANE, 1,2-DIMETHYL-, T 7.44 | 2402-06-4 | T | 120000 | NJ | N/A | N/A |
| CYCLOPROPANE, 1,1-DIMETHYL- 7.70 | 1630-94-0 | T | 220000 | NJ | N/A | N/A |
| 2(3H)-FURANONE, DIHYDRO-3,5-DI 8.58 | 5145-01-7 | T | 210000 | NJ | N/A | N/A |
| PENTANE, 3-METHYL- 8.78 | 96-14-0 | T | 780000 | NJ | N/A | N/A |
| 1-PENTENE, 2-METHYL- 8.98 | 763-29-1 | T | 110000 | NJ | N/A | N/A |
| 6-OXABICYCLO[3.1.0]HEXANE 9.22 | 285-67-6 | T | 140000 | NJ | N/A | N/A |
| 2-PENTENE, 4-METHYL-, (Z)- 9.27 | 691-38-3 | T | 130000 | NJ | N/A | N/A |
| 2-BUTENE, 2,3-DIMETHYL- 9.36 | 563-79-1 | T | 77000 | NJ | N/A | N/A |
| 1,4-HEXADIENE 9.43 | 592-45-0 | T | 88000 | NJ | N/A | N/A |
| FURAN, 2,3-DIHYDRO-3-METHYL- 9.52 | 1708-27-6 | T | 200000 | NJ | N/A | N/A |
| PENTANE, 2,4-DIMETHYL- 9.57 | 108-08-7 | T | 170000 | NJ | N/A | N/A |
| 1-PENTENE, 2-METHYL- 9.69 | 763-29-1 | T | 450000 | NJ | N/A | N/A |
| 2H-PYRAN, TETRAHYDRO-2-METHYL- 10.1 | 10141-72-7 | T | 360000 | NJ | N/A | N/A |
| HEPTANE, 4-METHYL- 10.33 | 589-53-7 | T | 480000 | NJ | N/A | N/A |
| HEXANE, 2,2-DIMETHYL- 10.56 | 590-73-8 | T | 370000 | NJ | N/A | N/A |
| 3-HEXENE, 2-METHYL-, (E)- 10.79 | 692-24-0 | T | 83000 | NJ | N/A | N/A |
| 2,4-HEXADIENE, 2-METHYL- 11.58 | 28823-41-8 | T | 94000 | NJ | N/A | N/A |
| PHENOL 15.32 | 108-95-2 | T | 190000 | NJ | N/A | N/A |
| DICHLORODIFLUOROMETHANE | 75-71-8 | A | U | U | PQL | 33000 |
| CHLOROMETHANE | 74-87-3 | A | U | U | PQL | 33000 |
| VINYL CHLORIDE | 75-01-4 | A | U | U | PQL | 33000 |
| BROMOMETHANE | 74-83-9 | A | U | U | PQL | 33000 |
| CHLOROETHANE | 75-00-3 | A | U | U | PQL | 33000 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | A | U | U | PQL | 33000 |
| FREON TF | 76-13-1 | A | U | U | PQL | 33000 |
| 1,1-DICHLOROETHENE | 75-35-4 | A | U | U | PQL | 33000 |
| METHYLENE CHLORIDE | 75-09-2 | A | U | U | PQL | 33000 |
| 1,1-DICHLOROETHANE | 75-34-3 | A | U | U | PQL | 33000 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | A | U | U | PQL | 33000 |
| CHLOROFORM | 67-66-3 | A | U | U | PQL | 33000 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | A | U | U | PQL | 33000 |
| CARBON TETRACHLORIDE | 56-23-5 | A | U | U | PQL | 33000 |
| BENZENE | 71-43-2 | A | 200000 | | PQL | 33000 |
| 1,2-DICHLOROETHANE | 107-06-2 | A | U | U | PQL | 33000 |
| TRICHLOROETHENE | 79-01-6 | A | U | U | PQL | 33000 |
| 1,2-DICHLOROPROPANE | 78-87-5 | A | U | U | PQL | 33000 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | A | U | U | PQL | 33000 |
| TOLUENE | 108-88-3 | A | 290000 | | PQL | 33000 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | A | U | U | PQL | 33000 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | A | U | U | PQL | 33000 |
| TETRACHLOROETHENE | 127-18-4 | A | U | U | PQL | 33000 |
| CHLOROBENZENE | 108-90-7 | A | U | U | PQL | 33000 |
| ETHYLBENZENE | 100-41-4 | A | U | U | PQL | 33000 |
| XYLENE (M,P) | 1330-20-7 | A | U | U | PQL | 33000 |
| STYRENE | 100-42-5 | A | U | U | PQL | 33000 |

| Sample ID | VP-9M | | | | | |
|---|---|---|---|---|---|---|
| Depth | 6.5-7' | | | | | |
| Sample Date | 10/28/2002 | | | | | |
| Laboratory ID | 507874D and 507874R1 | | | | | |
| Method | TO-15 | | | | | |
| Analysis Date | 11/01/2002 and 11/14/2002 | | | | | |
| Chemical | CAS # | | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | A | 450000 | | PQL | 6000 |
| 3-BUTENOIC ACID 5.57 | 625-38-7 | T | 24000 | NJ | N/A | N/A |
| PENTANE 7.20 | 109-66-0 | T | 380000 | NJ | N/A | N/A |
| CYCLOPROPANE, 1,1-DIMETHYL- 7.44 | 1630-94-0 | T | 85000 | NJ | N/A | N/A |
| CYCLOPROPANE, 1,1-DIMETHYL- 7.61 | 1630-94-0 | T | 49000 | NJ | N/A | N/A |
| FURAN, 2,5-DIHYDRO- 8.57 | 1708-29-8 | T | 170000 | NJ | N/A | N/A |
| CYCLOPROPANE, 1-ETHYL-2-METHYL 8.96 | 19781-68-1 | T | 86000 | NJ | N/A | N/A |
| 2(3H)-FURANONE 9.15 | 20825-71-2 | T | 58000 | NJ | N/A | N/A |
| 2-HEXENE, (Z)- 9.21 | 7688-21-3 | T | 80000 | NJ | N/A | N/A |
| 2-PENTENE, 4-METHYL-, (Z)- 9.25 | 691-38-3 | T | 130000 | NJ | N/A | N/A |
| 3-HEXENE, (Z)- 9.40 | 7642-09-3 | T | 57000 | NJ | N/A | N/A |
| FURAN, 2,3-DIHYDRO-3-METHYL- 9.50 | 1708-27-6 | T | 210000 | NJ | N/A | N/A |
| PENTANE, 2,4-DIMETHYL- 9.54 | 108-08-7 | T | 180000 | NJ | N/A | N/A |
| HEXANE, 2-METHYL- 10.16 | 591-76-4 | T | 210000 | NJ | N/A | N/A |
| 1-HEXENE, 5-METHYL- 10.26 | 3524-73-0 | T | 140000 | NJ | N/A | N/A |
| 1-PROPENE, 2-METHYL- 10.54 | 115-11-7 | T | 270000 | NJ | N/A | N/A |
| 2-PENTENE, 3-ETHYL- 10.77 | 816-79-5 | T | 73000 | NJ | N/A | N/A |
| HEXANE, 2-METHYL- 11.15 | 591-76-4 | T | 46000 | NJ | N/A | N/A |
| 1-PENTANOL, 2-METHYL- 11.47 | 105-30-6 | T | 50000 | NJ | N/A | N/A |
| 1-HEPTENE, 4-METHYL- 11.58 | 13151-05-8 | T | 92000 | NJ | N/A | N/A |
| \ | 1073-06-9 | T | 200000 | NJ | N/A | N/A |
| DICHLORODIFLUOROMETHANE | 75-71-8 | A | U | U | PQL | 15000 |
| CHLOROMETHANE | 74-87-3 | A | U | U | PQL | 15000 |
| VINYL CHLORIDE | 75-01-4 | A | U | U | PQL | 15000 |
| BROMOMETHANE | 74-83-9 | A | U | U | PQL | 15000 |
| CHLOROETHANE | 75-00-3 | A | U | U | PQL | 15000 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | A | U | U | PQL | 15000 |
| FREON TF | 76-13-1 | A | U | U | PQL | 15000 |
| 1,1-DICHLOROETHENE | 75-35-4 | A | U | U | PQL | 15000 |
| METHYLENE CHLORIDE | 75-09-2 | A | U | U | PQL | 15000 |
| 1,1-DICHLOROETHANE | 75-34-3 | A | U | U | PQL | 15000 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | A | U | U | PQL | 15000 |
| CHLOROFORM | 67-66-3 | A | U | U | PQL | 15000 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | A | U | U | PQL | 15000 |
| CARBON TETRACHLORIDE | 56-23-5 | A | U | U | PQL | 15000 |
| BENZENE | 71-43-2 | A | 77000 | | PQL | 15000 |
| 1,2-DICHLOROETHANE | 107-06-2 | A | U | U | PQL | 15000 |
| TRICHLOROETHENE | 79-01-6 | A | U | U | PQL | 15000 |
| 1,2-DICHLOROPROPANE | 78-87-5 | A | U | U | PQL | 15000 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | A | U | U | PQL | 15000 |
| TOLUENE | 108-88-3 | A | 150000 | | PQL | 15000 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | A | U | U | PQL | 15000 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | A | U | U | PQL | 15000 |
| TETRACHLOROETHENE | 127-18-4 | A | U | U | PQL | 15000 |
| CHLOROBENZENE | 108-90-7 | A | U | U | PQL | 15000 |
| ETHYLBENZENE | 100-41-4 | A | U | U | PQL | 15000 |
| XYLENE (M,P) | 1330-20-7 | A | U | U | PQL | 15000 |
| STYRENE | 100-42-5 | A | U | U | PQL | 15000 |

# Table 3-7
## October 2002 Soil Vapor Test Results, Stafford Site

| Sample ID | | | VP-9D | | | |
|---|---|---|---|---|---|---|
| Depth | | | 10.5-11' | | | |
| Sample Date | | | 10/28/2002 | | | |
| Laboratory ID | | | 507875 and 507875R1 | | | |
| Method | | | TO-15 | | | |
| Analysis Date | | | 11/09/2002 and 11/13/2002 | | | |
| Chemical | CAS # | | Concentration (ppb) | Quantification Qualifier | Quantification Type | Quantification Level |
| XYLENE (O) | 95-47-6 | A | U | U | PQL | 33000 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | A | U | U | PQL | 33000 |
| 1,3-DICHLOROBENZENE | 541-73-1 | A | U | U | PQL | 33000 |
| 1,4-DICHLOROBENZENE | 106-46-7 | A | U | U | PQL | 33000 |
| 1,2-DICHLOROBENZENE | 95-50-1 | A | U | U | PQL | 33000 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | A | U | U | PQL | 33000 |
| HEXACHLOROBUTADIENE | 87-68-3 | A | U | U | PQL | 33000 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | A | U | U | PQL | 33000 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | A | U | U | PQL | 33000 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | A | U | U | PQL | 33000 |
| 1,2-DIBROMOETHANE | 106-93-4 | A | U | U | PQL | 33000 |
| 1,3-BUTADIENE | 106-99-0 | A | U | U | PQL | 33000 |
| CARBON DISULFIDE | 75-15-0 | A | U | U | PQL | 33000 |
| CYCLOHEXANE | 110-82-7 | A | 300000 | | PQL | 33000 |
| N-HEPTANE | 142-82-5 | A | 320000 | | PQL | 33000 |
| DIBROMOCHLOROMETHANE | 124-48-1 | A | U | U | PQL | 33000 |
| N-HEXANE | 110-54-3 | A | 1700000 | | PQL | 33000 |
| BROMOFORM | 75-25-2 | A | U | U | PQL | 33000 |
| BROMODICHLOROMETHANE | 75-27-4 | A | U | U | PQL | 33000 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | A | U | U | PQL | 33000 |
| 4-ETHYLTOLUENE | 622-96-8 | A | U | U | PQL | 33000 |
| 3-CHLOROPROPENE | 107-05-1 | A | U | U | PQL | 33000 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | A | 400000 | | PQL | 33000 |
| BROMOETHENE | 593-60-2 | A | U | U | PQL | 33000 |
| 2-CHLOROTOLUENE | 95-49-8 | A | U | U | PQL | 33000 |
| BUTANE, 2-METHYL- 5.04 | 78-78-4 | T | 1200000 | NJ | N/A | N/A |
| PENTANE 5.44 | 109-66-0 | T | 580000 | NJ | N/A | N/A |
| UNKNOWN ALKANE 5.56 | | T | 210000 | J | N/A | N/A |
| UNKNOWN 5.77 | | T | 430000 | J | N/A | N/A |
| UNKNOWN ALKANE 6.08 | | T | 450000 | J | N/A | N/A |
| UNKNOWN ALKANE 6.64 | | T | 800000 | J | N/A | N/A |
| UNKNOWN ALKANE 6.71 | | T | 1900000 | J | N/A | N/A |
| UNKNOWN ALKANE 7.00 | | T | 1300000 | J | N/A | N/A |
| UNKNOWN 7.47 | | T | 340000 | J | N/A | N/A |
| UNKNOWN 7.75 | | T | 260000 | J | N/A | N/A |
| UNKNOWN ALKANE 7.93 | | T | 1200000 | J | N/A | N/A |
| UNKNOWN 8.36 | | T | 120000 | J | N/A | N/A |
| UNKNOWN 8.69 | | T | 330000 | J | N/A | N/A |
| UNKNOWN ALKANE 8.75 | | T | 200000 | J | N/A | N/A |
| UNKNOWN ALKANE 8.86 | | T | 370000 | J | N/A | N/A |
| UNKNOWN ALKANE 9.02 | | T | 99000 | J | N/A | N/A |
| UNKNOWN ALKANE 9.09 | | T | 100000 | J | N/A | N/A |
| UNKNOWN ALKANE 9.77 | | T | 160000 | J | N/A | N/A |
| UNKNOWN ALKANE 10.23 | | T | 77000 | J | N/A | N/A |

| Sample ID | | | VP-9M | | | |
|---|---|---|---|---|---|---|
| Depth | | | 6.5-7' | | | |
| Sample Date | | | 10/28/2002 | | | |
| Laboratory ID | | | 507874D and 507874R1 | | | |
| Method | | | TO-15 | | | |
| Analysis Date | | | 11/01/2002 and 11/14/2002 | | | |
| Chemical | CAS # | | Concentration (ppb) | Quantification Qualifier | Quantification Type | Quantification Level |
| XYLENE (O) | 95-47-6 | A | U | U | PQL | 15000 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | A | U | U | PQL | 15000 |
| 1,3-DICHLOROBENZENE | 541-73-1 | A | U | U | PQL | 15000 |
| 1,4-DICHLOROBENZENE | 106-46-7 | A | U | U | PQL | 15000 |
| 1,2-DICHLOROBENZENE | 95-50-1 | A | U | U | PQL | 15000 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | A | U | U | PQL | 15000 |
| HEXACHLOROBUTADIENE | 87-68-3 | A | U | U | PQL | 15000 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | A | U | U | PQL | 15000 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | A | U | U | PQL | 15000 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | A | U | U | PQL | 15000 |
| 1,2-DIBROMOETHANE | 106-93-4 | A | U | U | PQL | 15000 |
| 1,3-BUTADIENE | 106-99-0 | A | U | U | PQL | 15000 |
| CARBON DISULFIDE | 75-15-0 | A | U | U | PQL | 15000 |
| CYCLOHEXANE | 110-82-7 | A | 150000 | | PQL | 15000 |
| N-HEPTANE | 142-82-5 | A | 160000 | | PQL | 15000 |
| DIBROMOCHLOROMETHANE | 124-48-1 | A | U | U | PQL | 15000 |
| N-HEXANE | 110-54-3 | A | 880000 | | PQL | 15000 |
| BROMOFORM | 75-25-2 | A | U | U | PQL | 15000 |
| BROMODICHLOROMETHANE | 75-27-4 | A | U | U | PQL | 15000 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | A | U | U | PQL | 15000 |
| 4-ETHYLTOLUENE | 622-96-8 | A | U | U | PQL | 15000 |
| 3-CHLOROPROPENE | 107-05-1 | A | U | U | PQL | 15000 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | A | 210000 | | PQL | 15000 |
| BROMOETHENE | 593-60-2 | A | U | U | PQL | 15000 |
| 2-CHLOROTOLUENE | 95-49-8 | A | U | U | PQL | 15000 |
| UNKNOWN ALKANE 5.06 | | T | 660000 | J | N/A | N/A |
| UNKNOWN ALKANE 5.45 | | T | 330000 | J | N/A | N/A |
| UNKNOWN ALKANE 5.79 | | T | 220000 | J | N/A | N/A |
| UNKNOWN ALKANE 6.09 | | T | 250000 | J | N/A | N/A |
| UNKNOWN ALKANE 6.65 | | T | 370000 | J | N/A | N/A |
| UNKNOWN ALKANE 7.02 | | T | 680000 | J | N/A | N/A |
| UNKNOWN 7.44 | | T | 130000 | J | N/A | N/A |
| UNKNOWN 7.49 | | T | 180000 | J | N/A | N/A |
| UNKNOWN 7.57 | | T | 110000 | J | N/A | N/A |
| UNKNOWN 7.75 | | T | 140000 | J | N/A | N/A |
| UNKNOWN ALKANE 7.93 | | T | 630000 | J | N/A | N/A |
| UNKNOWN 8.37 | | T | 58000 | J | N/A | N/A |
| UNKNOWN ALKANE 8.69 | | T | 180000 | J | N/A | N/A |
| UNKNOWN ALKANE 8.75 | | T | 110000 | J | N/A | N/A |
| UNKNOWN ALKANE 8.86 | | T | 190000 | J | N/A | N/A |
| UNKNOWN ALKANE 9.04 | | T | 48000 | J | N/A | N/A |
| UNKNOWN ALKANE 9.09 | | T | 65000 | J | N/A | N/A |
| UNKNOWN ALKANE 9.77 | | T | 89000 | J | N/A | N/A |
| UNKNOWN ALKANE 10.23 | | T | 45000 | J | N/A | N/A |

# Table 3-7
## October 2002 Soil Vapor Test Results, Stafford Site

| Chemical | CAS # | | Concentration (ppb) | Quantification Qualifier | Quantification Type | Quantification Level |
|---|---|---|---|---|---|---|
| Sample ID | | | VP-9S | | | |
| Depth | | | 2.5-3' | | | |
| Sample Date | | | 10/28/2002 | | | |
| Laboratory ID | | | 507873D and 507873R1 | | | |
| Method | | | TO-15 | | | |
| Analysis Date | | | 11/01/2002 and 11/13/2002 | | | |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | A | U | U | PQL | 500 |
| 2H-PYRAN-2-ONE, TETRAHYDRO-6,6 7.20 | 2610-95-9 | T | 4700 | NJ | N/A | N/A |
| CYCLOPROPANE, 1,1-DIMETHYL- 7.70 | 1630-94-0 | T | 1600 | NJ | N/A | N/A |
| 1-PROPENE, 2-METHYL- 8.77 | 115-11-7 | T | 10000 | NJ | N/A | N/A |
| 1-PROPENE, 2-METHYL- 9.04 | 115-11-7 | T | 2100 | NJ | N/A | N/A |
| FURAN, 2,3-DIHYDRO-3-METHYL- 9.25 | 1708-27-6 | T | 1000 | NJ | N/A | N/A |
| 2-BUTENE 9.68 | 107-01-7 | T | 4200 | NJ | N/A | N/A |
| HEXANE, 2-METHYL- 10.15 | 591-76-4 | T | 1300 | NJ | N/A | N/A |
| PENTANE, 2,3-DIMETHYL- 10.24 | 565-59-3 | T | 3100 | NJ | N/A | N/A |
| 4-PENTENAL 10.65 | 2100-17-6 | T | 2000 | NJ | N/A | N/A |
| OCTANE 11.15 | 111-65-9 | T | 1200 | NJ | N/A | N/A |
| DICHLORODIFLUOROMETHANE | 75-71-8 | A | U | U | PQL | 500 |
| CHLOROMETHANE | 74-87-3 | A | U | U | PQL | 500 |
| VINYL CHLORIDE | 75-01-4 | A | U | U | PQL | 500 |
| BROMOMETHANE | 74-83-9 | A | U | U | PQL | 500 |
| CHLOROETHANE | 75-00-3 | A | U | U | PQL | 500 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | A | U | U | PQL | 500 |
| FREON TF | 76-13-1 | A | U | U | PQL | 500 |
| 1,1-DICHLOROETHENE | 75-35-4 | A | U | U | PQL | 500 |
| METHYLENE CHLORIDE | 75-09-2 | A | U | U | PQL | 500 |
| 1,1-DICHLOROETHANE | 75-34-3 | A | U | U | PQL | 500 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | A | U | U | PQL | 500 |
| CHLOROFORM | 67-66-3 | A | U | U | PQL | 500 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | A | U | U | PQL | 500 |
| CARBON TETRACHLORIDE | 56-23-5 | A | U | U | PQL | 500 |
| BENZENE | 71-43-2 | A | U | U | PQL | 500 |
| 1,2-DICHLOROETHANE | 107-06-2 | A | U | U | PQL | 500 |
| TRICHLOROETHENE | 79-01-6 | A | U | U | PQL | 500 |
| 1,2-DICHLOROPROPANE | 78-87-5 | A | U | U | PQL | 500 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | A | U | U | PQL | 500 |
| TOLUENE | 108-88-3 | A | U | U | PQL | 500 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | A | U | U | PQL | 500 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | A | U | U | PQL | 500 |
| TETRACHLOROETHENE | 127-18-4 | A | U | U | PQL | 500 |
| CHLOROBENZENE | 108-90-7 | A | U | U | PQL | 500 |
| ETHYLBENZENE | 100-41-4 | A | U | U | PQL | 500 |
| XYLENE (M,P) | 1330-20-7 | A | U | U | PQL | 500 |
| STYRENE | 100-42-5 | A | U | U | PQL | 500 |
| XYLENE (O) | 95-47-6 | A | U | U | PQL | 500 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | A | U | U | PQL | 500 |
| 1,3-DICHLOROBENZENE | 541-73-1 | A | U | U | PQL | 500 |
| 1,4-DICHLOROBENZENE | 106-46-7 | A | U | U | PQL | 500 |
| 1,2-DICHLOROBENZENE | 95-50-1 | A | U | U | PQL | 500 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | A | U | U | PQL | 500 |
| HEXACHLOROBUTADIENE | 87-68-3 | A | U | U | PQL | 500 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | A | U | U | PQL | 500 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | A | U | U | PQL | 500 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | A | U | U | PQL | 500 |

| Chemical | CAS # | | Concentration (ppb) | Quantification Qualifier | Quantification Type | Quantification Level |
|---|---|---|---|---|---|---|
| Sample ID | | | VP-10D | | | |
| Depth | | | 10.5-11' | | | |
| Sample Date | | | 10/28/2002 | | | |
| Laboratory ID | | | 386860 | | | |
| Method | | | 8260B | | | |
| Analysis Date | | | 10/31/2002 | | | |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | A | 15000 | | PQL | 640 |
| HEXANE, 3-ETHYL-4-METHYL- 13.89 | 3074-77-9 | T | 2100 | NJ | N/A | N/A |
| BENZENE, 1-BROMO-3-FLUORO- 14.10 | 1073-06-9 | T | 17000 | NJB | N/A | N/A |
| DICHLORODIFLUOROMETHANE | 75-71-8 | A | U | U | PQL | 640 |
| CHLOROMETHANE | 74-87-3 | A | U | U | PQL | 640 |
| VINYL CHLORIDE | 75-01-4 | A | U | U | PQL | 640 |
| BROMOMETHANE | 74-83-9 | A | U | U | PQL | 640 |
| CHLOROETHANE | 75-00-3 | A | U | U | PQL | 640 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | A | U | U | PQL | 640 |
| FREON TF | 76-13-1 | A | U | U | PQL | 640 |
| 1,1-DICHLOROETHENE | 75-35-4 | A | U | U | PQL | 640 |
| METHYLENE CHLORIDE | 75-09-2 | A | U | U | PQL | 640 |
| 1,1-DICHLOROETHANE | 75-34-3 | A | U | U | PQL | 640 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | A | U | U | PQL | 640 |
| CHLOROFORM | 67-66-3 | A | U | U | PQL | 640 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | A | U | U | PQL | 640 |
| CARBON TETRACHLORIDE | 56-23-5 | A | U | U | PQL | 640 |
| BENZENE | 71-43-2 | A | U | U | PQL | 640 |
| 1,2-DICHLOROETHANE | 107-06-2 | A | U | U | PQL | 640 |
| TRICHLOROETHENE | 79-01-6 | A | U | U | PQL | 640 |
| 1,2-DICHLOROPROPANE | 78-87-5 | A | U | U | PQL | 640 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | A | U | U | PQL | 640 |
| TOLUENE | 108-88-3 | A | 860 | | PQL | 640 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | A | 640 | U | PQL | 640 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | A | 640 | U | PQL | 640 |
| TETRACHLOROETHENE | 127-18-4 | A | 640 | U | PQL | 640 |
| CHLOROBENZENE | 108-90-7 | A | 640 | U | PQL | 640 |
| ETHYLBENZENE | 100-41-4 | A | 640 | U | PQL | 640 |
| XYLENE (M,P) | 1330-20-7 | A | 650 | | PQL | 640 |
| STYRENE | 100-42-5 | A | U | U | PQL | 640 |
| XYLENE (O) | 95-47-6 | A | U | U | PQL | 640 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | A | U | U | PQL | 640 |
| 1,3-DICHLOROBENZENE | 541-73-1 | A | U | U | PQL | 640 |
| 1,4-DICHLOROBENZENE | 106-46-7 | A | U | U | PQL | 640 |
| 1,2-DICHLOROBENZENE | 95-50-1 | A | U | U | PQL | 640 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | A | U | U | PQL | 640 |
| HEXACHLOROBUTADIENE | 87-68-3 | A | U | U | PQL | 640 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | A | U | U | PQL | 640 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | A | U | U | PQL | 640 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | A | U | U | PQL | 640 |
| 1,2-DIBROMOETHANE | 106-93-4 | A | U | U | PQL | 640 |
| 1,3-BUTADIENE | 106-99-0 | A | U | U | PQL | 640 |
| CARBON DISULFIDE | 75-15-0 | A | U | U | PQL | 640 |
| CYCLOHEXANE | 110-82-7 | A | U | U | PQL | 640 |
| N-HEPTANE | 142-82-5 | A | U | U | PQL | 640 |
| DIBROMOCHLOROMETHANE | 124-48-1 | A | U | U | PQL | 640 |
| N-HEXANE | 110-54-3 | A | U | U | PQL | 640 |
| BROMOFORM | 75-25-2 | A | U | U | PQL | 640 |

**Table 3-7**
**October 2002 Soil Vapor Test Results, Stafford Site**

| Sample ID | | | VP-9S | | | |
|---|---|---|---|---|---|---|
| Depth | | | 2.5-3' | | | |
| Sample Date | | | 10/28/2002 | | | |
| Laboratory ID | | | 507873D and 507873R1 | | | |
| Method | | | TO-15 | | | |
| Analysis Date | | | 11/01/2002 and 11/13/2002 | | | |
| Chemical | CAS # | | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| 1,2-DIBROMOETHANE | 106-93-4 | A | U | U | PQL | 500 |
| 1,3-BUTADIENE | 106-99-0 | A | U | U | PQL | 500 |
| CARBON DISULFIDE | 75-15-0 | A | U | U | PQL | 500 |
| CYCLOHEXANE | 110-82-7 | A | 2900 | | PQL | 500 |
| N-HEPTANE | 142-82-5 | A | 550 | | PQL | 500 |
| DIBROMOCHLOROMETHANE | 124-48-1 | A | U | U | PQL | 500 |
| N-HEXANE | 110-54-3 | A | 5000 | | PQL | 500 |
| BROMOFORM | 75-25-2 | A | U | U | PQL | 500 |
| BROMODICHLOROMETHANE | 75-27-4 | A | U | U | PQL | 500 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | A | U | U | PQL | 500 |
| 4-ETHYLTOLUENE | 622-96-8 | A | U | U | PQL | 500 |
| 3-CHLOROPROPENE | 107-05-1 | A | U | U | PQL | 500 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | A | 11000 | | PQL | 500 |
| BROMOETHENE | 593-60-2 | A | U | U | PQL | 500 |
| 2-CHLOROTOLUENE | 95-49-8 | A | U | U | PQL | 500 |
| UNKNOWN ALKANE 5.44 | | T | 5100 | J | N/A | N/A |
| UNKNOWN ALKANE 5.77 | | T | 2600 | J | N/A | N/A |
| UNKNOWN ALKANE 6.08 | | T | 13000 | J | N/A | N/A |
| UNKNOWN ALKANE 6.64 | | T | 12000 | J | N/A | N/A |
| UNKNOWN ALKANE 6.71 | | T | 20000 | J | N/A | N/A |
| UNKNOWN ALKANE 7.00 | | T | 13000 | J | N/A | N/A |
| UNKNOWN 7.47 | | T | 1700 | J | N/A | N/A |
| UNKNOWN 7.84 | | T | 2400 | J | N/A | N/A |
| UNKNOWN ALKANE 7.94 | | T | 12000 | J | N/A | N/A |
| UNKNOWN ALKANE 8.48 | | T | 1300 | J | N/A | N/A |
| UNKNOWN ALKANE 8.67 | | T | 1900 | J | N/A | N/A |
| UNKNOWN ALKANE 8.74 | | T | 3800 | J | N/A | N/A |
| UNKNOWN ALKANE 8.86 | | T | 3500 | J | N/A | N/A |
| UNKNOWN 9.05 | | T | 1900 | J | N/A | N/A |
| UNKNOWN ALKANE 9.77 | | T | 1700 | J | N/A | N/A |
| UNKNOWN ALKANE 10.22 | | T | 1500 | J | N/A | N/A |

| Sample ID | | | VP-10D | | | |
|---|---|---|---|---|---|---|
| Depth | | | 10.5-11' | | | |
| Sample Date | | | 10/28/2002 | | | |
| Laboratory ID | | | 386860 | | | |
| Method | | | 8260B | | | |
| Analysis Date | | | 10/31/2002 | | | |
| Chemical | CAS # | | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| BROMODICHLOROMETHANE | 75-27-4 | A | U | U | PQL | 640 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | A | U | U | PQL | 640 |
| 4-ETHYLTOLUENE | 622-96-8 | A | U | U | PQL | 640 |
| 3-CHLOROPROPENE | 107-05-1 | A | U | U | PQL | 640 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | A | U | U | PQL | 640 |
| BROMOETHENE | 593-60-2 | A | U | U | PQL | 640 |
| 2-CHLOROTOLUENE | 95-49-8 | A | U | U | PQL | 640 |
| UNKNOWN ALKANE 13.17 | | T | 2800 | J | N/A | N/A |

# Table 3-7
## October 2002 Soil Vapor Test Results, Stafford Site

| Sample ID | | | VP-10M | | | |
|---|---|---|---|---|---|---|
| Depth | | | 6.5-7' | | | |
| Sample Date | | | 10/28/2002 | | | |
| Laboratory ID | | | 386862 | | | |
| Method | | | 8260B | | | |
| Analysis Date | | | 10/31/2002 | | | |
| Chemical | CAS # | | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | A | 86 | | PQL | 3.0 |
| 1-PENTENE, 2-METHYL- 8.74 | 763-29-1 | T | 93 | NJ | N/A | N/A |
| HEXANE, 2-METHYL- 10.14 | 591-76-4 | T | 120 | NJ | N/A | N/A |
| HEPTANE, 2,2,4,6,6-PENTAMETHYL10.52 | 13475-82-6 | T | 120 | NJ | N/A | N/A |
| HEPTANE, 2-METHYL- 11.55 | 592-27-8 | T | 140 | NJ | N/A | N/A |
| OCTANE, 2,2-DIMETHYL- 12.92 | 15869-87-1 | T | 160 | NJ | N/A | N/A |
| OCTANE, 2,2-DIMETHYL- 13.01 | 15869-87-1 | T | 320 | NJ | N/A | N/A |
| HEXANE, 2,4-DIMETHYL- 13.37 | 589-43-5 | T | 240 | NJ | N/A | N/A |
| OCTANE, 2,3-DIMETHYL- 13.42 | 7146-60-3 | T | 140 | NJ | N/A | N/A |
| 1-HEXENE, 4-METHYL- 13.56 | 3769-23-1 | T | 140 | NJ | N/A | N/A |
| 4-PIPERIDINAMINE, 2,2,6,6-TETR 13.80 | 36768-62-4 | T | 120 | NJ | N/A | N/A |
| ETHANE, ISOCYANATO- 13.91 | 109-90-0 | T | 2400 | NJ | N/A | N/A |
| CAPROLACTAM 13.98 | 105-60-2 | T | 240 | NJ | N/A | N/A |
| BENZENE, 1-CHLORO-4-METHYL- 14.24 | 106-43-4 | T | 96 | NJ | N/A | N/A |
| HEPTANE, 2,2-DIMETHYL- 14.50 | 1071-26-7 | T | 120 | NJ | N/A | N/A |
| UNDECANE, 5,7-DIMETHYL- 14.77 | 17312-83-3 | T | 140 | NJ | N/A | N/A |
| ACETAMIDE, N-(2-ETHOXY-3,6-DIH 14.86 | 56248-08-9 | T | 69 | NJ | N/A | N/A |
| DODECANE, 2,7,10-TRIMETHYL- 14.99 | 74645-98-0 | T | 260 | NJ | N/A | N/A |
| HEXYL OCTYL ETHER 15.17 | 0-00-0 | T | 94 | NJ | N/A | N/A |
| PHENOL 15.35 | 108-95-2 | T | 83 | NJ | N/A | N/A |
| CYCLOPROPANE, 1,1-DIETHYL- 15.56 | 1003-19-6 | T | 77 | NJ | N/A | N/A |
| DICHLORODIFLUOROMETHANE | 75-71-8 | A | U | U | PQL | 3.0 |
| CHLOROMETHANE | 74-87-3 | A | U | U | PQL | 3.0 |
| VINYL CHLORIDE | 75-01-4 | A | U | U | PQL | 3.0 |
| BROMOMETHANE | 74-83-9 | A | U | U | PQL | 3.0 |
| CHLOROETHANE | 75-00-3 | A | U | U | PQL | 3.0 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | A | U | U | PQL | 3.0 |
| FREON TF | 76-13-1 | A | U | U | PQL | 3.0 |
| 1,1-DICHLOROETHENE | 75-35-4 | A | U | U | PQL | 3.0 |
| METHYLENE CHLORIDE | 75-09-2 | A | U | U | PQL | 3.0 |
| 1,1-DICHLOROETHANE | 75-34-3 | A | U | U | PQL | 3.0 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | A | U | U | PQL | 3.0 |
| CHLOROFORM | 67-66-3 | A | U | U | PQL | 3.0 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | A | U | U | PQL | 3.0 |
| CARBON TETRACHLORIDE | 56-23-5 | A | U | U | PQL | 3.0 |
| BENZENE | 71-43-2 | A | 21 | | PQL | 3.0 |
| 1,2-DICHLOROETHANE | 107-06-2 | A | U | U | PQL | 3.0 |
| TRICHLOROETHENE | 79-01-6 | A | U | U | PQL | 3.0 |
| 1,2-DICHLOROPROPANE | 78-87-5 | A | U | U | PQL | 3.0 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | A | U | U | PQL | 3.0 |
| TOLUENE | 108-88-3 | A | 230 | | PQL | 3.0 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | A | U | U | PQL | 3.0 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | A | U | U | PQL | 3.0 |
| TETRACHLOROETHENE | 127-18-4 | A | U | U | PQL | 3.0 |
| CHLOROBENZENE | 108-90-7 | A | U | U | PQL | 3.0 |
| ETHYLBENZENE | 100-41-4 | A | 60 | | PQL | 3.0 |
| XYLENE (M,P) | 1330-20-7 | A | 200 | | PQL | 3.0 |
| STYRENE | 100-42-5 | A | U | U | PQL | 3.0 |

| Sample ID | | | VP-10S | | | |
|---|---|---|---|---|---|---|
| Depth | | | 2.5-3' | | | |
| Sample Date | | | 10/28/2002 | | | |
| Laboratory ID | | | 386860 | | | |
| Method | | | 8260B | | | |
| Analysis Date | | | 10/31/2002 | | | |
| Chemical | CAS # | | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | A | 4.8 | | PQL | 2.5 |
| PENTANE, 2-METHYL- 8.41 | 107-83-5 | T | 22 | NJ | N/A | N/A |
| DECANE, 2,2,6-TRIMETHYL- 13.00 | 62237-97-2 | T | 43 | NJ | N/A | N/A |
| DECANE 13.37 | 124-18-5 | T | 34 | NJ | N/A | N/A |
| OCTANE, 2,3-DIMETHYL- 13.41 | 7146-60-3 | T | 22 | NJ | N/A | N/A |
| 2,2,6,6-TETRAMETHYLHEPTANE 13.55 | 40117-45-1 | T | 28 | NJ | N/A | N/A |
| N,N-DIETHYLALLYLAMINE 13.81 | 0-00-0 | T | 25 | NJ | N/A | N/A |
| 2,2,7,7-TETRAMETHYLOCTANE 13.90 | 1071-31-4 | T | 210 | NJ | N/A | N/A |
| 2,2,6,6-TETRAMETHYLHEPTANE 13.98 | 40117-45-1 | T | 49 | NJ | N/A | N/A |
| BENZENE, 1-BROMO-2-FLUORO- 14.10 | 1072-85-1 | T | 98 | NJ | N/A | N/A |
| ETHANOL, 2-(OCTYLOXY)- 14.19 | 10020-43-6 | T | 16 | NJ | N/A | N/A |
| THIAZOLE, 4-ETHYL-2-METHYL- 14.25 | 32272-48-3 | T | 23 | NJ | N/A | N/A |
| DECANE, 2,3,7-TRIMETHYL- 14.43 | 62238-13-5 | T | 19 | NJ | N/A | N/A |
| HEPTANE, 4-ETHYL-2,2,6,6-TETRA 14.49 | 62108-31-0 | T | 33 | NJ | N/A | N/A |
| ETHANEDIOIC ACID, BIS(CYCLOHEX14.55 | 370-81-0 | T | 12 | NJ | N/A | N/A |
| UNDECANE, 2,2-DIMETHYL- 14.63 | 17312-64-0 | T | 11 | NJ | N/A | N/A |
| DOCOSANE 14.77 | 629-97-0 | T | 29 | NJ | N/A | N/A |
| DODECANE, 3-METHYL- 14.98 | 17312-57-1 | T | 48 | NJ | N/A | N/A |
| TRIDECANE 15.18 | 629-50-5 | T | 14 | NJ | N/A | N/A |
| PHENOL 15.36 | 108-95-2 | T | 14 | NJ | N/A | N/A |
| 6-DODECENE, (E)- 15.57 | 7206-17-9 | T | 12 | NJ | N/A | N/A |
| DICHLORODIFLUOROMETHANE | 75-71-8 | A | U | U | PQL | 2.5 |
| CHLOROMETHANE | 74-87-3 | A | U | U | PQL | 2.5 |
| VINYL CHLORIDE | 75-01-4 | A | U | U | PQL | 2.5 |
| BROMOMETHANE | 74-83-9 | A | U | U | PQL | 2.5 |
| CHLOROETHANE | 75-00-3 | A | U | U | PQL | 2.5 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | A | U | U | PQL | 2.5 |
| FREON TF | 76-13-1 | A | U | U | PQL | 2.5 |
| 1,1-DICHLOROETHENE | 75-35-4 | A | U | U | PQL | 2.5 |
| METHYLENE CHLORIDE | 75-09-2 | A | 4.8 | | PQL | 2.5 |
| 1,1-DICHLOROETHANE | 75-34-3 | A | U | U | PQL | 2.5 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | A | U | U | PQL | 2.5 |
| CHLOROFORM | 67-66-3 | A | U | U | PQL | 2.5 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | A | U | U | PQL | 2.5 |
| CARBON TETRACHLORIDE | 56-23-5 | A | U | U | PQL | 2.5 |
| BENZENE | 71-43-2 | A | U | U | PQL | 2.5 |
| 1,2-DICHLOROETHANE | 107-06-2 | A | U | U | PQL | 2.5 |
| TRICHLOROETHENE | 79-01-6 | A | U | U | PQL | 2.5 |
| 1,2-DICHLOROPROPANE | 78-87-5 | A | U | U | PQL | 2.5 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | A | U | U | PQL | 2.5 |
| TOLUENE | 108-88-3 | A | 11 | | PQL | 2.5 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | A | U | U | PQL | 2.5 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | A | U | U | PQL | 2.5 |
| TETRACHLOROETHENE | 127-18-4 | A | U | U | PQL | 2.5 |
| CHLOROBENZENE | 108-90-7 | A | U | U | PQL | 2.5 |
| ETHYLBENZENE | 100-41-4 | A | 3.1 | | PQL | 2.5 |
| XYLENE (M,P) | 1330-20-7 | A | 12 | | PQL | 2.5 |
| STYRENE | 100-42-5 | A | U | U | PQL | 2.5 |

**Table 3-7**
**October 2002 Soil Vapor Test Results, Stafford Site**

| Sample ID | | | VP-10M | | | |
|---|---|---|---|---|---|---|
| Depth | | | 6.5-7' | | | |
| Sample Date | | | 10/28/2002 | | | |
| Laboratory ID | | | 386862 | | | |
| Method | | | 8260B | | | |
| Analysis Date | | | 10/31/2002 | | | |
| Chemical | CAS # | | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| XYLENE (O) | 95-47-6 | A | 68 | | PQL | 3.0 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | A | U | U | PQL | 3.0 |
| 1,3-DICHLOROBENZENE | 541-73-1 | A | U | U | PQL | 3.0 |
| 1,4-DICHLOROBENZENE | 106-46-7 | A | U | U | PQL | 3.0 |
| 1,2-DICHLOROBENZENE | 95-50-1 | A | U | U | PQL | 3.0 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | A | U | U | PQL | 3.0 |
| HEXACHLOROBUTADIENE | 87-68-3 | A | U | U | PQL | 3.0 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | A | 8.3 | | PQL | 3.0 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | A | 12 | | PQL | 3.0 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | A | U | U | PQL | 3.0 |
| 1,2-DIBROMOETHANE | 106-93-4 | A | U | U | PQL | 3.0 |
| 1,3-BUTADIENE | 106-99-0 | A | U | U | PQL | 3.0 |
| CARBON DISULFIDE | 75-15-0 | A | U | U | PQL | 3.0 |
| CYCLOHEXANE | 110-82-7 | A | 45 | | PQL | 3.0 |
| N-HEPTANE | 142-82-5 | A | 140 | | PQL | 3.0 |
| DIBROMOCHLOROMETHANE | 124-48-1 | A | U | U | PQL | 3.0 |
| N-HEXANE | 110-54-3 | A | 190 | | PQL | 3.0 |
| BROMOFORM | 75-25-2 | A | U | U | PQL | 3.0 |
| BROMODICHLOROMETHANE | 75-27-4 | A | U | U | PQL | 3.0 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | A | U | U | PQL | 3.0 |
| 4-ETHYLTOLUENE | 622-96-8 | A | 32 | | PQL | 3.0 |
| 3-CHLOROPROPENE | 107-05-1 | A | U | U | PQL | 3.0 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | A | 150 | | PQL | 3.0 |
| BROMOETHENE | 593-60-2 | A | U | U | PQL | 3.0 |
| 2-CHLOROTOLUENE | 95-49-8 | A | U | U | PQL | 3.0 |
| UNKNOWN 8.68 | | T | 87 | J | N/A | N/A |
| UNKNOWN ALKANE 12.11 | | T | 78 | J | N/A | N/A |
| UNKNOWN ALKANE 12.20 | | T | 180 | J | N/A | N/A |
| UNKNOWN ALKANE 12.40 | | T | 120 | J | N/A | N/A |
| UNKNOWN ALKANE 12.60 | | T | 210 | J | N/A | N/A |
| UNKNOWN ALKANE 12.81 | | T | 95 | J | N/A | N/A |
| UNKNOWN ALKANE 13.05 | | T | 110 | J | N/A | N/A |
| UNKNOWN ALKANE 13.28 | | T | 150 | J | N/A | N/A |
| UNKNOWN ALKANE 13.34 | | T | 280 | J | N/A | N/A |
| UNKNOWN 13.46 | | T | 51 | J | N/A | N/A |
| UNKNOWN ALKANE 13.57 | | T | 190 | J | N/A | N/A |
| UNKNOWN 13.63 | | T | 91 | J | N/A | N/A |
| UNKNOWN ALKANE 13.74 | | T | 70 | J | N/A | N/A |
| UNKNOWN ALKANE 13.81 | | T | 41 | J | N/A | N/A |
| UNKNOWN ALKANE 13.84 | | T | 72 | J | N/A | N/A |
| UNKNOWN ALKANE 14.07 | | T | 90 | J | N/A | N/A |
| UNKNOWN 14.22 | | T | 42 | J | N/A | N/A |
| UNKNOWN ALKANE 14.28 | | T | 68 | J | N/A | N/A |
| UNKNOWN ALKANE 14.47 | | T | 41 | J | N/A | N/A |

| Sample ID | | | VP-10S | | | |
|---|---|---|---|---|---|---|
| Depth | | | 2.5-3' | | | |
| Sample Date | | | 10/28/2002 | | | |
| Laboratory ID | | | 386860 | | | |
| Method | | | 8260B | | | |
| Analysis Date | | | 10/31/2002 | | | |
| Chemical | CAS # | | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| XYLENE (O) | 95-47-6 | A | 4.2 | | PQL | 2.5 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | A | U | U | PQL | 2.5 |
| 1,3-DICHLOROBENZENE | 541-73-1 | A | U | U | PQL | 2.5 |
| 1,4-DICHLOROBENZENE | 106-46-7 | A | U | U | PQL | 2.5 |
| 1,2-DICHLOROBENZENE | 95-50-1 | A | U | U | PQL | 2.5 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | A | U | U | PQL | 2.5 |
| HEXACHLOROBUTADIENE | 87-68-3 | A | U | U | PQL | 2.5 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | A | U | U | PQL | 2.5 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | A | U | U | PQL | 2.5 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | A | U | U | PQL | 2.5 |
| 1,2-DIBROMOETHANE | 106-93-4 | A | U | U | PQL | 2.5 |
| 1,3-BUTADIENE | 106-99-0 | A | U | U | PQL | 2.5 |
| CARBON DISULFIDE | 75-15-0 | A | U | U | PQL | 2.5 |
| CYCLOHEXANE | 110-82-7 | A | 7.3 | | PQL | 2.5 |
| N-HEPTANE | 142-82-5 | A | 13 | | PQL | 2.5 |
| DIBROMOCHLOROMETHANE | 124-48-1 | A | U | U | PQL | 2.5 |
| N-HEXANE | 110-54-3 | A | 28 | | PQL | 2.5 |
| BROMOFORM | 75-25-2 | A | U | U | PQL | 2.5 |
| BROMODICHLOROMETHANE | 75-27-4 | A | U | U | PQL | 2.5 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | A | U | U | PQL | 2.5 |
| 4-ETHYLTOLUENE | 622-96-8 | A | 3.0 | | PQL | 2.5 |
| 3-CHLOROPROPENE | 107-05-1 | A | U | U | PQL | 2.5 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | A | 16 | | PQL | 2.5 |
| BROMOETHENE | 593-60-2 | A | U | U | PQL | 2.5 |
| 2-CHLOROTOLUENE | 95-49-8 | A | U | U | PQL | 2.5 |
| UNKNOWN 8.67 | | T | 13 | J | N/A | N/A |
| UNKNOWN ALKANE 8.84 | | T | 16 | J | N/A | N/A |
| UNKNOWN ALKANE 12.11 | | T | 22 | J | N/A | N/A |
| UNKNOWN ALKANE 12.20 | | T | 47 | J | N/A | N/A |
| UNKNOWN ALKANE 12.81 | | T | 32 | J | N/A | N/A |
| UNKNOWN ALKANE 13.04 | | T | 26 | J | N/A | N/A |
| UNKNOWN ALKANE 13.17 | | T | 250 | J | N/A | N/A |
| UNKNOWN ALKANE 13.26 | | T | 57 | J | N/A | N/A |
| UNKNOWN ALKANE 13.34 | | T | 120 | J | N/A | N/A |
| UNKNOWN ALKANE 13.57 | | T | 91 | J | N/A | N/A |
| UNKNOWN ALKANE 13.61 | | T | 36 | J | N/A | N/A |
| UNKNOWN ALKANE 13.72 | | T | 24 | J | N/A | N/A |
| UNKNOWN ALKANE 13.80 | | T | 9.2 | J | N/A | N/A |
| UNKNOWN ALKANE 13.84 | | T | 38 | J | N/A | N/A |
| UNKNOWN ALKANE 13.96 | | T | 8.6 | J | N/A | N/A |
| UNKNOWN ALKANE 14.07 | | T | 39 | J | N/A | N/A |
| UNKNOWN 14.22 | | T | 17 | J | N/A | N/A |
| UNKNOWN ALKANE 14.28 | | T | 39 | J | N/A | N/A |
| UNKNOWN 14.97 | | T | 7.7 | J | N/A | N/A |

**Table 3-7**
**October 2002 Soil Vapor Test Results, Stafford Site**

| Sample ID | | | VP-11 | | | |
|---|---|---|---|---|---|---|
| Depth | | | 10.5-11' | | | |
| Sample Date | | | 10/28/2002 | | | |
| Laboratory ID | | | 386862 | | | |
| Method | | | 8260B | | | |
| Analysis Date | | | 10/31/2002 | | | |
| Chemical | CAS # | | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | A | U | U | PQL | 2.8 |
| HEPTANE, 2,2,4-TRIMETHYL- 12.93 | 14720-74-2 | T | 140 | NJ | N/A | N/A |
| OCTANE, 2,2-DIMETHYL- 13.02 | 15869-87-1 | T | 190 | NJ | N/A | N/A |
| HEXANE, 2,4-DIMETHYL- 13.37 | 589-43-5 | T | 160 | NJ | N/A | N/A |
| HEXANE, 2,5-DIMETHYL- 13.43 | 592-13-2 | T | 120 | NJ | N/A | N/A |
| 2,2,7,7-TETRAMETHYLOCTANE 13.55 | 1071-31-4 | T | 110 | NJ | N/A | N/A |
| THIAZOLE, 2,5-DIMETHYL- 13.63 | 4175-66-0 | T | 20 | NJ | N/A | N/A |
| 1-HEXENE, 3,3,5-TRIMETHYL- 13.72 | 13427-43-5 | T | 39 | NJ | N/A | N/A |
| PIRACETAM 13.81 | 7491-74-9 | T | 100 | NJ | N/A | N/A |
| OCTANE, 2,2-DIMETHYL- 13.90 | 15869-87-1 | T | 480 | NJ | N/A | N/A |
| 2,2,6,6-TETRAMETHYLHEPTANE 13.98 | 40117-45-1 | T | 170 | NJ | N/A | N/A |
| NONANE, 3-METHYL- 14.19 | 5911-04-6 | T | 39 | NJ | N/A | N/A |
| 2-ETHYL-4-METHYLTHIAZOLE 14.25 | 15679-12-6 | T | 61 | NJ | N/A | N/A |
| 3-ETHYL-3-METHYLHEPTANE 14.30 | 17302-01-1 | T | 240 | NJ | N/A | N/A |
| UNDECANE, 5-METHYL- 14.43 | 1632-70-8 | T | 47 | NJ | N/A | N/A |
| HEPTANE, 4-ETHYL-2,2,6,6-TETRA 14.49 | 62108-31-0 | T | 77 | NJ | N/A | N/A |
| 2-NONEN-4-ONE, 2-METHYL- 14.56 | 2903-23-3 | T | 20 | NJ | N/A | N/A |
| HEPTANE, 2,2,4,6,6-PENTAMETHYL14.62 | 13475-82-6 | T | 24 | NJ | N/A | N/A |
| HEPTADECANE, 8-METHYL- 14.77 | 13287-23-5 | T | 72 | NJ | N/A | N/A |
| TRIDECANE, 3-METHYL- 14.98 | 6418-41-3 | T | 89 | NJ | N/A | N/A |
| NONANE, 3-METHYL-5-PROPYL- 15.16 | 31081-18-2 | T | 20 | NJ | N/A | N/A |
| DICHLORODIFLUOROMETHANE | 75-71-8 | A | U | U | PQL | 2.8 |
| CHLOROMETHANE | 74-87-3 | A | U | U | PQL | 2.8 |
| VINYL CHLORIDE | 75-01-4 | A | U | U | PQL | 2.8 |
| BROMOMETHANE | 74-83-9 | A | U | U | PQL | 2.8 |
| CHLOROETHANE | 75-00-3 | A | U | U | PQL | 2.8 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | A | U | U | PQL | 2.8 |
| FREON TF | 76-13-1 | A | U | U | PQL | 2.8 |
| 1,1-DICHLOROETHENE | 75-35-4 | A | U | U | PQL | 2.8 |
| METHYLENE CHLORIDE | 75-09-2 | A | U | U | PQL | 2.8 |
| 1,1-DICHLOROETHANE | 75-34-3 | A | U | U | PQL | 2.8 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | A | U | U | PQL | 2.8 |
| CHLOROFORM | 67-66-3 | A | U | U | PQL | 2.8 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | A | U | U | PQL | 2.8 |
| CARBON TETRACHLORIDE | 56-23-5 | A | U | U | PQL | 2.8 |
| BENZENE | 71-43-2 | A | 2.8 | | PQL | 2.8 |
| 1,2-DICHLOROETHANE | 107-06-2 | A | U | U | PQL | 2.8 |
| TRICHLOROETHENE | 79-01-6 | A | U | U | PQL | 2.8 |
| 1,2-DICHLOROPROPANE | 78-87-5 | A | U | U | PQL | 2.8 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | A | U | U | PQL | 2.8 |
| TOLUENE | 108-88-3 | A | 3.3 | | PQL | 2.8 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | A | U | U | PQL | 2.8 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | A | U | U | PQL | 2.8 |
| TETRACHLOROETHENE | 127-18-4 | A | U | U | PQL | 2.8 |
| CHLOROBENZENE | 108-90-7 | A | U | U | PQL | 2.8 |
| ETHYLBENZENE | 100-41-4 | A | U | U | PQL | 2.8 |
| XYLENE (M,P) | 1330-20-7 | A | 3.0 | | PQL | 2.8 |
| STYRENE | 100-42-5 | A | U | U | PQL | 2.8 |

| Sample ID | | | VP-12 | | | |
|---|---|---|---|---|---|---|
| Depth | | | 10.5-11' | | | |
| Sample Date | | | 10/28/2002 | | | |
| Laboratory ID | | | 386862 | | | |
| Method | | | 8260B | | | |
| Analysis Date | | | 10/31/2002 | | | |
| Chemical | CAS # | | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | A | U | U | PQL | 2.8 |
| BUTANE, 2,2-DIMETHYL- 7.83 | 75-83-2 | T | 23 | NJ | N/A | N/A |
| OCTANE, 2,2-DIMETHYL- 13.01 | 15869-87-1 | T | 150 | NJ | N/A | N/A |
| OCTANE, 2,3-DIMETHYL- 13.38 | 7146-60-3 | T | 110 | NJ | N/A | N/A |
| HEPTANE, 3-ETHYL-2-METHYL- 13.42 | 14676-29-0 | T | 93 | NJ | N/A | N/A |
| HEPTANE, 2,2,4,6,6-PENTAMETHYL 13.56 | 13475-82-6 | T | 94 | NJ | N/A | N/A |
| 2-OCTENE, 2,6-DIMETHYL- 13.73 | 4057-42-5 | T | 27 | NJ | N/A | N/A |
| PIRACETAM 13.80 | 7491-74-9 | T | 78 | NJ | N/A | N/A |
| DECANE, 2,5,6-TRIMETHYL- 13.89 | 62108-23-0 | T | 480 | NJ | N/A | N/A |
| CIS-4,6-DIMETHYLCYCLOHEXANE-1, 13.97 | 0-00-0 | T | 140 | NJ | N/A | N/A |
| DECANE, 2,2,3-TRIMETHYL- 14.08 | 62338-09-4 | T | 330 | NJ | N/A | N/A |
| OCTANE, 2,6-DIMETHYL- 14.20 | 2051-30-1 | T | 30 | NJ | N/A | N/A |
| 2-METHOXYCYCLOHEXANONE 14.24 | 7429-44-9 | T | 48 | NJ | N/A | N/A |
| TETRADECANE, 5-METHYL- 14.42 | 25117-32-2 | T | 36 | NJ | N/A | N/A |
| HEPTANE, 4-ETHYL-2,2,6,6-TETRA 14.49 | 62108-31-0 | T | 73 | NJ | N/A | N/A |
| 1,1,3,3,5-PENTAMETHYLCYCLOHEXA14.56 | 70810-19-4 | T | 18 | NJ | N/A | N/A |
| DECANE, 2,2-DIMETHYL- 14.62 | 17302-37-3 | T | 19 | NJ | N/A | N/A |
| HENEICOSANE 14.77 | 629-94-7 | T | 60 | NJ | N/A | N/A |
| BENZALDEHYDE 14.84 | 100-52-7 | T | 11 | NJ | N/A | N/A |
| DECANE, 2,6,7-TRIMETHYL- 14.99 | 62108-25-2 | T | 80 | NJ | N/A | N/A |
| UNDECANE, 3,8-DIMETHYL- 15.17 | 17301-30-3 | T | 16 | NJ | N/A | N/A |
| DICHLORODIFLUOROMETHANE | 75-71-8 | A | U | U | PQL | 2.8 |
| CHLOROMETHANE | 74-87-3 | A | U | U | PQL | 2.8 |
| VINYL CHLORIDE | 75-01-4 | A | U | U | PQL | 2.8 |
| BROMOMETHANE | 74-83-9 | A | U | U | PQL | 2.8 |
| CHLOROETHANE | 75-00-3 | A | U | U | PQL | 2.8 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | A | U | U | PQL | 2.8 |
| FREON TF | 76-13-1 | A | U | U | PQL | 2.8 |
| 1,1-DICHLOROETHENE | 75-35-4 | A | U | U | PQL | 2.8 |
| METHYLENE CHLORIDE | 75-09-2 | A | U | U | PQL | 2.8 |
| 1,1-DICHLOROETHANE | 75-34-3 | A | U | U | PQL | 2.8 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | A | U | U | PQL | 2.8 |
| CHLOROFORM | 67-66-3 | A | U | U | PQL | 2.8 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | A | U | U | PQL | 2.8 |
| CARBON TETRACHLORIDE | 56-23-5 | A | U | U | PQL | 2.8 |
| BENZENE | 71-43-2 | A | U | U | PQL | 2.8 |
| 1,2-DICHLOROETHANE | 107-06-2 | A | U | U | PQL | 2.8 |
| TRICHLOROETHENE | 79-01-6 | A | U | U | PQL | 2.8 |
| 1,2-DICHLOROPROPANE | 78-87-5 | A | U | U | PQL | 2.8 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | A | U | U | PQL | 2.8 |
| TOLUENE | 108-88-3 | A | 3.1 | | PQL | 2.8 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | A | U | U | PQL | 2.8 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | A | U | U | PQL | 2.8 |
| TETRACHLOROETHENE | 127-18-4 | A | U | U | PQL | 2.8 |
| CHLOROBENZENE | 108-90-7 | A | U | U | PQL | 2.8 |
| ETHYLBENZENE | 100-41-4 | A | U | U | PQL | 2.8 |
| XYLENE (M,P) | 1330-20-7 | A | 5.6 | | PQL | 2.8 |
| STYRENE | 100-42-5 | A | U | U | PQL | 2.8 |

# Table 3-7
## October 2002 Soil Vapor Test Results, Stafford Site

| Sample ID | | | VP-11 | | | |
|---|---|---|---|---|---|---|
| Depth | | | 10.5-11' | | | |
| Sample Date | | | 10/28/2002 | | | |
| Laboratory ID | | | 386862 | | | |
| Method | | | 8260B | | | |
| Analysis Date | | | 10/31/2002 | | | |
| Chemical | CAS # | | Concentration (ppb) | Quantification Qualifier | Quantification Type | Quantification Level |
| XYLENE (O) | 95-47-6 | A | U | U | PQL | 2.8 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | A | U | U | PQL | 2.8 |
| 1,3-DICHLOROBENZENE | 541-73-1 | A | U | U | PQL | 2.8 |
| 1,4-DICHLOROBENZENE | 106-46-7 | A | U | U | PQL | 2.8 |
| 1,2-DICHLOROBENZENE | 95-50-1 | A | U | U | PQL | 2.8 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | A | U | U | PQL | 2.8 |
| HEXACHLOROBUTADIENE | 87-68-3 | A | U | U | PQL | 2.8 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | A | U | U | PQL | 2.8 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | A | U | U | PQL | 2.8 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | A | U | U | PQL | 2.8 |
| 1,2-DIBROMOETHANE | 106-93-4 | A | U | U | PQL | 2.8 |
| 1,3-BUTADIENE | 106-99-0 | A | U | U | PQL | 2.8 |
| CARBON DISULFIDE | 75-15-0 | A | U | U | PQL | 2.8 |
| CYCLOHEXANE | 110-82-7 | A | U | U | PQL | 2.8 |
| N-HEPTANE | 142-82-5 | A | U | U | PQL | 2.8 |
| DIBROMOCHLOROMETHANE | 124-48-1 | A | U | U | PQL | 2.8 |
| N-HEXANE | 110-54-3 | A | 5.2 | | PQL | 2.8 |
| BROMOFORM | 75-25-2 | A | U | U | PQL | 2.8 |
| BROMODICHLOROMETHANE | 75-27-4 | A | U | U | PQL | 2.8 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | A | U | U | PQL | 2.8 |
| 4-ETHYLTOLUENE | 622-96-8 | A | U | U | PQL | 2.8 |
| 3-CHLOROPROPENE | 107-05-1 | A | U | U | PQL | 2.8 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | A | 6.5 | | PQL | 2.8 |
| BROMOETHENE | 593-60-2 | A | U | U | PQL | 2.8 |
| 2-CHLOROTOLUENE | 95-49-8 | A | U | U | PQL | 2.8 |
| UNKNOWN ALKANE 12.11 | | T | 120 | J | N/A | N/A |
| UNKNOWN ALKANE 12.22 | | T | 210 | J | N/A | N/A |
| UNKNOWN 12.81 | | T | 150 | J | N/A | N/A |
| UNKNOWN 12.87 | | T | 60 | J | N/A | N/A |
| UNKNOWN 12.93 | | T | 51 | J | N/A | N/A |
| UNKNOWN ALKANE 13.05 | | T | 130 | J | N/A | N/A |
| UNKNOWN ALKANE 13.19 | | T | 780 | J | N/A | N/A |
| UNKNOWN ALKANE 13.28 | | T | 260 | J | N/A | N/A |
| UNKNOWN ALKANE 13.36 | | T | 400 | J | N/A | N/A |
| UNKNOWN 13.46 | | T | 69 | J | N/A | N/A |
| UNKNOWN ALKANE 13.57 | | T | 320 | J | N/A | N/A |
| UNKNOWN ALKANE 13.63 | | T | 110 | J | N/A | N/A |
| UNKNOWN ALKANE 13.74 | | T | 93 | J | N/A | N/A |
| UNKNOWN ALKANE 13.81 | | T | 55 | J | N/A | N/A |
| UNKNOWN ALKANE 13.86 | | T | 110 | J | N/A | N/A |
| UNKNOWN ALKANE 14.07 | | T | 130 | J | N/A | N/A |
| UNKNOWN ALKANE 14.22 | | T | 57 | J | N/A | N/A |
| UNKNOWN ALKANE 14.28 | | T | 97 | J | N/A | N/A |
| UNKNOWN ALKANE 14.47 | | T | 52 | J | N/A | N/A |

| Sample ID | | | VP-12 | | | |
|---|---|---|---|---|---|---|
| Depth | | | 10.5-11' | | | |
| Sample Date | | | 10/28/2002 | | | |
| Laboratory ID | | | 386862 | | | |
| Method | | | 8260B | | | |
| Analysis Date | | | 10/31/2002 | | | |
| Chemical | CAS # | | Concentration (ppb) | Quantification Qualifier | Quantification Type | Quantification Level |
| XYLENE (O) | 95-47-6 | A | U | U | PQL | 2.8 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | A | U | U | PQL | 2.8 |
| 1,3-DICHLOROBENZENE | 541-73-1 | A | U | U | PQL | 2.8 |
| 1,4-DICHLOROBENZENE | 106-46-7 | A | U | U | PQL | 2.8 |
| 1,2-DICHLOROBENZENE | 95-50-1 | A | U | U | PQL | 2.8 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | A | U | U | PQL | 2.8 |
| HEXACHLOROBUTADIENE | 87-68-3 | A | U | U | PQL | 2.8 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | A | U | U | PQL | 2.8 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | A | U | U | PQL | 2.8 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | A | U | U | PQL | 2.8 |
| 1,2-DIBROMOETHANE | 106-93-4 | A | U | U | PQL | 2.8 |
| 1,3-BUTADIENE | 106-99-0 | A | U | U | PQL | 2.8 |
| CARBON DISULFIDE | 75-15-0 | A | U | U | PQL | 2.8 |
| CYCLOHEXANE | 110-82-7 | A | U | U | PQL | 2.8 |
| N-HEPTANE | 142-82-5 | A | U | U | PQL | 2.8 |
| DIBROMOCHLOROMETHANE | 124-48-1 | A | U | U | PQL | 2.8 |
| N-HEXANE | 110-54-3 | A | U | U | PQL | 2.8 |
| BROMOFORM | 75-25-2 | A | U | U | PQL | 2.8 |
| BROMODICHLOROMETHANE | 75-27-4 | A | U | U | PQL | 2.8 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | A | U | U | PQL | 2.8 |
| 4-ETHYLTOLUENE | 622-96-8 | A | U | U | PQL | 2.8 |
| 3-CHLOROPROPENE | 107-05-1 | A | U | U | PQL | 2.8 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | A | 9.5 | | PQL | 2.8 |
| BROMOETHENE | 593-60-2 | A | U | U | PQL | 2.8 |
| 2-CHLOROTOLUENE | 95-49-8 | A | U | U | PQL | 2.8 |
| UNKNOWN ALKANE 12.11 | | T | 89 | J | N/A | N/A |
| UNKNOWN ALKANE 12.22 | | T | 150 | J | N/A | N/A |
| UNKNOWN 12.81 | | T | 110 | J | N/A | N/A |
| UNKNOWN ALKANE 12.87 | | T | 40 | J | N/A | N/A |
| UNKNOWN 12.93 | | T | 33 | J | N/A | N/A |
| UNKNOWN ALKANE 13.05 | | T | 80 | J | N/A | N/A |
| UNKNOWN ALKANE 13.19 | | T | 620 | J | N/A | N/A |
| UNKNOWN ALKANE 13.28 | | T | 170 | J | N/A | N/A |
| UNKNOWN ALKANE 13.36 | | T | 350 | J | N/A | N/A |
| UNKNOWN 13.57 | | T | 270 | J | N/A | N/A |
| UNKNOWN ALKANE 13.63 | | T | 89 | J | N/A | N/A |
| UNKNOWN ALKANE 13.74 | | T | 69 | J | N/A | N/A |
| UNKNOWN 13.81 | | T | 44 | J | N/A | N/A |
| UNKNOWN 13.86 | | T | 87 | J | N/A | N/A |
| UNKNOWN ALKANE 13.96 | | T | 30 | J | N/A | N/A |
| UNKNOWN ALKANE 14.07 | | T | 110 | J | N/A | N/A |
| UNKNOWN ALKANE 14.22 | | T | 45 | J | N/A | N/A |
| UNKNOWN ALKANE 14.28 | | T | 80 | J | N/A | N/A |
| UNKNOWN ALKANE 14.47 | | T | 34 | J | N/A | N/A |

**Table 3-7**
**October 2002 Soil Vapor Test Results, Stafford Site**

| Sample ID | | | VP-13 | | | |
|---|---|---|---|---|---|---|
| Depth | | | 10.5-11' | | | |
| Sample Date | | | 10/28/2002 | | | |
| Laboratory ID | | | 386862 | | | |
| Method | | | 8260B | | | |
| Analysis Date | | | 10/31/2002 | | | |
| Chemical | CAS # | | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | A | 120000 | | PQL | 6000 |
| BUTANE, 2-METHYL- 6.74 | 78-78-4 | T | 150000 | NJ | N/A | N/A |
| PENTANE 7.21 | 109-66-0 | T | 110000 | NJ | N/A | N/A |
| CYCLOPROPANE, 1,2-DIMETHYL-,T 7.44 | 2402-06-4 | T | 26000 | NJ | N/A | N/A |
| CYCLOPROPANE, 1,2-DIMETHYL-,T 7.70 | 2402-06-4 | T | 48000 | NJ | N/A | N/A |
| 2-PENTENE, 4-METHYL- 8.58 | 4461-48-7 | T | 48000 | NJ | N/A | N/A |
| PENTANE, 3-METHYL- 8.80 | 96-14-0 | T | 220000 | NJ | N/A | N/A |
| 2-HEXENE, (E)- 9.24 | 4050-45-7 | T | 44000 | NJ | N/A | N/A |
| CYCLOPENTENE, 3-METHYL- 9.45 | 1120-62-3 | T | 25000 | NJ | N/A | N/A |
| FURAN, 2,3-DIHYDRO-3-METHYL- 9.53 | 1708-27-6 | T | 76000 | NJ | N/A | N/A |
| PENTANE, 2,4-DIMETHYL- 9.59 | 108-08-7 | T | 62000 | NJ | N/A | N/A |
| CYCLOPENTANE, METHYL- 9.71 | 96-37-7 | T | 150000 | NJ | N/A | N/A |
| HEXANE, 2-METHYL- 10.18 | 591-76-4 | T | 160000 | NJ | N/A | N/A |
| HEXANE, 3-METHYL- 10.33 | 589-34-4 | T | 200000 | NJ | N/A | N/A |
| BUTANE, 2,2,3,3-TETRAMETHYL- 10.56 | 594-82-1 | T | 240000 | NJ | N/A | N/A |
| 2-HEXENE, 2-METHYL- 10.79 | 2738-19-4 | T | 49000 | NJ | N/A | N/A |
| HEPTANE, 4,4-DIMETHYL- 11.17 | 1068-19-5 | T | 52000 | NJ | N/A | N/A |
| FURAN, 2-METHOXY- 11.23 | 25414-22-6 | T | 65000 | NJ | N/A | N/A |
| 3,3-DIMETHYL-2-HEXANOL 11.47 | 22025-20-3 | T | 51000 | NJ | N/A | N/A |
| HEPTANE, 4-METHYL- 11.59 | 589-53-7 | T | 100000 | NJ | N/A | N/A |
| BENZENE, 1-BROMO-3-FLUORO- 14.10 | 1073-06-9 | T | 160000 | NJB | N/A | N/A |
| DICHLORODIFLUOROMETHANE | 75-71-8 | A | U | U | PQL | 15000 |
| CHLOROMETHANE | 74-87-3 | A | U | U | PQL | 15000 |
| VINYL CHLORIDE | 75-01-4 | A | U | U | PQL | 15000 |
| BROMOMETHANE | 74-83-9 | A | U | U | PQL | 15000 |
| CHLOROETHANE | 75-00-3 | A | U | U | PQL | 15000 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | A | U | U | PQL | 15000 |
| FREON TF | 76-13-1 | A | U | U | PQL | 15000 |
| 1,1-DICHLOROETHENE | 75-35-4 | A | U | U | PQL | 15000 |
| METHYLENE CHLORIDE | 75-09-2 | A | U | U | PQL | 15000 |
| 1,1-DICHLOROETHANE | 75-34-3 | A | U | U | PQL | 15000 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | A | U | U | PQL | 15000 |
| CHLOROFORM | 67-66-3 | A | U | U | PQL | 15000 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | A | U | U | PQL | 15000 |
| CARBON TETRACHLORIDE | 56-23-5 | A | U | U | PQL | 15000 |
| BENZENE | 71-43-2 | A | 120000 | | PQL | 15000 |
| 1,2-DICHLOROETHANE | 107-06-2 | A | U | U | PQL | 15000 |
| TRICHLOROETHENE | 79-01-6 | A | U | U | PQL | 15000 |
| 1,2-DICHLOROPROPANE | 78-87-5 | A | U | U | PQL | 15000 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | A | U | U | PQL | 15000 |
| TOLUENE | 108-88-3 | A | 140000 | | PQL | 15000 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | A | U | U | PQL | 15000 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | A | U | U | PQL | 15000 |
| TETRACHLOROETHENE | 127-18-4 | A | U | U | PQL | 15000 |
| CHLOROBENZENE | 108-90-7 | A | U | U | PQL | 15000 |
| ETHYLBENZENE | 100-41-4 | A | U | U | PQL | 15000 |
| XYLENE (M,P) | 1330-20-7 | A | 22000 | | PQL | 15000 |
| STYRENE | 100-42-5 | A | U | U | PQL | 15000 |

**Table 3-7**
**October 2002 Soil Vapor Test Results, Stafford Site**

| Sample ID | | | VP-13 | | | |
|---|---|---|---|---|---|---|
| Depth | | | 10.5-11' | | | |
| Sample Date | | | 10/28/2002 | | | |
| Laboratory ID | | | 386862 | | | |
| Method | | | 8260B | | | |
| Analysis Date | | | 10/31/2002 | | | |
| Chemical | CAS # | | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| XYLENE (O) | 95-47-6 | A | U | U | PQL | 15000 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | A | U | U | PQL | 15000 |
| 1,3-DICHLOROBENZENE | 541-73-1 | A | U | U | PQL | 15000 |
| 1,4-DICHLOROBENZENE | 106-46-7 | A | U | U | PQL | 15000 |
| 1,2-DICHLOROBENZENE | 95-50-1 | A | U | U | PQL | 15000 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | A | U | U | PQL | 15000 |
| HEXACHLOROBUTADIENE | 87-68-3 | A | U | U | PQL | 15000 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | A | U | U | PQL | 15000 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | A | U | U | PQL | 15000 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | A | U | U | PQL | 15000 |
| 1,2-DIBROMOETHANE | 106-93-4 | A | U | U | PQL | 15000 |
| 1,3-BUTADIENE | 106-99-0 | A | U | U | PQL | 15000 |
| CARBON DISULFIDE | 75-15-0 | A | U | U | PQL | 15000 |
| CYCLOHEXANE | 110-82-7 | A | 200000 | | PQL | 15000 |
| N-HEPTANE | 142-82-5 | A | 330000 | | PQL | 15000 |
| DIBROMOCHLOROMETHANE | 124-48-1 | A | U | U | PQL | 15000 |
| N-HEXANE | 110-54-3 | A | 990000 | | PQL | 15000 |
| BROMOFORM | 75-25-2 | A | U | U | PQL | 15000 |
| BROMODICHLOROMETHANE | 75-27-4 | A | U | U | PQL | 15000 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | A | U | U | PQL | 15000 |
| 4-ETHYLTOLUENE | 622-96-8 | A | U | U | PQL | 15000 |
| 3-CHLOROPROPENE | 107-05-1 | A | U | U | PQL | 15000 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | A | 500000 | | PQL | 15000 |
| BROMOETHENE | 593-60-2 | A | U | U | PQL | 15000 |
| 2-CHLOROTOLUENE | 95-49-8 | A | U | U | PQL | 15000 |
| UNKNOWN ALKANE 5.42 | | T | 280000 | J | N/A | N/A |
| UNKNOWN ALKANE 5.77 | | T | 190000 | J | N/A | N/A |
| UNKNOWN ALKANE 6.06 | | T | 250000 | J | N/A | N/A |
| UNKNOWN ALKANE 6.64 | | T | 410000 | J | N/A | N/A |
| UNKNOWN ALKANE 7.00 | | T | 760000 | J | N/A | N/A |
| UNKNOWN 7.47 | | T | 250000 | J | N/A | N/A |
| UNKNOWN 7.75 | | T | 200000 | J | N/A | N/A |
| UNKNOWN ALKANE 7.93 | | T | 860000 | J | N/A | N/A |
| UNKNOWN 8.36 | | T | 98000 | J | N/A | N/A |
| UNKNOWN 8.69 | | T | 310000 | J | N/A | N/A |
| UNKNOWN ALKANE 8.75 | | T | 170000 | J | N/A | N/A |
| UNKNOWN ALKANE 9.02 | | T | 100000 | J | N/A | N/A |
| UNKNOWN 9.08 | | T | 110000 | J | N/A | N/A |
| UNKNOWN ALKANE 9.77 | | T | 180000 | J | N/A | N/A |
| UNKNOWN 9.92 | | T | 96000 | J | N/A | N/A |
| UNKNOWN 10.22 | | T | 130000 | J | N/A | N/A |
| UNKNOWN ALKANE 10.42 | | T | 72000 | J | N/A | N/A |
| UNKNOWN ALKANE 10.56 | | T | 64000 | J | N/A | N/A |
| UNKNOWN ALKANE 10.74 | | T | 50000 | J | N/A | N/A |

# Table 3-8
## Sample Inventory, Stafford Site



| Sampling Date | Media | Golder Sample ID | Sample Location | Laboratory Sample ID | File Name |
|---|---|---|---|---|---|
| 29-Oct-02 | Air | Basement14 | 14 Park Basement | 508389 | SAQ02 |
| 29-Oct-02 | Air | FBasement14 | 14 Park Basement Duplicate | 508388 | SAQ02 |
| 23-Oct-02 | Air | Basement18 | 18 Park Basement | 507434 | SAQ01 |
| 23-Oct-02 | Air | Basement22 | 22 Park Crawlspace | 507438 | SAQ01 |
| 23-Oct-02 | Air | Basement73 | 73 Bay Ave Basement | 507436 | SAQ01 |
| 23-Oct-02 | Air | Basement73D | 73 Bay Ave Basement Duplicate | 507437 | SAQ01 |
| 29-Oct-02 | Air | First14 | 14 Park First Floor | 508390 | SAQ02 |
| 23-Oct-02 | Air | First18 | 18 Park First Floor | 507432 | SAQ01 |
| 23-Oct-02 | Air | First22 | 22 Park First Floor | 507439 | SAQ01 |
| 4-Nov-02 | Air | First63 | 22 Park First Floor | 509327 | SAQ03 |
| 23-Oct-02 | Air | First73 | 73 Bay First Floor | 507442 | SAQ01 |
| 23-Oct-02 | Air | Outdoor22 | Outdoor Beside 22 Park | 507440 | SAQ01 |
| 14-Nov-02 | Air | Outdoor73 | Outdoor Beside 73 Bay | 510407 | SAQ04 |
| 29-Oct-02 | Vapor | Subslab14 | 14 Park Subslab Vapor | 508387 | SAQ02 |
| 23-Oct-02 | Vapor | Subslab18 | 18 Park Subslab Vapor | 507433 | SAQ01 |
| 4-Nov-02 | Vapor | Subslab63 | 63 Bay Subslab Vapor | 509326 | SAQ03 |
| 23-Oct-02 | Vapor | Subslab73 | 73 Bay Subslab Vapor | 507435 | SAQ01 |
| 28-Oct-02 | Vapor | VP-9D | VP-9 Deep Vapor | 507875 | SAQ02 |
| 28-Oct-02 | Vapor | VP-9M | VP-9 Mid Depth Vapor | 507874 | SAQ02 |
| 28-Oct-02 | Vapor | VP-9S | VP-9 Shallow | 507873 | SAQ02 |
| 28-Oct-02 | Vapor | VP-10D | VP-10 Deep Vapor | 507878 | SAQ02 |
| 28-Oct-02 | Vapor | VP-10M | VP-10 Mid Depth Vapor | 507877 | SAQ02 |
| 28-Oct-02 | Vapor | VP-10S | VP-10 Shallow | 507876 | SAQ02 |
| 28-Oct-02 | Vapor | VP-11 | VP-11 Deep Vapor | 507879 | SAQ02 |
| 28-Oct-02 | Vapor | VP-12 | VP-12 Deep Vapor | 507880 | SAQ02 |
| 28-Oct-02 | Vapor | VP-13 | VP-13 Deep Vapor | 507881 | SAQ02 |
| 28-Oct-02 | GW | VP-9 | VP-9 Groundwater | 386857 | C207 |
| 28-Oct-02 | GW | VP-10 | VP-10 Groundwater | 386858 | C207 |
| 28-Oct-02 | GW | VP-11 | VP-11 Groundwater | 386859 | C207 |
| 28-Oct-02 | GW | VP-12 | VP-12 Groundwater | 386860 | C207 |
| 28-Oct-02 | GW | VP-12Dup | VP-12Dup Groundwater | 386862 | C207 |
| 28-Oct-02 | GW | VP-13 | VP-13 Groundwater | 386861 | C207 |
| 28-Oct-02 | Soil | VP-9 | VP-9 Soil | 386890 | C207 |
| 28-Oct-02 | Soil | VP-13 | VP-13 Soil | 386894 | C207 |
| | | | | | |

# Table 3-9
## Conversion Between ug/m3 and ppbV for Common VOCs

| Compound | ppbv | M.W. | ug/m$^3$ |
|---|---|---|---|
| Dichlorodifluoromethane | 1 | 120.92 | 5.08 |
| Chloromethane | 1 | 50.49 | 2.12 |
| Dichlorotetrafluoroethane | 1 | 170.93 | 7.18 |
| Vinyl Chloride | 1 | 62.5 | 2.63 |
| 1,3-Butadiene | 1 | 60.14 | 2.53 |
| Vinyl Chloride | 1 | 62.5 | 2.63 |
| Bromomethane | 1 | 94.95 | 3.99 |
| Chloroethane | 1 | 64.52 | 2.71 |
| Bromoethene | 1 | 106.96 | 4.50 |
| Acetone | 1 | 58.08 | 2.44 |
| Trichlorofluoromethane | 1 | 137.38 | 5.77 |
| Isopropyl Alcoho | 1 | 61.09 | 2.57 |
| 1,1-Dichloroethene | 1 | 96.95 | 4.08 |
| Methylene Chloride | 1 | 84.94 | 3.57 |
| 3-Chloropropene | 1 | 76.53 | 3.22 |
| Carbon Disulfide | 1 | 76.14 | 3.20 |
| Trichlorotrifluoroethane | 1 | 187.38 | 7.88 |
| trans-1,2-Dichloroethene | 1 | 96.95 | 4.08 |
| 1,1-Dichloroethane | 1 | 98.97 | 4.16 |
| Methyl tert-Butyl Ether | 1 | 88.15 | 3.71 |
| Methyl Ethyl Ketone | 1 | 72.11 | 3.03 |
| cis-1,2-Dichloroethene | 1 | 96.95 | 4.08 |
| n-Hexane | 1 | 86.18 | 3.62 |
| Chloroform | 1 | 119.39 | 5.02 |
| Tetrahydrofuran | 1 | 72.11 | 3.03 |
| 1,2-Dichloroethane | 1 | 98.96 | 4.16 |
| 1,1,1-Trichloroethane | 1 | 133.42 | 5.61 |
| Benzene | 1 | 78.11 | 3.28 |
| Carbon Tetrachloride | 1 | 153.84 | 6.47 |
| Cyclohexane | 1 | 84.16 | 3.54 |
| 1,2-Dichloropropane | 1 | 112.99 | 4.75 |
| Bromodichloromethane | 1 | 163.83 | 6.89 |
| Trichloroethene | 1 | 131.4 | 5.52 |
| 1,4-Dioxane | 1 | 88.11 | 3.70 |
| 2,2,4-Trimethylpentane | 1 | 132.38 | 5.56 |
| n-Heptane | 1 | 101.2 | 4.25 |
| cis-1,3-Dichloropropene | 1 | 110.98 | 4.66 |
| Methyl Isobutyl Ketone | 1 | 100.16 | 4.21 |
| trans-1,3-Dichloropropene | 1 | 110.98 | 4.66 |
| 1,1,2-Trichloroethane | 1 | 133.42 | 5.61 |
| Toluene | 1 | 92.13 | 3.87 |
| Methyl Butyl Ketone | 1 | 100.16 | 4.21 |
| Dibromochloromethane | 1 | 242.74 | 10.20 |
| 1,2-Dibromoethane | 1 | 187.88 | 7.90 |
| Tetrachloroethene | 1 | 165.85 | 6.97 |
| Chlorobenzene | 1 | 112.56 | 4.73 |
| Ethylbenzene | 1 | 106.16 | 4.46 |
| m,p-Xylene | 1 | 106.16 | 4.46 |
| Bromoform | 1 | 252.75 | 10.62 |
| Styrene | 1 | 104.14 | 4.38 |
| 1,1,2,2-Tetrachloroethane | 1 | 167.86 | 7.06 |
| o-Xylene | 1 | 106.16 | 4.46 |
| 2-Chlorotoluene | 1 | 126.59 | 5.32 |
| 4-Ethyltoluene | 1 | 120.2 | 5.05 |
| 1,3,5-Trimethylbenzene | 1 | 120.19 | 5.05 |
| 1,2,4-Trimethylbenzene | 1 | 120.19 | 5.05 |
| 1,3-Dichlorobenzene | 1 | 147.01 | 6.18 |
| 1,4-Dichlorobenzene | 1 | 147.01 | 6.18 |
| 1,2-Dichlorobenzene | 1 | 147.01 | 6.18 |
| 1,2,4-Trichlorobenzene | 1 | 181.46 | 7.63 |
| Hexachlorobutadiene | 1 | 260.76 | 10.96 |
| 2,2,4-Trimethypentane | 1 | 114.23 | 4.80 |
| Cyclohexane | 1 | 84.16 | 3.54 |
| MTBE | 1 | 88.17 | 3.71 |

Note: The above conversions are based on temperature of
17 degrees C (average groundwater temperature during Oct-02)

**Table 3-10**
**Results of Sub-Slab and Indoor Air Testing October 2002**
**Stafford Site**

| Sample ID | | 73 Bay Sub-slab Vapour | | | | Sample ID | | 73 Bay Basement | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | | | | | | Depth | | | | | |
| Sample Date | | 10/24/2002 | | | | Sample Date | | 10/24/2002 | | | |
| Laboratory ID | | 507435 | | | | Laboratory ID | | 507436 | | | |
| Method | | USEPA TO 15 | | | | Method | | USEPA TO 15 | | | |
| Analysis Date | | 10/30/2002 | | | | Analysis Date | | 10/29/2002 | | | |
| Chemical | CAS # | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level | Chemical | CAS # | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 5000 | | PQL | 200 | METHYL TERT-BUTYL ETHER | 1634-04-4 | 33 | | PQL | 1.0 |
| DICHLORODIFLUOROMETHANE | 75-71-8 | U | U | PQL | 300 | DICHLORODIFLUOROMETHANE | 75-71-8 | U | U | PQL | 2.5 |
| CHLOROMETHANE | 74-87-3 | U | U | PQL | 300 | CHLOROMETHANE | 74-87-3 | U | U | PQL | 2.5 |
| VINYL CHLORIDE | 75-01-4 | U | U | PQL | 300 | VINYL CHLORIDE | 75-01-4 | U | U | PQL | 2.5 |
| BROMOMETHANE | 74-83-9 | U | U | PQL | 300 | BROMOMETHANE | 74-83-9 | U | U | PQL | 2.5 |
| CHLOROETHANE | 75-00-3 | U | U | PQL | 300 | CHLOROETHANE | 75-00-3 | U | U | PQL | 2.5 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | U | U | PQL | 300 | TRICHLOROFLUOROMETHANE | 75-69-4 | U | U | PQL | 2.5 |
| FREON TF | 76-13-1 | U | U | PQL | 300 | FREON TF | 76-13-1 | U | U | PQL | 2.5 |
| 1,1-DICHLOROETHENE | 75-35-4 | U | U | PQL | 300 | 1,1-DICHLOROETHENE | 75-35-4 | U | U | PQL | 2.5 |
| METHYLENE CHLORIDE | 75-09-2 | U | U | PQL | 300 | METHYLENE CHLORIDE | 75-09-2 | U | U | PQL | 2.5 |
| 1,1-DICHLOROETHANE | 75-34-3 | U | U | PQL | 300 | 1,1-DICHLOROETHANE | 75-34-3 | U | U | PQL | 2.5 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | U | U | PQL | 300 | CIS-1,2-DICHLOROETHENE | 156-59-2 | U | U | PQL | 2.5 |
| CHLOROFORM | 67-66-3 | U | U | PQL | 300 | CHLOROFORM | 67-66-3 | U | U | PQL | 2.5 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | U | U | PQL | 300 | 1,1,1-TRICHLOROETHANE | 71-55-6 | U | U | PQL | 2.5 |
| CARBON TETRACHLORIDE | 56-23-5 | U | U | PQL | 300 | CARBON TETRACHLORIDE | 56-23-5 | U | U | PQL | 2.5 |
| BENZENE | 71-43-2 | U | U | PQL | 300 | BENZENE | 71-43-2 | U | U | PQL | 2.5 |
| 1,2-DICHLOROETHANE | 107-06-2 | U | U | PQL | 300 | 1,2-DICHLOROETHANE | 107-06-2 | U | U | PQL | 2.5 |
| TRICHLOROETHENE | 79-01-6 | U | U | PQL | 300 | TRICHLOROETHENE | 79-01-6 | U | U | PQL | 2.5 |
| 1,2-DICHLOROPROPANE | 78-87-5 | U | U | PQL | 300 | 1,2-DICHLOROPROPANE | 78-87-5 | U | U | PQL | 2.5 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | U | U | PQL | 300 | CIS-1,3-DICHLOROPROPENE | 10061-01-5 | U | U | PQL | 2.5 |
| TOLUENE | 108-88-3 | U | U | PQL | 300 | TOLUENE | 108-88-3 | U | U | PQL | 2.5 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | U | U | PQL | 300 | TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | U | U | PQL | 2.5 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | U | U | PQL | 300 | 1,1,2-TRICHLOROETHANE | 79-00-5 | U | U | PQL | 2.5 |
| TETRACHLOROETHENE | 127-18-4 | U | U | PQL | 300 | TETRACHLOROETHENE | 127-18-4 | U | U | PQL | 2.5 |
| CHLOROBENZENE | 108-90-7 | U | U | PQL | 300 | CHLOROBENZENE | 108-90-7 | U | U | PQL | 2.5 |
| ETHYLBENZENE | 100-41-4 | U | U | PQL | 300 | ETHYLBENZENE | 100-41-4 | U | U | PQL | 2.5 |
| XYLENE (M,P) | 1330-20-7 | U | U | PQL | 300 | XYLENE (M,P) | 1330-20-7 | 3.2 | | PQL | 2.5 |
| STYRENE | 100-42-5 | U | U | PQL | 300 | STYRENE | 100-42-5 | U | U | PQL | 2.5 |
| XYLENE (O) | 95-47-6 | U | U | PQL | 300 | XYLENE (O) | 95-47-6 | U | U | PQL | 2.5 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | U | U | PQL | 300 | 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | U | U | PQL | 2.5 |
| 1,3-DICHLOROBENZENE | 541-73-1 | U | U | PQL | 300 | 1,3-DICHLOROBENZENE | 541-73-1 | U | U | PQL | 2.5 |
| 1,4-DICHLOROBENZENE | 106-46-7 | U | U | PQL | 300 | 1,4-DICHLOROBENZENE | 106-46-7 | U | U | PQL | 2.5 |
| 1,2-DICHLOROBENZENE | 95-50-1 | U | U | PQL | 300 | 1,2-DICHLOROBENZENE | 95-50-1 | U | U | PQL | 2.5 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | U | U | PQL | 300 | 1,2,4-TRICHLOROBENZENE | 120-82-1 | U | U | PQL | 2.5 |
| HEXACHLOROBUTADIENE | 87-68-3 | U | U | PQL | 300 | HEXACHLOROBUTADIENE | 87-68-3 | U | U | PQL | 2.5 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | U | U | PQL | 300 | 1,3,5-TRIMETHYLBENZENE | 108-67-8 | U | U | PQL | 2.5 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | U | U | PQL | 300 | 1,2,4-TRIMETHYLBENZENE | 95-63-6 | U | U | PQL | 2.5 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | U | U | PQL | 300 | 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | U | U | PQL | 2.5 |
| 1,2-DIBROMOETHANE | 106-93-4 | U | U | PQL | 300 | 1,2-DIBROMOETHANE | 106-93-4 | U | U | PQL | 2.5 |
| 1,3-BUTADIENE | 106-99-0 | U | U | PQL | 300 | 1,3-BUTADIENE | 106-99-0 | U | U | PQL | 2.5 |
| CARBON DISULFIDE | 75-15-0 | U | U | PQL | 300 | CARBON DISULFIDE | 75-15-0 | U | U | PQL | 2.5 |
| CYCLOHEXANE | 110-82-7 | 4300 | | PQL | 300 | CYCLOHEXANE | 110-82-7 | 36 | | PQL | 2.5 |
| N-HEPTANE | 142-82-5 | U | U | PQL | 300 | N-HEPTANE | 142-82-5 | U | U | PQL | 2.5 |
| DIBROMOCHLOROMETHANE | 124-48-1 | U | U | PQL | 300 | DIBROMOCHLOROMETHANE | 124-48-1 | U | U | PQL | 2.5 |
| N-HEXANE | 110-54-3 | U | U | PQL | 300 | N-HEXANE | 110-54-3 | U | U | PQL | 2.5 |
| BROMOFORM | 75-25-2 | U | U | PQL | 300 | BROMOFORM | 75-25-2 | U | U | PQL | 2.5 |
| BROMODICHLOROMETHANE | 75-27-4 | U | U | PQL | 300 | BROMODICHLOROMETHANE | 75-27-4 | U | U | PQL | 2.5 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | U | U | PQL | 300 | TRANS-1,2-DICHLOROETHENE | 156-60-5 | U | U | PQL | 2.5 |
| 4-ETHYLTOLUENE | 622-96-8 | U | U | PQL | 300 | 4-ETHYLTOLUENE | 622-96-8 | U | U | PQL | 2.5 |
| 3-CHLOROPROPENE | 107-05-1 | U | U | PQL | 300 | 3-CHLOROPROPENE | 107-05-1 | U | U | PQL | 2.5 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 20000 | | PQL | 300 | 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 140 | | PQL | 2.5 |
| BROMOETHENE | 593-60-2 | U | U | PQL | 300 | BROMOETHENE | 593-60-2 | U | U | PQL | 2.5 |
| 2-CHLOROTOLUENE | 95-49-8 | U | U | PQL | 300 | 2-CHLOROTOLUENE | 95-49-8 | U | U | PQL | 2.5 |

**Table 3-10**
**Results of Sub-Slab and Indoor Air Testing October 2002**
**Stafford Site**

| Sample ID | | 73 Bay Basement Field Duplicate | | | | Sample ID | | 73 Bay First Floor | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | | | | | | Depth | | | | | |
| Sample Date | | 10/24/2002 | | | | Sample Date | | 10/24/2002 | | | |
| Laboratory ID | | 507437 | | | | Laboratory ID | | 507442 | | | |
| Method | | USEPA TO 15 | | | | Method | | USEPA TO 15 | | | |
| Analysis Date | | 10/30/2002 | | | | Analysis Date | | 10/30/2002 | | | |
| Chemical | CAS # | Concentration (ppb) | Quantification Qualifier | Quantification Type | Quantification Level | Chemical | CAS # | Concentration (ppb) | Quantification Qualifier | Quantification Type | Quantification Level |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 38 | | PQL | 1.0 | METHYL TERT-BUTYL ETHER | 1634-04-4 | 14 | | PQL | 0.50 |
| DICHLORODIFLUOROMETHANE | 75-71-8 | U | U | PQL | 2.5 | DICHLORODIFLUOROMETHANE | 75-71-8 | U | U | PQL | 0.50 |
| CHLOROMETHANE | 74-87-3 | U | U | PQL | 2.5 | CHLOROMETHANE | 74-87-3 | U | U | PQL | 0.50 |
| VINYL CHLORIDE | 75-01-4 | U | U | PQL | 2.5 | VINYL CHLORIDE | 75-01-4 | U | U | PQL | 0.50 |
| BROMOMETHANE | 74-83-9 | U | U | PQL | 2.5 | BROMOMETHANE | 74-83-9 | U | U | PQL | 0.50 |
| CHLOROETHANE | 75-00-3 | U | U | PQL | 2.5 | CHLOROETHANE | 75-00-3 | U | U | PQL | 0.50 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | U | U | PQL | 2.5 | TRICHLOROFLUOROMETHANE | 75-69-4 | U | U | PQL | 0.50 |
| FREON TF | 76-13-1 | U | U | PQL | 2.5 | FREON TF | 76-13-1 | U | U | PQL | 0.50 |
| 1,1-DICHLOROETHENE | 75-35-4 | U | U | PQL | 2.5 | 1,1-DICHLOROETHENE | 75-35-4 | U | U | PQL | 0.50 |
| METHYLENE CHLORIDE | 75-09-2 | U | U | PQL | 2.5 | METHYLENE CHLORIDE | 75-09-2 | 29 | | PQL | 0.50 |
| 1,1-DICHLOROETHANE | 75-34-3 | U | U | PQL | 2.5 | 1,1-DICHLOROETHANE | 75-34-3 | U | U | PQL | 0.50 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | U | U | PQL | 2.5 | CIS-1,2-DICHLOROETHENE | 156-59-2 | U | U | PQL | 0.50 |
| CHLOROFORM | 67-66-3 | U | U | PQL | 2.5 | CHLOROFORM | 67-66-3 | U | U | PQL | 0.50 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | U | U | PQL | 2.5 | 1,1,1-TRICHLOROETHANE | 71-55-6 | U | U | PQL | 0.50 |
| CARBON TETRACHLORIDE | 56-23-5 | U | U | PQL | 2.5 | CARBON TETRACHLORIDE | 56-23-5 | U | U | PQL | 0.50 |
| BENZENE | 71-43-2 | U | U | PQL | 2.5 | BENZENE | 71-43-2 | U | U | PQL | 0.50 |
| 1,2-DICHLOROETHANE | 107-06-2 | U | U | PQL | 2.5 | 1,2-DICHLOROETHANE | 107-06-2 | U | U | PQL | 0.50 |
| TRICHLOROETHENE | 79-01-6 | U | U | PQL | 2.5 | TRICHLOROETHENE | 79-01-6 | U | U | PQL | 0.50 |
| 1,2-DICHLOROPROPANE | 78-87-5 | U | U | PQL | 2.5 | 1,2-DICHLOROPROPANE | 78-87-5 | U | U | PQL | 0.50 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | U | U | PQL | 2.5 | CIS-1,3-DICHLOROPROPENE | 10061-01-5 | U | U | PQL | 0.50 |
| TOLUENE | 108-88-3 | U | U | PQL | 2.5 | TOLUENE | 108-88-3 | 12 | | PQL | 0.50 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | U | U | PQL | 2.5 | TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | U | U | PQL | 0.50 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | U | U | PQL | 2.5 | 1,1,2-TRICHLOROETHANE | 79-00-5 | U | U | PQL | 0.50 |
| TETRACHLOROETHENE | 127-18-4 | U | U | PQL | 2.5 | TETRACHLOROETHENE | 127-18-4 | U | U | PQL | 0.50 |
| CHLOROBENZENE | 108-90-7 | U | U | PQL | 2.5 | CHLOROBENZENE | 108-90-7 | U | U | PQL | 0.50 |
| ETHYLBENZENE | 100-41-4 | U | U | PQL | 2.5 | ETHYLBENZENE | 100-41-4 | 2.4 | | PQL | 0.50 |
| XYLENE (M,P) | 1330-20-7 | 2.7 | | PQL | 2.5 | XYLENE (M,P) | 1330-20-7 | 8.9 | | PQL | 0.50 |
| STYRENE | 100-42-5 | U | U | PQL | 2.5 | STYRENE | 100-42-5 | U | U | PQL | 0.50 |
| XYLENE (O) | 95-47-6 | U | U | PQL | 2.5 | XYLENE (O) | 95-47-6 | 3.8 | | PQL | 0.50 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | U | U | PQL | 2.5 | 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | U | U | PQL | 0.50 |
| 1,3-DICHLOROBENZENE | 541-73-1 | U | U | PQL | 2.5 | 1,3-DICHLOROBENZENE | 541-73-1 | U | U | PQL | 0.50 |
| 1,4-DICHLOROBENZENE | 106-46-7 | U | U | PQL | 2.5 | 1,4-DICHLOROBENZENE | 106-46-7 | U | U | PQL | 0.50 |
| 1,2-DICHLOROBENZENE | 95-50-1 | U | U | PQL | 2.5 | 1,2-DICHLOROBENZENE | 95-50-1 | U | U | PQL | 0.50 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | U | U | PQL | 2.5 | 1,2,4-TRICHLOROBENZENE | 120-82-1 | U | U | PQL | 0.50 |
| HEXACHLOROBUTADIENE | 87-68-3 | U | U | PQL | 2.5 | HEXACHLOROBUTADIENE | 87-68-3 | U | U | PQL | 0.50 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | U | U | PQL | 2.5 | 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 1.2 | | PQL | 0.50 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | U | U | PQL | 2.5 | 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 3.5 | | PQL | 0.50 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | U | U | PQL | 2.5 | 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | U | U | PQL | 0.50 |
| 1,2-DIBROMOETHANE | 106-93-4 | U | U | PQL | 2.5 | 1,2-DIBROMOETHANE | 106-93-4 | U | U | PQL | 0.50 |
| 1,3-BUTADIENE | 106-99-0 | U | U | PQL | 2.5 | 1,3-BUTADIENE | 106-99-0 | U | U | PQL | 0.50 |
| CARBON DISULFIDE | 75-15-0 | U | U | PQL | 2.5 | CARBON DISULFIDE | 75-15-0 | U | U | PQL | 0.50 |
| CYCLOHEXANE | 110-82-7 | 36 | | PQL | 2.5 | CYCLOHEXANE | 110-82-7 | 7.4 | | PQL | 0.50 |
| N-HEPTANE | 142-82-5 | U | U | PQL | 2.5 | N-HEPTANE | 142-82-5 | U | U | PQL | 0.50 |
| DIBROMOCHLOROMETHANE | 124-48-1 | U | U | PQL | 2.5 | DIBROMOCHLOROMETHANE | 124-48-1 | U | U | PQL | 0.50 |
| N-HEXANE | 110-54-3 | U | U | PQL | 2.5 | N-HEXANE | 110-54-3 | U | U | PQL | 0.50 |
| BROMOFORM | 75-25-2 | U | U | PQL | 2.5 | BROMOFORM | 75-25-2 | U | U | PQL | 0.50 |
| BROMODICHLOROMETHANE | 75-27-4 | U | U | PQL | 2.5 | BROMODICHLOROMETHANE | 75-27-4 | U | U | PQL | 0.50 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | U | U | PQL | 2.5 | TRANS-1,2-DICHLOROETHENE | 156-60-5 | U | U | PQL | 0.50 |
| 4-ETHYLTOLUENE | 622-96-8 | U | U | PQL | 2.5 | 4-ETHYLTOLUENE | 622-96-8 | 3.8 | | PQL | 0.50 |
| 3-CHLOROPROPENE | 107-05-1 | U | U | PQL | 2.5 | 3-CHLOROPROPENE | 107-05-1 | U | U | PQL | 0.50 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 150 | | PQL | 2.5 | 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 34 | | PQL | 0.50 |
| BROMOETHENE | 593-60-2 | U | U | PQL | 2.5 | BROMOETHENE | 593-60-2 | U | U | PQL | 0.50 |
| 2-CHLOROTOLUENE | 95-49-8 | U | U | PQL | 2.5 | 2-CHLOROTOLUENE | 95-49-8 | U | U | PQL | 0.50 |

**Table 3-10**
**Results of Sub-Slab and Indoor Air Testing October 2002**
**Stafford Site**

| Sample ID | | 63 Bay Sub-slab Vapour | | | |
|---|---|---|---|---|---|
| Depth | | | | | |
| Sample Date | | 11/5/2002 | | | |
| Laboratory ID | | 509326R1 | | | |
| Method | | USEPA TO 15 | | | |
| Analysis Date | | 11/14/2002 | | | |
| Chemical | CAS # | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 0.71 | | PQL | 0.50 |
| 1,7-NAPHTHYRIDINE 9.74 | 253-69-0 | 10 | NJ | N/A | N/A |
| TETRADECANE, 2,5-DIMETHYL- 13.89 | 56292-69-4 | 21 | NJ | N/A | N/A |
| BENZENE, 1-BROMO-3-FLUORO- 14.09 | 1073-06-9 | 27 | NJB | N/A | N/A |
| DECANE, 2-METHYL- 14.42 | 6975-98-0 | 5.7 | NJ | N/A | N/A |
| 2,2,7,7-TETRAMETHYLOCTANE 14.48 | 1071-31-4 | 48 | NJ | N/A | N/A |
| 2-PYRAZOLINE, 1-METHYL-4-PROPY 14.54 | 33063-77-3 | 6.8 | NJ | N/A | N/A |
| DECANE, 2,2,6-TRIMETHYL- 14.62 | 62237-97-2 | 20 | NJ | N/A | N/A |
| NONANE, 3-METHYL-5-PROPYL- 14.77 | 31081-18-2 | 95 | NJ | N/A | N/A |
| PENTANE, 2,3,4-TRIMETHYL- 14.83 | 565-75-3 | 12 | NJ | N/A | N/A |
| EICOSANE 14.86 | 112-95-8 | 19 | NJ | N/A | N/A |
| HEPTANE, 2,2-DIMETHYL- 14.99 | 1071-26-7 | 130 | NJ | N/A | N/A |
| HEPTADECANE, 2,6,10,15-TETRAME 15.17 | 54833-48-6 | 56 | NJ | N/A | N/A |
| DECANE, 2-METHYL- 15.24 | 6975-98-0 | 14 | NJ | N/A | N/A |
| NONANE, 5-BUTYL- 15.34 | 17312-63-9 | 26 | NJ | N/A | N/A |
| HEXANE, 3,3-DIMETHYL- 15.40 | 563-16-6 | 15 | NJ | N/A | N/A |
| UNDECANE, 3-METHYL- 15.53 | 1002-43-3 | 44 | NJ | N/A | N/A |
| DECANE, 3,3,8-TRIMETHYL- 15.78 | 62338-16-3 | 22 | NJ | N/A | N/A |
| HEXANE, 2,4,4-TRIMETHYL- 15.96 | 16747-30-1 | 7.8 | NJ | N/A | N/A |
| NONANE, 3-METHYL- 16.08 | 5911-04-6 | 28 | NJ | N/A | N/A |
| DECANE, 2,7,7-TRIMETHYL- 16.34 | 62338-15-2 | 5.2 | NJ | N/A | N/A |
| DICHLORODIFLUOROMETHANE | 75-71-8 | U | U | PQL | 10 |
| CHLOROMETHANE | 74-87-3 | U | U | PQL | 10 |
| VINYL CHLORIDE | 75-01-4 | U | U | PQL | 10 |
| BROMOMETHANE | 74-83-9 | U | U | PQL | 10 |
| CHLOROETHANE | 75-00-3 | U | U | PQL | 10 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | U | U | PQL | 10 |
| FREON TF | 76-13-1 | U | U | PQL | 10 |
| 1,1-DICHLOROETHENE | 75-35-4 | U | U | PQL | 10 |
| METHYLENE CHLORIDE | 75-09-2 | U | U | PQL | 10 |
| 1,1-DICHLOROETHANE | 75-34-3 | U | U | PQL | 10 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | U | U | PQL | 10 |
| CHLOROFORM | 67-66-3 | U | U | PQL | 10 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | U | U | PQL | 10 |
| CARBON TETRACHLORIDE | 56-23-5 | U | U | PQL | 10 |
| BENZENE | 71-43-2 | U | U | PQL | 10 |
| 1,2-DICHLOROETHANE | 107-06-2 | U | U | PQL | 10 |
| TRICHLOROETHENE | 79-01-6 | U | U | PQL | 10 |
| 1,2-DICHLOROPROPANE | 78-87-5 | U | U | PQL | 10 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | U | U | PQL | 10 |
| TOLUENE | 108-88-3 | U | U | PQL | 10 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | U | U | PQL | 10 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | U | U | PQL | 10 |
| TETRACHLOROETHENE | 127-18-4 | 59 | | PQL | 10 |
| CHLOROBENZENE | 108-90-7 | U | U | PQL | 10 |
| ETHYLBENZENE | 100-41-4 | U | U | PQL | 10 |
| XYLENE (M,P) | 1330-20-7 | 12 | | PQL | 10 |
| STYRENE | 100-42-5 | U | U | PQL | 10 |
| XYLENE (O) | 95-47-6 | U | U | PQL | 10 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | U | U | PQL | 10 |
| 1,3-DICHLOROBENZENE | 541-73-1 | U | U | PQL | 10 |
| 1,4-DICHLOROBENZENE | 106-46-7 | U | U | PQL | 10 |
| 1,2-DICHLOROBENZENE | 95-50-1 | U | U | PQL | 10 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | U | U | PQL | 10 |
| HEXACHLOROBUTADIENE | 87-68-3 | U | U | PQL | 10 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | U | U | PQL | 10 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | U | U | PQL | 10 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | U | U | PQL | 10 |
| 1,2-DIBROMOETHANE | 106-93-4 | U | U | PQL | 10 |
| 1,3-BUTADIENE | 106-99-0 | U | U | PQL | 10 |
| CARBON DISULFIDE | 75-15-0 | U | U | PQL | 10 |
| CYCLOHEXANE | 110-82-7 | U | U | PQL | 10 |
| N-HEPTANE | 142-82-5 | U | U | PQL | 10 |
| DIBROMOCHLOROMETHANE | 124-48-1 | U | U | PQL | 10 |
| N-HEXANE | 110-54-3 | U | U | PQL | 10 |
| BROMOFORM | 75-25-2 | U | U | PQL | 10 |
| BROMODICHLOROMETHANE | 75-27-4 | U | U | PQL | 10 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | U | U | PQL | 10 |
| 4-ETHYLTOLUENE | 622-96-8 | U | U | PQL | 10 |
| 3-CHLOROPROPENE | 107-05-1 | U | U | PQL | 10 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | U | U | PQL | 10 |
| BROMOETHENE | 593-60-2 | U | U | PQL | 10 |
| 2-CHLOROTOLUENE | 95-49-8 | U | U | PQL | 10 |
| UNKNOWN 7.00 | | 200 | J | N/A | N/A |
| UNKNOWN 8.43 | | 120 | J | N/A | N/A |
| UNKNOWN ALKANE 13.17 | | 44 | J | N/A | N/A |
| UNKNOWN 13.36 | | 28 | J | N/A | N/A |
| UNKNOWN ALKANE 13.57 | | 51 | J | N/A | N/A |
| UNKNOWN ALKANE 13.86 | | 130 | J | N/A | N/A |
| UNKNOWN ALKANE 13.98 | | 39 | J | N/A | N/A |
| UNKNOWN ALKANE 14.09 | | 250 | J | N/A | N/A |
| UNKNOWN 14.18 | | 21 | J | N/A | N/A |
| UNKNOWN ALKANE 14.22 | | 40 | J | N/A | N/A |
| UNKNOWN ALKANE 14.30 | | 340 | J | N/A | N/A |
| UNKNOWN ALKANE 14.48 | | 140 | J | N/A | N/A |
| UNKNOWN 14.56 | | 31 | J | N/A | N/A |
| UNKNOWN ALKANE 14.63 | | 39 | J | N/A | N/A |
| UNKNOWN ALKANE 14.68 | | 50 | J | N/A | N/A |
| UNKNOWN ALKANE 14.89 | | 83 | J | N/A | N/A |
| UNKNOWN ALKANE 15.09 | | 30 | J | N/A | N/A |
| UNKNOWN ALKANE 15.38 | | 28 | J | N/A | N/A |

| Sample ID | | 63 Bay First Floor | | | |
|---|---|---|---|---|---|
| Depth | | | | | |
| Sample Date | | 11/5/2002 | | | |
| Laboratory ID | | 509326R1 | | | |
| Method | | USEPA TO 15 | | | |
| Analysis Date | | 11/13/2002 | | | |
| Chemical | CAS # | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 0.77 | | PQL | 0.50 |
| BUTANE, 2-METHYL- 6.71 | 78-78-4 | 1.0 | NJ | N/A | N/A |
| BENZENE, 1-BROMO-2-FLUORO- 14.10 | 1072-85-1 | 14 | NJ | N/A | N/A |
| LIMONENE 14.91 | 138-86-3 | 1.1 | NJ | N/A | N/A |
| 1-HEXANOL, 2-ETHYL- 15.11 | 104-76-7 | 1.3 | NJ | N/A | N/A |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 0.64 | | PQL | 0.50 |
| CHLOROMETHANE | 74-87-3 | 0.75 | | PQL | 0.50 |
| VINYL CHLORIDE | 75-01-4 | U | U | PQL | 0.50 |
| BROMOMETHANE | 74-83-9 | U | U | PQL | 0.50 |
| CHLOROETHANE | 75-00-3 | U | U | PQL | 0.50 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | U | U | PQL | 0.50 |
| FREON TF | 76-13-1 | U | U | PQL | 0.50 |
| 1,1-DICHLOROETHENE | 75-35-4 | U | U | PQL | 0.50 |
| METHYLENE CHLORIDE | 75-09-2 | U | U | PQL | 0.50 |
| 1,1-DICHLOROETHANE | 75-34-3 | U | U | PQL | 0.50 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | U | U | PQL | 0.50 |
| CHLOROFORM | 67-66-3 | U | U | PQL | 0.50 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | U | U | PQL | 0.50 |
| CARBON TETRACHLORIDE | 56-23-5 | U | U | PQL | 0.50 |
| BENZENE | 71-43-2 | U | U | PQL | 0.50 |
| 1,2-DICHLOROETHANE | 107-06-2 | U | U | PQL | 0.50 |
| TRICHLOROETHENE | 79-01-6 | U | U | PQL | 0.50 |
| 1,2-DICHLOROPROPANE | 78-87-5 | U | U | PQL | 0.50 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | U | U | PQL | 0.50 |
| TOLUENE | 108-88-3 | 0.83 | | PQL | 0.50 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | U | U | PQL | 0.50 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | U | U | PQL | 0.50 |
| TETRACHLOROETHENE | 127-18-4 | U | U | PQL | 0.50 |
| CHLOROBENZENE | 108-90-7 | U | U | PQL | 0.50 |
| ETHYLBENZENE | 100-41-4 | U | U | PQL | 0.50 |
| XYLENE (M,P) | 1330-20-7 | 0.65 | | PQL | 0.50 |
| STYRENE | 100-42-5 | U | U | PQL | 0.50 |
| XYLENE (O) | 95-47-6 | U | U | PQL | 0.50 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | U | U | PQL | 0.50 |
| 1,3-DICHLOROBENZENE | 541-73-1 | U | U | PQL | 0.50 |
| 1,4-DICHLOROBENZENE | 106-46-7 | U | U | PQL | 0.50 |
| 1,2-DICHLOROBENZENE | 95-50-1 | U | U | PQL | 0.50 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | U | U | PQL | 0.50 |
| HEXACHLOROBUTADIENE | 87-68-3 | U | U | PQL | 0.50 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | U | U | PQL | 0.50 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 0.50 | | PQL | 0.50 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | U | U | PQL | 0.50 |
| 1,2-DIBROMOETHANE | 106-93-4 | U | U | PQL | 0.50 |
| 1,3-BUTADIENE | 106-99-0 | U | U | PQL | 0.50 |
| CARBON DISULFIDE | 75-15-0 | U | U | PQL | 0.50 |
| CYCLOHEXANE | 110-82-7 | U | U | PQL | 0.50 |
| N-HEPTANE | 142-82-5 | U | U | PQL | 0.50 |
| DIBROMOCHLOROMETHANE | 124-48-1 | U | U | PQL | 0.50 |
| N-HEXANE | 110-54-3 | 0.51 | | PQL | 0.50 |
| BROMOFORM | 75-25-2 | U | U | PQL | 0.50 |
| BROMODICHLOROMETHANE | 75-27-4 | U | U | PQL | 0.50 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | U | U | PQL | 0.50 |
| 4-ETHYLTOLUENE | 622-96-8 | U | U | PQL | 0.50 |
| 3-CHLOROPROPENE | 107-05-1 | U | U | PQL | 0.50 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | U | U | PQL | 0.50 |
| BROMOETHENE | 593-60-2 | U | U | PQL | 0.50 |
| 2-CHLOROTOLUENE | 95-49-8 | U | U | PQL | 0.50 |
| UNKNOWN ALKANE 5.07 | | 1.8 | J | N/A | N/A |

**Table 3-10**
**Results of Sub-Slab and Indoor Air Testing October 2002**
**Stafford Site**

| Sample ID | | 14 Park Sub-Slab Vapour | | | |
|---|---|---|---|---|---|
| Depth | | | | | |
| Sample Date | | 10/30/2002 | | | |
| Laboratory ID | | 508387 | | | |
| Method | | USEPA TO 15 | | | |
| Analysis Date | | 11/1/2002 | | | |
| Chemical | CAS # | Concentration (ppb) | Quantification Qualifier | Quantification Type | Quantification Level |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | U | U | PQL | 1.0 |
| OCTANE, 2,2-DIMETHYL- 13.89 | 15869-87-1 | 45 | NJ | N/A | N/A |
| BENZENE, 1-BROMO-3-FLUORO- 14 | 1073-06-9 | 58 | NJ | N/A | N/A |
| TRIDECANE 14.29 | 629-50-5 | 49 | NJ | N/A | N/A |
| PIPERIDINE 14.44 | 110-89-4 | 6.6 | NJ | N/A | N/A |
| OCTANE, 2,2-DIMETHYL- 14.49 | 15869-87-1 | 92 | NJ | N/A | N/A |
| 1-PROPANONE, 2-CHLORO-1-(4-CHI | 36025-21-5 | 9.3 | NJ | N/A | N/A |
| DECANE, 2,2-DIMETHYL- 14.62 | 17302-37-3 | 24 | NJ | N/A | N/A |
| HYDROXYLAMINE, O-DECYL- 14.78 | 29812-79-1 | 190 | NJ | N/A | N/A |
| 1-UNDECENE, 5-METHYL- 14.88 | 74630-38-9 | 29 | NJ | N/A | N/A |
| 1-PENTANOL, 3,4-DIMETHYL- 14.99 | 6570-87-2 | 220 | NJ | N/A | N/A |
| UNDECANE, 2,8-DIMETHYL- 15.17 | 17301-25-6 | 52 | NJ | N/A | N/A |
| NONANE, 3-METHYL- 15.26 | 5911-04-6 | 9.2 | NJ | N/A | N/A |
| 1-IODO-2-METHYLNONANE 15.34 | 0-00-0 | 17 | NJ | N/A | N/A |
| HEPTANE, 2,4-DIMETHYL- 15.41 | 2213-23-2 | 10 | NJ | N/A | N/A |
| DECANE, 2,2,9-TRIMETHYL- 15.54 | 62238-00-0 | 32 | NJ | N/A | N/A |
| HEPTADECANE, 4-METHYL- 15.78 | 26429-11-8 | 20 | NJ | N/A | N/A |
| UNDECANE, 4,8-DIMETHYL- 15.96 | 17301-33-6 | 10 | NJ | N/A | N/A |
| OCTANE, 2,6-DIMETHYL- 16.08 | 2051-30-1 | 43 | NJ | N/A | N/A |
| BENZENEMETHANOL, .ALPHA.,.ALP | 617-94-7 | 12 | NJ | N/A | N/A |
| TRIDECANE, 4-METHYL- 16.36 | 26730-12-1 | 11 | NJ | N/A | N/A |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 14 | | PQL | 1.0 |
| CHLOROMETHANE | 74-87-3 | U | U | PQL | 1.0 |
| VINYL CHLORIDE | 75-01-4 | U | U | PQL | 1.0 |
| BROMOMETHANE | 74-83-9 | U | U | PQL | 1.0 |
| CHLOROETHANE | 75-00-3 | U | U | PQL | 1.0 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | U | U | PQL | 1.0 |
| FREON TF | 76-13-1 | U | U | PQL | 1.0 |
| 1,1-DICHLOROETHENE | 75-35-4 | U | U | PQL | 1.0 |
| METHYLENE CHLORIDE | 75-09-2 | 2.7 | | PQL | 1.0 |
| 1,1-DICHLOROETHANE | 75-34-3 | U | U | PQL | 1.0 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | U | U | PQL | 1.0 |
| CHLOROFORM | 67-66-3 | U | U | PQL | 1.0 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | U | U | PQL | 1.0 |
| CARBON TETRACHLORIDE | 56-23-5 | U | U | PQL | 1.0 |
| BENZENE | 71-43-2 | U | U | PQL | 1.0 |
| 1,2-DICHLOROETHANE | 107-06-2 | U | U | PQL | 1.0 |
| TRICHLOROETHENE | 79-01-6 | U | U | PQL | 1.0 |
| 1,2-DICHLOROPROPANE | 78-87-5 | U | U | PQL | 1.0 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | U | U | PQL | 1.0 |
| TOLUENE | 108-88-3 | 9.4 | | PQL | 1.0 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | U | U | PQL | 1.0 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | U | U | PQL | 1.0 |
| TETRACHLOROETHENE | 127-18-4 | U | U | PQL | 1.0 |
| CHLOROBENZENE | 108-90-7 | U | U | PQL | 1.0 |
| ETHYLBENZENE | 100-41-4 | 3.4 | | PQL | 1.0 |
| XYLENE (M,P) | 1330-20-7 | 12 | | PQL | 1.0 |
| STYRENE | 100-42-5 | U | U | PQL | 1.0 |
| XYLENE (O) | 95-47-6 | 4.9 | | PQL | 1.0 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | U | U | PQL | 1.0 |
| 1,3-DICHLOROBENZENE | 541-73-1 | U | U | PQL | 1.0 |
| 1,4-DICHLOROBENZENE | 106-46-7 | U | U | PQL | 1.0 |
| 1,2-DICHLOROBENZENE | 95-50-1 | U | U | PQL | 1.0 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | U | U | PQL | 1.0 |
| HEXACHLOROBUTADIENE | 87-68-3 | U | U | PQL | 1.0 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 1.6 | | PQL | 1.0 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 5.3 | | PQL | 1.0 |
| 1,2-DICHLOROTETRAFLUOROETHA | 76-14-2 | U | U | PQL | 1.0 |
| 1,2-DIBROMOETHANE | 106-93-4 | U | U | PQL | 1.0 |
| 1,3-BUTADIENE | 106-99-0 | U | U | PQL | 1.0 |
| CARBON DISULFIDE | 75-15-0 | U | U | PQL | 1.0 |
| CYCLOHEXANE | 110-82-7 | U | U | PQL | 1.0 |
| N-HEPTANE | 142-82-5 | 1.0 | | PQL | 1.0 |
| DIBROMOCHLOROMETHANE | 124-48-1 | U | U | PQL | 1.0 |
| N-HEXANE | 110-54-3 | U | U | PQL | 1.0 |
| BROMOFORM | 75-25-2 | U | U | PQL | 1.0 |
| BROMODICHLOROMETHANE | 75-27-4 | U | U | PQL | 1.0 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | U | U | PQL | 1.0 |
| 4-ETHYLTOLUENE | 622-96-8 | 4.7 | | PQL | 1.0 |
| 3-CHLOROPROPENE | 107-05-1 | U | U | PQL | 1.0 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | U | U | PQL | 1.0 |
| BROMOETHENE | 593-60-2 | U | U | PQL | 1.0 |
| 2-CHLOROTOLUENE | 95-49-8 | U | U | PQL | 1.0 |
| UNKNOWN 13.30 | | 7.1 | J | N/A | N/A |
| UNKNOWN ALKANE 13.36 | | 27 | J | N/A | N/A |
| UNKNOWN ALKANE 13.58 | | 39 | J | N/A | N/A |
| UNKNOWN 13.63 | | 15 | J | N/A | N/A |
| UNKNOWN 13.74 | | 14 | J | N/A | N/A |
| UNKNOWN ALKANE 13.87 | | 99 | J | N/A | N/A |
| UNKNOWN ALKANE 13.98 | | 31 | J | N/A | N/A |
| UNKNOWN ALKANE 14.09 | | 180 | J | N/A | N/A |
| UNKNOWN 14.18 | | 12 | J | N/A | N/A |
| UNKNOWN ALKANE 14.22 | | 36 | J | N/A | N/A |
| UNKNOWN ALKANE 14.30 | | 200 | J | N/A | N/A |
| UNKNOWN ALKANE 14.48 | | 91 | J | N/A | N/A |
| UNKNOWN ALKANE 14.56 | | 22 | J | N/A | N/A |
| UNKNOWN ALKANE 14.63 | | 32 | J | N/A | N/A |
| UNKNOWN ALKANE 14.68 | | 30 | J | N/A | N/A |
| UNKNOWN ALKANE 14.89 | | 60 | J | N/A | N/A |
| UNKNOWN ALKANE 15.09 | | 26 | J | N/A | N/A |
| UNKNOWN ALKANE 15.26 | | 18 | J | N/A | N/A |
| UNKNOWN ALKANE 15.38 | | 30 | J | N/A | N/A |

| Sample ID | | 14 Park Basement | | | |
|---|---|---|---|---|---|
| Depth | | | | | |
| Sample Date | | 10/30/2002 | | | |
| Laboratory ID | | 508388 | | | |
| Method | | USEPA TO 15 | | | |
| Analysis Date | | 11/1/2002 | | | |
| Chemical | CAS # | Concentration (ppb) | Quantification Qualifier | Quantification Type | Quantification Level |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | U | U | PQL | 0.50 |
| BUTANAL 13.88 | 123-72-8 | 3.1 | NJ | N/A | N/A |
| TETRADECANE, 1-CHLORO- 14.20 | 2425-54-9 | 1.1 | NJ | N/A | N/A |
| BENZENE, 1-ETHYL-2-METHYL- 14.29 | 611-14-3 | 1.5 | NJ | N/A | N/A |
| CYCLOPENTANOL, 2-(AMINOMETHYL) 15.1 | 40482-02-8 | 1.4 | NJ | N/A | N/A |
| UNDECANE 15.25 | 1120-21-4 | 1.2 | NJ | N/A | N/A |
| PHENOL 15.32 | 108-95-2 | 4.3 | NJ | N/A | N/A |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 18 | | PQL | 0.50 |
| CHLOROMETHANE | 74-87-3 | U | U | PQL | 0.50 |
| VINYL CHLORIDE | 75-01-4 | U | U | PQL | 0.50 |
| BROMOMETHANE | 74-83-9 | U | U | PQL | 0.50 |
| CHLOROETHANE | 75-00-3 | U | U | PQL | 0.50 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | U | U | PQL | 0.50 |
| FREON TF | 76-13-1 | U | U | PQL | 0.50 |
| 1,1-DICHLOROETHENE | 75-35-4 | U | U | PQL | 0.50 |
| METHYLENE CHLORIDE | 75-09-2 | 4.2 | | PQL | 0.50 |
| 1,1-DICHLOROETHANE | 75-34-3 | U | U | PQL | 0.50 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | U | U | PQL | 0.50 |
| CHLOROFORM | 67-66-3 | U | U | PQL | 0.50 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | U | U | PQL | 0.50 |
| CARBON TETRACHLORIDE | 56-23-5 | U | U | PQL | 0.50 |
| BENZENE | 71-43-2 | U | U | PQL | 0.50 |
| 1,2-DICHLOROETHANE | 107-06-2 | U | U | PQL | 0.50 |
| TRICHLOROETHENE | 79-01-6 | U | U | PQL | 0.50 |
| 1,2-DICHLOROPROPANE | 78-87-5 | U | U | PQL | 0.50 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | U | U | PQL | 0.50 |
| TOLUENE | 108-88-3 | 2.4 | | PQL | 0.50 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | U | U | PQL | 0.50 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | U | U | PQL | 0.50 |
| TETRACHLOROETHENE | 127-18-4 | U | U | PQL | 0.50 |
| CHLOROBENZENE | 108-90-7 | U | U | PQL | 0.50 |
| ETHYLBENZENE | 100-41-4 | 0.84 | | PQL | 0.50 |
| XYLENE (M,P) | 1330-20-7 | 3.1 | | PQL | 0.50 |
| STYRENE | 100-42-5 | U | U | PQL | 0.50 |
| XYLENE (O) | 95-47-6 | 1.2 | | PQL | 0.50 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | U | U | PQL | 0.50 |
| 1,3-DICHLOROBENZENE | 541-73-1 | U | U | PQL | 0.50 |
| 1,4-DICHLOROBENZENE | 106-46-7 | U | U | PQL | 0.50 |
| 1,2-DICHLOROBENZENE | 95-50-1 | U | U | PQL | 0.50 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | U | U | PQL | 0.50 |
| HEXACHLOROBUTADIENE | 87-68-3 | U | U | PQL | 0.50 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 0.63 | | PQL | 0.50 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 1.9 | | PQL | 0.50 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | U | U | PQL | 0.50 |
| 1,2-DIBROMOETHANE | 106-93-4 | U | U | PQL | 0.50 |
| 1,3-BUTADIENE | 106-99-0 | U | U | PQL | 0.50 |
| CARBON DISULFIDE | 75-15-0 | 1.2 | | PQL | 0.50 |
| CYCLOHEXANE | 110-82-7 | U | U | PQL | 0.50 |
| N-HEPTANE | 142-82-5 | U | U | PQL | 0.50 |
| DIBROMOCHLOROMETHANE | 124-48-1 | U | U | PQL | 0.50 |
| N-HEXANE | 110-54-3 | 0.55 | | PQL | 0.50 |
| BROMOFORM | 75-25-2 | U | U | PQL | 0.50 |
| BROMODICHLOROMETHANE | 75-27-4 | U | U | PQL | 0.50 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | U | U | PQL | 0.50 |
| 4-ETHYLTOLUENE | 622-96-8 | 1.4 | | PQL | 0.50 |
| 3-CHLOROPROPENE | 107-05-1 | U | U | PQL | 0.50 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | U | U | PQL | 0.50 |
| BROMOETHENE | 593-60-2 | U | U | PQL | 0.50 |
| 2-CHLOROTOLUENE | 95-49-8 | 0.54 | | PQL | 0.50 |
| UNKNOWN ALKANE 5.12 | | 1.0 | J | N/A | N/A |
| UNKNOWN 13.81 | | 2.0 | J | N/A | N/A |
| UNKNOWN ALKANE 14.59 | | 1.0 | J | N/A | N/A |

**Table 3-10**
**Results of Sub-Slab and Indoor Air Testing October 2002**
**Stafford Site**

| Sample ID | 14 Park Basement Field Duplicate | | | | |
|---|---|---|---|---|---|
| Depth | | | | | |
| Sample Date | 10/30/2002 | | | | |
| Laboratory ID | 508389 | | | | |
| Method | USEPA TO 15 | | | | |
| Analysis Date | 11/1/2002 | | | | |
| Chemical | CAS # | Concentration (ppb) | Quantification Qualifier | Quantification Type | Quantification Level |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 0.50 | U | PQL | 0.50 |
| ACETAMIDE, 2-CHLORO-N,N-DI-2-P 5.12 | 93-71-0 | 1.2 | NJ | N/A | N/A |
| 2-PROPANOL, 1-CHLORO- 7.55 | 127-00-4 | 1.0 | NJ | N/A | N/A |
| HEXANOIC ACID, 1-METHYLOCTYL E 9.71 | 55193-16-3 | 1.4 | NJ | N/A | N/A |
| ACETAMIDE, N,N-DIMETHYL- 13.87 | 127-19-5 | 3.2 | NJ | N/A | N/A |
| BENZENE, 1-BROMO-3-FLUORO- 14.10 | 1073-06-9 | 19 | NJ | N/A | N/A |
| BENZENE, 1,3,5-TRIMETHYL- 14.30 | 108-67-8 | 1.4 | NJ | N/A | N/A |
| PHENOL 15.32 | 108-95-2 | 1.3 | NJ | N/A | N/A |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 21 | | PQL | 0.50 |
| CHLOROMETHANE | 74-87-3 | 0.50 | U | PQL | 0.50 |
| VINYL CHLORIDE | 75-01-4 | 0.50 | U | PQL | 0.50 |
| BROMOMETHANE | 74-83-9 | 0.50 | U | PQL | 0.50 |
| CHLOROETHANE | 75-00-3 | 0.50 | U | PQL | 0.50 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | 0.50 | U | PQL | 0.50 |
| FREON TF | 76-13-1 | 0.50 | U | PQL | 0.50 |
| 1,1-DICHLOROETHENE | 75-35-4 | 0.50 | U | PQL | 0.50 |
| METHYLENE CHLORIDE | 75-09-2 | 4.3 | | PQL | 0.50 |
| 1,1-DICHLOROETHANE | 75-34-3 | 0.50 | U | PQL | 0.50 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | 0.50 | U | PQL | 0.50 |
| CHLOROFORM | 67-66-3 | 0.50 | U | PQL | 0.50 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | 0.50 | U | PQL | 0.50 |
| CARBON TETRACHLORIDE | 56-23-5 | 0.50 | U | PQL | 0.50 |
| BENZENE | 71-43-2 | 0.50 | U | PQL | 0.50 |
| 1,2-DICHLOROETHANE | 107-06-2 | 0.50 | U | PQL | 0.50 |
| TRICHLOROETHENE | 79-01-6 | 0.50 | U | PQL | 0.50 |
| 1,2-DICHLOROPROPANE | 78-87-5 | 0.50 | U | PQL | 0.50 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | 0.50 | U | PQL | 0.50 |
| TOLUENE | 108-88-3 | 4.4 | | PQL | 0.50 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | 0.50 | U | PQL | 0.50 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | 0.50 | U | PQL | 0.50 |
| TETRACHLOROETHENE | 127-18-4 | 0.50 | U | PQL | 0.50 |
| CHLOROBENZENE | 108-90-7 | 0.50 | U | PQL | 0.50 |
| ETHYLBENZENE | 100-41-4 | 1.6 | | PQL | 0.50 |
| XYLENE (M,P) | 1330-20-7 | 5.7 | | PQL | 0.50 |
| STYRENE | 100-42-5 | 0.50 | U | PQL | 0.50 |
| XYLENE (O) | 95-47-6 | 2.2 | | PQL | 0.50 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | 0.50 | U | PQL | 0.50 |
| 1,3-DICHLOROBENZENE | 541-73-1 | 0.50 | U | PQL | 0.50 |
| 1,4-DICHLOROBENZENE | 106-46-7 | 0.50 | U | PQL | 0.50 |
| 1,2-DICHLOROBENZENE | 95-50-1 | 0.50 | U | PQL | 0.50 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | 0.50 | U | PQL | 0.50 |
| HEXACHLOROBUTADIENE | 87-68-3 | 0.50 | U | PQL | 0.50 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 0.76 | | PQL | 0.50 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 2.1 | | PQL | 0.50 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | 0.50 | U | PQL | 0.50 |
| 1,2-DIBROMOETHANE | 106-93-4 | 0.50 | U | PQL | 0.50 |
| 1,3-BUTADIENE | 106-99-0 | 0.50 | U | PQL | 0.50 |
| CARBON DISULFIDE | 75-15-0 | 0.50 | U | PQL | 0.50 |
| CYCLOHEXANE | 110-82-7 | 0.50 | U | PQL | 0.50 |
| N-HEPTANE | 142-82-5 | 0.77 | | PQL | 0.50 |
| DIBROMOCHLOROMETHANE | 124-48-1 | 0.50 | U | PQL | 0.50 |
| N-HEXANE | 110-54-3 | 0.51 | | PQL | 0.50 |
| BROMOFORM | 75-25-2 | 0.50 | U | PQL | 0.50 |
| BROMODICHLOROMETHANE | 75-27-4 | 0.50 | U | PQL | 0.50 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | 0.50 | U | PQL | 0.50 |
| 4-ETHYLTOLUENE | 622-96-8 | 1.8 | | PQL | 0.50 |
| 3-CHLOROPROPENE | 107-05-1 | 0.50 | U | PQL | 0.50 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 0.50 | U | PQL | 0.50 |
| BROMOETHENE | 593-60-2 | 0.50 | U | PQL | 0.50 |
| 2-CHLOROTOLUENE | 95-49-8 | 0.75 | | PQL | 0.50 |
| UNKNOWN 13.19 | | 1.3 | J | N/A | N/A |
| UNKNOWN ALKANE 14.59 | | 1.0 | J | N/A | N/A |

| Sample ID | 14 First Floor | | | | |
|---|---|---|---|---|---|
| Depth | | | | | |
| Sample Date | 10/30/2002 | | | | |
| Laboratory ID | 508390 | | | | |
| Method | USEPA TO 15 | | | | |
| Analysis Date | 11/10/2002 | | | | |
| Chemical | CAS # | Concentration (ppb) | Quantification Qualifier | Quantification Type | Quantification Level |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | U | U | PQL | 0.50 |
| OXIRANE, ETHENYL- 5.09 | 930-22-3 | 5.4 | NJ | N/A | N/A |
| FURAN, 2,5-DIHYDRO- 6.69 | 1708-29-8 | 1.2 | NJ | N/A | N/A |
| DIMETHYL ETHER 7.58 | 115-10-6 | 11 | NJ | N/A | N/A |
| ACETAMIDE, N,N-DIMETHYL- 13.86 | 127-19-5 | 2.2 | NJ | N/A | N/A |
| CYCLOHEXANE, 1,2,4-TRIS(METHYL 13.89 | 14296-81-2 | 1.9 | NJ | N/A | N/A |
| BENZENE, 1-BROMO-3-FLUORO- 14.10 | 1073-06-9 | 19 | NJ | N/A | N/A |
| UNDECANE 14.21 | 1120-21-4 | 1.4 | NJ | N/A | N/A |
| BENZALDEHYDE 14.85 | 100-52-7 | 1.1 | NJ | N/A | N/A |
| BICYCLO[2.2.1]HEPT-2-ENE, 1,7, 14.93 | 464-17-5 | 4.2 | NJ | N/A | N/A |
| BENZENE, 1-ETHYL-3-METHYL- 15.14 | 620-14-4 | 1.2 | NJ | N/A | N/A |
| BENZENEACETIC ACID, TRIMETHYLS 15.44 | 2078-18-4 | 3.1 | NJ | N/A | N/A |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 6.4 | | PQL | 0.50 |
| CHLOROMETHANE | 74-87-3 | U | U | PQL | 0.50 |
| VINYL CHLORIDE | 75-01-4 | U | U | PQL | 0.50 |
| BROMOMETHANE | 74-83-9 | U | U | PQL | 0.50 |
| CHLOROETHANE | 75-00-3 | U | U | PQL | 0.50 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | 0.52 | | PQL | 0.50 |
| FREON TF | 76-13-1 | U | U | PQL | 0.50 |
| 1,1-DICHLOROETHENE | 75-35-4 | U | U | PQL | 0.50 |
| METHYLENE CHLORIDE | 75-09-2 | 1.3 | | PQL | 0.50 |
| 1,1-DICHLOROETHANE | 75-34-3 | U | U | PQL | 0.50 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | U | U | PQL | 0.50 |
| CHLOROFORM | 67-66-3 | U | U | PQL | 0.50 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | U | U | PQL | 0.50 |
| CARBON TETRACHLORIDE | 56-23-5 | U | U | PQL | 0.50 |
| BENZENE | 71-43-2 | U | U | PQL | 0.50 |
| 1,2-DICHLOROETHANE | 107-06-2 | U | U | PQL | 0.50 |
| TRICHLOROETHENE | 79-01-6 | U | U | PQL | 0.50 |
| 1,2-DICHLOROPROPANE | 78-87-5 | U | U | PQL | 0.50 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | U | U | PQL | 0.50 |
| TOLUENE | 108-88-3 | 2.4 | | PQL | 0.50 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | U | U | PQL | 0.50 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | U | U | PQL | 0.50 |
| TETRACHLOROETHENE | 127-18-4 | U | U | PQL | 0.50 |
| CHLOROBENZENE | 108-90-7 | U | U | PQL | 0.50 |
| ETHYLBENZENE | 100-41-4 | 0.71 | | PQL | 0.50 |
| XYLENE (M,P) | 1330-20-7 | 2.7 | | PQL | 0.50 |
| STYRENE | 100-42-5 | 0.50 | | PQL | 0.50 |
| XYLENE (O) | 95-47-6 | 1.2 | | PQL | 0.50 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | U | U | PQL | 0.50 |
| 1,3-DICHLOROBENZENE | 541-73-1 | U | U | PQL | 0.50 |
| 1,4-DICHLOROBENZENE | 106-46-7 | U | U | PQL | 0.50 |
| 1,2-DICHLOROBENZENE | 95-50-1 | U | U | PQL | 0.50 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | U | U | PQL | 0.50 |
| HEXACHLOROBUTADIENE | 87-68-3 | U | U | PQL | 0.50 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 0.53 | | PQL | 0.50 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 1.5 | | PQL | 0.50 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | U | U | PQL | 0.50 |
| 1,2-DIBROMOETHANE | 106-93-4 | U | U | PQL | 0.50 |
| 1,3-BUTADIENE | 106-99-0 | U | U | PQL | 0.50 |
| CARBON DISULFIDE | 75-15-0 | U | U | PQL | 0.50 |
| CYCLOHEXANE | 110-82-7 | U | U | PQL | 0.50 |
| N-HEPTANE | 142-82-5 | 0.73 | | PQL | 0.50 |
| DIBROMOCHLOROMETHANE | 124-48-1 | U | U | PQL | 0.50 |
| N-HEXANE | 110-54-3 | U | U | PQL | 0.50 |
| BROMOFORM | 75-25-2 | U | U | PQL | 0.50 |
| BROMODICHLOROMETHANE | 75-27-4 | U | U | PQL | 0.50 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | U | U | PQL | 0.50 |
| 4-ETHYLTOLUENE | 622-96-8 | 1.3 | | PQL | 0.50 |
| 3-CHLOROPROPENE | 107-05-1 | U | U | PQL | 0.50 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | U | U | PQL | 0.50 |
| BROMOETHENE | 593-60-2 | U | U | PQL | 0.50 |
| 2-CHLOROTOLUENE | 95-49-8 | U | U | PQL | 0.50 |
| UNKNOWN 5.04 | | 1.9 | J | N/A | N/A |
| UNKNOWN 13.83 | | 1.6 | J | N/A | N/A |

| Sample ID | | 18 Park Sub-Slab Vapour | | | | Sample ID | | 18 Park Basement | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | | 10.5-11' | | | | Depth | | | | | |
| Sample Date | | 10/24/2002 | | | | Sample Date | | 10/24/2002 | | | |
| Laboratory ID | | 507433 | | | | Laboratory ID | | 507434 | | | |
| Method | | USEPA TO 15 | | | | Method | | USEPA TO 15 | | | |
| Analysis Date | | 10/29/2002 | | | | Analysis Date | | 10/29/2002 | | | |
| Chemical | CAS # | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level | Chemical | CAS # | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 1.4 | | PQL | 0.50 | METHYL TERT-BUTYL ETHER | 1634-04-4 | 2.6 | | PQL | 0.50 |
| DICHLORODIFLUOROMETHANI | 75-71-8 | U | U | PQL | 0.50 | DICHLORODIFLUOROMETHANI | 75-71-8 | U | U | PQL | 0.50 |
| CHLOROMETHANE | 74-87-3 | U | U | PQL | 0.50 | CHLOROMETHANE | 74-87-3 | 2.1 | | PQL | 0.50 |
| VINYL CHLORIDE | 75-01-4 | U | U | PQL | 0.50 | VINYL CHLORIDE | 75-01-4 | U | U | PQL | 0.50 |
| BROMOMETHANE | 74-83-9 | U | U | PQL | 0.50 | BROMOMETHANE | 74-83-9 | U | U | PQL | 0.50 |
| CHLOROETHANE | 75-00-3 | U | U | PQL | 0.50 | CHLOROETHANE | 75-00-3 | U | U | PQL | 0.50 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | U | U | PQL | 0.50 | TRICHLOROFLUOROMETHANE | 75-69-4 | U | U | PQL | 0.50 |
| FREON TF | 76-13-1 | U | U | PQL | 0.50 | FREON TF | 76-13-1 | U | U | PQL | 0.50 |
| 1,1-DICHLOROETHENE | 75-35-4 | U | U | PQL | 0.50 | 1,1-DICHLOROETHENE | 75-35-4 | U | U | PQL | 0.50 |
| METHYLENE CHLORIDE | 75-09-2 | 1.1 | | PQL | 0.50 | METHYLENE CHLORIDE | 75-09-2 | 2.1 | | PQL | 0.50 |
| 1,1-DICHLOROETHANE | 75-34-3 | U | U | PQL | 0.50 | 1,1-DICHLOROETHANE | 75-34-3 | U | U | PQL | 0.50 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | U | U | PQL | 0.50 | CIS-1,2-DICHLOROETHENE | 156-59-2 | U | U | PQL | 0.50 |
| CHLOROFORM | 67-66-3 | U | U | PQL | 0.50 | CHLOROFORM | 67-66-3 | U | U | PQL | 0.50 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | U | U | PQL | 0.50 | 1,1,1-TRICHLOROETHANE | 71-55-6 | U | U | PQL | 0.50 |
| CARBON TETRACHLORIDE | 56-23-5 | U | U | PQL | 0.50 | CARBON TETRACHLORIDE | 56-23-5 | U | U | PQL | 0.50 |
| BENZENE | 71-43-2 | 0.63 | | PQL | 0.50 | BENZENE | 71-43-2 | 1.2 | | PQL | 0.50 |
| 1,2-DICHLOROETHANE | 107-06-2 | U | U | PQL | 0.50 | 1,2-DICHLOROETHANE | 107-06-2 | U | U | PQL | 0.50 |
| TRICHLOROETHENE | 79-01-6 | U | U | PQL | 0.50 | TRICHLOROETHENE | 79-01-6 | U | U | PQL | 0.50 |
| 1,2-DICHLOROPROPANE | 78-87-5 | U | U | PQL | 0.50 | 1,2-DICHLOROPROPANE | 78-87-5 | U | U | PQL | 0.50 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | U | U | PQL | 0.50 | CIS-1,3-DICHLOROPROPENE | 10061-01-5 | U | U | PQL | 0.50 |
| TOLUENE | 108-88-3 | 9.9 | | PQL | 0.50 | TOLUENE | 108-88-3 | 8.7 | | PQL | 0.50 |
| TRANS-1,3-DICHLOROPROPEN | 10061-02-6 | U | U | PQL | 0.50 | TRANS-1,3-DICHLOROPROPEN | 10061-02-6 | U | U | PQL | 0.50 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | U | U | PQL | 0.50 | 1,1,2-TRICHLOROETHANE | 79-00-5 | U | U | PQL | 0.50 |
| TETRACHLOROETHENE | 127-18-4 | U | U | PQL | 0.50 | TETRACHLOROETHENE | 127-18-4 | U | U | PQL | 0.50 |
| CHLOROBENZENE | 108-90-7 | U | U | PQL | 0.50 | CHLOROBENZENE | 108-90-7 | U | U | PQL | 0.50 |
| ETHYLBENZENE | 100-41-4 | 4.0 | | PQL | 0.50 | ETHYLBENZENE | 100-41-4 | 1.3 | | PQL | 0.50 |
| XYLENE (M,P) | 1330-20-7 | 16 | | PQL | 0.50 | XYLENE (M,P) | 1330-20-7 | 4.4 | | PQL | 0.50 |
| STYRENE | 100-42-5 | U | U | PQL | 0.50 | STYRENE | 100-42-5 | 0.50 | | PQL | 0.50 |
| XYLENE (O) | 95-47-6 | 5.0 | | PQL | 0.50 | XYLENE (O) | 95-47-6 | 1.3 | | PQL | 0.50 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | U | U | PQL | 0.50 | 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | U | U | PQL | 0.50 |
| 1,3-DICHLOROBENZENE | 541-73-1 | U | U | PQL | 0.50 | 1,3-DICHLOROBENZENE | 541-73-1 | U | U | PQL | 0.50 |
| 1,4-DICHLOROBENZENE | 106-46-7 | U | U | PQL | 0.50 | 1,4-DICHLOROBENZENE | 106-46-7 | U | U | PQL | 0.50 |
| 1,2-DICHLOROBENZENE | 95-50-1 | U | U | PQL | 0.50 | 1,2-DICHLOROBENZENE | 95-50-1 | U | U | PQL | 0.50 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | U | U | PQL | 0.50 | 1,2,4-TRICHLOROBENZENE | 120-82-1 | U | U | PQL | 0.50 |
| HEXACHLOROBUTADIENE | 87-68-3 | U | U | PQL | 0.50 | HEXACHLOROBUTADIENE | 87-68-3 | U | U | PQL | 0.50 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 1.8 | | PQL | 0.50 | 1,3,5-TRIMETHYLBENZENE | 108-67-8 | U | U | PQL | 0.50 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 5.5 | | PQL | 0.50 | 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 1.2 | | PQL | 0.50 |
| 1,2-DICHLOROTETRAFLUOROE | 76-14-2 | U | U | PQL | 0.50 | 1,2-DICHLOROTETRAFLUOROE | 76-14-2 | U | U | PQL | 0.50 |
| 1,2-DIBROMOETHANE | 106-93-4 | U | U | PQL | 0.50 | 1,2-DIBROMOETHANE | 106-93-4 | U | U | PQL | 0.50 |
| 1,3-BUTADIENE | 106-99-0 | U | U | PQL | 0.50 | 1,3-BUTADIENE | 106-99-0 | 0.94 | | PQL | 0.50 |
| CARBON DISULFIDE | 75-15-0 | U | U | PQL | 0.50 | CARBON DISULFIDE | 75-15-0 | U | U | PQL | 0.50 |
| CYCLOHEXANE | 110-82-7 | U | U | PQL | 0.50 | CYCLOHEXANE | 110-82-7 | U | U | PQL | 0.50 |
| N-HEPTANE | 142-82-5 | 1.6 | | PQL | 0.50 | N-HEPTANE | 142-82-5 | 0.57 | | PQL | 0.50 |
| DIBROMOCHLOROMETHANE | 124-48-1 | U | U | PQL | 0.50 | DIBROMOCHLOROMETHANE | 124-48-1 | U | U | PQL | 0.50 |
| N-HEXANE | 110-54-3 | 0.51 | | PQL | 0.50 | N-HEXANE | 110-54-3 | 0.68 | | PQL | 0.50 |
| BROMOFORM | 75-25-2 | U | U | PQL | 0.50 | BROMOFORM | 75-25-2 | U | U | PQL | 0.50 |
| BROMODICHLOROMETHANE | 75-27-4 | U | U | PQL | 0.50 | BROMODICHLOROMETHANE | 75-27-4 | U | U | PQL | 0.50 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | U | U | PQL | 0.50 | TRANS-1,2-DICHLOROETHENE | 156-60-5 | U | U | PQL | 0.50 |
| 4-ETHYLTOLUENE | 622-96-8 | 5.2 | | PQL | 0.50 | 4-ETHYLTOLUENE | 622-96-8 | 1.1 | | PQL | 0.50 |
| 3-CHLOROPROPENE | 107-05-1 | U | U | PQL | 0.50 | 3-CHLOROPROPENE | 107-05-1 | U | U | PQL | 0.50 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 1.1 | | PQL | 0.50 | 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 2.3 | | PQL | 0.50 |
| BROMOETHENE | 593-60-2 | U | U | PQL | 0.50 | BROMOETHENE | 593-60-2 | U | U | PQL | 0.50 |
| 2-CHLOROTOLUENE | 95-49-8 | U | U | PQL | 0.50 | 2-CHLOROTOLUENE | 95-49-8 | U | U | PQL | 0.50 |

**Table 3-10**
**Results of Sub-Slab and Indoor Air Testing October 2002**
**Stafford Site**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 18 Park First Floor | | | | Sample ID | | 22 Park Crawlspace | | | |
| | | | | | | Depth | | | | | |
| | | 10/24/2002 | | | | Sample Date | | 10/24/2002 | | | |
| | | 507432 | | | | Laboratory ID | | 507438 | | | |
| | | USEPA TO 15 | | | | Method | | USEPA TO 15 | | | |
| | | 10/29/2002 | | | | Analysis Date | | 10/30/2002 | | | |
| Chemical | CAS # | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level | Chemical | CAS # | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 1.4 | | PQL | 0.50 | METHYL TERT-BUTYL ETHER | 1634-04-4 | 0.62 | | PQL | 0.50 |
| DICHLORODIFLUOROMETHANI | 75-71-8 | U | U | PQL | 0.50 | DICHLORODIFLUOROMETHANI | 75-71-8 | U | U | PQL | 0.50 |
| CHLOROMETHANE | 74-87-3 | 1.2 | | PQL | 0.50 | CHLOROMETHANE | 74-87-3 | U | U | PQL | 0.50 |
| VINYL CHLORIDE | 75-01-4 | U | U | PQL | 0.50 | VINYL CHLORIDE | 75-01-4 | U | U | PQL | 0.50 |
| BROMOMETHANE | 74-83-9 | U | U | PQL | 0.50 | BROMOMETHANE | 74-83-9 | U | U | PQL | 0.50 |
| CHLOROETHANE | 75-00-3 | U | U | PQL | 0.50 | CHLOROETHANE | 75-00-3 | U | U | PQL | 0.50 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | U | U | PQL | 0.50 | TRICHLOROFLUOROMETHANE | 75-69-4 | U | U | PQL | 0.50 |
| FREON TF | 76-13-1 | U | U | PQL | 0.50 | FREON TF | 76-13-1 | U | U | PQL | 0.50 |
| 1,1-DICHLOROETHENE | 75-35-4 | U | U | PQL | 0.50 | 1,1-DICHLOROETHENE | 75-35-4 | U | U | PQL | 0.50 |
| METHYLENE CHLORIDE | 75-09-2 | 2.9 | | PQL | 0.50 | METHYLENE CHLORIDE | 75-09-2 | U | U | PQL | 0.50 |
| 1,1-DICHLOROETHANE | 75-34-3 | U | U | PQL | 0.50 | 1,1-DICHLOROETHANE | 75-34-3 | U | U | PQL | 0.50 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | U | U | PQL | 0.50 | CIS-1,2-DICHLOROETHENE | 156-59-2 | U | U | PQL | 0.50 |
| CHLOROFORM | 67-66-3 | U | U | PQL | 0.50 | CHLOROFORM | 67-66-3 | U | U | PQL | 0.50 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | U | U | PQL | 0.50 | 1,1,1-TRICHLOROETHANE | 71-55-6 | U | U | PQL | 0.50 |
| CARBON TETRACHLORIDE | 56-23-5 | U | U | PQL | 0.50 | CARBON TETRACHLORIDE | 56-23-5 | U | U | PQL | 0.50 |
| BENZENE | 71-43-2 | 0.91 | | PQL | 0.50 | BENZENE | 71-43-2 | U | U | PQL | 0.50 |
| 1,2-DICHLOROETHANE | 107-06-2 | U | U | PQL | 0.50 | 1,2-DICHLOROETHANE | 107-06-2 | U | U | PQL | 0.50 |
| TRICHLOROETHENE | 79-01-6 | U | U | PQL | 0.50 | TRICHLOROETHENE | 79-01-6 | U | U | PQL | 0.50 |
| 1,2-DICHLOROPROPANE | 78-87-5 | U | U | PQL | 0.50 | 1,2-DICHLOROPROPANE | 78-87-5 | U | U | PQL | 0.50 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | U | U | PQL | 0.50 | CIS-1,3-DICHLOROPROPENE | 10061-01-5 | U | U | PQL | 0.50 |
| TOLUENE | 108-88-3 | 5.5 | | PQL | 0.50 | TOLUENE | 108-88-3 | 1.3 | | PQL | 0.50 |
| TRANS-1,3-DICHLOROPROPEN | 10061-02-6 | U | U | PQL | 0.50 | TRANS-1,3-DICHLOROPROPEN | 10061-02-6 | U | U | PQL | 0.50 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | U | U | PQL | 0.50 | 1,1,2-TRICHLOROETHANE | 79-00-5 | U | U | PQL | 0.50 |
| TETRACHLOROETHENE | 127-18-4 | U | U | PQL | 0.50 | TETRACHLOROETHENE | 127-18-4 | U | U | PQL | 0.50 |
| CHLOROBENZENE | 108-90-7 | U | U | PQL | 0.50 | CHLOROBENZENE | 108-90-7 | U | U | PQL | 0.50 |
| ETHYLBENZENE | 100-41-4 | 0.91 | | PQL | 0.50 | ETHYLBENZENE | 100-41-4 | U | U | PQL | 0.50 |
| XYLENE (M,P) | 1330-20-7 | 3.1 | | PQL | 0.50 | XYLENE (M,P) | 1330-20-7 | 1.5 | | PQL | 0.50 |
| STYRENE | 100-42-5 | U | U | PQL | 0.50 | STYRENE | 100-42-5 | U | U | PQL | 0.50 |
| XYLENE (O) | 95-47-6 | 0.91 | | PQL | 0.50 | XYLENE (O) | 95-47-6 | 0.56 | | PQL | 0.50 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | U | U | PQL | 0.50 | 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | U | U | PQL | 0.50 |
| 1,3-DICHLOROBENZENE | 541-73-1 | U | U | PQL | 0.50 | 1,3-DICHLOROBENZENE | 541-73-1 | U | U | PQL | 0.50 |
| 1,4-DICHLOROBENZENE | 106-46-7 | U | U | PQL | 0.50 | 1,4-DICHLOROBENZENE | 106-46-7 | U | U | PQL | 0.50 |
| 1,2-DICHLOROBENZENE | 95-50-1 | U | U | PQL | 0.50 | 1,2-DICHLOROBENZENE | 95-50-1 | U | U | PQL | 0.50 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | U | U | PQL | 0.50 | 1,2,4-TRICHLOROBENZENE | 120-82-1 | U | U | PQL | 0.50 |
| HEXACHLOROBUTADIENE | 87-68-3 | U | U | PQL | 0.50 | HEXACHLOROBUTADIENE | 87-68-3 | U | U | PQL | 0.50 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | U | U | PQL | 0.50 | 1,3,5-TRIMETHYLBENZENE | 108-67-8 | U | U | PQL | 0.50 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 0.68 | | PQL | 0.50 | 1,2,4-TRIMETHYLBENZENE | 95-63-6 | U | U | PQL | 0.50 |
| 1,2-DICHLOROTETRAFLUOROE | 76-14-2 | U | U | PQL | 0.50 | 1,2-DICHLOROTETRAFLUOROE | 76-14-2 | U | U | PQL | 0.50 |
| 1,2-DIBROMOETHANE | 106-93-4 | U | U | PQL | 0.50 | 1,2-DIBROMOETHANE | 106-93-4 | U | U | PQL | 0.50 |
| 1,3-BUTADIENE | 106-99-0 | 0.72 | | PQL | 0.50 | 1,3-BUTADIENE | 106-99-0 | U | U | PQL | 0.50 |
| CARBON DISULFIDE | 75-15-0 | U | U | PQL | 0.50 | CARBON DISULFIDE | 75-15-0 | U | U | PQL | 0.50 |
| CYCLOHEXANE | 110-82-7 | U | U | PQL | 0.50 | CYCLOHEXANE | 110-82-7 | U | U | PQL | 0.50 |
| N-HEPTANE | 142-82-5 | 1.1 | | PQL | 0.50 | N-HEPTANE | 142-82-5 | U | U | PQL | 0.50 |
| DIBROMOCHLOROMETHANE | 124-48-1 | U | U | PQL | 0.50 | DIBROMOCHLOROMETHANE | 124-48-1 | U | U | PQL | 0.50 |
| N-HEXANE | 110-54-3 | 2.1 | | PQL | 0.50 | N-HEXANE | 110-54-3 | U | U | PQL | 0.50 |
| BROMOFORM | 75-25-2 | U | U | PQL | 0.50 | BROMOFORM | 75-25-2 | U | U | PQL | 0.50 |
| BROMODICHLOROMETHANE | 75-27-4 | U | U | PQL | 0.50 | BROMODICHLOROMETHANE | 75-27-4 | U | U | PQL | 0.50 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | U | U | PQL | 0.50 | TRANS-1,2-DICHLOROETHENE | 156-60-5 | U | U | PQL | 0.50 |
| 4-ETHYLTOLUENE | 622-96-8 | 0.76 | | PQL | 0.50 | 4-ETHYLTOLUENE | 622-96-8 | U | U | PQL | 0.50 |
| 3-CHLOROPROPENE | 107-05-1 | U | U | PQL | 0.50 | 3-CHLOROPROPENE | 107-05-1 | U | U | PQL | 0.50 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 0.94 | | PQL | 0.50 | 2,2,4-TRIMETHYLPENTANE | 540-84-1 | U | U | PQL | 0.50 |
| BROMOETHENE | 593-60-2 | U | U | PQL | 0.50 | BROMOETHENE | 593-60-2 | U | U | PQL | 0.50 |
| 2-CHLOROTOLUENE | 95-49-8 | U | U | PQL | 0.50 | 2-CHLOROTOLUENE | 95-49-8 | U | U | PQL | 0.50 |

| Sample ID | | 22 Park First Floor | | | |
|---|---|---|---|---|---|
| Depth | | | | | |
| Sample Date | | 10/24/2002 | | | |
| Laboratory ID | | 507439 | | | |
| Method | | USEPA TO 15 | | | |
| Analysis Date | | 10/30/2002 | | | |
| Chemical | CAS # | Concen-tration (ppb) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | U | U | PQL | 0.50 |
| DICHLORODIFLUOROMETHANE | 75-71-8 | U | U | PQL | 0.50 |
| CHLOROMETHANE | 74-87-3 | U | U | PQL | 0.50 |
| VINYL CHLORIDE | 75-01-4 | U | U | PQL | 0.50 |
| BROMOMETHANE | 74-83-9 | U | U | PQL | 0.50 |
| CHLOROETHANE | 75-00-3 | U | U | PQL | 0.50 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | U | U | PQL | 0.50 |
| FREON TF | 76-13-1 | U | U | PQL | 0.50 |
| 1,1-DICHLOROETHENE | 75-35-4 | U | U | PQL | 0.50 |
| METHYLENE CHLORIDE | 75-09-2 | 0.51 | | PQL | 0.50 |
| 1,1-DICHLOROETHANE | 75-34-3 | U | U | PQL | 0.50 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | U | U | PQL | 0.50 |
| CHLOROFORM | 67-66-3 | U | U | PQL | 0.50 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | U | U | PQL | 0.50 |
| CARBON TETRACHLORIDE | 56-23-5 | U | U | PQL | 0.50 |
| BENZENE | 71-43-2 | U | U | PQL | 0.50 |
| 1,2-DICHLOROETHANE | 107-06-2 | U | U | PQL | 0.50 |
| TRICHLOROETHENE | 79-01-6 | U | U | PQL | 0.50 |
| 1,2-DICHLOROPROPANE | 78-87-5 | U | U | PQL | 0.50 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | U | U | PQL | 0.50 |
| TOLUENE | 108-88-3 | 3.6 | | PQL | 0.50 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | U | U | PQL | 0.50 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | U | U | PQL | 0.50 |
| TETRACHLOROETHENE | 127-18-4 | U | U | PQL | 0.50 |
| CHLOROBENZENE | 108-90-7 | U | U | PQL | 0.50 |
| ETHYLBENZENE | 100-41-4 | U | U | PQL | 0.50 |
| XYLENE (M,P) | 1330-20-7 | 1.8 | | PQL | 0.50 |
| STYRENE | 100-42-5 | U | U | PQL | 0.50 |
| XYLENE (O) | 95-47-6 | 0.63 | | PQL | 0.50 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | U | U | PQL | 0.50 |
| 1,3-DICHLOROBENZENE | 541-73-1 | U | U | PQL | 0.50 |
| 1,4-DICHLOROBENZENE | 106-46-7 | U | U | PQL | 0.50 |
| 1,2-DICHLOROBENZENE | 95-50-1 | U | U | PQL | 0.50 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | U | U | PQL | 0.50 |
| HEXACHLOROBUTADIENE | 87-68-3 | U | U | PQL | 0.50 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | U | U | PQL | 0.50 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 0.58 | | PQL | 0.50 |
| 1,2-DICHLOROTETRAFLUOROET | 76-14-2 | U | U | PQL | 0.50 |
| 1,2-DIBROMOETHANE | 106-93-4 | U | U | PQL | 0.50 |
| 1,3-BUTADIENE | 106-99-0 | U | U | PQL | 0.50 |
| CARBON DISULFIDE | 75-15-0 | U | U | PQL | 0.50 |
| CYCLOHEXANE | 110-82-7 | U | U | PQL | 0.50 |
| N-HEPTANE | 142-82-5 | U | U | PQL | 0.50 |
| DIBROMOCHLOROMETHANE | 124-48-1 | U | U | PQL | 0.50 |
| N-HEXANE | 110-54-3 | U | U | PQL | 0.50 |
| BROMOFORM | 75-25-2 | U | U | PQL | 0.50 |
| BROMODICHLOROMETHANE | 75-27-4 | U | U | PQL | 0.50 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | U | U | PQL | 0.50 |
| 4-ETHYLTOLUENE | 622-96-8 | 0.57 | | PQL | 0.50 |
| 3-CHLOROPROPENE | 107-05-1 | U | U | PQL | 0.50 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | U | U | PQL | 0.50 |
| BROMOETHENE | 593-60-2 | U | U | PQL | 0.50 |
| 2-CHLOROTOLUENE | 95-49-8 | U | U | PQL | 0.50 |

**Table 3-11**
**Results of Field Duplicate Analyses of Indoor Air Samples, Stafford Site**

| Sample ID<br>Chemical | 73 Bay Sub-slab Vapour<br>Concen-tration (ppb) | 73 Bay Sub-slab Vapour Field Duplicate<br>Concen-tration (ppb) | Relative Percent Difference | Sample ID<br>Chemical | 14 Park Basement<br>Concen-tration (ppb) | 14 Park Basement Field Duplicate<br>Concen-tration (ppb) | Relative Percent Difference |
|---|---|---|---|---|---|---|---|
| METHYL TERT-BUTYL ETHER | 33 | 38 | 14 | PHENOL 15.32 | 4.3 | 1.3 | 107 |
| XYLENE (M,P) | 3.2 | 2.7 | 17 | DICHLORODIFLUOROMETHANE | 18 | 21 | 15 |
| CYCLOHEXANE | 36 | 36 | 0.0 | METHYLENE CHLORIDE | 4.2 | 4.3 | 2.4 |
| 2,2,4-TRIMETHYLPENTANE | 140 | 150 | 6.9 | TOLUENE | 2.4 | 4.4 | 59 |
| | | | | ETHYLBENZENE | 0.84 | 1.6 | 62 |
| | | | | XYLENE (M,P) | 3.1 | 5.7 | 59 |
| | | | | XYLENE (O) | 1.2 | 2.2 | 59 |
| | | | | 1,3,5-TRIMETHYLBENZENE | 0.63 | 0.76 | 19 |
| | | | | 1,2,4-TRIMETHYLBENZENE | 1.9 | 2.1 | 10 |
| | | | | CARBON DISULFIDE | 1.2 | 0.50 | 82 |
| | | | | N-HEXANE | 0.55 | 0.51 | 7.5 |
| | | | | 4-ETHYLTOLUENE | 1.4 | 1.8 | 25 |
| | | | | 2-CHLOROTOLUENE | 0.54 | 0.75 | 33 |

**Table 3-12**
**Results of Outdoor Air Analysis, Stafford Site**

| Sample ID | | | Outdoor Air 73 Bay Ave | | | |
|---|---|---|---|---|---|---|
| Depth | | | N/A | | | |
| Sample Date | | | 11/14/2002 | | | |
| Laboratory ID | | | 510407 | | | |
| Method | | | TO-15 | | | |
| Analysis Date | | | 11/22/2002 | | | |
| Chemical | CAS # | | Concentration (ppb) | Quantification Qualifier | Quantification Type | Quantification Level |
| DICHLORODIFLUOROMETHANE | 75-71-8 | A | **0.58** | | PQL | 0.50 |
| CHLOROMETHANE | 74-87-3 | A | **0.62** | | PQL | 0.50 |
| VINYL CHLORIDE | 75-01-4 | A | U | U | PQL | 0.50 |
| BROMOMETHANE | 74-83-9 | A | U | U | PQL | 0.50 |
| CHLOROETHANE | 75-00-3 | A | U | U | PQL | 0.50 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | A | U | U | PQL | 0.50 |
| FREON TF | 76-13-1 | A | U | U | PQL | 0.50 |
| 1,1-DICHLOROETHENE | 75-35-4 | A | U | U | PQL | 0.50 |
| METHYLENE CHLORIDE | 75-09-2 | A | U | U | PQL | 0.50 |
| 1,1-DICHLOROETHANE | 75-34-3 | A | U | U | PQL | 0.50 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | A | U | U | PQL | 0.50 |
| CHLOROFORM | 67-66-3 | A | U | U | PQL | 0.50 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | A | U | U | PQL | 0.50 |
| CARBON TETRACHLORIDE | 56-23-5 | A | U | U | PQL | 0.50 |
| BENZENE | 71-43-2 | A | U | U | PQL | 0.50 |
| 1,2-DICHLOROETHANE | 107-06-2 | A | U | U | PQL | 0.50 |
| TRICHLOROETHENE | 79-01-6 | A | U | U | PQL | 0.50 |
| 1,2-DICHLOROPROPANE | 78-87-5 | A | U | U | PQL | 0.50 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | A | U | U | PQL | 0.50 |
| TOLUENE | 108-88-3 | A | U | U | PQL | 0.50 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | A | U | U | PQL | 0.50 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | A | U | U | PQL | 0.50 |
| TETRACHLOROETHENE | 127-18-4 | A | U | U | PQL | 0.50 |
| CHLOROBENZENE | 108-90-7 | A | U | U | PQL | 0.50 |
| ETHYLBENZENE | 100-41-4 | A | U | U | PQL | 0.50 |
| XYLENE (M,P) | 1330-20-7 | A | U | U | PQL | 0.50 |
| STYRENE | 100-42-5 | A | U | U | PQL | 0.50 |
| XYLENE (O) | 95-47-6 | A | U | U | PQL | 0.50 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | A | U | U | PQL | 0.50 |
| 1,3-DICHLOROBENZENE | 541-73-1 | A | U | U | PQL | 0.50 |
| 1,4-DICHLOROBENZENE | 106-46-7 | A | U | U | PQL | 0.50 |
| 1,2-DICHLOROBENZENE | 95-50-1 | A | U | U | PQL | 0.50 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | A | U | U | PQL | 0.50 |
| HEXACHLOROBUTADIENE | 87-68-3 | A | U | U | PQL | 0.50 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | A | U | U | PQL | 0.50 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | A | U | U | PQL | 0.50 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | A | U | U | PQL | 0.50 |

| Sample ID | | | Outdoor Air 22 Park | | | |
|---|---|---|---|---|---|---|
| Depth | | | N/A | | | |
| Sample Date | | | 10/24/2002 | | | |
| Laboratory ID | | | 507440 | | | |
| Method | | | TO-15 | | | |
| Analysis Date | | | 10/30/2002 | | | |
| Chemical | CAS # | | Concentration (ppb) | Quantification Qualifier | Quantification Type | Quantification Level |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | A | U | U | PQL | 0.50 |
| DICHLORODIFLUOROMETHANE | 75-71-8 | A | U | U | PQL | 0.50 |
| CHLOROMETHANE | 74-87-3 | A | U | U | PQL | 0.50 |
| VINYL CHLORIDE | 75-01-4 | A | U | U | PQL | 0.50 |
| BROMOMETHANE | 74-83-9 | A | U | U | PQL | 0.50 |
| CHLOROETHANE | 75-00-3 | A | U | U | PQL | 0.50 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | A | U | U | PQL | 0.50 |
| FREON TF | 76-13-1 | A | U | U | PQL | 0.50 |
| 1,1-DICHLOROETHENE | 75-35-4 | A | U | U | PQL | 0.50 |
| METHYLENE CHLORIDE | 75-09-2 | A | U | U | PQL | 0.50 |
| 1,1-DICHLOROETHANE | 75-34-3 | A | U | U | PQL | 0.50 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | A | U | U | PQL | 0.50 |
| CHLOROFORM | 67-66-3 | A | U | U | PQL | 0.50 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | A | U | U | PQL | 0.50 |
| CARBON TETRACHLORIDE | 56-23-5 | A | U | U | PQL | 0.50 |
| BENZENE | 71-43-2 | A | U | U | PQL | 0.50 |
| 1,2-DICHLOROETHANE | 107-06-2 | A | U | U | PQL | 0.50 |
| TRICHLOROETHENE | 79-01-6 | A | U | U | PQL | 0.50 |
| 1,2-DICHLOROPROPANE | 78-87-5 | A | U | U | PQL | 0.50 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | A | U | U | PQL | 0.50 |
| TOLUENE | 108-88-3 | A | **1.0** | | PQL | 0.50 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | A | U | U | PQL | 0.50 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | A | U | U | PQL | 0.50 |
| TETRACHLOROETHENE | 127-18-4 | A | U | U | PQL | 0.50 |
| CHLOROBENZENE | 108-90-7 | A | U | U | PQL | 0.50 |
| ETHYLBENZENE | 100-41-4 | A | U | U | PQL | 0.50 |
| XYLENE (M,P) | 1330-20-7 | A | **1.1** | | PQL | 0.50 |
| STYRENE | 100-42-5 | A | U | U | PQL | 0.50 |
| XYLENE (O) | 95-47-6 | A | U | U | PQL | 0.50 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | A | U | U | PQL | 0.50 |
| 1,3-DICHLOROBENZENE | 541-73-1 | A | U | U | PQL | 0.50 |
| 1,4-DICHLOROBENZENE | 106-46-7 | A | U | U | PQL | 0.50 |
| 1,2-DICHLOROBENZENE | 95-50-1 | A | U | U | PQL | 0.50 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | A | U | U | PQL | 0.50 |
| HEXACHLOROBUTADIENE | 87-68-3 | A | U | U | PQL | 0.50 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | A | U | U | PQL | 0.50 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | A | U | U | PQL | 0.50 |

**Table 3-12**
**Results of Outdoor Air Analysis, Stafford Site**

| Sample ID | | | Outdoor Air 73 Bay Ave | | | | Sample ID | | | Outdoor Air 22 Park | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | | | N/A | | | | Depth | | | N/A | | | |
| Sample Date | | | 11/14/2002 | | | | Sample Date | | | 10/24/2002 | | | |
| Laboratory ID | | | 510407 | | | | Laboratory ID | | | 507440 | | | |
| Method | | | TO-15 | | | | Method | | | TO-15 | | | |
| Analysis Date | | | 11/22/2002 | | | | Analysis Date | | | 10/30/2002 | | | |
| Chemical | CAS # | | Concentration (ppb) | Quantification Qualifier | Quantification Type | Quantification Level | Chemical | CAS # | | Concentration (ppb) | Quantification Qualifier | Quantification Type | Quantification Level |
| 1,2-DIBROMOETHANE | 106-93-4 | A | U | U | PQL | 0.50 | 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | A | U | U | PQL | 0.50 |
| 1,3-BUTADIENE | 106-99-0 | A | U | U | PQL | 0.50 | 1,2-DIBROMOETHANE | 106-93-4 | A | U | U | PQL | 0.50 |
| CARBON DISULFIDE | 75-15-0 | A | U | U | PQL | 0.50 | 1,3-BUTADIENE | 106-99-0 | A | U | U | PQL | 0.50 |
| CYCLOHEXANE | 110-82-7 | A | U | U | PQL | 0.50 | CARBON DISULFIDE | 75-15-0 | A | U | U | PQL | 0.50 |
| N-HEPTANE | 142-82-5 | A | U | U | PQL | 0.50 | CYCLOHEXANE | 110-82-7 | A | U | U | PQL | 0.50 |
| DIBROMOCHLOROMETHANE | 124-48-1 | A | U | U | PQL | 0.50 | N-HEPTANE | 142-82-5 | A | U | U | PQL | 0.50 |
| N-HEXANE | 110-54-3 | A | U | U | PQL | 0.50 | DIBROMOCHLOROMETHANE | 124-48-1 | A | U | U | PQL | 0.50 |
| BROMOFORM | 75-25-2 | A | U | U | PQL | 0.50 | N-HEXANE | 110-54-3 | A | U | U | PQL | 0.50 |
| BROMODICHLOROMETHANE | 75-27-4 | A | U | U | PQL | 0.50 | BROMOFORM | 75-25-2 | A | U | U | PQL | 0.50 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | A | U | U | PQL | 0.50 | BROMODICHLOROMETHANE | 75-27-4 | A | U | U | PQL | 0.50 |
| 4-ETHYLTOLUENE | 622-96-8 | A | U | U | PQL | 0.50 | TRANS-1,2-DICHLOROETHENE | 156-60-5 | A | U | U | PQL | 0.50 |
| 3-CHLOROPROPENE | 107-05-1 | A | U | U | PQL | 0.50 | 4-ETHYLTOLUENE | 622-96-8 | A | U | U | PQL | 0.50 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | A | U | U | PQL | 0.50 | 3-CHLOROPROPENE | 107-05-1 | A | U | U | PQL | 0.50 |
| BROMOETHENE | 593-60-2 | A | U | U | PQL | 0.50 | 2,2,4-TRIMETHYLPENTANE | 540-84-1 | A | U | U | PQL | 0.50 |
| 2-CHLOROTOLUENE | 95-49-8 | A | U | U | PQL | 0.50 | BROMOETHENE | 593-60-2 | A | U | U | PQL | 0.50 |
| | | | | | | | 2-CHLOROTOLUENE | 95-49-8 | U | U | U | PQL | 0.50 |

**Table 3-13**

Compilation of Background Indoor Air Quality Data

| Study | Date & Time | Statistic | Number | Concentrations in Indoor Air (ug/m3) Benzene | Toluene | Ethyl-benzene | m,p-Xylene | o-Xylene | n-Hexane | n-Heptane |
|---|---|---|---|---|---|---|---|---|---|---|
| **Lowry AFB Study (Versar, 2000)**[7] | | | | | | | | | | |
| Colorado | 1997 - 1998 | Median | 12-26 | - | - | - | - | - | - | - |
| | | Arithmetic Mean | 12-26 | - | - | - | - | - | - | - |
| | | Maximum | 12-26 | - | - | - | - | - | - | - |
| **Redfields Colorado Study (Envirogroup, 1999)**[7] | | | | | | | | | | |
| Redfields, Denver | 1999 | Median | 55-78 | - | - | - | - | - | - | - |
| Colorado | | Arithmetic Mean | 55-78 | - | - | - | - | - | - | - |
| | | 90th percentile | 55-78 | - | - | - | - | - | - | - |
| | | Maximum | 55-78 | - | - | - | - | - | - | - |
| **Denver Colorado Study (Walsh, 1999)**[7] | | | | | | | | | | |
| Denver, Colorado | 1997-1999 | Lognormal Mean | 55-415 | 4.71 | - | - | - | - | - | - |
| | | 95% Tolerance Limit | 55-415 | 12.2 | - | - | - | - | - | - |
| | | Maximum | 55-415 | 41 | - | - | - | - | - | - |
| **Health Canada Study (Davis and Otson, 1996)**[1] | | | | | | | | | | |
| Across Canada | 1991, 1992 | Arithmetic Mean | 757 | 5.4 | 40.8 | 8.2 | 20.7 | 5.6 | 1.2 | - |
| | All seasons | Maximum | 757 | 67.9 | 5730 | 540 | 1470 | 320 | 124 | - |
| **U.S. EPA TEAM Study (U.S. EPA, 1987)**[2] | | | | | | | | | | |
| Elizabeth-Bayonne, | Fall 1981 | Arithmetic Mean | 340 | 28 | - | 19 | 52 | 16 | - | - |
| New Jersey | Fall 1981 | Maximum | 85 | 120 | - | 320 | 120 | 46 | - | - |
| | Summer 1982 | Arithmetic Mean | 150 | - | - | 9.2 | 37 | 12 | - | - |
| | Summer 1982 | Maximum | 71 | - | - | 180 | 150 | 100 | - | - |
| | Winter 1983 | Arithmetic Mean | 49 | - | - | 12 | 36 | 13 | - | - |
| | Winter 1983 | Maximum | 8 | - | - | 32 | 63 | 24 | - | - |
| Los Angeles, California | Feb-84 | Arithmetic Mean | 110 | 18 | - | 11 | 28 | 13 | - | - |
| | Feb-84 | Maximum | 25 | 49 | - | 29 | 58 | 34 | - | - |
| Los Angeles, California | May-84 | Arithmetic Mean | 50 | 9.2 | - | 7.4 | 24 | 7.2 | - | - |
| | May-84 | Maximum | 25 | 29 | - | 35 | 94 | 29 | - | - |
| Contra Costa, California | Jun-84 | Arithmetic Mean | 67 | 7.5 | - | 3.7 | 11 | 4.4 | - | - |
| | Jun-84 | Maximum | 10 | 22 | - | 9 | 26 | 11 | - | - |
| **U.S. National Survey (Shah and Singh, 1988)** | | | | | | | | | | |
| Across U.S.A | pre 1988 | Median | 96-2278 | 10.0 | 6.3 | 4.8 | - | - | - | - |
| | | Arithmetic Mean | 96-2278 | 16.5 | 27.9 | 12.4 | - | - | - | - |
| | | Upper Quartile | 96-2278 | 21.1 | 28.8 | 9.3 | - | - | - | - |
| **Dutch Study (Lebret et al., 1985)**[3] | | | | | | | | | | |
| Ede, Netherlands | Winter 81/82 | Median | 100 | 7 | 40 | 3 | 12 | - | 4 | 3 |
| Post war | | Maximum | 100 | 148 | 697 | 45 | 178 | - | 107 | 68 |
| Rotterdam, Netherlands | Winter 82/83 | Median | 100 | 7 | 23 | 2 | 9 | - | 5 | 3 |
| Pre war | | Maximum | 100 | 24 | 526 | 117 | 159 | - | 338 | 30 |
| Ede, Netherlands | Winter 82/83 | Median | 100 | 5 | 43 | 2 | 10 | - | 3 | 2 |
| < 6 years | | Maximum | 100 | 53 | 2252 | 138 | 753 | - | 178 | 556 |
| **Greater Toronto Study (Otson and Zhu, 1997)**[4] | | | | | | | | | | |
| Greater Toronto | Feb. 12-Apr. 9, 1996 | Arithmetic Mean | 44 | 3.42 | 15.2 | 1.58 | - | - | 5.24 | - |
| | | Maximum | 44 | 45.8 | 186 | 20.9 | - | - | 108 | - |
| **Saskatchewan and Ontario Study (SRC, 1992)**[5] | | | | | | | | | | |
| Regina, Saskatoon, SA | Jan. 14, 1991 - | Arithmetic Mean | 44 | 15 | 23.9 | 9.6 | 21.6 | 5.7 | 14.5 | - |
| Tillsonburg, Ontario | Feb 11, 1991 | Maximum | 44 | 42.3 | 110.5 | 32.9 | 74.2 | 20.3 | 99.4 | - |
| **Tennessee Houses (Oak Ridge National Laboratory, 1988)**[6] | | | | | | | | | | |
| East Tennessee Houses | Aug 84 to Jan 85 | Median | 8 | 7.5 | 38.5 | 6.5 | 18.5 | 6 | 9 | - |
| | | Maximum | 8 | 30 | 111 | 82 | 302 | 323 | 113 | - |

**Above data adapted from Hers et al. (2001). The Use of Indoor Air Measurements To Evaluate Intrusion of Subsurface VOC Vapors into Buildings. J. of Air & Waste Management Assoc. 51: 174-185. September**

Notes:

1. OVM 3500 (3M Co.) passive samplers, 24 hour samples, quantified by GC/MSD
2. Personal air samplers using Tenax, arithmetic mean of 12 hour daytime and 12 hour nighttime samples, quantified by GC/MS
3. Charcoal tubes, 5 to 7 day samples at 100 ml/min, GC/FID and GC/MS
4. OVM 3500 passive samplers, 24 hour samples, quantified by GC/MSD
5. OVM 3500 passive samplers, 24 hour samples, quantified by GC/MSD, 20 houses in Sask (Regina and Saskatoon), 24 in Tillsonburg, Ontario
6. Sorbent tubes consisting of Tenax or Tenax-carbonaceous mixtures quantified by GCMS
7. SummaTM steel canisters and EPA Method TO-14 or TO-15.
8. - = not tested or below detection limit

**Table 3-14**
Compilation of Background Indoor Air Quality Data

| Study | Date & Time | Statistic | Number | Benzene | Toluene | Ethyl-benzene | m,p-Xylene | o-Xylene | n-Hexane | n-Heptane |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Concentrations in Indoor Air (ppbV) | | | | | | |
| **Lowry AFB Study (Versar, 2000)[7]** | | | | | | | | | | |
| Colorado | 1997 - 1998 | Median | 12-26 | - | - | - | - | - | - | - |
| | | Arithmetic Mean | 12-26 | - | - | - | - | - | - | - |
| | | Maximum | 12-26 | - | - | - | - | - | - | - |
| **Redfields Colorado Study (Envirogroup, 1999)[7]** | | | | | | | | | | |
| Redfields, Denver | 1999 | Median | 55-78 | - | - | - | - | - | - | - |
| Colorado | | Arithmetic Mean | 55-78 | - | - | - | - | - | - | - |
| | | 90th percentile | 55-78 | - | - | - | - | - | - | - |
| | | Maximum | 55-78 | - | - | - | - | - | - | - |
| **Denver Colorado Study (Walsh, 1999)[7]** | | | | | | | | | | |
| Denver, Colorado | 1997-1999 | Lognormal Mean | 55-415 | 1.44 | - | - | - | - | - | - |
| | | 95% Tolerance Limit | 55-415 | 3.72 | - | - | - | - | - | - |
| | | Maximum | 55-415 | 12.5 | - | - | - | - | - | - |
| **Health Canada Study (Davis and Otson, 1996)[1]** | | | | | | | | | | |
| Across Canada | 1991, 1992 | Arithmetic Mean | 757 | 1.65 | 10.5 | 1.84 | 4.64 | 1.26 | 0.33 | - |
| | All seasons | Maximum | 757 | 20.7 | 1481 | 121 | 330 | 71.7 | 34.3 | - |
| **U.S. EPA TEAM Study (U.S. EPA, 1987)[2]** | | | | | | | | | | |
| Elizabeth-Bayonne, | Fall 1981 | Arithmetic Mean | 340 | 8.54 | - | 4.26 | 11.7 | 3.59 | - | - |
| New Jersey | Fall 1981 | Maximum | 85 | 36.6 | - | 71.7 | 26.9 | 10.3 | - | - |
| | Summer 1982 | Arithmetic Mean | 150 | - | - | 2.06 | 8.30 | 2.69 | - | - |
| | Summer 1982 | Maximum | 71 | - | - | 40.4 | 33.6 | 22.4 | - | - |
| | Winter 1983 | Arithmetic Mean | 49 | - | - | 2.69 | 8.07 | 2.91 | - | - |
| | Winter 1983 | Maximum | 8 | - | - | 7.17 | 14.13 | 5.38 | - | - |
| Los Angeles, California | Feb-84 | Arithmetic Mean | 110 | 5.49 | - | 2.47 | 6.28 | 2.91 | - | - |
| | Feb-84 | Maximum | 25 | 14.9 | - | 6.50 | 13.0 | 7.62 | - | - |
| Los Angeles, California | May-84 | Arithmetic Mean | 50 | 2.80 | - | 1.66 | 5.38 | 1.61 | - | - |
| | May-84 | Maximum | 25 | 8.84 | - | 7.85 | 21.1 | 6.50 | - | - |
| Contra Costa, California | Jun-84 | Arithmetic Mean | 67 | 2.29 | - | 0.83 | 2.47 | 0.99 | - | - |
| | Jun-84 | Maximum | 10 | 6.71 | - | 2.02 | 5.83 | 2.47 | - | - |
| **U.S. National Survey (Shah and Singh, 1988)** | | | | | | | | | | |
| Across U.S.A | pre 1988 | Median | 96-2278 | 3.06 | 1.62 | 1.08 | - | - | - | - |
| | | Arithmetic Mean | 96-2278 | 5.04 | 7.21 | 2.77 | - | - | - | - |
| | | Upper Quartile | 96-2278 | 6.43 | 7.43 | 2.09 | - | - | - | - |
| **Dutch Study (Lebret et al., 1985)[3]** | | | | | | | | | | |
| Ede, Netherlands | Winter 81/82 | Median | 100 | 2.13 | 10.3 | 0.67 | 2.69 | - | 1.10 | 0.71 |
| Post war | | Maximum | 100 | 45.1 | 180 | 10.1 | 39.9 | - | 29.6 | 16.0 |
| Rotterdam, Netherlands | Winter 82/83 | Median | 100 | 2.13 | 5.94 | 0.45 | 2.02 | - | 1.38 | 0.71 |
| Pre war | | Maximum | 100 | 7.32 | 136 | 26.2 | 35.7 | - | 93.4 | 7.06 |
| Ede, Netherlands | Winter 82/83 | Median | 100 | 1.52 | 11.1 | 0.45 | 2.24 | - | 0.83 | 0.47 |
| < 6 years | | Maximum | 100 | 16.2 | 582 | 30.9 | 169 | - | 49.2 | 131 |
| **Greater Toronto Study (Otson and Zhu, 1997)[4]** | | | | | | | | | | |
| Greater Toronto | Feb. 12-Apr. 9, 1996 | Arithmetic Mean | 44 | 1.04 | 3.93 | 0.35 | - | - | 1.45 | - |
| | | Maximum | 44 | 14.0 | 48.1 | 4.69 | - | - | 29.8 | - |
| **Saskatchewan and Ontario Study (SRC, 1992)[5]** | | | | | | | | | | |
| Regina, Saskatoon, SA | Jan. 14, 1991 - | Arithmetic Mean | 44 | 4.57 | 6.18 | 2.15 | 4.84 | 1.28 | 4.01 | - |
| Tillsonburg, Ontario | Feb 11, 1991 | Maximum | 44 | 12.9 | 28.6 | 7.38 | 16.6 | 4.55 | 27.5 | - |
| **Tennessee Houses (Oak Ridge National Laboratory, 1988)[6]** | | | | | | | | | | |
| East Tennessee Houses | Aug 84 to Jan 85 | Median | 8 | 2.29 | 9.95 | 1.46 | 4.15 | 1.35 | 2.49 | - |
| | | Maximum | 8 | 9.15 | 28.7 | 18.4 | 67.7 | 72.4 | 31.2 | - |

**Above data adapted from Hers et al. (2001). The Use of Indoor Air Measurements To Evaluate Intrusion of Subsurface VOC Vapors into Buildings. J. of Air & Waste Management Assoc. 51: 174-185. September**

Notes:
1. OVM 3500 (3M Co.) passive samplers, 24 hour samples, quantified by GC/MSD
2. Personal air samplers using Tenax, arithmetic mean of 12 hour daytime and 12 hour nighttime samples, quantified by GC/MS
3. Charcoal tubes, 5 to 7 day samples at 100 ml/min, GC/FID and GC/MS
4. OVM 3500 passive samplers, 24 hour samples, quantified by GC/MSD
5. OVM 3500 passive samplers, 24 hour samples, quantified by GC/MSD, 20 houses in Sask (Regina and Saskatoon), 24 in Tillsonburg, Ontario
6. Sorbent tubes consisting of Tenax or Tenax-carbonaceous mixtures quantified by GCMS
7. SummaTM steel canisters and EPA Method TO-14 or TO-15.
8. - = not tested or below detection limit

# Table 3-15
## Vapor Pathway Assessment 63 Bay Avenue, Stafford Site

| | Oct-02 Ground-water VP-13 (ug/L) | Oct-02 Predicted Deep Vapour (ppbV) | Adj House Measured Soil Vapor VP-13 10-5 - 11' (ppbV) | Measured Sub-slab Vapor Conc. 5.5-6' (ppbV) | Measured First Floor Conc. (ppbV) | Alpha Predicted Deep Vapor/ First Floor | Alpha Measured Deep Vapor/ First Floor | Local Back-ground (ppbV) |
|---|---|---|---|---|---|---|---|---|
| MTBE | 190000 | 1045872 | 120,000 | 0.71 | 0.77 | N/A | N/A | 0.62 to 2.6 |
| n-Hexane | NT | N/A | 990,000 | <10 | 0.51 | N/A | N/A | <0.5 to 2.1 |
| n-Heptane | NT | N/A | 330,000 | <10 | <0.5 | N/A | N/A | <0.5 to 1.1 |
| Cyclohexane | <5000 | 5649718 [1] | 200,000 | <10 | <0.5 | N/A | N/A | <0.5 |
| 2,2,4-TriMethylPentane | NT | N/A | 500,000 | <10 | <0.5 | N/A | N/A | <0.5 to 2.3 |
| Benzene | 7500 | 521183 | 120,000 | <10 | <0.5 | N/A | N/A | <0.5-1.2 |
| Toluene | 14000 | 983217 | 140,000 | <10 | 0.85 | N/A | N/A | 3.6 to 8.7 |
| Ethylbenzene | 4200 | 304034 | <15,000 | <10 | <0.5 | N/A | N/A | <0.5 to 1.3 |
| M&P-Xylene | NT | N/A | 22,000 | 12 | 0.65 | N/A | N/A | 1.8 to 4.4 |
| O-Xylene | NT | N/A | <15,000 | <10 | <0.5 | N/A | N/A | 0.63 to 1.3 |
| Total Xylenes | 20000 | 1165397 | NT | NT | NT | NT | NT | NT |
| Oxygen | | | 0.2 to 0.5 % | | | | | |
| % LEL | | | 12 to 100 | | | | | |

Notes:
1. Estimated using 1/2 detection limit for cyclohexane
R = Retention Time, NQ = Not quantified, N/A = Not applicable, NT = Not tested
Background based on indoor air concentrations measured at two nearby off-plume houses

# Table 3-15
## Vapor Pathway Assessment 73 Bay Avenue, Stafford Site

| | Oct-02 Ground-water VP-9 (ug/L) | Oct-02 Predicted Deep Vapour (ppbV) | Adjacent to House (Oct-02) Measured Deep Vapor VP-9D 10-5 - 11' (ppbV) | Adjacent to House (Oct-02) Measured Mid Vapor VP-9M 6.5 - 7' (ppbV) | Adjacent to House (Oct-02) Measured Shallow Vapor VP-9S 2.5-3' (ppbV) | Measured Sub-slab Vapor Conc. 5.5-6' (ppbV) | Measured Base-ment Conc. (ppbV) | Measured First Floor Conc. (ppbV) | Alpha Predicted Deep Vapor/ Basement | | Alpha Measured Deep Vapor/ Basement | | Alpha Measured Subslab Vapor/ Basement | Local Back-ground (ppbV) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MTBE | 590000 | 3247706 | 1,600,000 | 450,000 | <500 | 5,000 | 36 | 14 | 1.1E-05 | | 2.2E-05 | | 7.1E-03 | 0.62 to 2.6 |
| n-Hexane | NT | N/A | 1,700,000 | 880,000 | 5,000 | <300 | <2.5 | <0.5 | N/A | | N/A | | N/A | <0.5 to 2.1 |
| n-Heptane | NT | N/A | 320,000 | 160,000 | 550 | <300 | <2.5 | <0.5 | N/A | | N/A | | N/A | <0.5 to 1.1 |
| Cyclohexane | 12500 | 28248588 | 300,000 | 150,000 | 2,900 | 4,300 | 36 | 7.4 | 1.3E-06 | | 1.2E-04 | | 8.4E-03 | <0.5 |
| 2,2,4-TriMethylPentane | NT | N/A | 400,000 | 210,000 | 11,000 | 20,000 | 145 | 34 | N/A | | 3.6E-04 | | 7.3E-03 | <0.5 to 2.3 |
| Unknown Alkane R ~ 5.05 | NT | N/A | 1,200,000 | 660,000 | ND | 11,000 | 63 | 23 | N/A | | 5.3E-05 | | 5.8E-03 | NQ |
| Unknown Alkane R ~ 6.08 | NT | N/A | 450,000 | 250,000 | 13,000 | 22,000 | 85 | 33 | N/A | | 1.9E-04 | | 3.9E-03 | NQ |
| Unknown Alkane R ~ 6.65 | NT | N/A | 800,000 | 370,000 | 12,000 | 17,000 | 79 | NQ | N/A | | 9.9E-05 | | 4.6E-03 | NQ |
| Unknown Alkane R ~ 6.73 | NT | N/A | 1,900,000 | NQ | 20,000 | 15,000 | 82 | 33 | N/A | | 4.3E-05 | | 5.5E-03 | NQ |
| Average | | | | | | | | | | | 1.3E-04 | | 6.1E-03 | |
| Benzene | 12000 | 833892 | 200,000 | 77,000 | <500 | <300 | <2.5 | <0.5 | 1.5E-06 | < | 6.3E-06 | < | N/A | <0.5-1.2 |
| Toluene | 43000 | 3019881 | 290,000 | 150000 J | 260 J | <300 | <2.5 | 12.0 | 4.1E-07 | < | 4.3E-06 | < | N/A | 3.6 to 8.7 |
| Ethylbenzene | 3500 | 253362 | < 33000 | < 15000 | <500 | <300 | <2.5 | 2.4 | 4.9E-06 | | N/A | | N/A | <0.5 to 1.3 |
| M&P-Xylene | NT | N/A | < 33000 | 14,400 | <500 | <300 | 3.0 | 8.9 | N/A | | N/A | | N/A | 1.8 to 4.4 |
| O-Xylene | NT | N/A | < 33000 | < 15000 | <500 | <300 | <2.5 | 3.8 | N/A | | N/A | | N/A | 0.63 to 1.3 |
| Total Xylenes | 24000 | 1398476 | < 33000 | < 15000 | <500 | <300 | 4.25 | 6.35 | N/A | | N/A | | N/A | NT |
| Oxygen | | | <1.0 % | 0.9 to 1.6 % | 8.3-10.2 % | NT | | | | | | | | |
| % LEL | | | N/A | 25-100 % | 35 to 37 % | NT | | | | | | | | |

Notes:
1. Estimated using 1/2 detection limit for cyclohexane
R = Retention Time, NQ = Not quantified, N/A = Not applicable, NT = Not tested
Background based on indoor air concentrations measured at two nearby off-plume houses

# Table 3-15



## Vapor Pathway Assessment 14 Park Avenue, Stafford Site

| | Average Oct-02 Ground-water VP-10&11 (ug/L) | Oct-02 Predicted Deep Vapour (ppbV) | Adjacent to House (Oct-02) Measured Soil Vapor VP-10D 10-5 - 11' (ppbV) | Measured Soil Vapor VP-10M 6.5 - 7' (ppbV) | Measured Soil Vapor VP-10S 2.5-3' (ppbV) | Measured Sub-slab Vapor Conc. 5.5-6' (ppbV) | Measured Base-ment Conc. (ppbV) | Measured First Floor Conc. (ppbV) | Alpha Predicted Deep Vapor/ Basement | Alpha Measured Deep Vapor/ Basement | Alpha Measured Subslab Vapor/ Basement | Local Back-ground (ppbV) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MTBE | 155650 | 856789 | 15,000 | 86 | 4.8 | <1 | <0.5 | <0.5 | N/A | N/A | N/A | 0.62 to 2.6 |
| n-Hexane | NT | N/A | 360 J | 190 | 28 | <1 | 0.53 | <0.5 | N/A | N/A | N/A | <0.5 to 2.1 |
| n-Heptane | NT | N/A | <640 | 140 | 13 | 1.0 | 0.51 | 0.73 | N/A | N/A | N/A | <0.5 to 1.1 |
| Cyclohexane | 6262.5 | 14152542 | <640 | 45 | 7.3 | <1 | <0.5 | <0.5 | N/A | N/A | N/A | <0.5 |
| 2,2,4-TriMethylPentane | NT | N/A | 350 J | 150 | 16 | <1 | <0.5 | <0.5 | N/A | N/A | N/A | <0.5 to 2.3 |
| Benzene | 3050 | 211948 | <640 | 21 | 1.6 J | <1 | <2.5 | <0.5 | N/A | N/A | N/A | <0.5-1.2 |
| Toluene | 6013 | 422257 | 860 | 230 | 11 | 9.4 | <2.5 | 2.4 | N/A | N/A | N/A | 3.6 to 8.7 |
| Ethylbenzene | 1110 | 80352 | <640 | 60 | 3.1 | 3.4 | <2.5 | 0.7 | N/A | N/A | N/A | <0.5 to 1.3 |
| M&P-Xylene | NT | N/A | 650 | 200 | 12 | 12 | 4.4 | 2.7 | N/A | N/A | N/A | 1.8 to 4.4 |
| O-Xylene | NT | N/A | <640 | 68 | 4.2 | 4.9 | <2.5 | 1.2 | N/A | N/A | N/A | 0.63 to 1.3 |
| Total Xylenes | 1663 | 96874 | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT |
| Oxygen | | | | | | | | | | | | |
| % LEL | | | | | | | | | | | | |

Notes:
1. Estimated using 1/2 detection limit for cyclohexane
R = Retention Time, NQ = Not quantified, N/A = Not applicable, NT = Not tested
Background based on indoor air concentrations measured at two nearby off-plume houses

**Table 3-15**
**Vapor Pathway Assessment 18 Park Avenue, Stafford Site**

| | Oct-02 Ground-water VP-11 (ug/L) | Oct-02 Predicted Deep Vapour (ppbV) | Adj House Measured Soil Vapor VP-11 10-5 - 11' (ppbV) | Measured Sub-slab Vapor Conc. 5.5-6' (ppbV) | Measured Base-ment Conc. (ppbV) | Measured First Floor Conc. (ppbV) | Alpha Predicted Deep Vapor/ Basement | Alpha Measured Deep Vapor/ Basement | Alpha Measured Subslab Vapor/ Basement | Ratio Base-ment / First floor | Local Back-ground (ppbV) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MTBE | 1300 | 7156 | <2.8 | 1.4 | 2.6 | 1.4 | N/A | N/A | N/A | N/A | 0.62 to 2.6 |
| n-Hexane | NT | N/A | 5.2 | 0.51 | 0.68 | 2.1 | N/A | N/A | N/A | N/A | <0.5 to 2.1 |
| n-Heptane | NT | N/A | 2.8 | 1.6 | 0.57 | 1.1 | N/A | N/A | N/A | N/A | <0.5 to 1.1 |
| Cyclohexane | <50 | 56497 | <2.8 | <0.5 | <0.5 | <0.5 | N/A | N/A | N/A | N/A | <0.5 |
| 2,2,4-TriMethylPentane | NT | N/A | 6.5 | 1.1 | 2.3 | 0.94 | N/A | N/A | N/A | N/A | <0.5 to 2.3 |
| Benzene | 100 | 6949 | 2.8 | 0.63 | 1.2 | 0.9 | N/A | N/A | N/A | N/A | <0.5-1.2 |
| Toluene | <50 | 1756 | 3.3 | 9.9 | 8.7 | 5.5 | N/A | N/A | N/A | N/A | 3.6 to 8.7 |
| Ethylbenzene | <40 | 1448 | <2.8 | 4.0 | 1.3 | 0.91 | N/A | N/A | N/A | N/A | <0.5 to 1.3 |
| M&P-Xylene | NT | N/A | 3.0 | 16 | 4.4 | 3.1 | N/A | N/A | N/A | N/A | 1.8 to 4.4 |
| O-Xylene | NT | N/A | <2.8 | 5.0 | 1.3 | 0.910 | N/A | N/A | N/A | N/A | 0.63 to 1.3 |
| Total Xylenes | <50 | 1457 | NT | NT | NT | NT | NT | NT | NT | NT | NT |
| Oxygen | | | | 20.3 | | | | | | | |
| % LEL | | | | 0.0 | | | | | | | |

Notes:
1. Estimated using 1/2 detection limit for groundwater concentration
R = Retention Time, NQ = Not quantified, N/A = Not applicable, NT = Not tested
Background based on indoor air concentrations measured at two nearby off-plume houses

# Table 3-15
## Vapor Pathway Assessment 22 Park Avenue, Stafford Site

| | Sep-02 Ground-water BH-6 (ug/L) | Oct-02 Predicted Deep Vapour (ppbV) | Adj House Measured Soil Vapor VP-12 10-5 - 11' (ppbV) | Measured Crawlspace Air Conc. (ppbV) | Measured First Floor Conc. (ppbV) | Alpha Predicted Deep Vapor/ First Floor | Alpha Measured Deep Vapor/ First Floor | Ratio Crawl-space / First floor | Local Back-ground (ppbV) |
|---|---|---|---|---|---|---|---|---|---|
| MTBE | 16885 | 1872 | <2.8 | 0.62 | <0.5 | N/A | N/A | N/A | 0.62 to 2.6 |
| n-Hexane | NT | N/A | <2.8 | <0.5 | <0.5 | N/A | N/A | N/A | <0.5 to 2.1 |
| n-Heptane | NT | N/A | <2.8 | <0.5 | <0.5 | N/A | N/A | N/A | <0.5 to 1.1 |
| Cyclohexane | NT | N/A | <2.8 | <0.5 | <0.5 | N/A | N/A | N/A | <0.5 |
| 2,2,4-TriMethylPentane | NT | N/A | 9.5 | <0.5 | <0.5 | N/A | N/A | N/A | <0.5 to 2.3 |
| Benzene | 598 | 1807 | <2.8 | <0.5 | <0.5 | N/A | N/A | N/A | <0.5-1.2 |
| Toluene | 17 | N/A | 3.1 | 1.3 | 3.6 | N/A | N/A | N/A | 3.6 to 8.7 |
| Ethylbenzene | 51 | N/A | <2.8 | <0.5 | <0.5 | N/A | N/A | N/A | <0.5 to 1.3 |
| M&P-Xylene | 68 | N/A | 5.6 | 2 | 1.8 | N/A | N/A | N/A | 1.8 to 4.4 |
| O-Xylene | 4 | N/A | <2.8 | 0.56 | 0.63 | N/A | N/A | N/A | 0.63 to 1.3 |
| Total Xylenes | NT | N/A | NT | NT | NT | NT | NT | NT | NT |
| Oxygen % | | | 19.8 | NT | | | | | |
| % LEL | | | 9.0 | NT | | | | | |

Notes:
1. Estimated using 1/2 detection limit for cyclohexane
R = Retention Time, NQ = Not quantified, N/A = Not applicable, NT = Not tested
Background based on indoor air concentrations measured at two nearby off-plume houses

# Table 3-16
## Physical-Chemical Parameters for Key Compounds

| Chemical | MW | Vapor Pressure Pa | atm | Solubility S (g/m3) | Log $K_{ow}$ | Henry's Law Constant (Pa-m3/mol) | (atm-m3/mol) | H' 20 C |
|---|---|---|---|---|---|---|---|---|
| Benzene | 78.11 | 12700 | 0.12573 | 1780 | 2.13 | 557 | 0.00551 | 0.229 |
| Toluene | 92.13 | 3800 | 0.03762 | 515 | 2.69 | 680 | 0.00673 | 0.280 |
| Ethylbenzene | 106.2 | 1270 | 0.012573 | 152 | 3.13 | 887 | 0.00878 | 0.365 |
| o-xylene | 106.2 | 1170 | 0.011583 | 220 | 3.15 | 565 | 0.00559 | 0.232 |
| m-xylene | 106.2 | 1100 | 0.01089 | 160 | 3.2 | 730 | 0.00723 | 0.300 |
| p-Xylene | 106.2 | 1170 | 0.011583 | 215 | 3.18 | 578 | 0.00572 | 0.238 |
| n-Hexane | 87.17 | 20200 | 0.19998 | 9.5 | 4.11 | 183225 | 1.81 | 75.4 |
| n-Heptane | 100.21 | 6110 | 0.060489 | 2.93 | 5 | 208970 | 2.07 | 86.0 |
| 2,2,4-Trimethypentane | 114.23 | 6560 | 0.064944 | 2.44 | - | 307100 | 3.04 | 126.4 |
| Cyclohexane | 84.16 | 12700 | 0.12573 | 55 | 3.44 | 19433 | 0.192 | 8.00 |
| MTBE | 88.17 | 33333 | 0.33 | 48000 | - | 49.6 | 0.000491 | 0.0204 |

Notes:
1. Source of physical-chemical parameters (except MTBE) is Mackay et al. Illustrated Handbook of Physical - Chemical Properties and Environmental Fate for Organic Chemicals (Table 2.2). Lewis Publishers, Chelsea, Michigan, 1993.
2. Source of physical-chemical parameters for MTBE is RISC 4.0 Computer Program (Lyn Spense Engineering)

Table 4-1

Final Summa Canister Pressures Measured at Laboratory

| Lab No. | Client ID | Final Pressure, (in Hg) | Collection Date | Collection Time | Matrix |
|---|---|---|---|---|---|
| 558685 | SUBSLAB-1 | 0.4 | 1/23/2004 | 1210 | Air |
| 558686 | SUBSLAB-2 | 0.4 | 1/23/2004 | 1213 | Air |
| 558687 | BASEMENT-1 | 0.2 | 1/23/2004 | 1233 | Air |
| 558688 | SUBSLAB-3 | 0.4 | 1/23/2004 | 1233 | Air |
| 558689 | DUPE | 0.4 | 1/23/2004 | 1236 | Air |
| 558690 | FIRST-1 | 0.0 | 1/23/2004 | 1245 | Air |
| 558691 | EASTVP-S | -4.3 | 1/22/2004 | 1410 | Air |
| 558692 | EASTVP-M | 0.7 | 1/22/2004 | 1412 | Air |
| 558693 | EASTVP-D | -9.3 | 1/22/2004 | 1422 | Air |
| 558694 | WESTVP-D | -7.4 | 1/22/2004 | 1430 | Air |

# Table 4-4
## Results of January 2004 Groundwater Testing at Stafford Site

| **Sample ID** | **TB01** | | **West-S** | | **West-D** | | **East-S** | | **East-D** | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Lab Sample No.** | 495391 | | 495392 | | 495393 | | 495394 | | 495395 | |
| **Sampling Date** | 1/16/2004 0:00 | | 1/19/2004 0:00 | | 1/19/2004 0:00 | | 1/19/2004 0:00 | | 1/19/2004 0:00 | |
| **Matrix** | WATER | | WATER | | WATER | | WATER | | WATER | |
| **Dilution Factor** | 1 | | 1000 | | 1000 | | 1 | | 50 | |
| **Units** | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | |
| **VOLATILE COMPOUNDS (GC/MS)** | | | | | | | | | | |
| Chloromethane | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| Bromomethane | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| Vinyl Chloride | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| Chloroethane | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| Methylene Chloride | 3 | U | 3000 | U | 3000 | U | 3 | U | 150 | U |
| Acetone | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| Carbon Disulfide | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| Trichlorofluoromethane | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| 1,1-Dichloroethene | 2 | U | 2000 | U | 2000 | U | 2 | U | 100 | U |
| 1,1-Dichloroethane | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| trans-1,2-Dichloroethene | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| cis-1,2-Dichloroethene | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| Chloroform | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| 1,2-Dichloroethane | 2 | U | 2000 | U | 2000 | U | 2 | U | 100 | U |
| 2-Butanone | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| 1,1,1-Trichloroethane | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| Carbon Tetrachloride | 2 | U | 2000 | U | 2000 | U | 2 | U | 100 | U |
| Bromodichloromethane | 1 | U | 1000 | U | 1000 | U | 1 | U | 50 | U |
| 1,2-Dichloropropane | 1 | U | 1000 | U | 1000 | U | 1 | U | 50 | U |
| cis-1,3-Dichloropropene | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| Trichloroethene | 1 | U | 1000 | U | 1000 | U | 1 | U | 50 | U |
| Dibromochloromethane | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| 1,1,2-Trichloroethane | 3 | U | 3000 | U | 3000 | U | 3 | U | 150 | U |
| Benzene | 1 | U | **6300** | | **9600** | | **62** | | **6300** | |
| trans-1,3-Dichloropropene | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| Bromoform | 4 | U | 4000 | U | 4000 | U | 4 | U | 200 | U |
| 4-Methyl-2-Pentanone | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| 2-Hexanone | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| Tetrachloroethene | 1 | U | 1000 | U | 1000 | U | 1 | U | 50 | U |
| 1,1,2,2-Tetrachloroethane | 1 | U | 1000 | U | 1000 | U | 1 | U | 50 | U |
| Toluene | 5 | U | **30000** | | **8600** | | **9.5** | | **170** | J |
| Chlorobenzene | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| Ethylbenzene | 4 | U | **3200** | J | **3300** | J | **12** | | **2700** | |
| Styrene | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| Xylene (Total) | 5 | U | **18000** | | **15000** | | **30** | | **11000** | |
| Freon TF | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| MTBE | 5 | U | **83000** | | **140000** | | **110** | | **2200** | |
| Cyclohexane | 5 | U | 5000 | U | 5000 | U | **2.9** | J | **160** | J |
| 1,2-Dibromoethane | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| 1,3-Dichlorobenzene | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| 1,4-Dichlorobenzene | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| 1,2-Dichlorobenzene | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| Dichlorodifluoromethane | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| 1,2,4-Trichlorobenzene | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| 1,2-Dibromo-3-chloropropane | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| Isopropylbenzene | 5 | U | 5000 | U | 5000 | U | **1.5** | J | **220** | J |
| Methyl Acetate | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| Methyl Cyclohexane | 5 | U | 5000 | U | 5000 | U | **2** | J | **92** | J |
| Isooctane | 5 | U | 5000 | U | 5000 | U | 5 | U | 250 | U |
| Total Confident Conc. | 0 | | 137300 | | 173200 | | **223.5** | | 22200 | |
| Total Estimated Conc. (TICs) | NA | | NA | | NA | | NA | | NA | |

NR - Not analyzed. TB = transport blank U - The compound was not detected at the indicated concentration.

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than zero. The concentration given is an approximate value.

B - The analyte was found in the laboratory blank as well as the sample. This indicates possible laboratory contamination of the sample.

# Table 4-6
## 2004 Soil Vapor Results, Stafford Site

| Sample ID | | VP-WEST Deep | | | |
|---|---|---|---|---|---|
| Depth | | 9.5-10' | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558694 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 4900 | UG/M3 | U | 0.184 |
| CHLOROMETHANE | 74-87-3 | 2100 | UG/M3 | U | 0.179 |
| VINYL CHLORIDE | 75-01-4 | 2600 | UG/M3 | U | 0.191 |
| BROMOMETHANE | 74-83-9 | 3900 | UG/M3 | U | 0.232 |
| CHLOROETHANE | 75-00-3 | 2600 | UG/M3 | U | 0.212 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | 5600 | UG/M3 | U | 0.172 |
| FREON TF | 76-13-1 | 7700 | UG/M3 | U | 0.159 |
| 1,1-DICHLOROETHENE | 75-35-4 | 4000 | UG/M3 | U | 0.165 |
| METHYLENE CHLORIDE | 75-09-2 | 3500 | UG/M3 | U | 0.182 |
| 1,1-DICHLOROETHANE | 75-34-3 | 4000 | UG/M3 | U | 0.167 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | 4000 | UG/M3 | U | 0.119 |
| CHLOROFORM | 67-66-3 | 4900 | UG/M3 | U | 0.184 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | 5500 | UG/M3 | U | 0.167 |
| CARBON TETRACHLORIDE | 56-23-5 | 6300 | UG/M3 | U | 0.168 |
| BENZENE | 71-43-2 | 61000 | UG/M3 | | 0.150 |
| 1,2-DICHLOROETHANE | 107-06-2 | 4000 | UG/M3 | U | 0.155 |
| TRICHLOROETHENE | 79-01-6 | 5400 | UG/M3 | U | 0.166 |
| 1,2-DICHLOROPROPANE | 78-87-5 | 4600 | UG/M3 | U | 0.173 |
| CIS-1,3-DICHLOROPROPENE | 0061-01-! | 4500 | UG/M3 | U | 0.174 |
| TOLUENE | 108-88-3 | 870000 | UG/M3 | E | 0.171 |
| TRANS-1,3-DICHLOROPROPENE | 0061-02-( | 4500 | UG/M3 | U | 0.167 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | 5500 | UG/M3 | U | 0.181 |
| TETRACHLOROETHENE | 127-18-4 | 6800 | UG/M3 | U | 0.173 |
| CHLOROBENZENE | 108-90-7 | 4600 | UG/M3 | U | 0.151 |
| ETHYLBENZENE | 100-41-4 | 48000 | UG/M3 | | 0.132 |
| XYLENE (M,P) | 1330-20-7 | 100000 | UG/M3 | | 0.312 |
| STYRENE | 100-42-5 | 4300 | UG/M3 | U | 0.131 |
| XYLENE (O) | 95-47-6 | 24000 | UG/M3 | | 0.160 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | 6900 | UG/M3 | U | 0.181 |
| 1,3-DICHLOROBENZENE | 541-73-1 | 6000 | UG/M3 | U | 0.179 |
| 1,4-DICHLOROBENZENE | 106-46-7 | 6000 | UG/M3 | U | 0.176 |
| 1,2-DICHLOROBENZENE | 95-50-1 | 6000 | UG/M3 | U | 0.162 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | 7400 | UG/M3 | U | 0.193 |

# Table 4-6
## 2004 Soil Vapor Results, Stafford Site

| Sample ID | | VP-WEST Deep | | | |
|---|---|---|---|---|---|
| Depth | | 9.5-10' | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558694 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| HEXACHLOROBUTADIENE | 87-68-3 | 11000 | UG/M3 | U | 0.198 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 4900 | UG/M3 | U | 0.180 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 4900 | UG/M3 | U | 0.156 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | 7000 | UG/M3 | U | 0.147 |
| 1,2-DIBROMOETHANE | 106-93-4 | 7700 | UG/M3 | U | 0.170 |
| 1,3-BUTADIENE | 106-99-0 | 2200 | UG/M3 | U | 0.253 |
| CARBON DISULFIDE | 75-15-0 | 3100 | UG/M3 | U | 0.177 |
| ACETONE | 67-64-1 | 140000 | UG/M3 | | 0.204 |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 65000 | UG/M3 | | 0.162 |
| CYCLOHEXANE | 110-82-7 | 280000 | UG/M3 | E | 0.155 |
| DIBROMOCHLOROMETHANE | 124-48-1 | 8500 | UG/M3 | U | 0.142 |
| METHYL ETHYL KETONE | 78-93-3 | 2900 | UG/M3 | U | 0.135 |
| METHYL ISOBUTYL KETONE | 108-10-1 | 4100 | UG/M3 | U | 0.155 |
| BROMOFORM | 75-25-2 | 10000 | UG/M3 | U | 0.142 |
| BROMODICHLOROMETHANE | 75-27-4 | 6700 | UG/M3 | U | 0.152 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | 4000 | UG/M3 | U | 0.162 |
| 4-ETHYLTOLUENE | 622-96-8 | 4900 | UG/M3 | U | 0.111 |
| 3-CHLOROPROPENE | 107-05-1 | 3100 | UG/M3 | U | 0.163 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 700000 | UG/M3 | E | 0.160 |
| BROMOETHENE | 593-60-2 | 4400 | UG/M3 | U | 0.186 |
| 2-CHLOROTOLUENE | 95-49-8 | 5200 | UG/M3 | U | 0.160 |
| N-HEXANE | 110-54-3 | 600000 | UG/M3 | E | 0.233 |
| N-HEPTANE | 142-82-5 | 450000 | UG/M3 | E | 0.146 |
| TERT-BUTYL ALCOHOL | 75-65-0 | 30000 | UG/M3 | U | 0.218 |

U - compound not detected at the indicated concentration J = Data indicates the presence of compound that meets the identification criteria. The result is less than the quantification limit but greater than zero. The concentration is approximate E = Exceeds calibration range. D = compound identified at secondary dilution factor

**Table 4-6**
**2004 Soil Vapor Results, Stafford Site**

| Sample ID | | VP-WEST Deep Duplicate | | | |
|---|---|---|---|---|---|
| Depth | | 9.5-10' | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558694D1 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 12000 | UG/M3 | U | 0.184 |
| CHLOROMETHANE | 74-87-3 | 5200 | UG/M3 | U | 0.179 |
| VINYL CHLORIDE | 75-01-4 | 6400 | UG/M3 | U | 0.191 |
| BROMOMETHANE | 74-83-9 | 9700 | UG/M3 | U | 0.232 |
| CHLOROETHANE | 75-00-3 | 6600 | UG/M3 | U | 0.212 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | 14000 | UG/M3 | U | 0.172 |
| FREON TF | 76-13-1 | 19000 | UG/M3 | U | 0.159 |
| 1,1-DICHLOROETHENE | 75-35-4 | 9900 | UG/M3 | U | 0.165 |
| METHYLENE CHLORIDE | 75-09-2 | 8700 | UG/M3 | U | 0.182 |
| 1,1-DICHLOROETHANE | 75-34-3 | 10000 | UG/M3 | U | 0.167 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | 9900 | UG/M3 | U | 0.119 |
| CHLOROFORM | 67-66-3 | 12000 | UG/M3 | U | 0.184 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | 14000 | UG/M3 | U | 0.167 |
| CARBON TETRACHLORIDE | 56-23-5 | 16000 | UG/M3 | U | 0.168 |
| BENZENE | 71-43-2 | 45000 | UG/M3 | D | 0.150 |
| 1,2-DICHLOROETHANE | 107-06-2 | 10000 | UG/M3 | U | 0.155 |
| TRICHLOROETHENE | 79-01-6 | 13000 | UG/M3 | U | 0.166 |
| 1,2-DICHLOROPROPANE | 78-87-5 | 12000 | UG/M3 | U | 0.173 |
| CIS-1,3-DICHLOROPROPENE | 0061-01- | 11000 | UG/M3 | U | 0.174 |
| TOLUENE | 108-88-3 | 600000 | UG/M3 | D | 0.171 |
| TRANS-1,3-DICHLOROPROPENE | 0061-02- | 11000 | UG/M3 | U | 0.167 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | 14000 | UG/M3 | U | 0.181 |
| TETRACHLOROETHENE | 127-18-4 | 17000 | UG/M3 | U | 0.173 |
| CHLOROBENZENE | 108-90-7 | 12000 | UG/M3 | U | 0.151 |
| ETHYLBENZENE | 100-41-4 | 31000 | UG/M3 | D | 0.132 |
| XYLENE (M,P) | 1330-20-7 | 65000 | UG/M3 | D | 0.312 |
| STYRENE | 100-42-5 | 11000 | UG/M3 | U | 0.131 |
| XYLENE (O) | 95-47-6 | 15000 | UG/M3 | D | 0.160 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | 17000 | UG/M3 | U | 0.181 |
| 1,3-DICHLOROBENZENE | 541-73-1 | 15000 | UG/M3 | U | 0.179 |
| 1,4-DICHLOROBENZENE | 106-46-7 | 15000 | UG/M3 | U | 0.176 |
| 1,2-DICHLOROBENZENE | 95-50-1 | 15000 | UG/M3 | U | 0.162 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | 19000 | UG/M3 | U | 0.193 |

# Table 4-6
## 2004 Soil Vapor Results, Stafford Site

| Sample ID | | VP-WEST Deep Duplicate | | | |
|---|---|---|---|---|---|
| Depth | | 9.5-10' | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558694D1 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| HEXACHLOROBUTADIENE | 87-68-3 | 27000 | UG/M3 | U | 0.198 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 12000 | UG/M3 | U | 0.180 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 12000 | UG/M3 | U | 0.156 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | 17000 | UG/M3 | U | 0.147 |
| 1,2-DIBROMOETHANE | 106-93-4 | 19000 | UG/M3 | U | 0.170 |
| 1,3-BUTADIENE | 106-99-0 | 5500 | UG/M3 | U | 0.253 |
| CARBON DISULFIDE | 75-15-0 | 7800 | UG/M3 | U | 0.177 |
| ACETONE | 67-64-1 | 59000 | UG/M3 | U | 0.204 |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 47000 | UG/M3 | D | 0.162 |
| CYCLOHEXANE | 110-82-7 | 590000 | UG/M3 | D | 0.155 |
| DIBROMOCHLOROMETHANE | 124-48-1 | 21000 | UG/M3 | U | 0.142 |
| METHYL ETHYL KETONE | 78-93-3 | 7400 | UG/M3 | U | 0.135 |
| METHYL ISOBUTYL KETONE | 108-10-1 | 10000 | UG/M3 | U | 0.155 |
| BROMOFORM | 75-25-2 | 26000 | UG/M3 | U | 0.142 |
| BROMODICHLOROMETHANE | 75-27-4 | 17000 | UG/M3 | U | 0.152 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | 9900 | UG/M3 | U | 0.162 |
| 4-ETHYLTOLUENE | 622-96-8 | 12000 | UG/M3 | U | 0.111 |
| 3-CHLOROPROPENE | 107-05-1 | 7800 | UG/M3 | U | 0.163 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 890000 | UG/M3 | D | 0.160 |
| BROMOETHENE | 593-60-2 | 11000 | UG/M3 | U | 0.186 |
| 2-CHLOROTOLUENE | 95-49-8 | 13000 | UG/M3 | U | 0.160 |
| N-HEXANE | 110-54-3 | 670000 | UG/M3 | D | 0.233 |
| N-HEPTANE | 142-82-5 | 450000 | UG/M3 | D | 0.146 |
| TERT-BUTYL ALCOHOL | 75-65-0 | 76000 | UG/M3 | U | 0.218 |

# Table 4-6
## 2004 Soil Vapor Results, Stafford Site

| Sample ID | **VP-EAST Shallow** | | | | |
|---|---|---|---|---|---|
| Depth | 2.5-3' | | | | |
| Sample Date | 1/23/2004 | | | | |
| Laboratory ID | 558691 | | | | |
| Method | TO-15 | | | | |
| Analysis Date | 01/29/2004 | | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| TERT-BUTYL ALCOHOL | 75-65-0 | 30 | UG/M3 | U | 0.218 |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 2.8 | UG/M3 | | 0.184 |
| CHLOROMETHANE | 74-87-3 | 1.0 | UG/M3 | U | 0.179 |
| VINYL CHLORIDE | 75-01-4 | 1.3 | UG/M3 | U | 0.191 |
| BROMOMETHANE | 74-83-9 | 1.9 | UG/M3 | U | 0.232 |
| CHLOROETHANE | 75-00-3 | 1.3 | UG/M3 | U | 0.212 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | 2.8 | UG/M3 | U | 0.172 |
| FREON TF | 76-13-1 | 3.8 | UG/M3 | U | 0.159 |
| 1,1-DICHLOROETHENE | 75-35-4 | 2.0 | UG/M3 | U | 0.165 |
| METHYLENE CHLORIDE | 75-09-2 | 2.2 | UG/M3 | | 0.182 |
| 1,1-DICHLOROETHANE | 75-34-3 | 2.0 | UG/M3 | U | 0.167 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | 2.0 | UG/M3 | U | 0.119 |
| CHLOROFORM | 67-66-3 | 2.4 | UG/M3 | U | 0.184 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | 2.7 | UG/M3 | U | 0.167 |
| CARBON TETRACHLORIDE | 56-23-5 | 3.1 | UG/M3 | U | 0.168 |
| BENZENE | 71-43-2 | 1.6 | UG/M3 | U | 0.150 |
| 1,2-DICHLOROETHANE | 107-06-2 | 2.0 | UG/M3 | U | 0.155 |
| TRICHLOROETHENE | 79-01-6 | 2.7 | UG/M3 | U | 0.166 |
| 1,2-DICHLOROPROPANE | 78-87-5 | 2.3 | UG/M3 | U | 0.173 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | 2.3 | UG/M3 | U | 0.174 |
| TOLUENE | 108-88-3 | 3.2 | UG/M3 | | 0.171 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | 2.3 | UG/M3 | U | 0.167 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | 2.7 | UG/M3 | U | 0.181 |
| TETRACHLOROETHENE | 127-18-4 | 3.4 | UG/M3 | U | 0.173 |
| CHLOROBENZENE | 108-90-7 | 2.3 | UG/M3 | U | 0.151 |
| ETHYLBENZENE | 100-41-4 | 2.2 | UG/M3 | U | 0.132 |
| XYLENE (M,P) | 1330-20-7 | 6.5 | UG/M3 | | 0.312 |
| STYRENE | 100-42-5 | 2.1 | UG/M3 | U | 0.131 |
| XYLENE (O) | 95-47-6 | 2.2 | UG/M3 | U | 0.160 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | 3.4 | UG/M3 | U | 0.181 |
| 1,3-DICHLOROBENZENE | 541-73-1 | 3.0 | UG/M3 | U | 0.179 |
| 1,4-DICHLOROBENZENE | 106-46-7 | 3.0 | UG/M3 | U | 0.176 |
| 1,2-DICHLOROBENZENE | 95-50-1 | 3.0 | UG/M3 | U | 0.162 |

# Table 4-6
## 2004 Soil Vapor Results, Stafford Site

| Sample ID | VP-EAST Shallow | | | | |
|---|---|---|---|---|---|
| Depth | 2.5-3' | | | | |
| Sample Date | 1/23/2004 | | | | |
| Laboratory ID | 558691 | | | | |
| Method | TO-15 | | | | |
| Analysis Date | 01/29/2004 | | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | 3.7 | UG/M3 | U | 0.193 |
| HEXACHLOROBUTADIENE | 87-68-3 | 5.3 | UG/M3 | U | 0.198 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 2.5 | UG/M3 | U | 0.180 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 4.4 | UG/M3 | | 0.156 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | 3.5 | UG/M3 | U | 0.147 |
| 1,2-DIBROMOETHANE | 106-93-4 | 3.8 | UG/M3 | U | 0.170 |
| 1,3-BUTADIENE | 106-99-0 | 1.1 | UG/M3 | U | 0.253 |
| CARBON DISULFIDE | 75-15-0 | 1.6 | UG/M3 | U | 0.177 |
| ACETONE | 67-64-1 | 12 | UG/M3 | U | 0.204 |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 21 | UG/M3 | | 0.162 |
| CYCLOHEXANE | 110-82-7 | 6.9 | UG/M3 | | 0.155 |
| DIBROMOCHLOROMETHANE | 124-48-1 | 4.3 | UG/M3 | U | 0.142 |
| METHYL ETHYL KETONE | 78-93-3 | 1.5 | UG/M3 | U | 0.135 |
| METHYL ISOBUTYL KETONE | 108-10-1 | 2.0 | UG/M3 | U | 0.155 |
| BROMOFORM | 75-25-2 | 5.2 | UG/M3 | U | 0.142 |
| BROMODICHLOROMETHANE | 75-27-4 | 3.4 | UG/M3 | U | 0.152 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | 2.0 | UG/M3 | U | 0.162 |
| 4-ETHYLTOLUENE | 622-96-8 | 3.4 | UG/M3 | | 0.111 |
| 3-CHLOROPROPENE | 107-05-1 | 1.6 | UG/M3 | U | 0.163 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 2.3 | UG/M3 | U | 0.160 |
| BROMOETHENE | 593-60-2 | 2.2 | UG/M3 | U | 0.186 |
| 2-CHLOROTOLUENE | 95-49-8 | 2.6 | UG/M3 | U | 0.160 |
| N-HEXANE | 110-54-3 | 13 | UG/M3 | | 0.233 |
| N-HEPTANE | 142-82-5 | 4.1 | UG/M3 | | 0.146 |
| TERT-BUTYL ALCOHOL | 75-65-0 | 15 | UG/M3 | U | 0.218 |

# Table 4-6
## 2004 Soil Vapor Results, Stafford Site

| Sample ID | | VP-EAST Mid | | | |
|---|---|---|---|---|---|
| Depth | | 6-6.5' | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558692 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 3.2 | UG/M3 | | 0.184 |
| CHLOROMETHANE | 74-87-3 | 1.0 | UG/M3 | U | 0.179 |
| VINYL CHLORIDE | 75-01-4 | 1.3 | UG/M3 | U | 0.191 |
| BROMOMETHANE | 74-83-9 | 1.9 | UG/M3 | U | 0.232 |
| CHLOROETHANE | 75-00-3 | 1.3 | UG/M3 | U | 0.212 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | 2.8 | UG/M3 | U | 0.172 |
| FREON TF | 76-13-1 | 3.8 | UG/M3 | U | 0.159 |
| 1,1-DICHLOROETHENE | 75-35-4 | 2.0 | UG/M3 | U | 0.165 |
| METHYLENE CHLORIDE | 75-09-2 | 2.3 | UG/M3 | | 0.182 |
| 1,1-DICHLOROETHANE | 75-34-3 | 2.0 | UG/M3 | U | 0.167 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | 2.0 | UG/M3 | U | 0.119 |
| CHLOROFORM | 67-66-3 | 2.4 | UG/M3 | U | 0.184 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | 2.7 | UG/M3 | U | 0.167 |
| CARBON TETRACHLORIDE | 56-23-5 | 3.1 | UG/M3 | U | 0.168 |
| BENZENE | 71-43-2 | 1.6 | UG/M3 | U | 0.150 |
| 1,2-DICHLOROETHANE | 107-06-2 | 2.0 | UG/M3 | U | 0.155 |
| TRICHLOROETHENE | 79-01-6 | 2.7 | UG/M3 | U | 0.166 |
| 1,2-DICHLOROPROPANE | 78-87-5 | 2.3 | UG/M3 | U | 0.173 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | 2.3 | UG/M3 | U | 0.174 |
| TOLUENE | 108-88-3 | 2.2 | UG/M3 | | 0.171 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | 2.3 | UG/M3 | U | 0.167 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | 2.7 | UG/M3 | U | 0.181 |
| TETRACHLOROETHENE | 127-18-4 | 3.4 | UG/M3 | U | 0.173 |
| CHLOROBENZENE | 108-90-7 | 2.3 | UG/M3 | U | 0.151 |
| ETHYLBENZENE | 100-41-4 | 2.2 | UG/M3 | U | 0.132 |
| XYLENE (M,P) | 1330-20-7 | 4.0 | UG/M3 | | 0.312 |
| STYRENE | 100-42-5 | 2.1 | UG/M3 | U | 0.131 |
| XYLENE (O) | 95-47-6 | 2.2 | UG/M3 | U | 0.160 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | 3.4 | UG/M3 | U | 0.181 |
| 1,3-DICHLOROBENZENE | 541-73-1 | 3.0 | UG/M3 | U | 0.179 |
| 1,4-DICHLOROBENZENE | 106-46-7 | 3.0 | UG/M3 | U | 0.176 |
| 1,2-DICHLOROBENZENE | 95-50-1 | 3.0 | UG/M3 | U | 0.162 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | 3.7 | UG/M3 | U | 0.193 |

# Table 4-6
## 2004 Soil Vapor Results, Stafford Site

| Sample ID | | VP-EAST Mid | | | |
|---|---|---|---|---|---|
| Depth | | 6-6.5' | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558692 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| HEXACHLOROBUTADIENE | 87-68-3 | 5.3 | UG/M3 | U | 0.198 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 2.5 | UG/M3 | U | 0.180 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 2.5 | UG/M3 | U | 0.156 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | 3.5 | UG/M3 | U | 0.147 |
| 1,2-DIBROMOETHANE | 106-93-4 | 3.8 | UG/M3 | U | 0.170 |
| 1,3-BUTADIENE | 106-99-0 | 1.1 | UG/M3 | U | 0.253 |
| CARBON DISULFIDE | 75-15-0 | 1.6 | UG/M3 | U | 0.177 |
| ACETONE | 67-64-1 | 12 | UG/M3 | U | 0.204 |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 20 | UG/M3 | | 0.162 |
| CYCLOHEXANE | 110-82-7 | 1.7 | UG/M3 | U | 0.155 |
| DIBROMOCHLOROMETHANE | 124-48-1 | 4.3 | UG/M3 | U | 0.142 |
| METHYL ETHYL KETONE | 78-93-3 | 1.5 | UG/M3 | U | 0.135 |
| METHYL ISOBUTYL KETONE | 108-10-1 | 2.0 | UG/M3 | U | 0.155 |
| BROMOFORM | 75-25-2 | 5.2 | UG/M3 | U | 0.142 |
| BROMODICHLOROMETHANE | 75-27-4 | 3.4 | UG/M3 | U | 0.152 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | 2.0 | UG/M3 | U | 0.162 |
| 4-ETHYLTOLUENE | 622-96-8 | 2.5 | UG/M3 | U | 0.111 |
| 3-CHLOROPROPENE | 107-05-1 | 1.6 | UG/M3 | U | 0.163 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 2.3 | UG/M3 | U | 0.160 |
| BROMOETHENE | 593-60-2 | 2.2 | UG/M3 | U | 0.186 |
| 2-CHLOROTOLUENE | 95-49-8 | 2.6 | UG/M3 | U | 0.160 |
| N-HEXANE | 110-54-3 | 12 | UG/M3 | | 0.233 |
| N-HEPTANE | 142-82-5 | 2.5 | UG/M3 | | 0.146 |
| TERT-BUTYL ALCOHOL | 75-65-0 | 15 | UG/M3 | U | 0.218 |

**Table 4-6**
**2004 Soil Vapor Results, Stafford Site**

| Sample ID | | **VP-EAST Deep** | | | |
|---|---|---|---|---|---|
| Depth | | 9.5-10' | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558693 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 2.7 | UG/M3 | | 0.184 |
| CHLOROMETHANE | 74-87-3 | 1.0 | UG/M3 | U | 0.179 |
| VINYL CHLORIDE | 75-01-4 | 1.3 | UG/M3 | U | 0.191 |
| BROMOMETHANE | 74-83-9 | 1.9 | UG/M3 | U | 0.232 |
| CHLOROETHANE | 75-00-3 | 1.3 | UG/M3 | U | 0.212 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | 2.8 | UG/M3 | U | 0.172 |
| FREON TF | 76-13-1 | 3.8 | UG/M3 | U | 0.159 |
| 1,1-DICHLOROETHENE | 75-35-4 | 2.0 | UG/M3 | U | 0.165 |
| METHYLENE CHLORIDE | 75-09-2 | 2.7 | UG/M3 | | 0.182 |
| 1,1-DICHLOROETHANE | 75-34-3 | 2.0 | UG/M3 | U | 0.167 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | 2.0 | UG/M3 | U | 0.119 |
| CHLOROFORM | 67-66-3 | 2.4 | UG/M3 | U | 0.184 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | 2.7 | UG/M3 | U | 0.167 |
| CARBON TETRACHLORIDE | 56-23-5 | 3.1 | UG/M3 | U | 0.168 |
| BENZENE | 71-43-2 | 1.6 | UG/M3 | U | 0.150 |
| 1,2-DICHLOROETHANE | 107-06-2 | 2.0 | UG/M3 | U | 0.155 |
| TRICHLOROETHENE | 79-01-6 | 2.7 | UG/M3 | U | 0.166 |
| 1,2-DICHLOROPROPANE | 78-87-5 | 2.3 | UG/M3 | U | 0.173 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | 2.3 | UG/M3 | U | 0.174 |
| TOLUENE | 108-88-3 | 4.1 | UG/M3 | | 0.171 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | 2.3 | UG/M3 | U | 0.167 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | 2.7 | UG/M3 | U | 0.181 |
| TETRACHLOROETHENE | 127-18-4 | 3.4 | UG/M3 | U | 0.173 |
| CHLOROBENZENE | 108-90-7 | 2.3 | UG/M3 | U | 0.151 |
| ETHYLBENZENE | 100-41-4 | 2.2 | UG/M3 | | 0.132 |
| XYLENE (M,P) | 1330-20-7 | 10 | UG/M3 | | 0.312 |
| STYRENE | 100-42-5 | 2.1 | UG/M3 | U | 0.131 |
| XYLENE (O) | 95-47-6 | 3.6 | UG/M3 | | 0.160 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | 3.4 | UG/M3 | U | 0.181 |
| 1,3-DICHLOROBENZENE | 541-73-1 | 3.0 | UG/M3 | U | 0.179 |
| 1,4-DICHLOROBENZENE | 106-46-7 | 3.0 | UG/M3 | U | 0.176 |
| 1,2-DICHLOROBENZENE | 95-50-1 | 3.0 | UG/M3 | U | 0.162 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | 3.7 | UG/M3 | U | 0.193 |

# Table 4-6
## 2004 Soil Vapor Results, Stafford Site

| Sample ID | | VP-EAST Deep | | | |
|---|---|---|---|---|---|
| Depth | | 9.5-10' | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558693 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| HEXACHLOROBUTADIENE | 87-68-3 | 5.3 | UG/M3 | U | 0.198 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 2.5 | UG/M3 | U | 0.180 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 5.4 | UG/M3 | | 0.156 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | 3.5 | UG/M3 | U | 0.147 |
| 1,2-DIBROMOETHANE | 106-93-4 | 3.8 | UG/M3 | U | 0.170 |
| 1,3-BUTADIENE | 106-99-0 | 1.1 | UG/M3 | U | 0.253 |
| CARBON DISULFIDE | 75-15-0 | 1.6 | UG/M3 | U | 0.177 |
| ACETONE | 67-64-1 | 12 | UG/M3 | U | 0.204 |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 22 | UG/M3 | | 0.162 |
| CYCLOHEXANE | 110-82-7 | 18 | UG/M3 | | 0.155 |
| DIBROMOCHLOROMETHANE | 124-48-1 | 4.3 | UG/M3 | U | 0.142 |
| METHYL ETHYL KETONE | 78-93-3 | 1.5 | UG/M3 | U | 0.135 |
| METHYL ISOBUTYL KETONE | 108-10-1 | 2.0 | UG/M3 | U | 0.155 |
| BROMOFORM | 75-25-2 | 5.2 | UG/M3 | U | 0.142 |
| BROMODICHLOROMETHANE | 75-27-4 | 3.4 | UG/M3 | U | 0.152 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | 2.0 | UG/M3 | U | 0.162 |
| 4-ETHYLTOLUENE | 622-96-8 | 4.7 | UG/M3 | | 0.111 |
| 3-CHLOROPROPENE | 107-05-1 | 1.6 | UG/M3 | U | 0.163 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 2.3 | UG/M3 | U | 0.160 |
| BROMOETHENE | 593-60-2 | 2.2 | UG/M3 | U | 0.186 |
| 2-CHLOROTOLUENE | 95-49-8 | 2.6 | UG/M3 | U | 0.160 |
| N-HEXANE | 110-54-3 | 14 | UG/M3 | | 0.233 |
| N-HEPTANE | 142-82-5 | 13 | UG/M3 | | 0.146 |
| TERT-BUTYL ALCOHOL | 75-65-0 | 15 | UG/M3 | U | 0.218 |

**2004 Subslab and Indoor Air Testing Results, Stafford Site**

| Sample ID | | **73 Bay Subslab #1** | | | |
|---|---|---|---|---|---|
| Depth | | 0.1' | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558685 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 3.0 | UG/M3 | | 0.184 |
| CHLOROMETHANE | 74-87-3 | 1.2 | UG/M3 | | 0.179 |
| VINYL CHLORIDE | 75-01-4 | 1.3 | UG/M3 | U | 0.191 |
| BROMOMETHANE | 74-83-9 | 1.9 | UG/M3 | U | 0.232 |
| CHLOROETHANE | 75-00-3 | 1.3 | UG/M3 | U | 0.212 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | 2.8 | UG/M3 | U | 0.172 |
| FREON TF | 76-13-1 | 3.8 | UG/M3 | U | 0.159 |
| 1,1-DICHLOROETHENE | 75-35-4 | 2.0 | UG/M3 | U | 0.165 |
| METHYLENE CHLORIDE | 75-09-2 | 1.7 | UG/M3 | U | 0.182 |
| 1,1-DICHLOROETHANE | 75-34-3 | 2.0 | UG/M3 | U | 0.167 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | 2.0 | UG/M3 | U | 0.119 |
| CHLOROFORM | 67-66-3 | 2.4 | UG/M3 | U | 0.184 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | 2.7 | UG/M3 | U | 0.167 |
| CARBON TETRACHLORIDE | 56-23-5 | 3.1 | UG/M3 | U | 0.168 |
| BENZENE | 71-43-2 | 1.6 | UG/M3 | U | 0.150 |
| 1,2-DICHLOROETHANE | 107-06-2 | 2.0 | UG/M3 | U | 0.155 |
| TRICHLOROETHENE | 79-01-6 | 2.7 | UG/M3 | U | 0.166 |
| 1,2-DICHLOROPROPANE | 78-87-5 | 2.3 | UG/M3 | U | 0.173 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | 2.3 | UG/M3 | U | 0.174 |
| TOLUENE | 108-88-3 | 2.3 | UG/M3 | | 0.171 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | 2.3 | UG/M3 | U | 0.167 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | 2.7 | UG/M3 | U | 0.181 |
| TETRACHLOROETHENE | 127-18-4 | 3.4 | UG/M3 | U | 0.173 |
| CHLOROBENZENE | 108-90-7 | 2.3 | UG/M3 | U | 0.151 |
| ETHYLBENZENE | 100-41-4 | 2.2 | UG/M3 | U | 0.132 |
| XYLENE (M,P) | 1330-20-7 | 2.2 | UG/M3 | U | 0.312 |
| STYRENE | 100-42-5 | 2.1 | UG/M3 | U | 0.131 |
| XYLENE (O) | 95-47-6 | 2.2 | UG/M3 | U | 0.160 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | 3.4 | UG/M3 | U | 0.181 |
| 1,3-DICHLOROBENZENE | 541-73-1 | 3.0 | UG/M3 | U | 0.179 |
| 1,4-DICHLOROBENZENE | 106-46-7 | 3.0 | UG/M3 | U | 0.176 |
| 1,2-DICHLOROBENZENE | 95-50-1 | 3.0 | UG/M3 | U | 0.162 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | 3.7 | UG/M3 | U | 0.193 |

# Table 4-7
## 2004 Subslab and Indoor Air Testing Results, Stafford Site

| Sample ID | | 73 Bay Subslab #1 | | | |
|---|---|---|---|---|---|
| Depth | | 0.1' | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558685 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| HEXACHLOROBUTADIENE | 87-68-3 | 5.3 | UG/M3 | U | 0.198 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 2.5 | UG/M3 | U | 0.180 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 2.5 | UG/M3 | U | 0.156 |
| 1,2-DICHLOROTETRAFLUOROET | 76-14-2 | 3.5 | UG/M3 | U | 0.147 |
| 1,2-DIBROMOETHANE | 106-93-4 | 3.8 | UG/M3 | U | 0.170 |
| 1,3-BUTADIENE | 106-99-0 | 1.1 | UG/M3 | U | 0.253 |
| CARBON DISULFIDE | 75-15-0 | 1.6 | UG/M3 | U | 0.177 |
| ACETONE | 67-64-1 | 52 | UG/M3 | | 0.204 |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 1.8 | UG/M3 | U | 0.162 |
| CYCLOHEXANE | 110-82-7 | 29 | UG/M3 | | 0.155 |
| DIBROMOCHLOROMETHANE | 124-48-1 | 4.3 | UG/M3 | U | 0.142 |
| METHYL ETHYL KETONE | 78-93-3 | 1.5 | UG/M3 | U | 0.135 |
| METHYL ISOBUTYL KETONE | 108-10-1 | 2.0 | UG/M3 | U | 0.155 |
| BROMOFORM | 75-25-2 | 5.2 | UG/M3 | U | 0.142 |
| BROMODICHLOROMETHANE | 75-27-4 | 3.4 | UG/M3 | U | 0.152 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | 2.0 | UG/M3 | U | 0.162 |
| 4-ETHYLTOLUENE | 622-96-8 | 2.5 | UG/M3 | U | 0.111 |
| 3-CHLOROPROPENE | 107-05-1 | 1.6 | UG/M3 | U | 0.163 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 170 | UG/M3 | | 0.160 |
| BROMOETHENE | 593-60-2 | 2.2 | UG/M3 | U | 0.186 |
| 2-CHLOROTOLUENE | 95-49-8 | 2.6 | UG/M3 | U | 0.160 |
| N-HEXANE | 110-54-3 | 1.8 | UG/M3 | U | 0.233 |
| N-HEPTANE | 142-82-5 | 2.0 | UG/M3 | U | 0.146 |
| TERT-BUTYL ALCOHOL | 75-65-0 | 15 | UG/M3 | U | 0.218 |

U - compound not detected at the indicated concentration J = Data indicates the presence of compound that meets the identification criteria. The result is less than the quantification limit but greater than zero. The concentration is approximate E = Exceeds calibration range. D = compound identified at secondary dilution factor

# Table 4-7
## 2004 Subslab and Indoor Air Testing Results, Stafford Site

| Sample ID | | 73 Bay Subslab #2 | | | |
|---|---|---|---|---|---|
| Depth | | 0.1' | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558686 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 3.0 | UG/M3 | | 0.184 |
| CHLOROMETHANE | 74-87-3 | 1.5 | UG/M3 | | 0.179 |
| VINYL CHLORIDE | 75-01-4 | 1.3 | UG/M3 | U | 0.191 |
| BROMOMETHANE | 74-83-9 | 1.9 | UG/M3 | U | 0.232 |
| CHLOROETHANE | 75-00-3 | 1.3 | UG/M3 | U | 0.212 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | 2.8 | UG/M3 | U | 0.172 |
| FREON TF | 76-13-1 | 3.8 | UG/M3 | U | 0.159 |
| 1,1-DICHLOROETHENE | 75-35-4 | 2.0 | UG/M3 | U | 0.165 |
| METHYLENE CHLORIDE | 75-09-2 | 1.7 | UG/M3 | U | 0.182 |
| 1,1-DICHLOROETHANE | 75-34-3 | 2.0 | UG/M3 | U | 0.167 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | 2.0 | UG/M3 | U | 0.119 |
| CHLOROFORM | 67-66-3 | 2.4 | UG/M3 | U | 0.184 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | 2.7 | UG/M3 | U | 0.167 |
| CARBON TETRACHLORIDE | 56-23-5 | 3.1 | UG/M3 | U | 0.168 |
| BENZENE | 71-43-2 | 1.6 | UG/M3 | U | 0.150 |
| 1,2-DICHLOROETHANE | 107-06-2 | 2.0 | UG/M3 | U | 0.155 |
| TRICHLOROETHENE | 79-01-6 | 2.7 | UG/M3 | U | 0.166 |
| 1,2-DICHLOROPROPANE | 78-87-5 | 2.3 | UG/M3 | U | 0.173 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | 2.3 | UG/M3 | U | 0.174 |
| TOLUENE | 108-88-3 | 2.1 | UG/M3 | | 0.171 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | 2.3 | UG/M3 | U | 0.167 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | 2.7 | UG/M3 | U | 0.181 |
| TETRACHLOROETHENE | 127-18-4 | 3.4 | UG/M3 | U | 0.173 |
| CHLOROBENZENE | 108-90-7 | 2.3 | UG/M3 | U | 0.151 |
| ETHYLBENZENE | 100-41-4 | 2.2 | UG/M3 | U | 0.132 |
| XYLENE (M,P) | 1330-20-7 | 2.2 | UG/M3 | U | 0.312 |
| STYRENE | 100-42-5 | 2.1 | UG/M3 | U | 0.131 |
| XYLENE (O) | 95-47-6 | 2.2 | UG/M3 | U | 0.160 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | 3.4 | UG/M3 | U | 0.181 |
| 1,3-DICHLOROBENZENE | 541-73-1 | 3.0 | UG/M3 | U | 0.179 |
| 1,4-DICHLOROBENZENE | 106-46-7 | 3.0 | UG/M3 | U | 0.176 |
| 1,2-DICHLOROBENZENE | 95-50-1 | 3.0 | UG/M3 | U | 0.162 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | 3.7 | UG/M3 | U | 0.193 |

# 2004 Subslab and Indoor Air Testing Results, Stafford Site

| Sample ID | | **73 Bay Subslab #2** | | | |
|---|---|---|---|---|---|
| Depth | | 0.1' | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558686 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| HEXACHLOROBUTADIENE | 87-68-3 | 5.3 | UG/M3 | U | 0.198 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 2.5 | UG/M3 | U | 0.180 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 2.5 | UG/M3 | U | 0.156 |
| 1,2-DICHLOROTETRAFLUOROETH | 76-14-2 | 3.5 | UG/M3 | U | 0.147 |
| 1,2-DIBROMOETHANE | 106-93-4 | 3.8 | UG/M3 | U | 0.170 |
| 1,3-BUTADIENE | 106-99-0 | 1.1 | UG/M3 | U | 0.253 |
| CARBON DISULFIDE | 75-15-0 | 1.6 | UG/M3 | U | 0.177 |
| ACETONE | 67-64-1 | 29 | UG/M3 | | 0.204 |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 1.8 | UG/M3 | U | 0.162 |
| CYCLOHEXANE | 110-82-7 | 41 | UG/M3 | | 0.155 |
| DIBROMOCHLOROMETHANE | 124-48-1 | 4.3 | UG/M3 | U | 0.142 |
| METHYL ETHYL KETONE | 78-93-3 | 1.5 | UG/M3 | U | 0.135 |
| METHYL ISOBUTYL KETONE | 108-10-1 | 2.0 | UG/M3 | U | 0.155 |
| BROMOFORM | 75-25-2 | 5.2 | UG/M3 | U | 0.142 |
| BROMODICHLOROMETHANE | 75-27-4 | 3.4 | UG/M3 | U | 0.152 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | 2.0 | UG/M3 | U | 0.162 |
| 4-ETHYLTOLUENE | 622-96-8 | 2.5 | UG/M3 | U | 0.111 |
| 3-CHLOROPROPENE | 107-05-1 | 1.6 | UG/M3 | U | 0.163 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 240 | UG/M3 | E | 0.160 |
| BROMOETHENE | 593-60-2 | 2.2 | UG/M3 | U | 0.186 |
| 2-CHLOROTOLUENE | 95-49-8 | 2.6 | UG/M3 | U | 0.160 |
| N-HEXANE | 110-54-3 | 1.8 | UG/M3 | U | 0.233 |
| N-HEPTANE | 142-82-5 | 2.0 | UG/M3 | U | 0.146 |
| TERT-BUTYL ALCOHOL | 75-65-0 | 15 | UG/M3 | U | 0.218 |

## 2004 Subslab and Indoor Air Testing Results, Stafford Site

| Sample ID | | 73 Bay Subslab #2 dilution | | | |
|---|---|---|---|---|---|
| Depth | | 0.1' | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558686D1 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 4.9 | UG/M3 | U | 0.184 |
| CHLOROMETHANE | 74-87-3 | 2.1 | UG/M3 | U | 0.179 |
| VINYL CHLORIDE | 75-01-4 | 2.6 | UG/M3 | U | 0.191 |
| BROMOMETHANE | 74-83-9 | 3.9 | UG/M3 | U | 0.232 |
| CHLOROETHANE | 75-00-3 | 2.6 | UG/M3 | U | 0.212 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | 5.6 | UG/M3 | U | 0.172 |
| FREON TF | 76-13-1 | 7.7 | UG/M3 | U | 0.159 |
| 1,1-DICHLOROETHENE | 75-35-4 | 4.0 | UG/M3 | U | 0.165 |
| METHYLENE CHLORIDE | 75-09-2 | 3.5 | UG/M3 | U | 0.182 |
| 1,1-DICHLOROETHANE | 75-34-3 | 4.0 | UG/M3 | U | 0.167 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | 4.0 | UG/M3 | U | 0.119 |
| CHLOROFORM | 67-66-3 | 4.9 | UG/M3 | U | 0.184 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | 5.5 | UG/M3 | U | 0.167 |
| CARBON TETRACHLORIDE | 56-23-5 | 6.3 | UG/M3 | U | 0.168 |
| BENZENE | 71-43-2 | 3.2 | UG/M3 | U | 0.150 |
| 1,2-DICHLOROETHANE | 107-06-2 | 4.0 | UG/M3 | U | 0.155 |
| TRICHLOROETHENE | 79-01-6 | 5.4 | UG/M3 | U | 0.166 |
| 1,2-DICHLOROPROPANE | 78-87-5 | 4.6 | UG/M3 | U | 0.173 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | 4.5 | UG/M3 | U | 0.174 |
| TOLUENE | 108-88-3 | 3.8 | UG/M3 | U | 0.171 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | 4.5 | UG/M3 | U | 0.167 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | 5.5 | UG/M3 | U | 0.181 |
| TETRACHLOROETHENE | 127-18-4 | 6.8 | UG/M3 | U | 0.173 |
| CHLOROBENZENE | 108-90-7 | 4.6 | UG/M3 | U | 0.151 |
| ETHYLBENZENE | 100-41-4 | 4.3 | UG/M3 | U | 0.132 |
| XYLENE (M,P) | 1330-20-7 | 4.3 | UG/M3 | U | 0.312 |
| STYRENE | 100-42-5 | 4.3 | UG/M3 | U | 0.131 |
| XYLENE (O) | 95-47-6 | 4.3 | UG/M3 | U | 0.160 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | 6.9 | UG/M3 | U | 0.181 |
| 1,3-DICHLOROBENZENE | 541-73-1 | 6.0 | UG/M3 | U | 0.179 |
| 1,4-DICHLOROBENZENE | 106-46-7 | 6.0 | UG/M3 | U | 0.176 |
| 1,2-DICHLOROBENZENE | 95-50-1 | 6.0 | UG/M3 | U | 0.162 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | 7.4 | UG/M3 | U | 0.193 |

**Table 4-7**
**2004 Subslab and Indoor Air Testing Results, Stafford Site**

| Sample ID | | **73 Bay Subslab #2 dilution** | | | |
|---|---|---|---|---|---|
| Depth | | 0.1' | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558686D1 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| HEXACHLOROBUTADIENE | 87-68-3 | 11 | UG/M3 | U | 0.198 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 4.9 | UG/M3 | U | 0.180 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 4.9 | UG/M3 | U | 0.156 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | 7.0 | UG/M3 | U | 0.147 |
| 1,2-DIBROMOETHANE | 106-93-4 | 7.7 | UG/M3 | U | 0.170 |
| 1,3-BUTADIENE | 106-99-0 | 2.2 | UG/M3 | U | 0.253 |
| CARBON DISULFIDE | 75-15-0 | 3.1 | UG/M3 | U | 0.177 |
| ACETONE | 67-64-1 | 29 | UG/M3 | D | 0.204 |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 3.6 | UG/M3 | U | 0.162 |
| CYCLOHEXANE | 110-82-7 | 48 | UG/M3 | D | 0.155 |
| DIBROMOCHLOROMETHANE | 124-48-1 | 8.5 | UG/M3 | U | 0.142 |
| METHYL ETHYL KETONE | 78-93-3 | 2.9 | UG/M3 | U | 0.135 |
| METHYL ISOBUTYL KETONE | 108-10-1 | 4.1 | UG/M3 | U | 0.155 |
| BROMOFORM | 75-25-2 | 10 | UG/M3 | U | 0.142 |
| BROMODICHLOROMETHANE | 75-27-4 | 6.7 | UG/M3 | U | 0.152 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | 4.0 | UG/M3 | U | 0.162 |
| 4-ETHYLTOLUENE | 622-96-8 | 4.9 | UG/M3 | U | 0.111 |
| 3-CHLOROPROPENE | 107-05-1 | 3.1 | UG/M3 | U | 0.163 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 250 | UG/M3 | D | 0.160 |
| BROMOETHENE | 593-60-2 | 4.4 | UG/M3 | U | 0.186 |
| 2-CHLOROTOLUENE | 95-49-8 | 5.2 | UG/M3 | U | 0.160 |
| N-HEXANE | 110-54-3 | 3.5 | UG/M3 | U | 0.233 |
| N-HEPTANE | 142-82-5 | 4.1 | UG/M3 | U | 0.146 |
| TERT-BUTYL ALCOHOL | 75-65-0 | 30 | UG/M3 | U | 0.218 |

## 2004 Subslab and Indoor Air Testing Results, Stafford Site

| Sample ID | | **73 Bay Subslab #3** | | | |
|---|---|---|---|---|---|
| Depth | | 0.1' | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558688 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 49 | UG/M3 | U | 0.184 |
| CHLOROMETHANE | 74-87-3 | 21 | UG/M3 | U | 0.179 |
| VINYL CHLORIDE | 75-01-4 | 26 | UG/M3 | U | 0.191 |
| BROMOMETHANE | 74-83-9 | 39 | UG/M3 | U | 0.232 |
| CHLOROETHANE | 75-00-3 | 26 | UG/M3 | U | 0.212 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | 56 | UG/M3 | U | 0.172 |
| FREON TF | 76-13-1 | 77 | UG/M3 | U | 0.159 |
| 1,1-DICHLOROETHENE | 75-35-4 | 40 | UG/M3 | U | 0.165 |
| METHYLENE CHLORIDE | 75-09-2 | 35 | UG/M3 | U | 0.182 |
| 1,1-DICHLOROETHANE | 75-34-3 | 40 | UG/M3 | U | 0.167 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | 40 | UG/M3 | U | 0.119 |
| CHLOROFORM | 67-66-3 | 49 | UG/M3 | U | 0.184 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | 55 | UG/M3 | U | 0.167 |
| CARBON TETRACHLORIDE | 56-23-5 | 63 | UG/M3 | U | 0.168 |
| BENZENE | 71-43-2 | 32 | UG/M3 | U | 0.150 |
| 1,2-DICHLOROETHANE | 107-06-2 | 40 | UG/M3 | U | 0.155 |
| TRICHLOROETHENE | 79-01-6 | 54 | UG/M3 | U | 0.166 |
| 1,2-DICHLOROPROPANE | 78-87-5 | 46 | UG/M3 | U | 0.173 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | 45 | UG/M3 | U | 0.174 |
| TOLUENE | 108-88-3 | 38 | UG/M3 | U | 0.171 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | 45 | UG/M3 | U | 0.167 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | 55 | UG/M3 | U | 0.181 |
| TETRACHLOROETHENE | 127-18-4 | 68 | UG/M3 | U | 0.173 |
| CHLOROBENZENE | 108-90-7 | 46 | UG/M3 | U | 0.151 |
| ETHYLBENZENE | 100-41-4 | 43 | UG/M3 | U | 0.132 |
| XYLENE (M,P) | 1330-20-7 | 43 | UG/M3 | U | 0.312 |
| STYRENE | 100-42-5 | 43 | UG/M3 | U | 0.131 |
| XYLENE (O) | 95-47-6 | 43 | UG/M3 | U | 0.160 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | 69 | UG/M3 | U | 0.181 |
| 1,3-DICHLOROBENZENE | 541-73-1 | 60 | UG/M3 | U | 0.179 |
| 1,4-DICHLOROBENZENE | 106-46-7 | 60 | UG/M3 | U | 0.176 |
| 1,2-DICHLOROBENZENE | 95-50-1 | 60 | UG/M3 | U | 0.162 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | 74 | UG/M3 | U | 0.193 |

## 2004 Subslab and Indoor Air Testing Results, Stafford Site

| Sample ID | | **73 Bay Subslab #3** | | | |
|---|---|---|---|---|---|
| Depth | | 0.1' | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558688 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| HEXACHLOROBUTADIENE | 87-68-3 | 110 | UG/M3 | U | 0.198 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 49 | UG/M3 | U | 0.180 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 49 | UG/M3 | U | 0.156 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | 70 | UG/M3 | U | 0.147 |
| 1,2-DIBROMOETHANE | 106-93-4 | 77 | UG/M3 | U | 0.170 |
| 1,3-BUTADIENE | 106-99-0 | 22 | UG/M3 | U | 0.253 |
| CARBON DISULFIDE | 75-15-0 | 31 | UG/M3 | U | 0.177 |
| ACETONE | 67-64-1 | 240 | UG/M3 | U | 0.204 |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 36 | UG/M3 | U | 0.162 |
| CYCLOHEXANE | 110-82-7 | 1800 | UG/M3 | | 0.155 |
| DIBROMOCHLOROMETHANE | 124-48-1 | 85 | UG/M3 | U | 0.142 |
| METHYL ETHYL KETONE | 78-93-3 | 29 | UG/M3 | U | 0.135 |
| METHYL ISOBUTYL KETONE | 108-10-1 | 41 | UG/M3 | U | 0.155 |
| BROMOFORM | 75-25-2 | 100 | UG/M3 | U | 0.142 |
| BROMODICHLOROMETHANE | 75-27-4 | 67 | UG/M3 | U | 0.152 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | 40 | UG/M3 | U | 0.162 |
| 4-ETHYLTOLUENE | 622-96-8 | 49 | UG/M3 | U | 0.111 |
| 3-CHLOROPROPENE | 107-05-1 | 31 | UG/M3 | U | 0.163 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 8400 | UG/M3 | E | 0.160 |
| BROMOETHENE | 593-60-2 | 44 | UG/M3 | U | 0.186 |
| 2-CHLOROTOLUENE | 95-49-8 | 52 | UG/M3 | U | 0.160 |
| N-HEXANE | 110-54-3 | 35 | UG/M3 | U | 0.233 |
| N-HEPTANE | 142-82-5 | 41 | UG/M3 | U | 0.146 |
| TERT-BUTYL ALCOHOL | 75-65-0 | 2100 | UG/M3 | | 0.218 |

**2004 Subslab and Indoor Air Testing Results, Stafford Site**

| Sample ID | | 73 Bay Subslab #3 Dilution | | | |
|---|---|---|---|---|---|
| Depth | | 0.1' | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558688D1 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 200 | UG/M3 | U | 0.184 |
| CHLOROMETHANE | 74-87-3 | 83 | UG/M3 | U | 0.179 |
| VINYL CHLORIDE | 75-01-4 | 100 | UG/M3 | U | 0.191 |
| BROMOMETHANE | 74-83-9 | 160 | UG/M3 | U | 0.232 |
| CHLOROETHANE | 75-00-3 | 110 | UG/M3 | U | 0.212 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | 220 | UG/M3 | U | 0.172 |
| FREON TF | 76-13-1 | 310 | UG/M3 | U | 0.159 |
| 1,1-DICHLOROETHENE | 75-35-4 | 160 | UG/M3 | U | 0.165 |
| METHYLENE CHLORIDE | 75-09-2 | 140 | UG/M3 | U | 0.182 |
| 1,1-DICHLOROETHANE | 75-34-3 | 160 | UG/M3 | U | 0.167 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | 160 | UG/M3 | U | 0.119 |
| CHLOROFORM | 67-66-3 | 200 | UG/M3 | U | 0.184 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | 220 | UG/M3 | U | 0.167 |
| CARBON TETRACHLORIDE | 56-23-5 | 250 | UG/M3 | U | 0.168 |
| BENZENE | 71-43-2 | 130 | UG/M3 | U | 0.150 |
| 1,2-DICHLOROETHANE | 107-06-2 | 160 | UG/M3 | U | 0.155 |
| TRICHLOROETHENE | 79-01-6 | 210 | UG/M3 | U | 0.166 |
| 1,2-DICHLOROPROPANE | 78-87-5 | 180 | UG/M3 | U | 0.173 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | 180 | UG/M3 | U | 0.174 |
| TOLUENE | 108-88-3 | 150 | UG/M3 | U | 0.171 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | 180 | UG/M3 | U | 0.167 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | 220 | UG/M3 | U | 0.181 |
| TETRACHLOROETHENE | 127-18-4 | 270 | UG/M3 | U | 0.173 |
| CHLOROBENZENE | 108-90-7 | 180 | UG/M3 | U | 0.151 |
| ETHYLBENZENE | 100-41-4 | 170 | UG/M3 | U | 0.132 |
| XYLENE (M,P) | 1330-20-7 | 170 | UG/M3 | U | 0.312 |
| STYRENE | 100-42-5 | 170 | UG/M3 | U | 0.131 |
| XYLENE (O) | 95-47-6 | 170 | UG/M3 | U | 0.160 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | 270 | UG/M3 | U | 0.181 |
| 1,3-DICHLOROBENZENE | 541-73-1 | 240 | UG/M3 | U | 0.179 |
| 1,4-DICHLOROBENZENE | 106-46-7 | 240 | UG/M3 | U | 0.176 |
| 1,2-DICHLOROBENZENE | 95-50-1 | 240 | UG/M3 | U | 0.162 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | 300 | UG/M3 | U | 0.193 |

# Table 4-7
## 2004 Subslab and Indoor Air Testing Results, Stafford Site

| Sample ID | | 73 Bay Subslab #3 Dilution | | | |
|---|---|---|---|---|---|
| Depth | | 0.1' | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558688D1 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| HEXACHLOROBUTADIENE | 87-68-3 | 430 | UG/M3 | U | 0.198 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 200 | UG/M3 | U | 0.180 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 200 | UG/M3 | U | 0.156 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | 280 | UG/M3 | U | 0.147 |
| 1,2-DIBROMOETHANE | 106-93-4 | 310 | UG/M3 | U | 0.170 |
| 1,3-BUTADIENE | 106-99-0 | 88 | UG/M3 | U | 0.253 |
| CARBON DISULFIDE | 75-15-0 | 120 | UG/M3 | U | 0.177 |
| ACETONE | 67-64-1 | 950 | UG/M3 | U | 0.204 |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 140 | UG/M3 | U | 0.162 |
| CYCLOHEXANE | 110-82-7 | 1300 | UG/M3 | D | 0.155 |
| DIBROMOCHLOROMETHANE | 124-48-1 | 340 | UG/M3 | U | 0.142 |
| METHYL ETHYL KETONE | 78-93-3 | 120 | UG/M3 | U | 0.135 |
| METHYL ISOBUTYL KETONE | 108-10-1 | 160 | UG/M3 | U | 0.155 |
| BROMOFORM | 75-25-2 | 410 | UG/M3 | U | 0.142 |
| BROMODICHLOROMETHANE | 75-27-4 | 270 | UG/M3 | U | 0.152 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | 160 | UG/M3 | U | 0.162 |
| 4-ETHYLTOLUENE | 622-96-8 | 200 | UG/M3 | U | 0.111 |
| 3-CHLOROPROPENE | 107-05-1 | 130 | UG/M3 | U | 0.163 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 7500 | UG/M3 | D | 0.160 |
| BROMOETHENE | 593-60-2 | 170 | UG/M3 | U | 0.186 |
| 2-CHLOROTOLUENE | 95-49-8 | 210 | UG/M3 | U | 0.160 |
| N-HEXANE | 110-54-3 | 140 | UG/M3 | U | 0.233 |
| N-HEPTANE | 142-82-5 | 160 | UG/M3 | U | 0.146 |
| TERT-BUTYL ALCOHOL | 75-65-0 | 1200 | UG/M3 | U | 0.218 |

# Table 4-7
## 2004 Subslab and Indoor Air Testing Results, Stafford Site

| Sample ID | | 73 Bay Basement | | | |
|---|---|---|---|---|---|
| Depth | | N/A | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558687 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 3.2 | UG/M3 | | 0.184 |
| CHLOROMETHANE | 74-87-3 | 1.7 | UG/M3 | | 0.179 |
| VINYL CHLORIDE | 75-01-4 | 1.3 | UG/M3 | U | 0.191 |
| BROMOMETHANE | 74-83-9 | 1.9 | UG/M3 | U | 0.232 |
| CHLOROETHANE | 75-00-3 | 1.3 | UG/M3 | U | 0.212 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | 2.8 | UG/M3 | U | 0.172 |
| FREON TF | 76-13-1 | 3.8 | UG/M3 | U | 0.159 |
| 1,1-DICHLOROETHENE | 75-35-4 | 2.0 | UG/M3 | U | 0.165 |
| METHYLENE CHLORIDE | 75-09-2 | 1.7 | UG/M3 | U | 0.182 |
| 1,1-DICHLOROETHANE | 75-34-3 | 2.0 | UG/M3 | U | 0.167 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | 2.0 | UG/M3 | U | 0.119 |
| CHLOROFORM | 67-66-3 | 2.4 | UG/M3 | U | 0.184 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | 2.7 | UG/M3 | U | 0.167 |
| CARBON TETRACHLORIDE | 56-23-5 | 3.1 | UG/M3 | U | 0.168 |
| BENZENE | 71-43-2 | 1.6 | UG/M3 | U | 0.150 |
| 1,2-DICHLOROETHANE | 107-06-2 | 2.0 | UG/M3 | U | 0.155 |
| TRICHLOROETHENE | 79-01-6 | 2.7 | UG/M3 | U | 0.166 |
| 1,2-DICHLOROPROPANE | 78-87-5 | 2.3 | UG/M3 | U | 0.173 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | 2.3 | UG/M3 | U | 0.174 |
| TOLUENE | 108-88-3 | 1.9 | UG/M3 | | 0.171 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | 2.3 | UG/M3 | U | 0.167 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | 2.7 | UG/M3 | U | 0.181 |
| TETRACHLOROETHENE | 127-18-4 | 3.4 | UG/M3 | U | 0.173 |
| CHLOROBENZENE | 108-90-7 | 2.3 | UG/M3 | U | 0.151 |
| ETHYLBENZENE | 100-41-4 | 2.2 | UG/M3 | U | 0.132 |
| XYLENE (M,P) | 1330-20-7 | 2.2 | UG/M3 | U | 0.312 |
| STYRENE | 100-42-5 | 2.1 | UG/M3 | U | 0.131 |
| XYLENE (O) | 95-47-6 | 2.2 | UG/M3 | U | 0.160 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | 3.4 | UG/M3 | U | 0.181 |
| 1,3-DICHLOROBENZENE | 541-73-1 | 3.0 | UG/M3 | U | 0.179 |
| 1,4-DICHLOROBENZENE | 106-46-7 | 3.0 | UG/M3 | U | 0.176 |
| 1,2-DICHLOROBENZENE | 95-50-1 | 3.0 | UG/M3 | U | 0.162 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | 3.7 | UG/M3 | U | 0.193 |

**2004 Subslab and Indoor Air Testing Results, Stafford Site**

| Sample ID | | **73 Bay Basement** | | | |
|---|---|---|---|---|---|
| Depth | | N/A | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558687 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| HEXACHLOROBUTADIENE | 87-68-3 | 5.3 | UG/M3 | U | 0.198 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 2.5 | UG/M3 | U | 0.180 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 2.5 | UG/M3 | U | 0.156 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | 3.5 | UG/M3 | U | 0.147 |
| 1,2-DIBROMOETHANE | 106-93-4 | 3.8 | UG/M3 | U | 0.170 |
| 1,3-BUTADIENE | 106-99-0 | 1.1 | UG/M3 | U | 0.253 |
| CARBON DISULFIDE | 75-15-0 | 1.6 | UG/M3 | U | 0.177 |
| ACETONE | 67-64-1 | 13 | UG/M3 | | 0.204 |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 1.8 | UG/M3 | U | 0.162 |
| CYCLOHEXANE | 110-82-7 | 41 | UG/M3 | | 0.155 |
| DIBROMOCHLOROMETHANE | 124-48-1 | 4.3 | UG/M3 | U | 0.142 |
| METHYL ETHYL KETONE | 78-93-3 | 1.5 | UG/M3 | U | 0.135 |
| METHYL ISOBUTYL KETONE | 108-10-1 | 2.0 | UG/M3 | U | 0.155 |
| BROMOFORM | 75-25-2 | 5.2 | UG/M3 | U | 0.142 |
| BROMODICHLOROMETHANE | 75-27-4 | 3.4 | UG/M3 | U | 0.152 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | 2.0 | UG/M3 | U | 0.162 |
| 4-ETHYLTOLUENE | 622-96-8 | 2.5 | UG/M3 | U | 0.111 |
| 3-CHLOROPROPENE | 107-05-1 | 1.6 | UG/M3 | U | 0.163 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 310 | UG/M3 | E | 0.160 |
| BROMOETHENE | 593-60-2 | 2.2 | UG/M3 | U | 0.186 |
| 2-CHLOROTOLUENE | 95-49-8 | 2.6 | UG/M3 | U | 0.160 |
| N-HEXANE | 110-54-3 | 1.8 | UG/M3 | U | 0.233 |
| N-HEPTANE | 142-82-5 | 2.0 | UG/M3 | U | 0.146 |
| TERT-BUTYL ALCOHOL | 75-65-0 | 15 | UG/M3 | U | 0.218 |

## 2004 Subslab and Indoor Air Testing Results, Stafford Site

| Sample ID | | 73 Bay Basement Dilution | | | |
|---|---|---|---|---|---|
| Depth | | N/A | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558687D1 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 4.9 | UG/M3 | U | 0.184 |
| CHLOROMETHANE | 74-87-3 | 2.1 | UG/M3 | U | 0.179 |
| VINYL CHLORIDE | 75-01-4 | 2.6 | UG/M3 | U | 0.191 |
| BROMOMETHANE | 74-83-9 | 3.9 | UG/M3 | U | 0.232 |
| CHLOROETHANE | 75-00-3 | 2.6 | UG/M3 | U | 0.212 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | 5.6 | UG/M3 | U | 0.172 |
| FREON TF | 76-13-1 | 7.7 | UG/M3 | U | 0.159 |
| 1,1-DICHLOROETHENE | 75-35-4 | 4.0 | UG/M3 | U | 0.165 |
| METHYLENE CHLORIDE | 75-09-2 | 3.5 | UG/M3 | U | 0.182 |
| 1,1-DICHLOROETHANE | 75-34-3 | 4.0 | UG/M3 | U | 0.167 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | 4.0 | UG/M3 | U | 0.119 |
| CHLOROFORM | 67-66-3 | 4.9 | UG/M3 | U | 0.184 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | 5.5 | UG/M3 | U | 0.167 |
| CARBON TETRACHLORIDE | 56-23-5 | 6.3 | UG/M3 | U | 0.168 |
| BENZENE | 71-43-2 | 3.2 | UG/M3 | U | 0.150 |
| 1,2-DICHLOROETHANE | 107-06-2 | 4.0 | UG/M3 | U | 0.155 |
| TRICHLOROETHENE | 79-01-6 | 5.4 | UG/M3 | U | 0.166 |
| 1,2-DICHLOROPROPANE | 78-87-5 | 4.6 | UG/M3 | U | 0.173 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | 4.5 | UG/M3 | U | 0.174 |
| TOLUENE | 108-88-3 | 3.8 | UG/M3 | U | 0.171 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | 4.5 | UG/M3 | U | 0.167 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | 5.5 | UG/M3 | U | 0.181 |
| TETRACHLOROETHENE | 127-18-4 | 6.8 | UG/M3 | U | 0.173 |
| CHLOROBENZENE | 108-90-7 | 4.6 | UG/M3 | U | 0.151 |
| ETHYLBENZENE | 100-41-4 | 4.3 | UG/M3 | U | 0.132 |
| XYLENE (M,P) | 1330-20-7 | 4.3 | UG/M3 | U | 0.312 |
| STYRENE | 100-42-5 | 4.3 | UG/M3 | U | 0.131 |
| XYLENE (O) | 95-47-6 | 4.3 | UG/M3 | U | 0.160 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | 6.9 | UG/M3 | U | 0.181 |
| 1,3-DICHLOROBENZENE | 541-73-1 | 6.0 | UG/M3 | U | 0.179 |
| 1,4-DICHLOROBENZENE | 106-46-7 | 6.0 | UG/M3 | U | 0.176 |
| 1,2-DICHLOROBENZENE | 95-50-1 | 6.0 | UG/M3 | U | 0.162 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | 7.4 | UG/M3 | U | 0.193 |

## 2004 Subslab and Indoor Air Testing Results, Stafford Site

| Sample ID | | 73 Bay Basement Dilution | | | |
|---|---|---|---|---|---|
| Depth | | N/A | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558687D1 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| HEXACHLOROBUTADIENE | 87-68-3 | 11 | UG/M3 | U | 0.198 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 4.9 | UG/M3 | U | 0.180 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 4.9 | UG/M3 | U | 0.156 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | 7.0 | UG/M3 | U | 0.147 |
| 1,2-DIBROMOETHANE | 106-93-4 | 7.7 | UG/M3 | U | 0.170 |
| 1,3-BUTADIENE | 106-99-0 | 2.2 | UG/M3 | U | 0.253 |
| CARBON DISULFIDE | 75-15-0 | 3.1 | UG/M3 | U | 0.177 |
| ACETONE | 67-64-1 | 24 | UG/M3 | U | 0.204 |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 3.6 | UG/M3 | U | 0.162 |
| CYCLOHEXANE | 110-82-7 | 45 | UG/M3 | D | 0.155 |
| DIBROMOCHLOROMETHANE | 124-48-1 | 8.5 | UG/M3 | U | 0.142 |
| METHYL ETHYL KETONE | 78-93-3 | 2.9 | UG/M3 | U | 0.135 |
| METHYL ISOBUTYL KETONE | 108-10-1 | 4.1 | UG/M3 | U | 0.155 |
| BROMOFORM | 75-25-2 | 10 | UG/M3 | U | 0.142 |
| BROMODICHLOROMETHANE | 75-27-4 | 6.7 | UG/M3 | U | 0.152 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | 4.0 | UG/M3 | U | 0.162 |
| 4-ETHYLTOLUENE | 622-96-8 | 4.9 | UG/M3 | U | 0.111 |
| 3-CHLOROPROPENE | 107-05-1 | 3.1 | UG/M3 | U | 0.163 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 300 | UG/M3 | D | 0.160 |
| BROMOETHENE | 593-60-2 | 4.4 | UG/M3 | U | 0.186 |
| 2-CHLOROTOLUENE | 95-49-8 | 5.2 | UG/M3 | U | 0.160 |
| N-HEXANE | 110-54-3 | 3.5 | UG/M3 | U | 0.233 |
| N-HEPTANE | 142-82-5 | 4.1 | UG/M3 | U | 0.146 |
| TERT-BUTYL ALCOHOL | 75-65-0 | 30 | UG/M3 | U | 0.218 |

## 2004 Subslab and Indoor Air Testing Results, Stafford Site

| Sample ID | | **73 Bay Basement Duplicate** | | | |
|---|---|---|---|---|---|
| Depth | | N/A | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558689 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 3.0 | UG/M3 | | 0.184 |
| CHLOROMETHANE | 74-87-3 | 1.6 | UG/M3 | | 0.179 |
| VINYL CHLORIDE | 75-01-4 | 1.3 | UG/M3 | U | 0.191 |
| BROMOMETHANE | 74-83-9 | 1.9 | UG/M3 | U | 0.232 |
| CHLOROETHANE | 75-00-3 | 1.3 | UG/M3 | U | 0.212 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | 2.8 | UG/M3 | U | 0.172 |
| FREON TF | 76-13-1 | 3.8 | UG/M3 | U | 0.159 |
| 1,1-DICHLOROETHENE | 75-35-4 | 2.0 | UG/M3 | U | 0.165 |
| METHYLENE CHLORIDE | 75-09-2 | 1.7 | UG/M3 | U | 0.182 |
| 1,1-DICHLOROETHANE | 75-34-3 | 2.0 | UG/M3 | U | 0.167 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | 2.0 | UG/M3 | U | 0.119 |
| CHLOROFORM | 67-66-3 | 2.4 | UG/M3 | U | 0.184 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | 2.7 | UG/M3 | U | 0.167 |
| CARBON TETRACHLORIDE | 56-23-5 | 3.1 | UG/M3 | U | 0.168 |
| BENZENE | 71-43-2 | 1.6 | UG/M3 | U | 0.150 |
| 1,2-DICHLOROETHANE | 107-06-2 | 2.0 | UG/M3 | U | 0.155 |
| TRICHLOROETHENE | 79-01-6 | 2.7 | UG/M3 | U | 0.166 |
| 1,2-DICHLOROPROPANE | 78-87-5 | 2.3 | UG/M3 | U | 0.173 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | 2.3 | UG/M3 | U | 0.174 |
| TOLUENE | 108-88-3 | 3.4 | UG/M3 | | 0.171 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | 2.3 | UG/M3 | U | 0.167 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | 2.7 | UG/M3 | U | 0.181 |
| TETRACHLOROETHENE | 127-18-4 | 3.4 | UG/M3 | U | 0.173 |
| CHLOROBENZENE | 108-90-7 | 2.3 | UG/M3 | U | 0.151 |
| ETHYLBENZENE | 100-41-4 | 2.2 | UG/M3 | U | 0.132 |
| XYLENE (M,P) | 1330-20-7 | 2.2 | UG/M3 | U | 0.312 |
| STYRENE | 100-42-5 | 2.1 | UG/M3 | U | 0.131 |
| XYLENE (O) | 95-47-6 | 2.2 | UG/M3 | U | 0.160 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | 3.4 | UG/M3 | U | 0.181 |
| 1,3-DICHLOROBENZENE | 541-73-1 | 3.0 | UG/M3 | U | 0.179 |
| 1,4-DICHLOROBENZENE | 106-46-7 | 3.0 | UG/M3 | U | 0.176 |
| 1,2-DICHLOROBENZENE | 95-50-1 | 3.0 | UG/M3 | U | 0.162 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | 3.7 | UG/M3 | U | 0.193 |

**2004 Subslab and Indoor Air Testing Results, Stafford Site**

| Sample ID | | **73 Bay Basement Duplicate** | | | |
|---|---|---|---|---|---|
| Depth | | N/A | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558689 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| HEXACHLOROBUTADIENE | 87-68-3 | 5.3 | UG/M3 | U | 0.198 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 2.5 | UG/M3 | U | 0.180 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 2.5 | UG/M3 | U | 0.156 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | 3.5 | UG/M3 | U | 0.147 |
| 1,2-DIBROMOETHANE | 106-93-4 | 3.8 | UG/M3 | U | 0.170 |
| 1,3-BUTADIENE | 106-99-0 | 1.1 | UG/M3 | U | 0.253 |
| CARBON DISULFIDE | 75-15-0 | 1.6 | UG/M3 | U | 0.177 |
| ACETONE | 67-64-1 | 26 | UG/M3 | | 0.204 |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 1.8 | UG/M3 | U | 0.162 |
| CYCLOHEXANE | 110-82-7 | 55 | UG/M3 | | 0.155 |
| DIBROMOCHLOROMETHANE | 124-48-1 | 4.3 | UG/M3 | U | 0.142 |
| METHYL ETHYL KETONE | 78-93-3 | 1.5 | UG/M3 | U | 0.135 |
| METHYL ISOBUTYL KETONE | 108-10-1 | 2.0 | UG/M3 | U | 0.155 |
| BROMOFORM | 75-25-2 | 5.2 | UG/M3 | U | 0.142 |
| BROMODICHLOROMETHANE | 75-27-4 | 3.4 | UG/M3 | U | 0.152 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | 2.0 | UG/M3 | U | 0.162 |
| 4-ETHYLTOLUENE | 622-96-8 | 2.5 | UG/M3 | U | 0.111 |
| 3-CHLOROPROPENE | 107-05-1 | 1.6 | UG/M3 | U | 0.163 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 320 | UG/M3 | E | 0.160 |
| BROMOETHENE | 593-60-2 | 2.2 | UG/M3 | U | 0.186 |
| 2-CHLOROTOLUENE | 95-49-8 | 2.6 | UG/M3 | U | 0.160 |
| N-HEXANE | 110-54-3 | 1.8 | UG/M3 | U | 0.233 |
| N-HEPTANE | 142-82-5 | 2.0 | UG/M3 | U | 0.146 |
| TERT-BUTYL ALCOHOL | 75-65-0 | 15 | UG/M3 | U | 0.218 |

## 2004 Subslab and Indoor Air Testing Results, Stafford Site

| Sample ID | | 73 Bay First Floor | | | |
|---|---|---|---|---|---|
| Depth | | N/A | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558690 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 3.0 | UG/M3 | | 0.184 |
| CHLOROMETHANE | 74-87-3 | 1.7 | UG/M3 | | 0.179 |
| VINYL CHLORIDE | 75-01-4 | 1.3 | UG/M3 | U | 0.191 |
| BROMOMETHANE | 74-83-9 | 1.9 | UG/M3 | U | 0.232 |
| CHLOROETHANE | 75-00-3 | 1.3 | UG/M3 | U | 0.212 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | 2.8 | UG/M3 | U | 0.172 |
| FREON TF | 76-13-1 | 3.8 | UG/M3 | U | 0.159 |
| 1,1-DICHLOROETHENE | 75-35-4 | 2.0 | UG/M3 | U | 0.165 |
| METHYLENE CHLORIDE | 75-09-2 | 1.7 | UG/M3 | U | 0.182 |
| 1,1-DICHLOROETHANE | 75-34-3 | 2.0 | UG/M3 | U | 0.167 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | 2.0 | UG/M3 | U | 0.119 |
| CHLOROFORM | 67-66-3 | 2.4 | UG/M3 | U | 0.184 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | 2.7 | UG/M3 | U | 0.167 |
| CARBON TETRACHLORIDE | 56-23-5 | 3.1 | UG/M3 | U | 0.168 |
| BENZENE | 71-43-2 | 1.6 | UG/M3 | U | 0.150 |
| 1,2-DICHLOROETHANE | 107-06-2 | 2.0 | UG/M3 | U | 0.155 |
| TRICHLOROETHENE | 79-01-6 | 2.7 | UG/M3 | U | 0.166 |
| 1,2-DICHLOROPROPANE | 78-87-5 | 2.3 | UG/M3 | U | 0.173 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | 2.3 | UG/M3 | U | 0.174 |
| TOLUENE | 108-88-3 | 4.1 | UG/M3 | | 0.171 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | 2.3 | UG/M3 | U | 0.167 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | 2.7 | UG/M3 | U | 0.181 |
| TETRACHLOROETHENE | 127-18-4 | 3.4 | UG/M3 | U | 0.173 |
| CHLOROBENZENE | 108-90-7 | 2.3 | UG/M3 | U | 0.151 |
| ETHYLBENZENE | 100-41-4 | 2.2 | UG/M3 | U | 0.132 |
| XYLENE (M,P) | 1330-20-7 | 2.2 | UG/M3 | U | 0.312 |
| STYRENE | 100-42-5 | 2.1 | UG/M3 | U | 0.131 |
| XYLENE (O) | 95-47-6 | 2.2 | UG/M3 | U | 0.160 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | 3.4 | UG/M3 | U | 0.181 |
| 1,3-DICHLOROBENZENE | 541-73-1 | 3.0 | UG/M3 | U | 0.179 |
| 1,4-DICHLOROBENZENE | 106-46-7 | 3.0 | UG/M3 | U | 0.176 |
| 1,2-DICHLOROBENZENE | 95-50-1 | 3.0 | UG/M3 | U | 0.162 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | 3.7 | UG/M3 | U | 0.193 |

## 2004 Subslab and Indoor Air Testing Results, Stafford Site

| Sample ID | | 73 Bay First Floor | | | |
|---|---|---|---|---|---|
| Depth | | N/A | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558690 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| HEXACHLOROBUTADIENE | 87-68-3 | 5.3 | UG/M3 | U | 0.198 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 2.5 | UG/M3 | U | 0.180 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 2.5 | UG/M3 | U | 0.156 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | 3.5 | UG/M3 | U | 0.147 |
| 1,2-DIBROMOETHANE | 106-93-4 | 3.8 | UG/M3 | U | 0.170 |
| 1,3-BUTADIENE | 106-99-0 | 1.1 | UG/M3 | U | 0.253 |
| CARBON DISULFIDE | 75-15-0 | 1.6 | UG/M3 | U | 0.177 |
| ACETONE | 67-64-1 | 26 | UG/M3 | | 0.204 |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 1.8 | UG/M3 | U | 0.162 |
| CYCLOHEXANE | 110-82-7 | 41 | UG/M3 | | 0.155 |
| DIBROMOCHLOROMETHANE | 124-48-1 | 4.3 | UG/M3 | U | 0.142 |
| METHYL ETHYL KETONE | 78-93-3 | 1.5 | UG/M3 | U | 0.135 |
| METHYL ISOBUTYL KETONE | 108-10-1 | 2.0 | UG/M3 | U | 0.155 |
| BROMOFORM | 75-25-2 | 5.2 | UG/M3 | U | 0.142 |
| BROMODICHLOROMETHANE | 75-27-4 | 3.4 | UG/M3 | U | 0.152 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | 2.0 | UG/M3 | U | 0.162 |
| 4-ETHYLTOLUENE | 622-96-8 | 2.5 | UG/M3 | U | 0.111 |
| 3-CHLOROPROPENE | 107-05-1 | 1.6 | UG/M3 | U | 0.163 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 210 | UG/M3 | E | 0.160 |
| BROMOETHENE | 593-60-2 | 2.2 | UG/M3 | U | 0.186 |
| 2-CHLOROTOLUENE | 95-49-8 | 2.6 | UG/M3 | U | 0.160 |
| N-HEXANE | 110-54-3 | 1.8 | UG/M3 | U | 0.233 |
| N-HEPTANE | 142-82-5 | 2.0 | UG/M3 | U | 0.146 |
| TERT-BUTYL ALCOHOL | 75-65-0 | 15 | UG/M3 | U | 0.218 |

**2004 Subslab and Indoor Air Testing Results, Stafford Site**

| Sample ID | | 73 Bay First Floor Dilution | | | |
|---|---|---|---|---|---|
| Depth | | N/A | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558690D1 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| DICHLORODIFLUOROMETHANE | 75-71-8 | 4.9 | UG/M3 | U | 0.184 |
| CHLOROMETHANE | 74-87-3 | 2.1 | UG/M3 | U | 0.179 |
| VINYL CHLORIDE | 75-01-4 | 2.6 | UG/M3 | U | 0.191 |
| BROMOMETHANE | 74-83-9 | 3.9 | UG/M3 | U | 0.232 |
| CHLOROETHANE | 75-00-3 | 2.6 | UG/M3 | U | 0.212 |
| TRICHLOROFLUOROMETHANE | 75-69-4 | 5.6 | UG/M3 | U | 0.172 |
| FREON TF | 76-13-1 | 7.7 | UG/M3 | U | 0.159 |
| 1,1-DICHLOROETHENE | 75-35-4 | 4.0 | UG/M3 | U | 0.165 |
| METHYLENE CHLORIDE | 75-09-2 | 3.5 | UG/M3 | U | 0.182 |
| 1,1-DICHLOROETHANE | 75-34-3 | 4.0 | UG/M3 | U | 0.167 |
| CIS-1,2-DICHLOROETHENE | 156-59-2 | 4.0 | UG/M3 | U | 0.119 |
| CHLOROFORM | 67-66-3 | 4.9 | UG/M3 | U | 0.184 |
| 1,1,1-TRICHLOROETHANE | 71-55-6 | 5.5 | UG/M3 | U | 0.167 |
| CARBON TETRACHLORIDE | 56-23-5 | 6.3 | UG/M3 | U | 0.168 |
| BENZENE | 71-43-2 | 3.2 | UG/M3 | U | 0.150 |
| 1,2-DICHLOROETHANE | 107-06-2 | 4.0 | UG/M3 | U | 0.155 |
| TRICHLOROETHENE | 79-01-6 | 5.4 | UG/M3 | U | 0.166 |
| 1,2-DICHLOROPROPANE | 78-87-5 | 4.6 | UG/M3 | U | 0.173 |
| CIS-1,3-DICHLOROPROPENE | 10061-01-5 | 4.5 | UG/M3 | U | 0.174 |
| TOLUENE | 108-88-3 | 4.5 | UG/M3 | D | 0.171 |
| TRANS-1,3-DICHLOROPROPENE | 10061-02-6 | 4.5 | UG/M3 | U | 0.167 |
| 1,1,2-TRICHLOROETHANE | 79-00-5 | 5.5 | UG/M3 | U | 0.181 |
| TETRACHLOROETHENE | 127-18-4 | 6.8 | UG/M3 | U | 0.173 |
| CHLOROBENZENE | 108-90-7 | 4.6 | UG/M3 | U | 0.151 |
| ETHYLBENZENE | 100-41-4 | 4.3 | UG/M3 | U | 0.132 |
| XYLENE (M,P) | 1330-20-7 | 4.3 | UG/M3 | U | 0.312 |
| STYRENE | 100-42-5 | 4.3 | UG/M3 | U | 0.131 |
| XYLENE (O) | 95-47-6 | 4.3 | UG/M3 | U | 0.160 |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | 6.9 | UG/M3 | U | 0.181 |
| 1,3-DICHLOROBENZENE | 541-73-1 | 6.0 | UG/M3 | U | 0.179 |
| 1,4-DICHLOROBENZENE | 106-46-7 | 6.0 | UG/M3 | U | 0.176 |
| 1,2-DICHLOROBENZENE | 95-50-1 | 6.0 | UG/M3 | U | 0.162 |
| 1,2,4-TRICHLOROBENZENE | 120-82-1 | 7.4 | UG/M3 | U | 0.193 |

# Table 4-7

## 2004 Subslab and Indoor Air Testing Results, Stafford Site

| Sample ID | | 73 Bay First Floor Dilution | | | |
|---|---|---|---|---|---|
| Depth | | N/A | | | |
| Sample Date | | 1/23/2004 | | | |
| Laboratory ID | | 558690D1 | | | |
| Method | | TO-15 | | | |
| Analysis Date | | 01/29/2004 | | | |
| Chemical | CAS # | Concen-tration (ug/m3) | Quanti-fication Qualifier | Quanti-fication Type | Quanti-fication Level |
| HEXACHLOROBUTADIENE | 87-68-3 | 11 | UG/M3 | U | 0.198 |
| 1,3,5-TRIMETHYLBENZENE | 108-67-8 | 4.9 | UG/M3 | U | 0.180 |
| 1,2,4-TRIMETHYLBENZENE | 95-63-6 | 4.9 | UG/M3 | U | 0.156 |
| 1,2-DICHLOROTETRAFLUOROETHANE | 76-14-2 | 7.0 | UG/M3 | U | 0.147 |
| 1,2-DIBROMOETHANE | 106-93-4 | 7.7 | UG/M3 | U | 0.170 |
| 1,3-BUTADIENE | 106-99-0 | 2.2 | UG/M3 | U | 0.253 |
| CARBON DISULFIDE | 75-15-0 | 3.1 | UG/M3 | U | 0.177 |
| ACETONE | 67-64-1 | 26 | UG/M3 | D | 0.204 |
| METHYL TERT-BUTYL ETHER | 1634-04-4 | 3.6 | UG/M3 | U | 0.162 |
| CYCLOHEXANE | 110-82-7 | 38 | UG/M3 | D | 0.155 |
| DIBROMOCHLOROMETHANE | 124-48-1 | 8.5 | UG/M3 | U | 0.142 |
| METHYL ETHYL KETONE | 78-93-3 | 2.9 | UG/M3 | U | 0.135 |
| METHYL ISOBUTYL KETONE | 108-10-1 | 4.1 | UG/M3 | U | 0.155 |
| BROMOFORM | 75-25-2 | 10 | UG/M3 | U | 0.142 |
| BROMODICHLOROMETHANE | 75-27-4 | 6.7 | UG/M3 | U | 0.152 |
| TRANS-1,2-DICHLOROETHENE | 156-60-5 | 4.0 | UG/M3 | U | 0.162 |
| 4-ETHYLTOLUENE | 622-96-8 | 4.9 | UG/M3 | U | 0.111 |
| 3-CHLOROPROPENE | 107-05-1 | 3.1 | UG/M3 | U | 0.163 |
| 2,2,4-TRIMETHYLPENTANE | 540-84-1 | 190 | UG/M3 | D | 0.160 |
| BROMOETHENE | 593-60-2 | 4.4 | UG/M3 | U | 0.186 |
| 2-CHLOROTOLUENE | 95-49-8 | 5.2 | UG/M3 | U | 0.160 |
| N-HEXANE | 110-54-3 | 3.5 | UG/M3 | U | 0.233 |
| N-HEPTANE | 142-82-5 | 4.1 | UG/M3 | U | 0.146 |
| TERT-BUTYL ALCOHOL | 75-65-0 | 30 | UG/M3 | U | 0.218 |

**Weather Conditions at Atlantic City Airport - January 2004**

| Date | Time | Temp (oF) | Temp (oC) | Pressure (mbar) | Wind direction | Wind MPH | Weather | Comments |
|---|---|---|---|---|---|---|---|---|
| Jan. 14 | 9:00 AM | | | | | | | |
| | 10:00 AM | 19 | -7.2 | 1024 | N | 8 | | |
| | 11:00 AM | 21 | -6.1 | 1024 | NW | 10 | | |
| | Noon | 21.9 | -5.6 | 1022 | NNW | 9 | | |
| | 1:00 PM | 21.9 | -5.6 | 1020 | N | 7 | | |
| | 2:00 PM | 21.9 | -5.6 | 1019 | Calm | 0 | | |
| | 3:00 PM | 24.1 | -4.4 | 1017 | SE | 3 | | |
| | 4:00 PM | 21.9 | -5.6 | 1016 | E | 8 | | |
| | 5:00 PM | 21 | -6.1 | 1016 | SE | 8 | | |
| | 6:00 PM | 21 | -6.1 | 1016 | ESE | 7 | | |
| | 7:00 PM | 21.9 | -5.6 | 1015 | ESE | 6 | | |
| | 8:00 PM | 23 | -5 | 1013 | ESE | 14 | | |
| | 9:00 PM | 24.1 | -4.4 | 1011 | ESE | 10 | | |
| | 10:00 PM | 25 | -3.9 | 1011 | ESE | 13 | | |
| | 11:00 PM | 26.1 | -3.3 | 1009 | ESE | 12 | light snow | |
| | Midnight | 26.1 | -3.3 | 1007 | E | 12 | light snow; mist | |
| Jan. 15 | 1:00 AM | 28 | -2 | 1004 | E | 12 | light snow; mist | |
| | 2:00 AM | 28 | -2 | 1003 | NE | 9 | light snow; mist | This event was a |
| | 3:00 AM | 30 | -1.1 | 1003 | NNE | 10 | light snow; mist | total of 2.0" of snow |
| | 4:00 AM | 28 | -2.2 | 1002 | WNW | 9 | light snow; mist | (0.2" water equivalent) |
| | 5:00 AM | 24 | -4 | 1003 | N | 22 | light snow; mist | |
| | 6:00 AM | 23 | -5 | 1004 | N | 18 | light snow | |
| | 7:00 AM | 21 | -6.1 | 1005 | N | 18 | | |
| | 8:00 AM | 17 | -8 | 1007 | N | 20 | light snow | |
| | 9:00 AM | 15 | -9 | 1010 | N | 17 | light snow | |
| | 10:00 AM | | | | | | | |
| | 11:00 AM | 17.1 | -8.3 | 1012 | NNW | 16 | | |
| | Noon | 19 | -7.2 | 1011 | NW | 22 | | |
| | 1:00 PM | 19.9 | -6.7 | 1011 | WNW | 18 | | |
| | 2:00 PM | 21.9 | -5.6 | 1010 | NW | 17 | | |
| | 3:00 PM | 21.9 | -5.6 | 1011 | NW | 14 | | |
| | 4:00 PM | 21 | -6.1 | 1011 | NW | 25 | | |
| | 5:00 PM | 18 | -7.8 | 1011 | NW | 15 | | |
| | 6:00 PM | 16 | -8.9 | 1012 | NW | 10 | | |
| | 7:00 PM | 16 | -8.9 | 1013 | NNW | 12 | | |
| | 8:00 PM | 14 | -10 | 1013 | NNW | 12 | | |
| | 9:00 PM | 10.9 | -11.7 | 1014 | NW | 9 | | |
| | 10:00 PM | 8.1 | -13.3 | 1014 | NNW | 6 | | |
| | 11:00 PM | 7 | -13.9 | 1014 | NW | 7 | | |
| | Midnight | 6.1 | -14.4 | 1014 | NW | 13 | | |
| Jan. 16 | 1:00 AM | 8.1 | -13.3 | 1014 | NW | 21 | | |
| | 2:00 AM | 7 | -13.9 | 1014 | WNW | 21 | | |
| | 3:00 AM | 6.1 | -14.4 | 1014 | WNW | 15 | | |
| | 4:00 AM | 7 | -13.9 | 1013 | W | 18 | | Jan. 16: High was 26°F |
| | 5:00 AM | 7 | -13.9 | 1012 | W | 20 | | Low was 6°F |
| | 6:00 AM | 8.1 | -13.3 | 1012 | W | 20 | | No precipitation |
| | 7:00 AM | 8.1 | -13.3 | 1012 | WNW | 18 | | Average wind speed: |
| | 8:00 AM | 9 | -12.8 | 1012 | W | 20 | | 21.9 mph |
| | 9:00 AM | 12.9 | -10.6 | 1012 | WNW | 20 | | |

## Weather Conditions at Atlantic City Airport - January 2004

| Date | Time | Temp (oF) | Temp (oC) | Pressure (mbar) | Wind direction | Wind MPH | Weather | Comments |
|---|---|---|---|---|---|---|---|---|
| | 10:00 AM | 16 | -8.9 | 1013 | WNW | 29 | | |
| Jan. 18 | 8:00 AM | 33 | 1 | 1004 | SSW | 7 | precipitation | |
| | 9:00 AM | 35.1 | 1.7 | 1003 | S | 6 | light rain; mist | |
| | 10:00 AM | 35 | 2 | 1002 | S | 3 | light rain | |
| | 11:00 AM | 35 | 2 | 1000 | S | 3 | light rain | On Jan. 18, there was |
| | Noon | 35 | 2 | 998 | Variable | 3 | light rain; mist | 0.4" of snow, but most |
| | 1:00 PM | 37 | 3 | 996 | WSW | 6 | light rain; mist | precipitation was rain |
| | 2:00 PM | 37 | 3 | 995 | NW | 5 | light rain; mist | (0.41" water equivalent) |
| | 3:00 PM | 37 | 3 | 994 | NW | 12 | mist | |
| | 4:00 PM | 37 | 2.8 | 995 | NW | 10 | light rain; mist | |
| | 5:00 PM | 36 | 2.2 | 995 | NNW | 13 | mist | |
| | 6:00 PM | 34 | 1.1 | 996 | NW | 12 | light snow; mist | |
| | 7:00 PM | 33 | 1 | 997 | NW | 13 | | |
| | 8:00 PM | 34 | 1.1 | 998 | WNW | 13 | | |
| | 9:00 PM | 33 | 1 | 999 | NW | 14 | | |
| | 10:00 PM | 32 | 0 | 1000 | WNW | 10 | | |
| | 11:00 PM | 30.9 | -0.6 | 1001 | NW | 12 | | |
| | Midnight | 28.9 | -1.7 | 1002 | NW | 18 | | |
| Jan. 19 | 1:00 AM | 28 | -2.2 | 1003 | WNW | 18 | | |
| | 2:00 AM | 26.1 | -3.3 | 1004 | | | | |
| | 3:00 AM | 24.1 | -4.4 | 1005 | | | | |
| | 4:00 AM | 24.1 | -4.4 | 1005 | | | | |
| | 5:00 AM | 23 | -5 | 1005 | | | | |
| | 6:00 AM | 23 | -5 | 1006 | | | | |
| | 7:00 AM | 23 | -5 | 1006 | | | | |
| | 8:00 AM | | | | | | | |
| | 9:00 AM | 24.1 | -4.4 | 1006 | | | | |
| | 10:00 AM | 28 | -2.2 | 1006 | WNW | 23 | | |
| | 11:00 AM | 28.9 | -1.7 | 1006 | WNW | 21 | | |
| | Noon | 28.9 | -1.7 | 1006 | WNW | 24 | | |
| | 1:00 PM | 28.9 | -1.7 | 1006 | WNW | 18 | | |
| | 2:00 PM | 30 | -1.1 | 1006 | W | 23 | | |
| | 3:00 PM | 30 | -1.1 | 1006 | W | 22 | | |
| | 4:00 PM | 28.9 | -1.7 | 1007 | W | 20 | | |
| | 5:00 PM | 26.1 | -3.3 | 1007 | WNW | 24 | | |
| | 6:00 PM | 25 | -3.9 | 1008 | W | 17 | | |
| | 7:00 PM | 25 | -3.9 | 1009 | W | 15 | | |
| | 8:00 PM | 24.1 | -4.4 | 1010 | W | 16 | | |
| | 9:00 PM | 24.1 | -4.4 | 1010 | W | 16 | | |
| | 10:00 PM | 23 | -5 | 1011 | W | 16 | | |
| | 11:00 PM | 23 | -5 | 1011 | W | 13 | | |
| | Midnight | 21.9 | -5.6 | 1011 | W | 16 | | |
| Jan. 20 | 1:00 AM | 21.9 | -5.6 | 1011 | W | 18 | | |
| | 2:00 AM | 21 | -6.1 | 1012 | W | 12 | | |
| | 3:00 AM | 21 | -6.1 | 1012 | W | 14 | | |
| | 4:00 AM | 19.9 | -6.7 | 1012 | W | 13 | | |
| | 5:00 AM | 19.9 | -6.7 | 1013 | W | 8 | | |

# Table 4-8
## Weather Conditions at Atlantic City Airport - January 2004

| Date | Time | Temp (oF) | Temp (oC) | Pressure (mbar) | Wind direction | Wind MPH | Weather | Comments |
|---|---|---|---|---|---|---|---|---|
| | 6:00 AM | 19.9 | -6.7 | 1013 | W | 10 | | |
| | 7:00 AM | 21 | -6.1 | 1017 | WNW | 13 | | |
| | 8:00 AM | 21.9 | -5.6 | 1017 | WNW | 12 | | |
| | 9:00 AM | 25 | -3.9 | 1015 | WNW | 14 | | |
| | 10:00 AM | 27 | -2.8 | 1015 | NW | 22 | | |
| | 11:00 AM | 28 | -2.2 | 1015 | NW | 22 | | |
| | Noon | 28 | -2.2 | 1014 | WNW | 28 | | |
| | 1:00 PM | 30 | -1.1 | 1014 | WNW | 25 | | |
| | 2:00 PM | 30 | -1.1 | 1014 | NW | 26 | | |
| | 3:00 PM | 28.9 | -1.7 | 1015 | W | 25 | | |
| | 4:00 PM | 28.9 | -1.7 | 1015 | WNW | 15 | | |
| | 5:00 PM | 27 | -2.8 | 1016 | W | 16 | | |
| | 6:00 PM | 25 | -3.9 | 1017 | W | 13 | | |
| | 7:00 PM | 25 | -3.9 | 1017 | W | 14 | | |
| | 8:00 PM | 24.1 | -4.4 | 1017 | W | 14 | | |
| | 9:00 PM | 23 | -5 | 1018 | WNW | 13 | | |
| | 10:00 PM | 21.9 | -5.6 | 1018 | WNW | 12 | | |
| | 11:00 PM | 19.9 | -6.7 | 1019 | WNW | 10 | | |
| | Midnight | 19 | -7.2 | 1019 | WNW | 9 | | |
| Jan. 21 | 1:00 AM | 19 | -7.2 | 1019 | WNW | 12 | | |
| | 2:00 AM | 19 | -7.2 | 1020 | WNW | 12 | | |
| | 3:00 AM | 19 | -7.2 | 1020 | WNW | 14 | | |
| | 4:00 AM | 18 | -7.8 | 1020 | WNW | 12 | | |
| | 5:00 AM | 17.1 | -8.3 | 1020 | WNW | 14 | | |
| | 6:00 AM | 17.1 | -8.3 | 1020 | WNW | 12 | | |
| | 7:00 AM | 17.1 | -8.3 | 1020 | WNW | 13 | | |
| | 8:00 AM | 17.1 | -8.3 | 1021 | WNW | 12 | | |
| | 9:00 AM | 19.9 | -6.7 | 1021 | WNW | 14 | | |
| | 10:00 AM | 24 | -4 | 1021 | NW | 16 | | |
| | 11:00 AM | 26.1 | -3.3 | 1021 | WNW | 16 | | |
| | Noon | 28 | -2.2 | 1020 | NW | 9 | | |
| | 1:00 PM | 30 | -1.1 | 1019 | WNW | 14 | | |
| | 2:00 PM | 30 | -1.1 | 1018 | WSW | 10 | | |
| | 3:00 PM | 30 | -1.1 | 1018 | W | 14 | | |
| | 4:00 PM | 28 | -2.2 | 1018 | W | 10 | | |
| | 5:00 PM | 27 | -2.8 | 1018 | WSW | 13 | | |
| | 6:00 PM | 26.1 | -3.3 | 1018 | W | 8 | | |
| | 7:00 PM | 24.1 | -4.4 | 1018 | W | 6 | | |
| | 8:00 PM | 23 | -5 | 1018 | WSW | 7 | | |
| | 9:00 PM | 21.9 | -5.6 | 1017 | SSW | 3 | | |
| | 10:00 PM | 21 | -6.1 | 1017 | SW | 3 | | |
| | 11:00 PM | 19 | -7.2 | 1017 | SW | 3 | | |
| | Midnight | 18 | -7.8 | 1017 | SSW | 3 | | |
| Jan. 22 | 1:00 AM | 19 | -7 | 1016 | Calm | 0 | | |
| | 2:00 AM | 15.1 | -9.4 | 1015 | Calm | 0 | | |
| | 3:00 AM | 21 | -6.1 | 1015 | Calm | 0 | | |
| | 4:00 AM | 24.1 | -4.4 | 1014 | SSW | 7 | | |
| | 5:00 AM | 25 | -3.9 | 1013 | SSW | 7 | | |
| | 6:00 AM | | | | | | | |

# Table 4-8
## Weather Conditions at Atlantic City Airport - January 2004

| Date | Time | Temp (oF) | Temp (oC) | Pressure (mbar) | Wind direction | Wind MPH | Weather | Comments |
|---|---|---|---|---|---|---|---|---|
| | 7:00 AM | | | | | | | |
| | 8:00 AM | | | | | | | |
| | 9:00 AM | 33.1 | 0.6 | 1010 | SSW | 13 | | |
| | 10:00 AM | 36 | 2.2 | 1009 | S | 12 | | |
| | 11:00 AM | 37.9 | 3.3 | 1008 | S | 12 | | |
| | Noon | 37.9 | 3.3 | 1007 | S | 10 | | |
| | 1:00 PM | 37.9 | 3.3 | 1006 | SW | 13 | | |
| | 2:00 PM | 39.9 | 4.4 | 1005 | WSW | 13 | | |
| | 3:00 PM | 39 | 3.9 | 1005 | WSW | 12 | | |
| | 4:00 PM | 37.9 | 3.3 | 1005 | WSW | 13 | | |
| | 5:00 PM | 34.9 | 3.3 | 1005 | W | 13 | | |
| | 6:00 PM | 36 | 2.2 | 1005 | WSW | 8 | | |
| | 7:00 PM | 35.1 | 1.7 | 1006 | W | 10 | | |
| | 8:00 PM | 35.1 | 1.7 | 1007 | NW | 20 | | |
| | 9:00 PM | 32 | 0 | 1008 | NW | 20 | | |
| | 10:00 PM | 28.9 | -1.7 | 1009 | NW | 20 | | |
| | 11:00 PM | 26.1 | -3.3 | 1010 | NW | 17 | | |
| | Midnight | 23 | -5 | 1011 | NW | 24 | | |
| Jan. 23 | 1:00 AM | 21 | -6.1 | 1012 | NW | 20 | | |
| | 2:00 AM | 19 | -7.2 | 1013 | NW | 22 | | |
| | 3:00 AM | 17.1 | -8.3 | 1013 | NW | 16 | | |
| | 4:00 AM | 16 | -8.9 | 1013 | WNW | 13 | | |
| | 5:00 AM | 15.1 | -9.4 | 1014 | WNW | 12 | | |
| | 6:00 AM | 12.9 | -10.6 | 1014 | WNW | 8 | | |
| | 7:00 AM | 14 | -10 | 1015 | W | 13 | | |
| | 8:00 AM | 14 | -10 | 1015 | WNW | 17 | | |
| | 9:00 AM | 17.1 | -8.3 | 1015 | WNW | 22 | | |
| | 10:00 AM | 18 | -7.8 | 1015 | W | 24 | | |
| | 11:00 AM | 19 | -7.2 | 1015 | W | 22 | | |
| | Noon | 19 | -7.2 | 1015 | NW | 24 | | |
| | 1:00 PM | 19 | -7 | 1014 | W | 23 | | |
| | 2:00 PM | 19 | -7.2 | 1014 | W | 22 | | |
| | 3:00 PM | 19 | -7.2 | 1014 | NW | 25 | | |
| | 4:00 PM | 18 | -7.8 | 1014 | W | 22 | | |

Note: Jan. 17: High was 36°F; low was 16°F, 0.3" of snow (0.02" water equivalent), Avg. wind speed = 10.7 mph

# Table 4-9
## 2004 Vapor Pathway Assessment 73 Bay Avenue Details, Stafford Site

| | Jan-04 Ground-water VP-WEST (ug/L) | Jan-04 Ground-water VP-EAST (ug/L) | Henry's Law Constant (-) | Jan-04 Max Predicted Deep soil Vapor ($ug/m^3$) | Jan-04 Avg Predicted Deep soil Vapor ($ug/m^3$) | Conver-sion ug/m3 to ppbV | Jan-04 Max Predicted Deep soil Vapour (ppbV) | Jan-04 Avg Predicted Deep soil Vapour (ppbV) | Measured Deep Vapor VP-WESTD 9.5-10' (ppbV) | Measured Deep Vapor VP-WESTDil 9.5-10' (ppbV) | Measured Deep Vapor VP-WEST Avg 9.5-10' (ppbV) | Measured Deep Vapor VP-EASTD 9.5-10' (ppbV) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MTBE | 83000 | 110 | 0.0204 | 1693200 | 847722 | 3.706 | 456,881 | 228,743 | 65,000 | 47,000 | 56,000 | 22 |
| n-Hexane | NT | NT | 75.4 | N/A | N/A | 3.622 | N/A | N/A | 600,000E | 670,000 | 670,000 | 14 |
| n-Heptane | NT | NT | 86.0 | N/A | N/A | 4.253 | N/A | N/A | 450,000E | 450,000 | 450,000 | 13 |
| Cyclohexane | <5000 | 2.9 | 8.00 | 20000000 | 10011600 | 3.54 | 5,649,718 | 2,828,136 | 280,000E | 590,000 | 590,000 | 18 |
| 2,2,4-TriMethylPentane | NT | NT | 126.4 | N/A | N/A | 4.8 | N/A | N/A | 700,000E | 890,000 | 890,000 | <2.3 |
| Benzene | 6300 | 62 | 0.228 | 1,436,400 | 725,268 | 3.281 | 437,793 | 221,051 | 61,000 | 45,000 | 53,000 | <1.6 |
| Toluene | 30000 | 9.5 | 0.272 | 8,160,000 | 4,081,292 | 3.873 | 2,106,894 | 1,053,781 | N/A | 600,000 | 600,000 | 4.1 |
| Ethylbenzene | 3200 | 12 | 0.323 | 1,033,600 | 518,738 | 4.462 | 231,645 | 116,257 | 48,000 | 31,000 | 39,500 | 2.2 |
| M&P-Xylene | NT | NT | 0.307 | N/A | N/A | 4.462 | N/A | N/A | 100,000 | 65,000 | 82,500 | 10 |
| O-Xylene | NT | NT | 0.213 | N/A | N/A | 4.462 | N/A | N/A | 24,000 | 15,000 | 19,500 | 3.6 |
| Total Xylenes | 18000 | 30 | 0.26 | 4,680,000 | 2,343,900 | 4.462 | 1,048,857 | 525,303 | 124,000 | 80,000 | 102,000 | 14 |
| Oxygen | | | | | | | | | 4.6 | | | 21 |

Notes:
1. Estimated using 1/2 detection limit for cyclohexane
NQ = Not quantified, N/A = Not applicable, NT = Not tested, DIL = dilution E = Out of calibration range
Background based on indoor air concentrations measured at two nearby off-plume houses

## Table 4-9
## 2004 Vapor Pathway Assessment 73 Bay Avenue Details, Stafford Site



| Measured Mid Vapor VP-EASTM 6.5 - 7' (ppbV) | Measured Shallow Vapor VP-EASTS 2.5-3' (ppbV) | Measured Sub-slab #1 Vapor Conc. 5.5-6' (ppbV) | Measured Sub-slab #2 Vapor Conc. 5.5-6' (ppbV) | Measured Sub-slab #2 dil Vapor Conc. 5.5-6' (ppbV) | Measured Sub-slab #2 Avg Vapor Conc. 5.5-6' (ppbV) | Measured Sub-slab #3 Vapor Conc. 5.5-6' (ppbV) | Measured Sub-slab #3 dil Vapor Conc. 5.5-6' (ppbV) | Measured Sub-slab #3 Avg Vapor Conc. 5.5-6' (ppbV) | Measured Basement Conc. (ppbV) | Measured Basement Dil Conc. (ppbV) |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 21 | <1.8 | <1.8 | <3.6 | <3.6 | <36 | <140 | <140 | <1.8 | <3.6 |
| 12 | 13 | <1.8 | <1.8 | <3.5 | <3.5 | <35 | <140 | <140 | <1.8 | <3.5 |
| 3 | 4.1 | <2.0 | <2.0 | <4.1 | <4.1 | <41 | <160 | <160 | <2.0 | <4.1 |
| <1.7 | 6.9 | 29 | 41 | 48 | 45 | 1,800 | 1,300 | 1,550 | 41 | 45 |
| <2.3 | <2.3 | 170 | 240E | 250 | 250 | 8,400E | 7,500 | 7,500 | 310E | 300 |
| <1.6 | <1.6 | <1.6 | <1.6 | <3.2 | <3.2 | <32 | <130 | <130 | <1.6 | <3.2 |
| 2.2 | 3.2 | 2.3 | 2.1 | <3.8 | <3.8 | <38 | <150 | <150 | 1.9 | <3.8 |
| <2.2 | <2.2 | <2.2 | <2.2 | <4.3 | <4.3 | <43 | <170 | <170 | <2.2 | <4.3 |
| 4.0 | 6.5 | <2.2 | <2.2 | <4.3 | <4.3 | <43 | <170 | <170 | <2.2 | <4.3 |
| <2.2 | <2.2 | <2.2 | <2.2 | <4.3 | <4.3 | <43 | <170 | <170 | <2.2 | <4.3 |
| 5.1 | 7.6 | <2.2 | <2.2 | <4.3 | <4.3 | <43 | <170 | <170 | <2.2 | <4.3 |
| 21 | 22 | | | | | | | | | |

# Table 4-9
## 2004 Vapor Pathway Assessment 73 Bay Avenue Details, Stafford Site

| | | | | | ALPHA'S | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Measured Basement Dup Conc. (ppbV)** | **Measured Base-ment Avg Conc. (ppbV)** | **Measured First Floor Conc. (ppbV)** | **Measured First Floor Dil Conc.** | **Measured First Floor Avg Conc.** | **Gdw Alpha Max** | **Gdw Alpha Avg** | **Vapor Alpha Max** | **Vapor Alpha Avg** | **Subslab Alpha using Subslab #3** | **Ratio Base-ment / First floor** | **Local Back-ground Stage 2 (ppbV)** |
| <1.8 | <3.6 | <1.8 | <3.6 | <3.6 | N/A | N/A | N/A | N/A | N/A | N/A | 0.62 to 2.6 |
| <1.8 | <3.5 | <1.8 | <3.5 | <3.5 | N/A | N/A | N/A | N/A | N/A | N/A | <0.5 to 2.1 |
| <2.0 | <4.1 | <2.0 | <4.1 | <4.1 | N/A | N/A | N/A | N/A | N/A | N/A | <0.5 to 1.1 |
| 55 | 47 | 41 | 38 | 40 | 8.3E-06 | 1.7E-05 | 8.0E-05 | 1.6E-04 | 3.0E-02 | 1.2 | <0.5 |
| 320E | 300 | 210E | 190 | 190 | N/A | N/A | 3.4E-04 | 6.7E-04 | 4.0E-02 | 1.6 | <0.5 to 2.3 |
| <1.6 | <3.2 | <1.6 | <3.2 | <3.2 | < 3.7E-06 | < 7.2E-06 | < 3.0E-05 | < 6.0E-05 | N/A | N/A | <0.5-1.2 |
| 3.4 | <3.8 | 4.1 | <4.5 | <4.5 | < 1.6E-06 | < 3.2E-06 | < 5.7E-06 | < 1.1E-05 | N/A | N/A | 3.6 to 8.7 |
| <2.2 | <4.3 | <2.2 | <4.3 | <4.3 | < 9.5E-06 | < 1.9E-05 | < 5.6E-05 | < 1.1E-04 | N/A | N/A | <0.5 to 1.3 |
| <2.2 | <4.3 | <2.2 | <4.3 | <4.3 | N/A | N/A | N/A | N/A | N/A | N/A | 1.8 to 4.4 |
| <2.2 | <4.3 | <2.2 | <4.3 | <4.3 | N/A | N/A | N/A | N/A | N/A | N/A | 0.63 to 1.3 |
| <2.2 | <4.3 | <2.2 | <4.3 | <4.3 | < 2.1E-06 | < 4.2E-06 | < 2.2E-05 | < 4.3E-05 | N/A | N/A | NT |

## Table 4-10
## 2004 Vapor Pathway Assessment 73 Bay Avenue Summary, Stafford Site

| | Jan-04 Ground-water VP-WEST (ug/L) | Jan-04 Ground-water VP-EAST (ug/L) | Jan-04 Max Predicted Deep soil Vapor (ppbV) | Jan-04 Avg Predicted Deep soil Vapor (ppbV) | Measured Deep Vapor VP-WEST 9.5-10' (ppbV) | Measured Deep Vapor VP-EASTD 9.5-10' (ppbV) | Measured Mid Vapor VP-EASTM 6.5 - 7' (ppbV) | Measured Shallow Vapor VP-EASTS 2.5-3' (ppbV) | Measured Sub-slab (#3) Vapor Conc. 5.5-6' (ppbV) | Measured Base-ment Conc. (ppbV) | Measured First Floor Conc. (ppbV) | ALPHA'S | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Gdw Alpha Max Max | Gdw Alpha Avg Avg | Vapor Alpha Max Max | Vapor Alpha Avg Avg | Subslab Alpha #3 |
| MTBE | 83000 | 110 | 456,881 | 228,743 | 56,000 | 22 | 20 | 21 | <140 | <3.6 | <3.6 | N/A | N/A | N/A | N/A | N/A |
| n-Hexane | NT | NT | N/A | N/A | 670,000 | 14 | 12 | 13 | <140 | <3.5 | <3.5 | N/A | N/A | N/A | N/A | N/A |
| n-Heptane | NT | NT | N/A | N/A | 450,000 | 13 | 3 | 4.1 | <160 | <4.1 | <4.1 | N/A | N/A | N/A | N/A | N/A |
| Cyclohexane | <5000 | 2.9 | 5,649,718 | 2,828,136 | 590,000 | 18 | <1.7 | 6.9 | 1,550 | 47 | 40 | 8.3E-06 | 1.7E-05 | 8.0E-05 | 1.6E-04 | 3.0E-02 |
| 2,2,4-Trimethylpentane | NT | NT | N/A | N/A | 890,000 | <2.3 | <2.3 | <2.3 | 7,500 | 300 | 190 | N/A | N/A | 3.4E-04 | 6.7E-04 | 4.0E-02 |
| Benzene | 6300 | 62 | 437,793 | 221,051 | 53,000 | <1.6 | <1.6 | <1.6 | <130 | <3.2 | <3.2 | < 3.7E-06 | < 7.2E-06 | < 3.0E-05 | < 6.0E-05 | N/A |
| Toluene | 30000 | 9.5 | 2,106,894 | 1,053,781 | 600,000 | 4.1 | 2.2 | 3.2 | <150 | <3.8 | <4.5 | < 1.6E-06 | < 3.2E-06 | < 5.7E-06 | < 1.1E-05 | N/A |
| Ethylbenzene | 3200 | 12 | 231,645 | 116,257 | 39,500 | 2.2 | <2.2 | <2.2 | <170 | <4.3 | <4.3 | < 9.5E-06 | < 1.9E-05 | < 5.6E-05 | < 1.1E-04 | N/A |
| M&P-Xylene | NT | NT | N/A | N/A | 82,500 | 10 | 4.0 | 6.5 | <170 | <4.3 | <4.3 | N/A | N/A | N/A | N/A | N/A |
| O-Xylene | NT | NT | N/A | N/A | 19,500 | 3.6 | <2.2 | <2.2 | <170 | <4.3 | <4.3 | N/A | N/A | N/A | N/A | N/A |
| Total Xylenes | 18000 | 30 | 1,048,857 | 525,303 | 102,000 | 14 | 5.1 | 7.6 | <170 | <4.3 | <4.3 | < 2.1E-06 | < 4.2E-06 | < 2.2E-05 | < 4.3E-05 | N/A |
| Oxygen | | | | | 4.6 | 21 | 21 | 22 | | | | | | | | |

Notes:
1. Estimated using 1/2 detection limit for cyclohexane
NQ = Not quantified, N/A = Not applicable, NT = Not tested

**Table 5-1**
**Johnson and Ettinger Model Input Values for Site-Specific Assessment, Stafford Site**

| Input Parameter | Units | Value | Rationale |
|---|---|---|---|
| **Chemical Properties** | | | |
| *MTBE* | | | |
| Henry's Law Constant | dimensionless | 2.56E-02 | USEPA Spreadsheet |
| Air Diffusion Coefficient | $cm^2/sec$ | 1.02E-01 | USEPA Spreadsheet |
| Water Diffusion Coefficient | $cm^2/sec$ | 1.05E-05 | USEPA Spreadsheet |
| *224 Trimethylpentane* | | | |
| Henry's Law Constant | dimensionless | 1.24E+02 | TPHCWG Volume 3 [1] |
| Air Diffusion Coefficient | $cm^2/sec$ | 6.00E-02 | TPHCWG Volume 3 |
| Water Diffusion Coefficient | $cm^2/sec$ | 6.59E-06 | TPHCWG Volume 3 |
| *Cyclohexane* | | | |
| Henry's Law Constant | dimensionless | 7.84E+00 | TPHCWG Volume 3 |
| Air Diffusion Coefficient | $cm^2/sec$ | 8.39E-02 | TPHCWG Volume 3 |
| Water Diffusion Coefficient | $cm^2/sec$ | 9.10E-06 | TPHCWG Volume 3 |
| **Soil Properties** | | | |
| Depth to Groundwater | m | 3.35 | Measured |
| Depth to Soil Vapour Samples | m | 3.20 | Measured |
| Total Porosity | $cm^3/cm^3$ | 0.378 | Average measurements two soil samples |
| Layer 1 Unsaturated Zone Water-filled Porosity (0.84 m) | $cm^3/cm^3$ | 0.028 | Mid-point residual saturation and field capacity based on measurements two soil samples |
| Layer 2 Unsaturated Zone Water-filled Porosity (0.84 m) | $cm^3/cm^3$ | 0.045 | Field capacity based on measurements two soil samples |
| Capillary Transition Zone Water-filled Porosity | $cm^3/cm^3$ | 0.253 | Draft USEPA VI Guidance default |
| Capillary Transition Zone Height | $cm^3/cm^3$ | 0.17 | Draft USEPA VI Guidance default |
| Soil Temperature | C | 15 | Estimated |
| **Building Properties** | | | |
| Building Air Exchange Rate | $hr^{-1}$ | 0.47 | Estimated value based on $CO_2$ tracer test conducted in January 2004, the air exchange rate measured in basement was 0.59; however, some of this exchange is due to mixing of tracer in rest of house, estimate that 80 percent of air change due to outside air |
| Basement Mixing Height | m | 2.13 | Measured |
| Basement Footprint Area | $m^2$ | 36.5 | Measured |
| Subsurface Foundation Area | $m^2$ | 79.6 | Measured |
| Volume Basement | $m^3$ | 77.9 | Calculated |
| Ratio Volume/Area | m | 0.98 | Calculated |
| Depth to Base of Foundation | m | 1.68 | Measured |
| Assumed Perimeter Crack Width | cm | 0.1 | Assumed; draft USEPA VI Guidance default |
| Perimeter Foundation Crack Length | m | 25.6 | Calculated |
| Building Crack Area | $m^2$ | 0.40 | Assumed perimeter crack width (1 mm) times perimeter foundation crack length plus open dirt area (0.6 by 0.6 m) |
| Building Crack Ratio | dimensionless | 0.0050 | Calculated |
| Crack Dust Water-Filled Porosity | $cm^3/cm^3$ | Dry | Assumed; draft USEPA VI Guidance default |
| Building Foundation Slab Thickness | m | 0.1 | Measured |
| **Method 1 (Estimate $Q_{soil}$ based on $Q_{soil}/Q_{build}$ ratio)** | | | |
| $Q_{soil}$ | L/min | 2.0 | Adjust such that Qsoil/Qbuild = 0.0033 (EPA value) |
| $Q_{soil}$ | $cm^3/sec$ | 33 | Adjust such that Qsoil/Qbuild = 0.0033 (EPA value) |
| $Q_{build}$ | L/min | 613 | Calculated |
| $Q_{soi}l/Q_{build}$ | dimensionless | 0.0033 | Calculated |
| **Method 2 (Calculate $Q_{soil}$ using Perimeter Crack Model)** | | | |
| Soil air permeability | $cm^2$ | 1.00E-07 | Estimated, input directly into spreadsheet |
| Building Depressurization | Pa | 0.6 | Measured October 23, 2002 |
| Equivalent Perimeter Crack Width | cm | 1.54 | Calculated, includes open crack area |
| $Q_{soil}$ | L/min | 0.61 | Calculated |
| $Q_{soil}$ | $cm^3/sec$ | 10 | Calculated |
| $Q_{soi}l/Q_{build}$ | dimensionless | 0.0010 | Calculated |

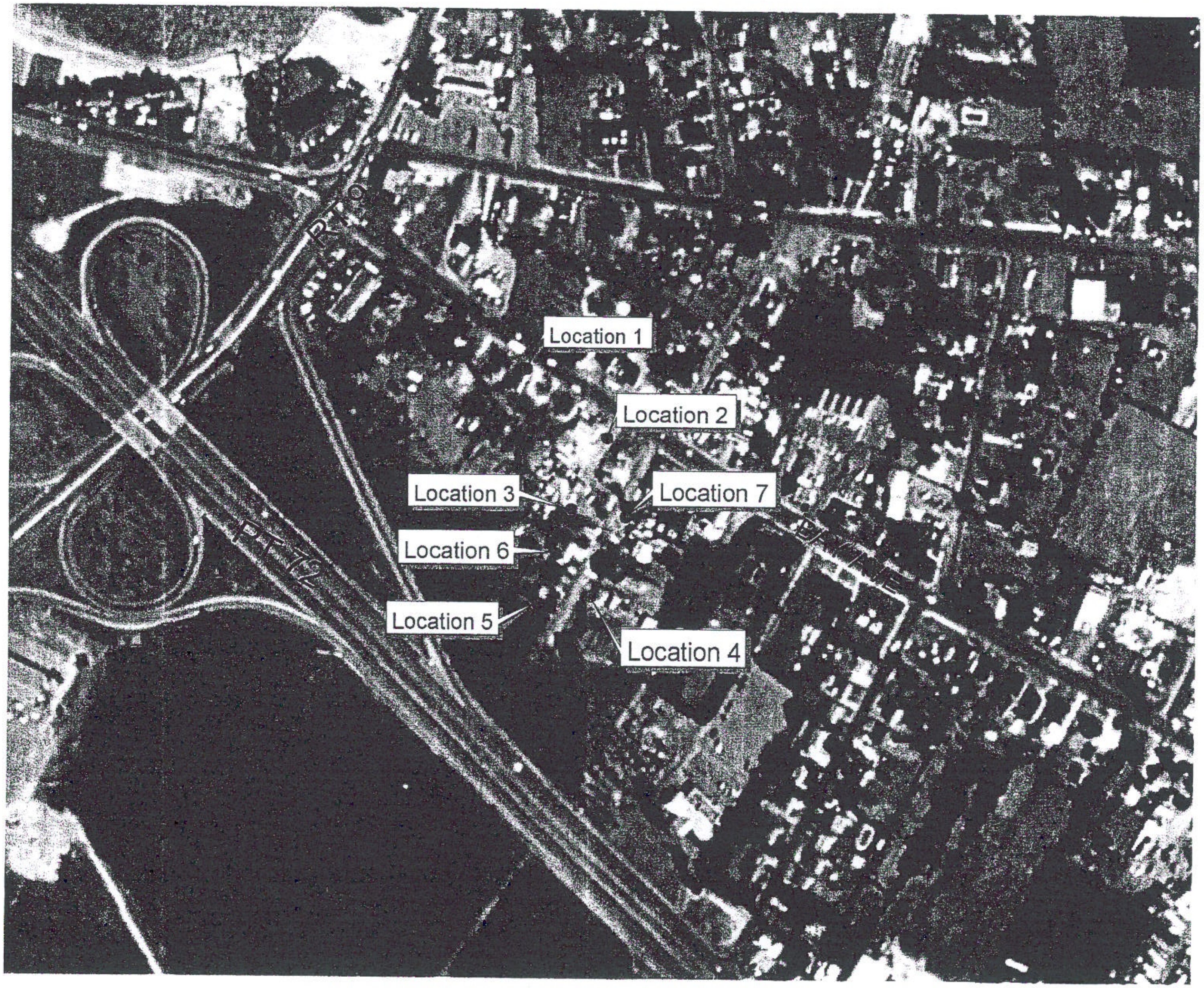
1. Total Petroluem Hydrocarbon Criteria Working Group, Selection of Representative TPH Fractions Based on Fate and Transport Considerations

# Table 5-2
## Comparison of Site Specific Alpha's to Measured Alpha's for 73 Bay Avenue, Stafford Site



| Chemical | Pathway | Measured Alpha (Basement) | | | Site Specific J&E Alpha (basement) | | US EPA VI Q5 |
|---|---|---|---|---|---|---|---|
| | | October 2002 Data (1 side house, max) | January 2004 Data (1 side house, max) | January 2004 Data (both sides house, avg) | Method 1 ($Q_{soil}/Q_{build}$ ratio) | Method 2 (PCM) | Alpha (Basement) |
| MTBE[1] | Groundwater to Indoor Air | 1.10E-05 | N/A | N/A | 1.2E-03 | 7.4E-04 | 1.2E-03 |
| Cyclohexane | Soil Vapour to Indoor Air | 1.20E-04 | 8.00E-05 | 1.60E-04 | 2.3E-03 | 1.1E-03 | 2.2E-03 |
| 224 Trimethylpentane | Soil Vapour to Indoor Air | 3.60E-04 | 3.40E-04 | 6.70E-04 | 2.1E-03 | 9.5E-04 | 2.2E-03 |

# Bay Avenue - Manahawkin, Stafford Twp.




New Jersey
Department
of
Environmental Protection

Site Remediation
Program

## Environmental Measurements Section

Golder - NJDEP
Vapor Intrusion
Research Study

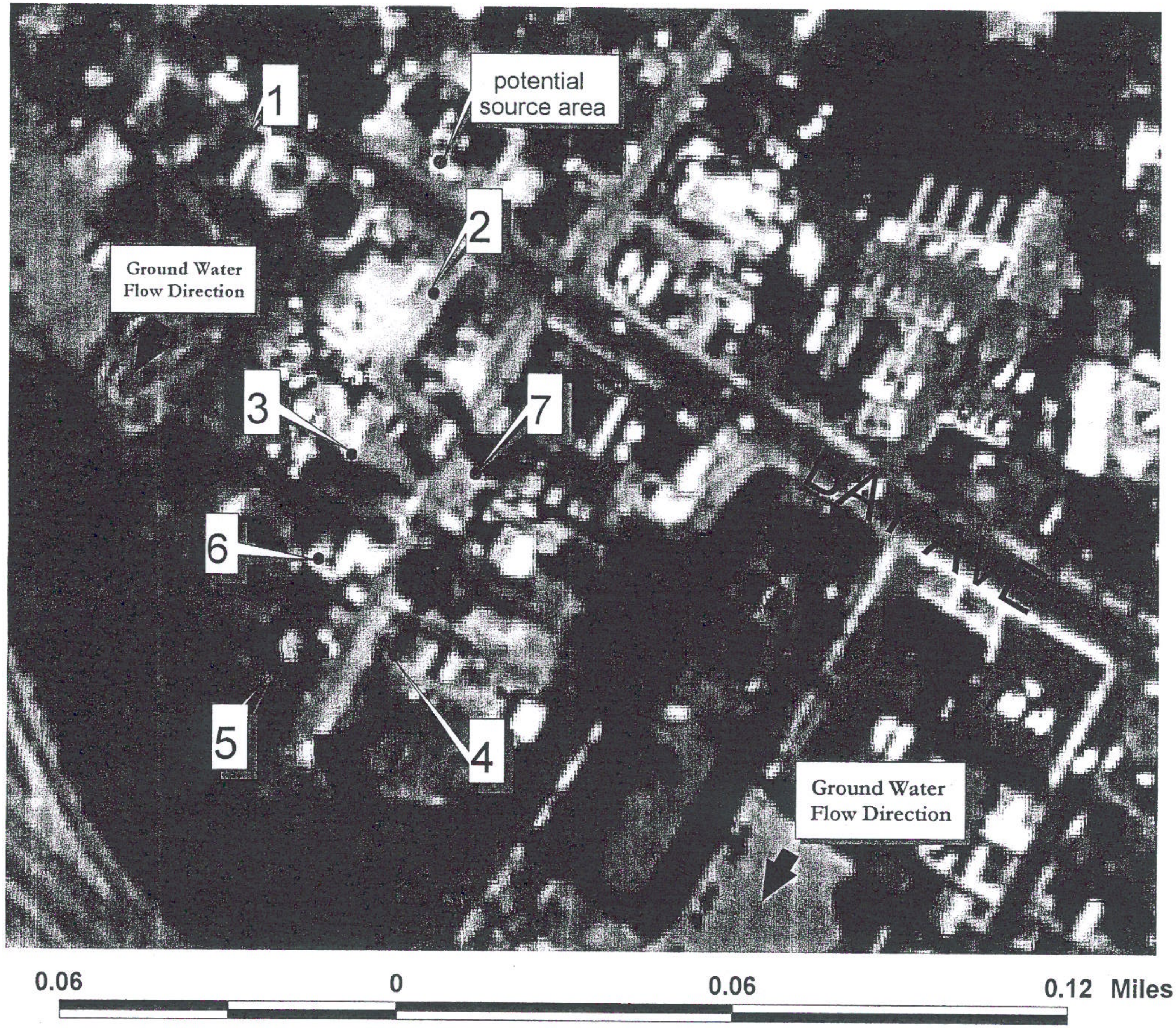
● Sample Locations

N
W E
S

0.1 0 0.1 0.2 0.3 0.4 Miles

**FIGURE 2-1**

# Bay Avenue - Manahawkin, Stafford Twp.




New Jersey
Department
of
Environmental
Protection

Site Remediation
Program

Environmental
Measurements
Section

**Golder - NJDEP**
**Vapor Intrusion**
**Research Study**

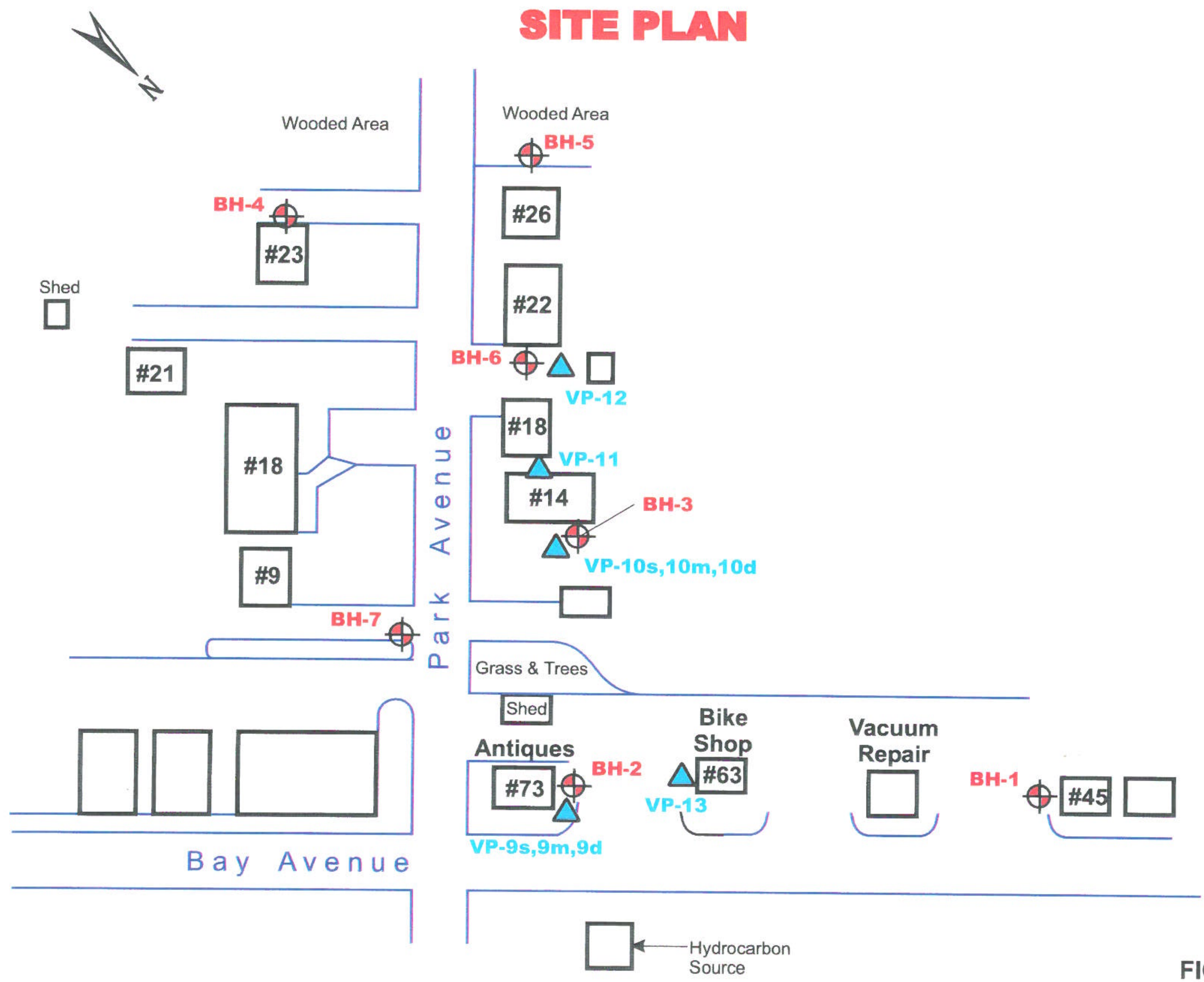
● **Sample Locations**

**September 9 - 12, 2002**

N
W E
S

FIGURE 2-2

# STAFFORD TOWNSHIP
# SITE PLAN

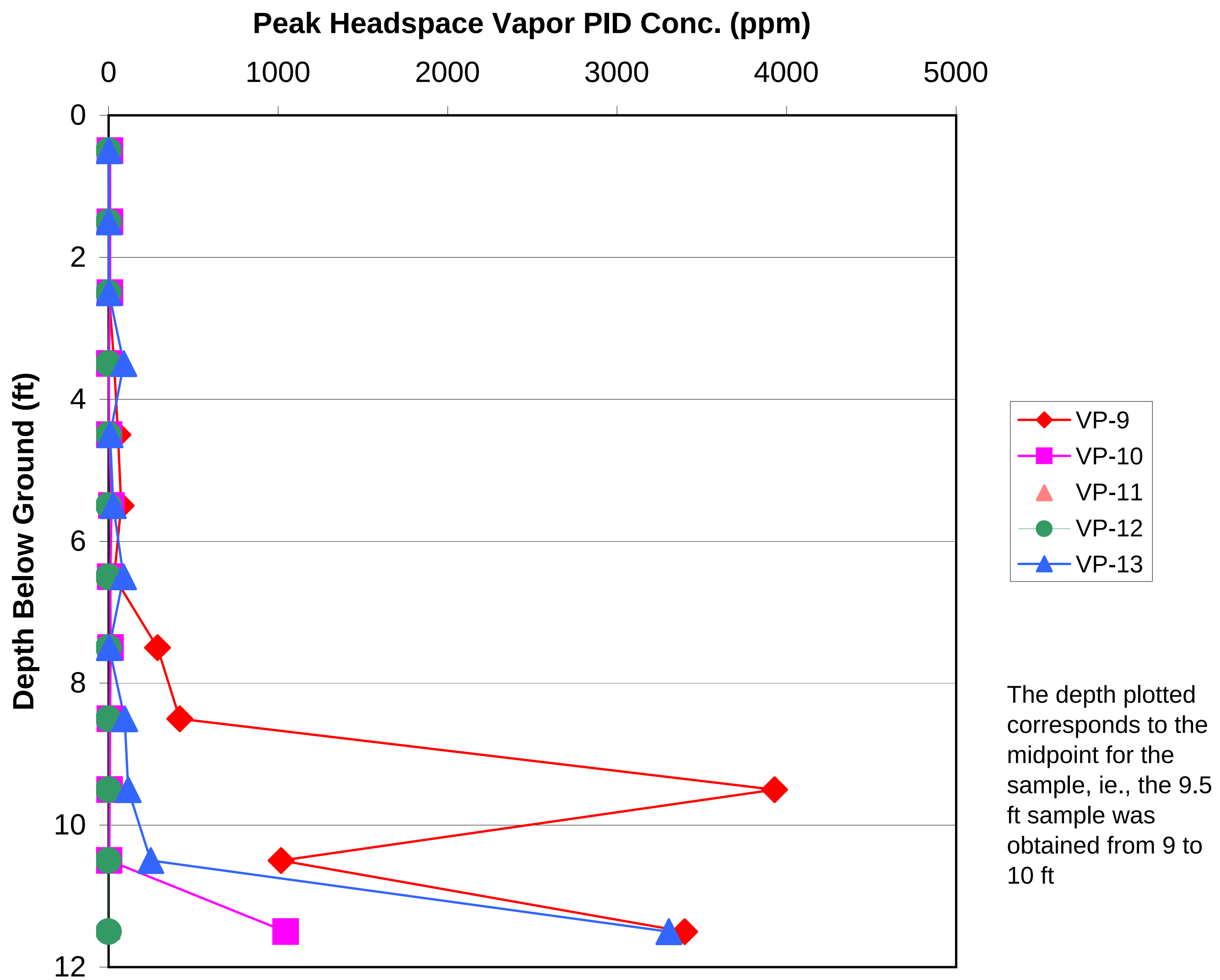



PROJECT NO. 023-6124C DATE: 20-MAR-03

Golder Associates

FIGURE 3-1

**Figure 3-2. Stafford Site Soil Headspace Vapor Test Results October 2002**



# STAFFORD TOWNSHIP

# SHALLOW GROUNDWATER QUALITY (BTEX) - SEPTEMBER 2002

PROJECT NO. 023-6124C DATE: 20-MAR-03

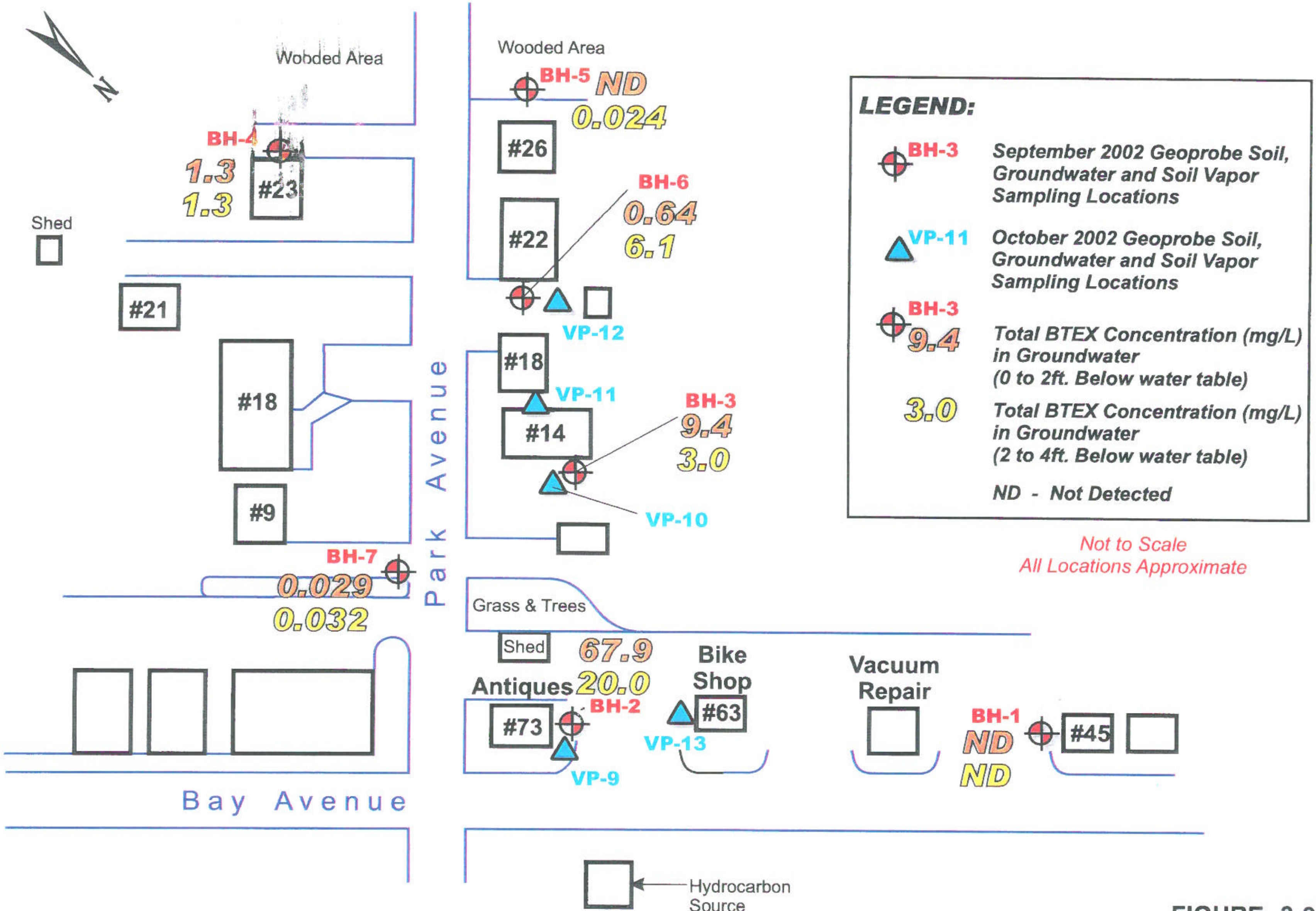



FIGURE 3-3

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PROJECT NO. 023-6124C DATE: 20-MAR-03

# STAFFORD TOWNSHIP

## SHALLOW GROUNDWATER QUALITY (MTBE) - SEPTEMBER 2002

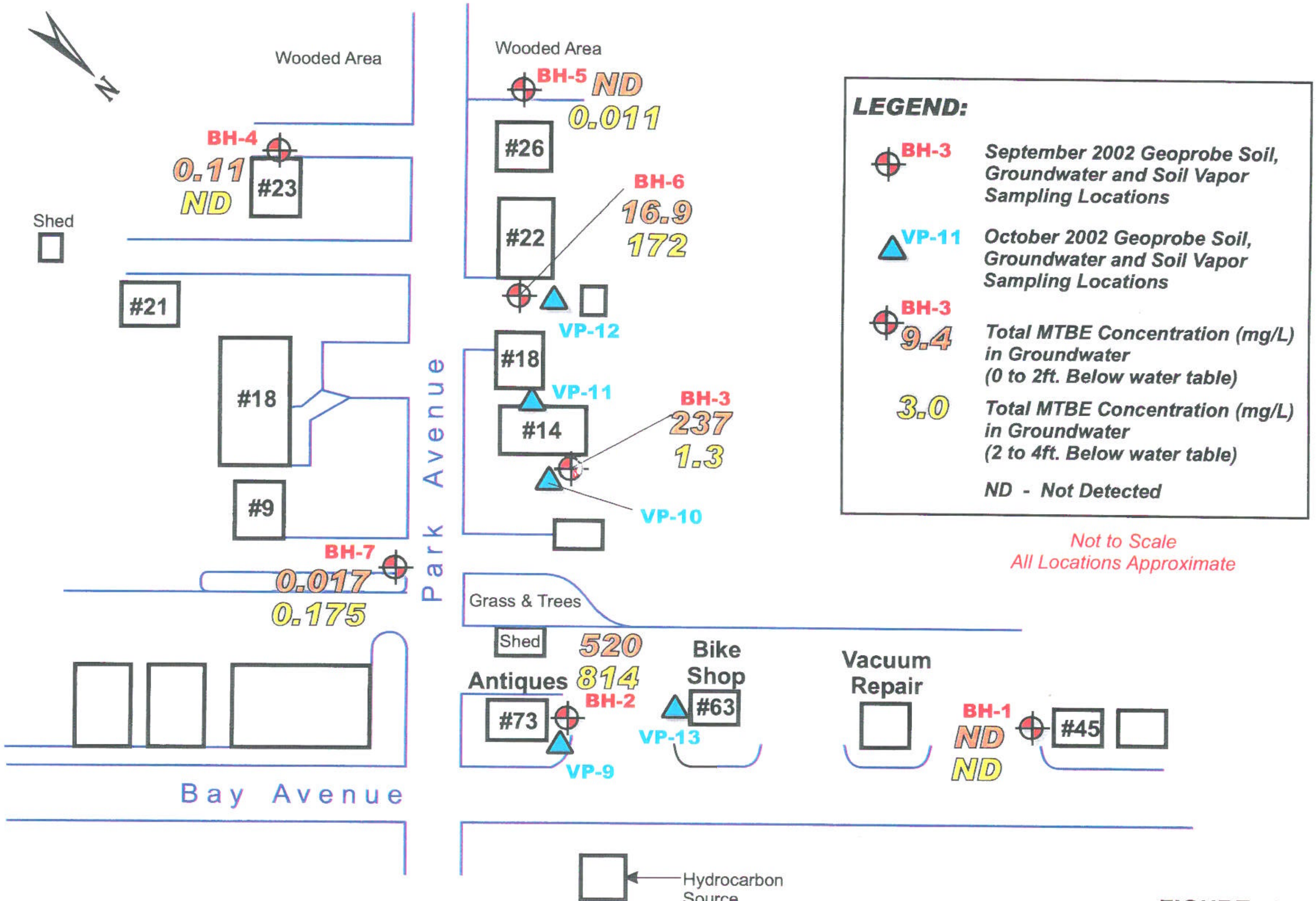


FIGURE 3-4

Golder Associates

# STAFFORD TOWNSHIP
## SHALLOW GROUNDWATER QUALITY (BTEX) - OCTOBER 2002

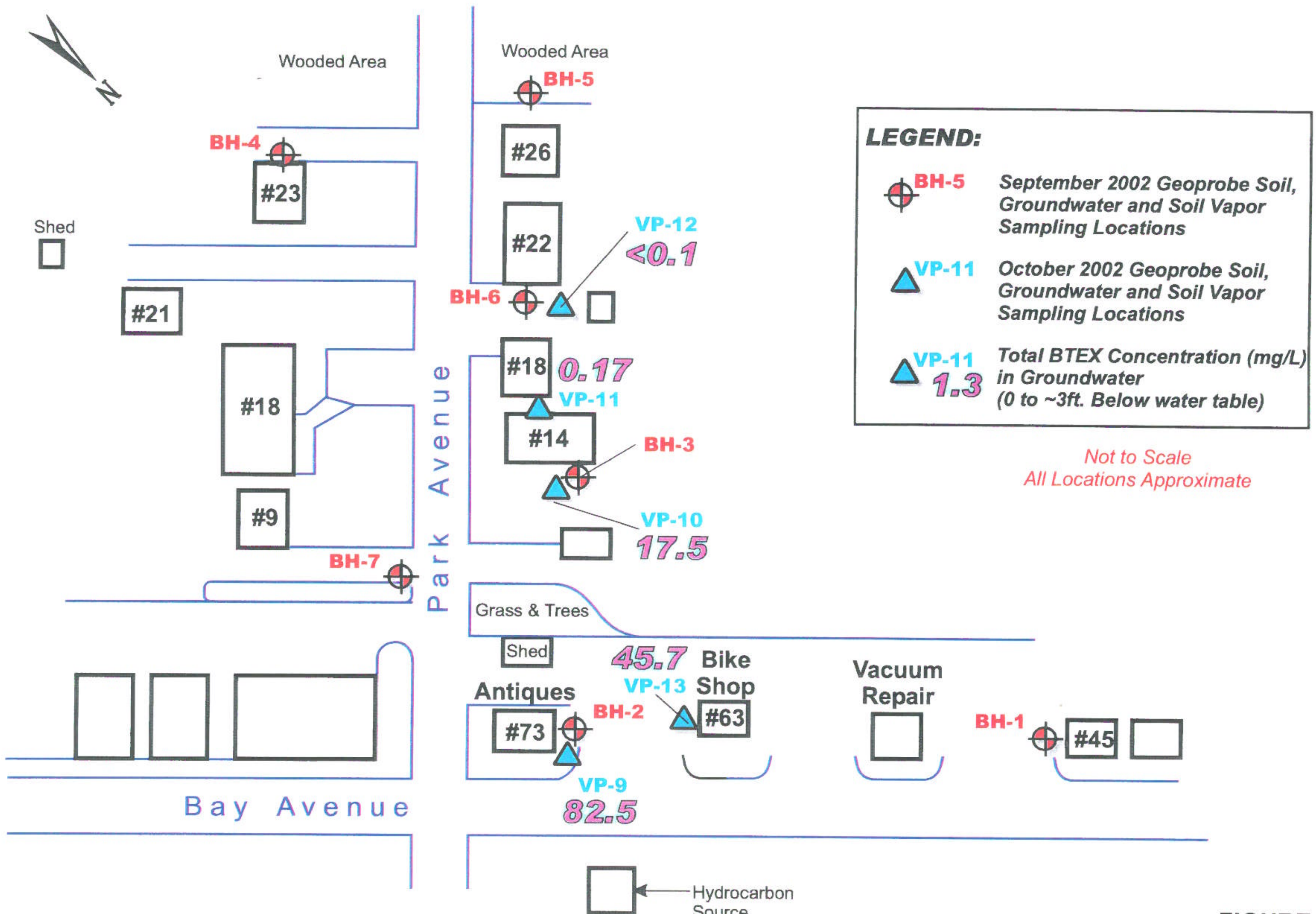


FIGURE 3-5

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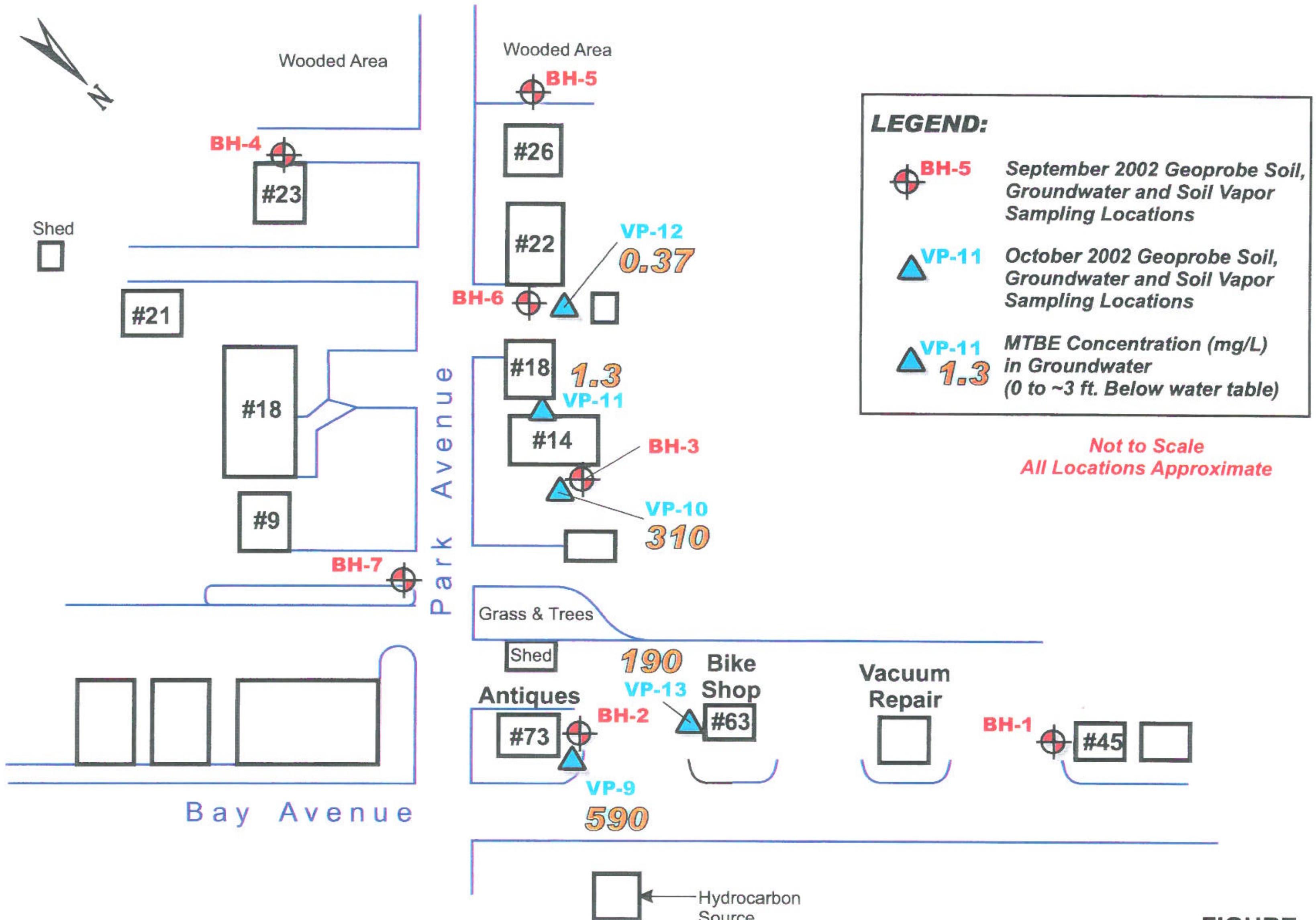
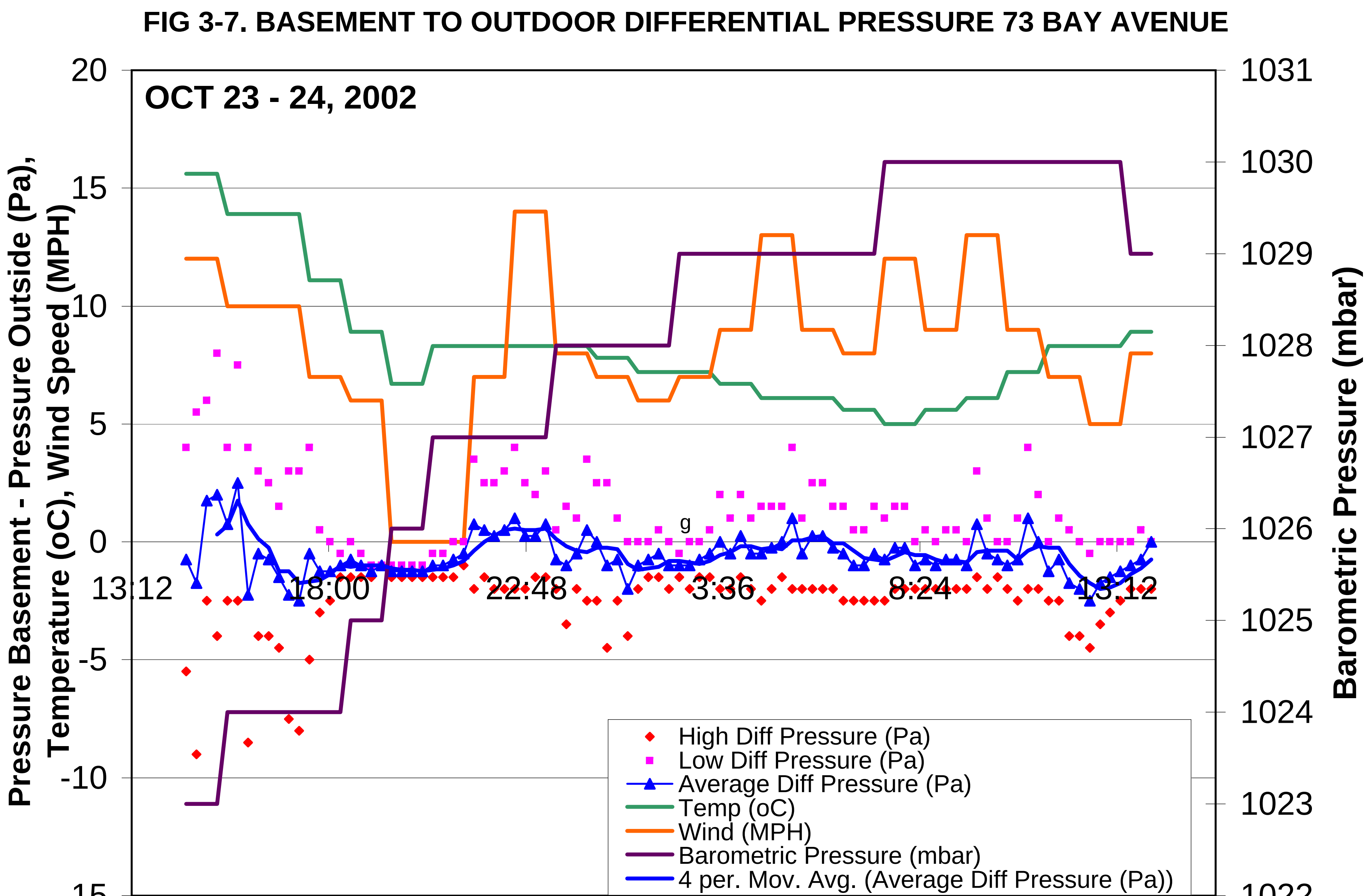
# STAFFORD TOWNSHIP
# SHALLOW GROUNDWATER QUALITY (MTBE) - OCTOBER 2002

PROJECT NO. 023-6124C DATE: 20-MAR-03




Golder Associates

FIGURE 3-6



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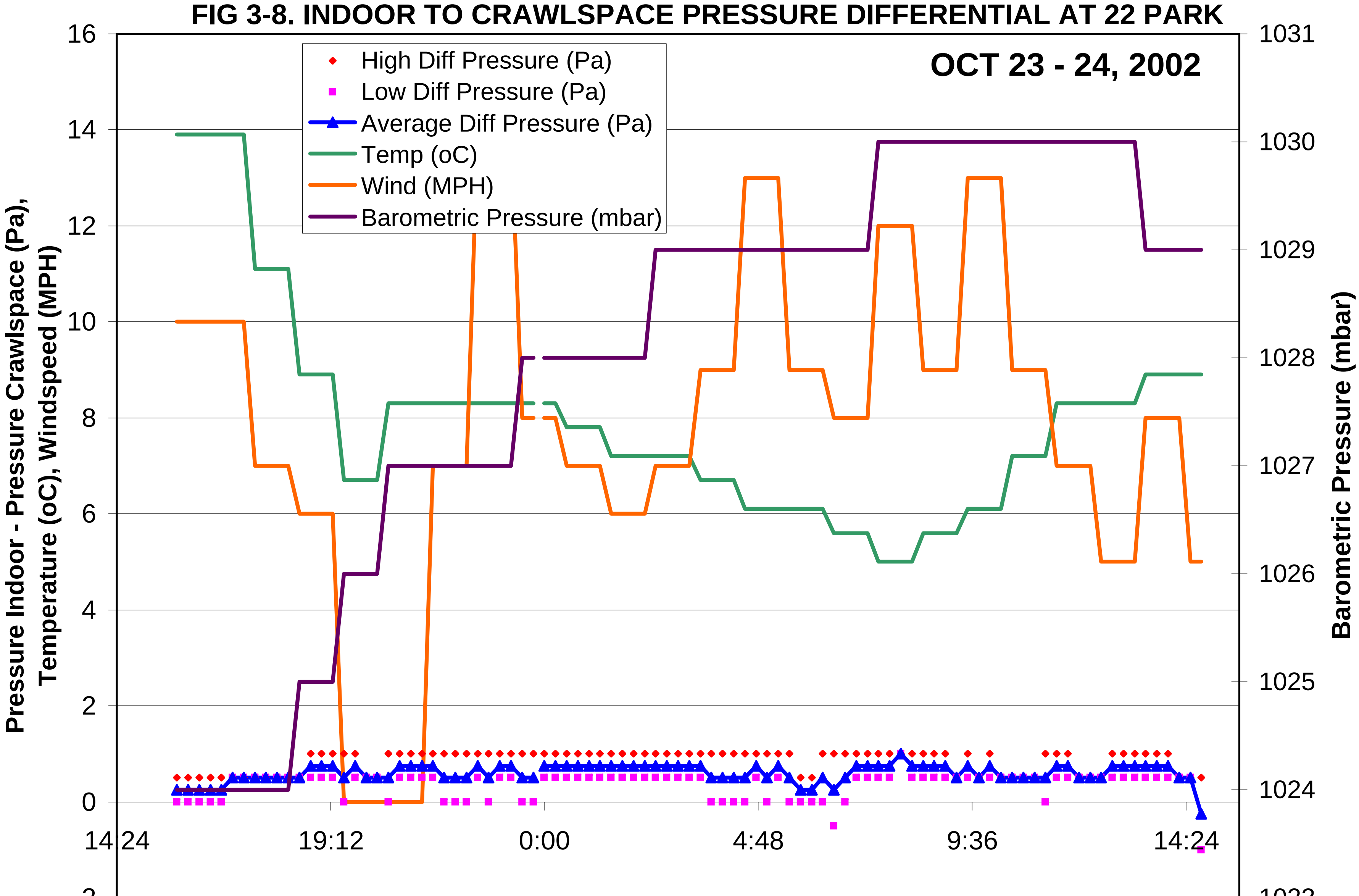



Golder Associates

**FIG 3-9. BASEMENT TO OUTDOOR DIFFERENTIAL PRESSURE AT 14 PARK**

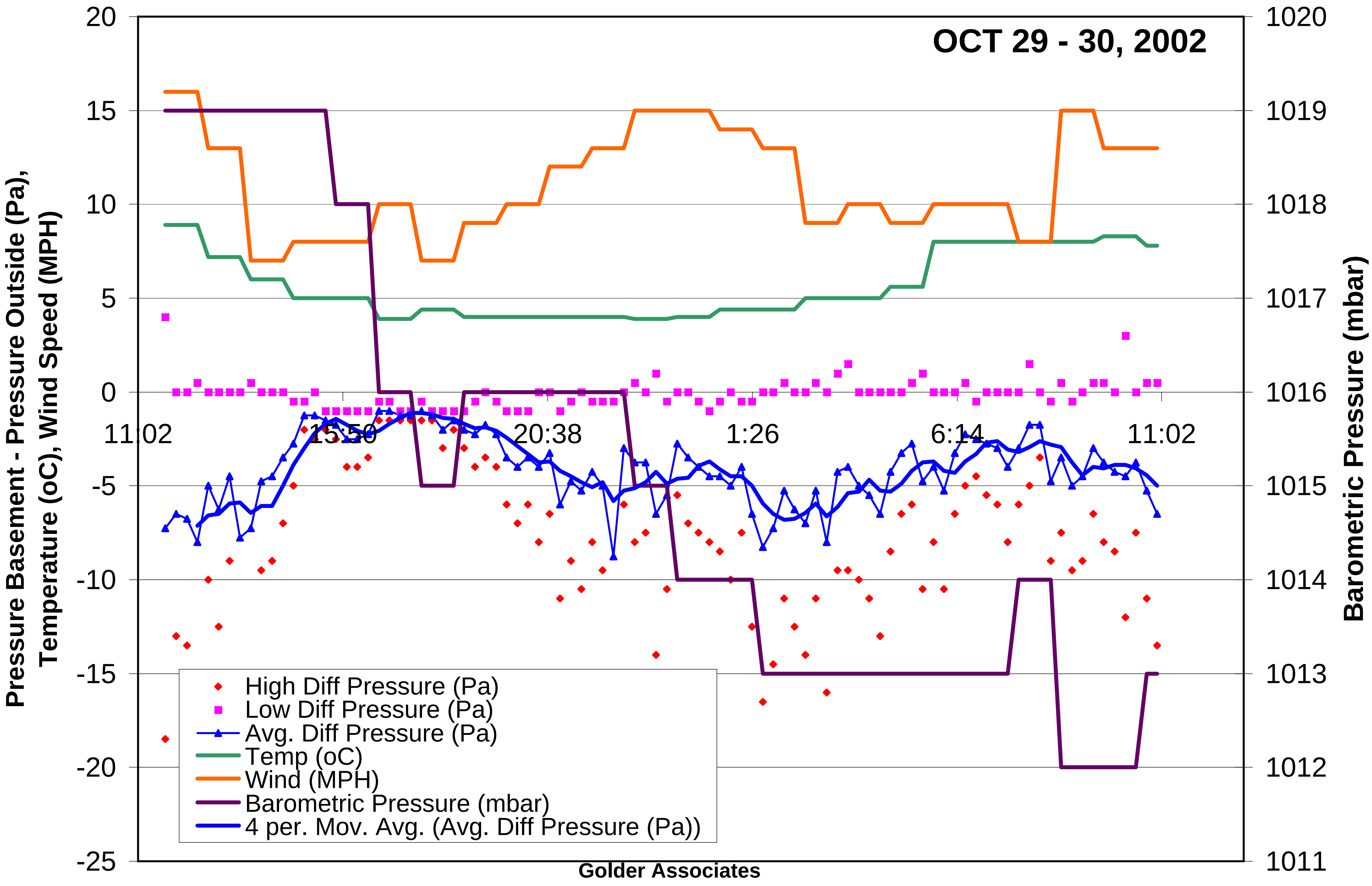
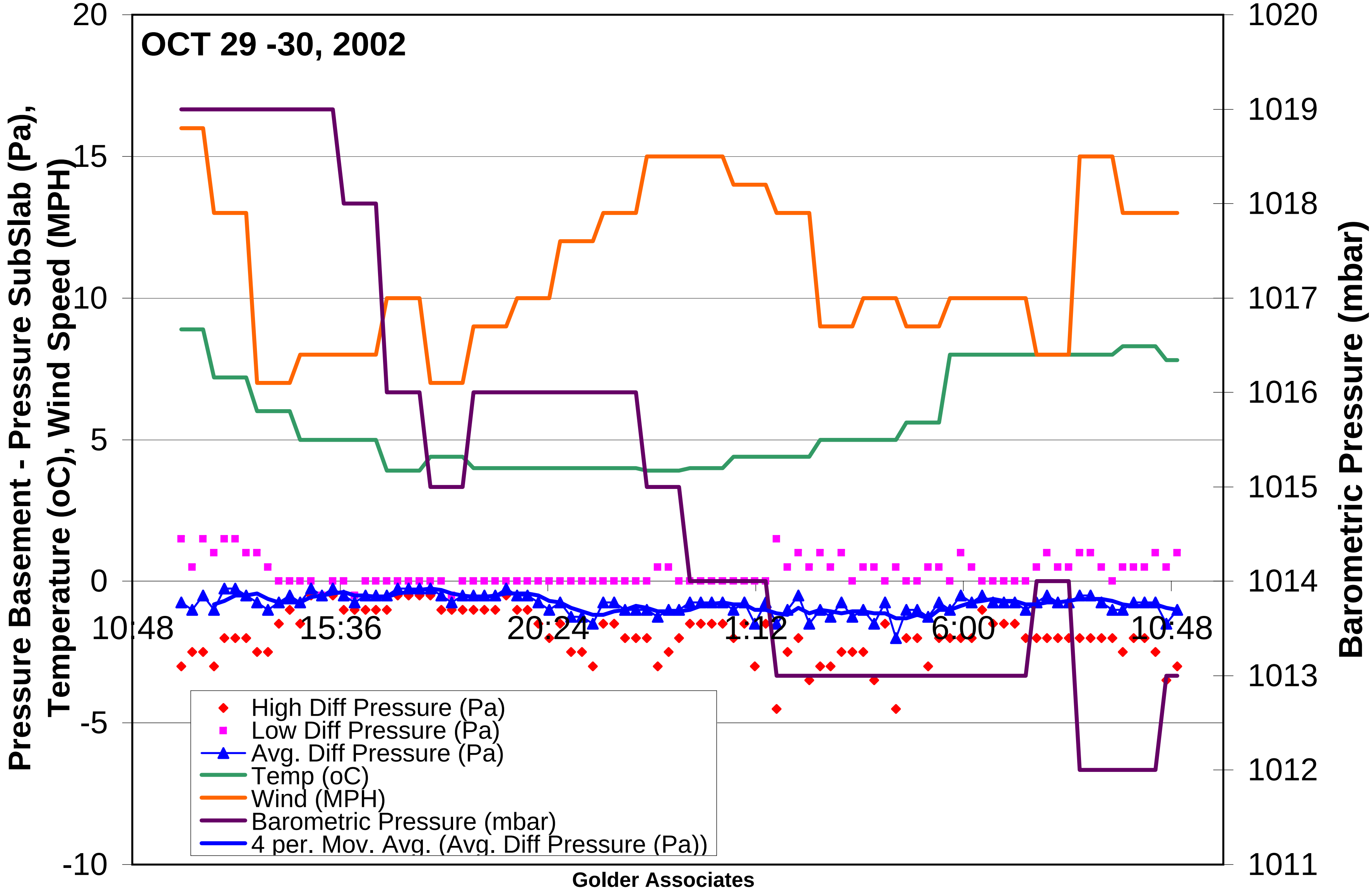
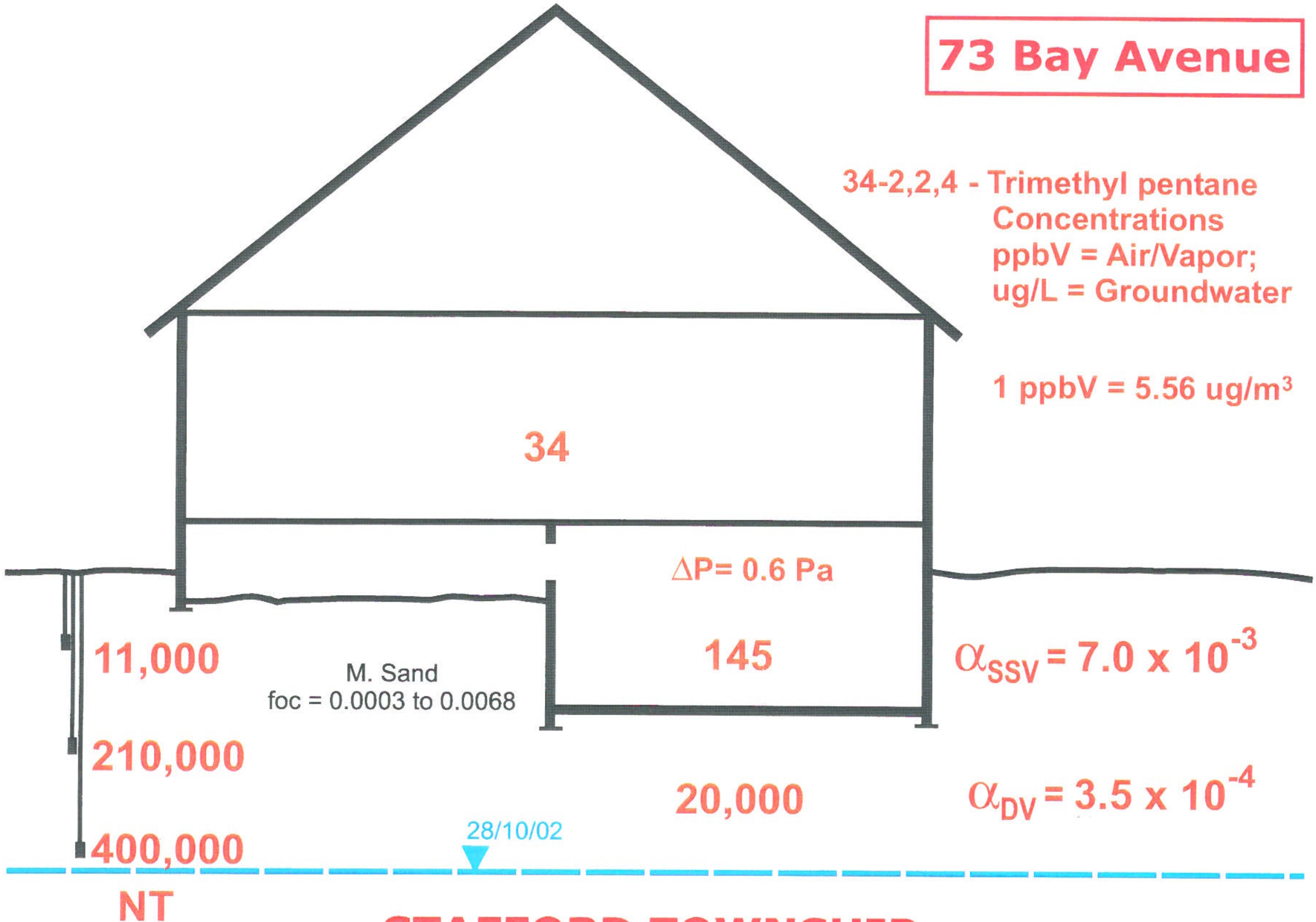


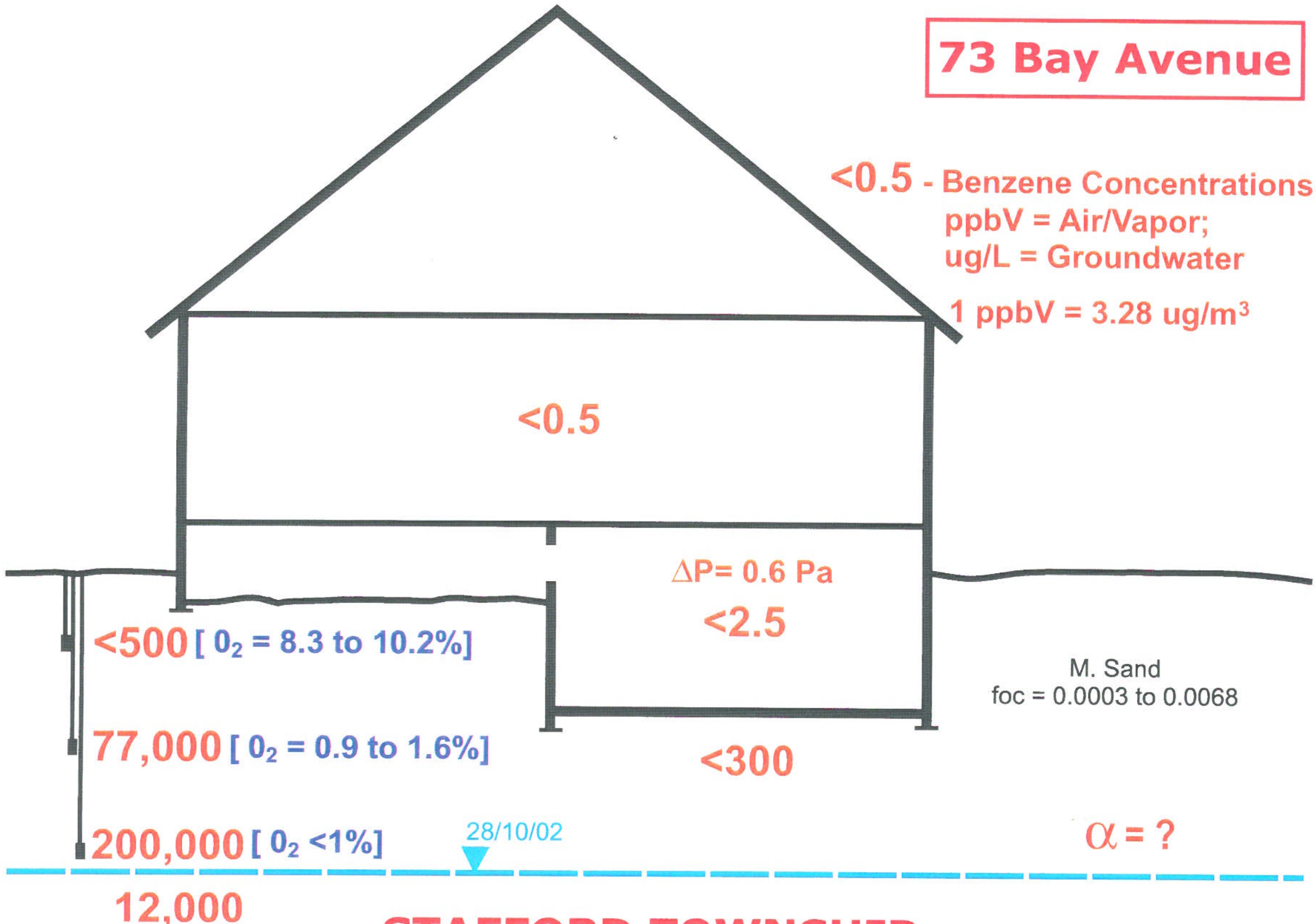
FIG 3-10. BASEMENT TO SUBSLAB DIFFERENTIAL PRESSURE AT 14 PARK



PROJECT NO. 023-6124C DATE: 20-MAR-03

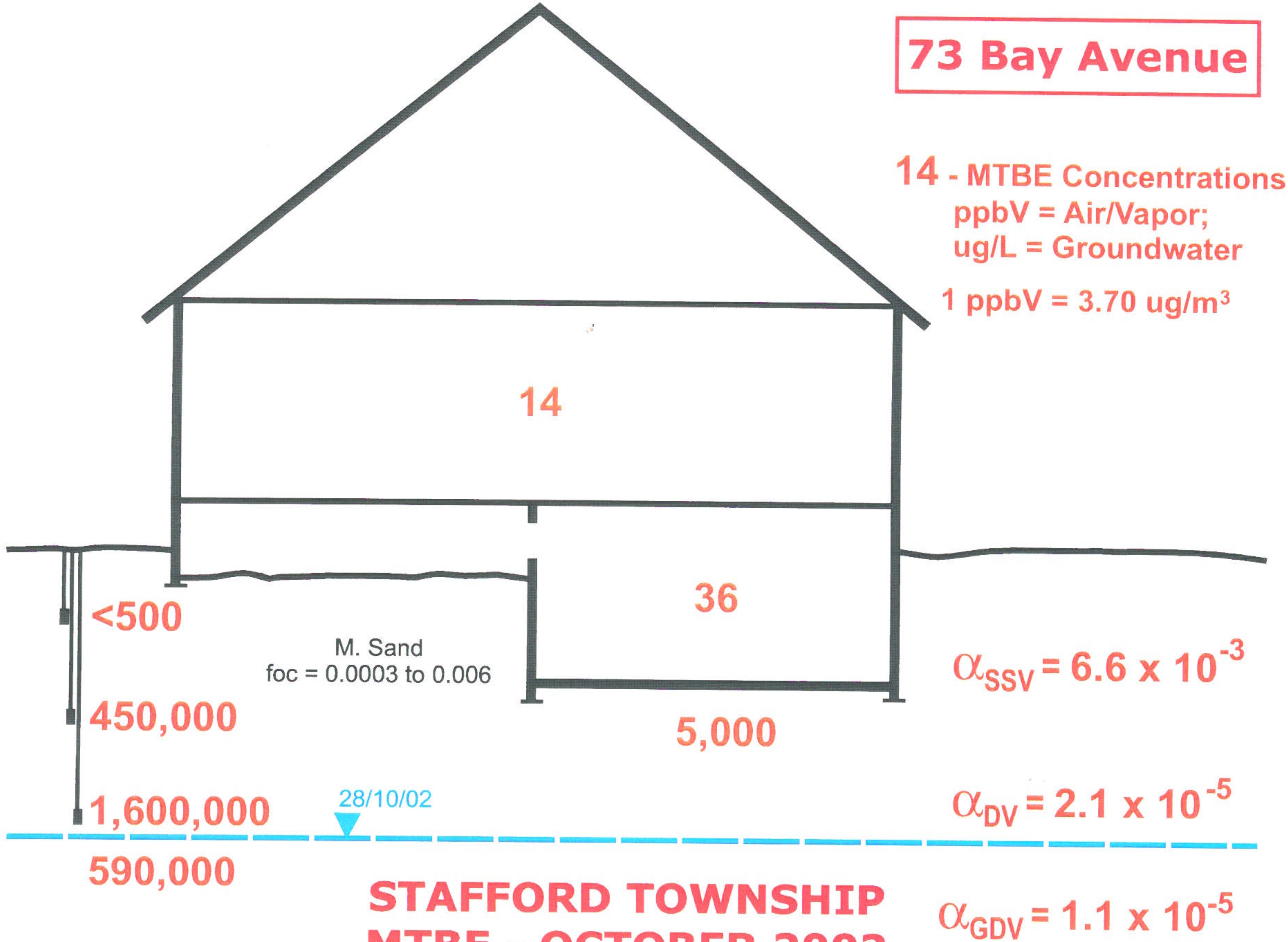



**STAFFORD TOWNSHIP**
**2,2,4 - TRIMETHYLPENTANE - OCTOBER 2002**

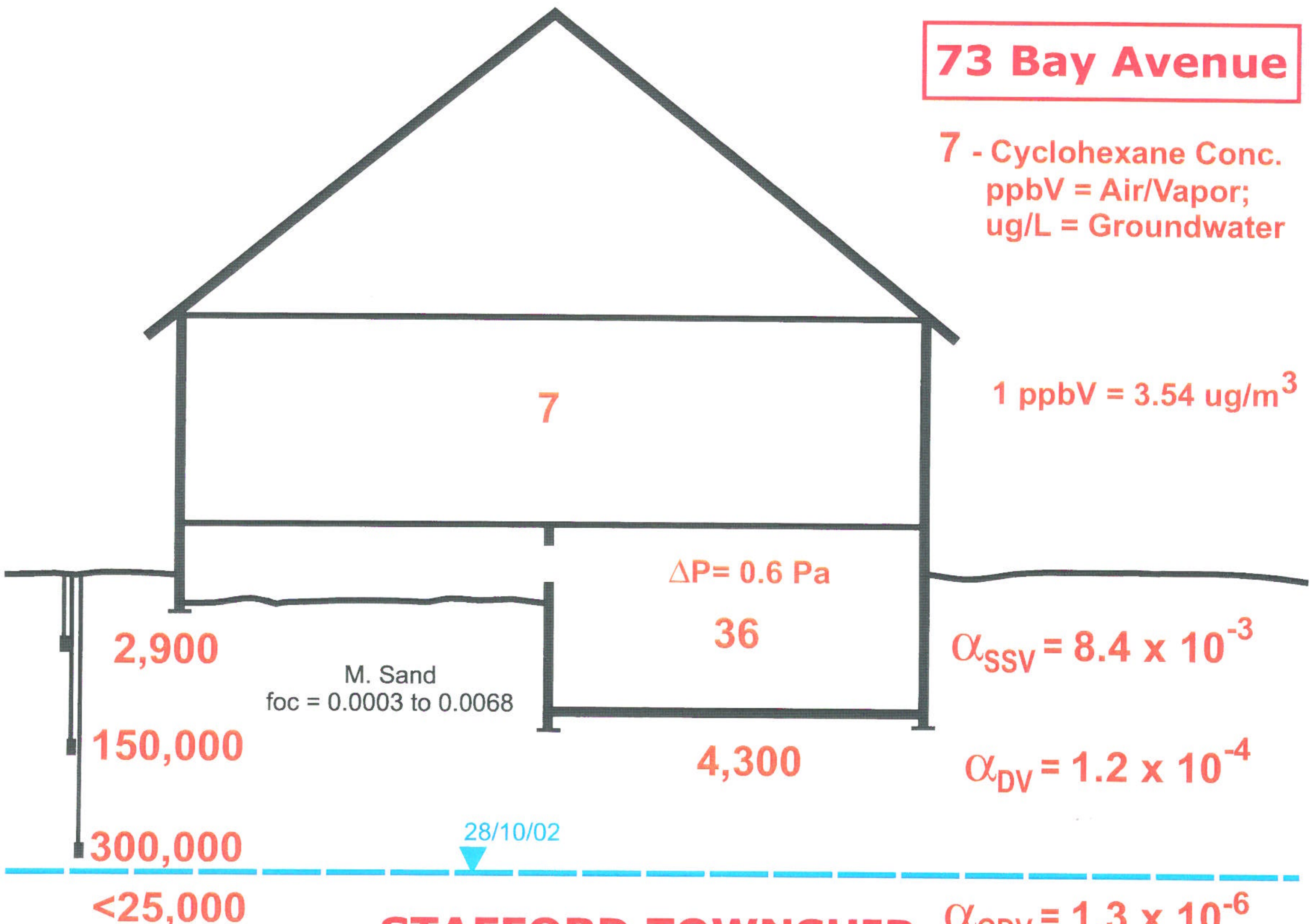



# STAFFORD TOWNSHIP BENZENE - OCTOBER 2002

PROJECT NO. 023-6124C DATE: 20-MAR-03




**STAFFORD TOWNSHIP**
**MTBE - OCTOBER 2002**




**STAFFORD TOWNSHIP**
**CYCLOHEXANE - OCTOBER 2002**

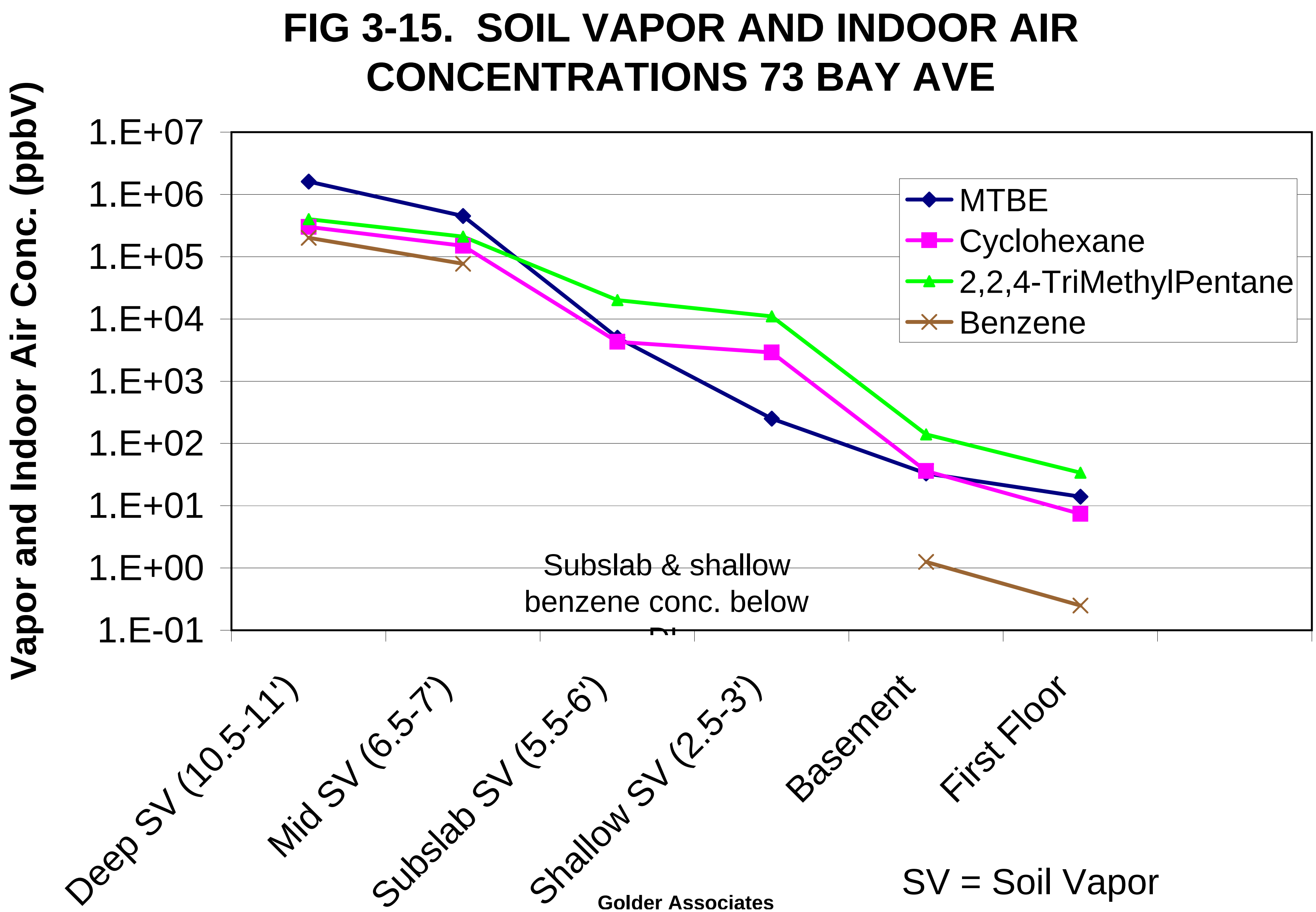
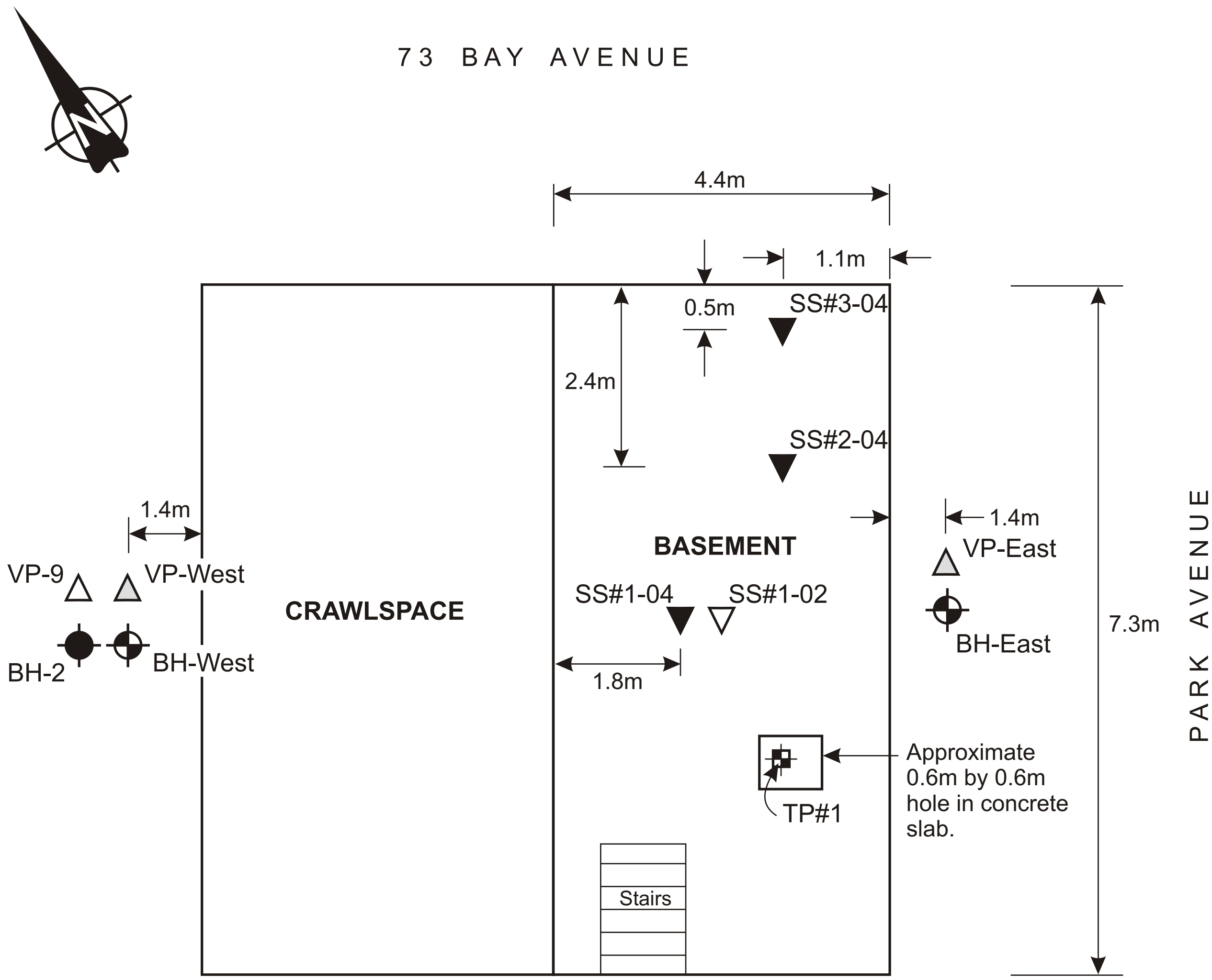


FIG 3-15. SOIL VAPOR AND INDOOR AIR CONCENTRATIONS 73 BAY AVE
Vapor and Indoor Air Conc. (ppbV)
1.E+07
1.E+06
1.E+05
1.E+04
1.E+03
1.E+02
1.E+01
1.E+00
1.E-01
MTBE
Cyclohexane
2,2,4-TriMethylPentane
Benzene
Subslab & shallow
benzene conc. below
Deep SV (10.5-11')
Mid SV (6.5-7')
Subslab SV (5.5-6')
Shallow SV (2.5-3')
Basement
First Floor
SV = Soil Vapor
Golder Associates




**LEGEND:**

- 2002 Geoprobe groundwater sampling location
- 2004 Geoprobe groundwater sampling location
- 2002 Vapour probe location
- 2004 Vapour probe location
- 2002 Sub-slab vapour probe location
- 2004 Sub-slab vapour probe location
- 2004 Hand-dug test pit location

Not to Scale

| | | | | | |
|---|---|---|---|---|---|
| PROJECT | NJDEP STAFFORD TOWNSHIP | | | | |
| TITLE | SAMPLING LOCATIONS AT 73 BAY AVENUE | | | | |
| Golder Associates | PROJECT No. | | 023-6124C | FILE No. PLAN | |
| | DESIGN | IH | 03AUG04 | SCALE NTS | REV. |
| | CADD | SS | 03AUG04 | FIGURE 4-1 | |
| | CHECK | IH | 03AUG04 | | |
| | REVIEW | | | | |

REVISION DATE: 03-AUG-04 BY:SS COREL FILE:N:\Bur-Graphics\Projects\6000\2003\023-6124C\Plan.cdr

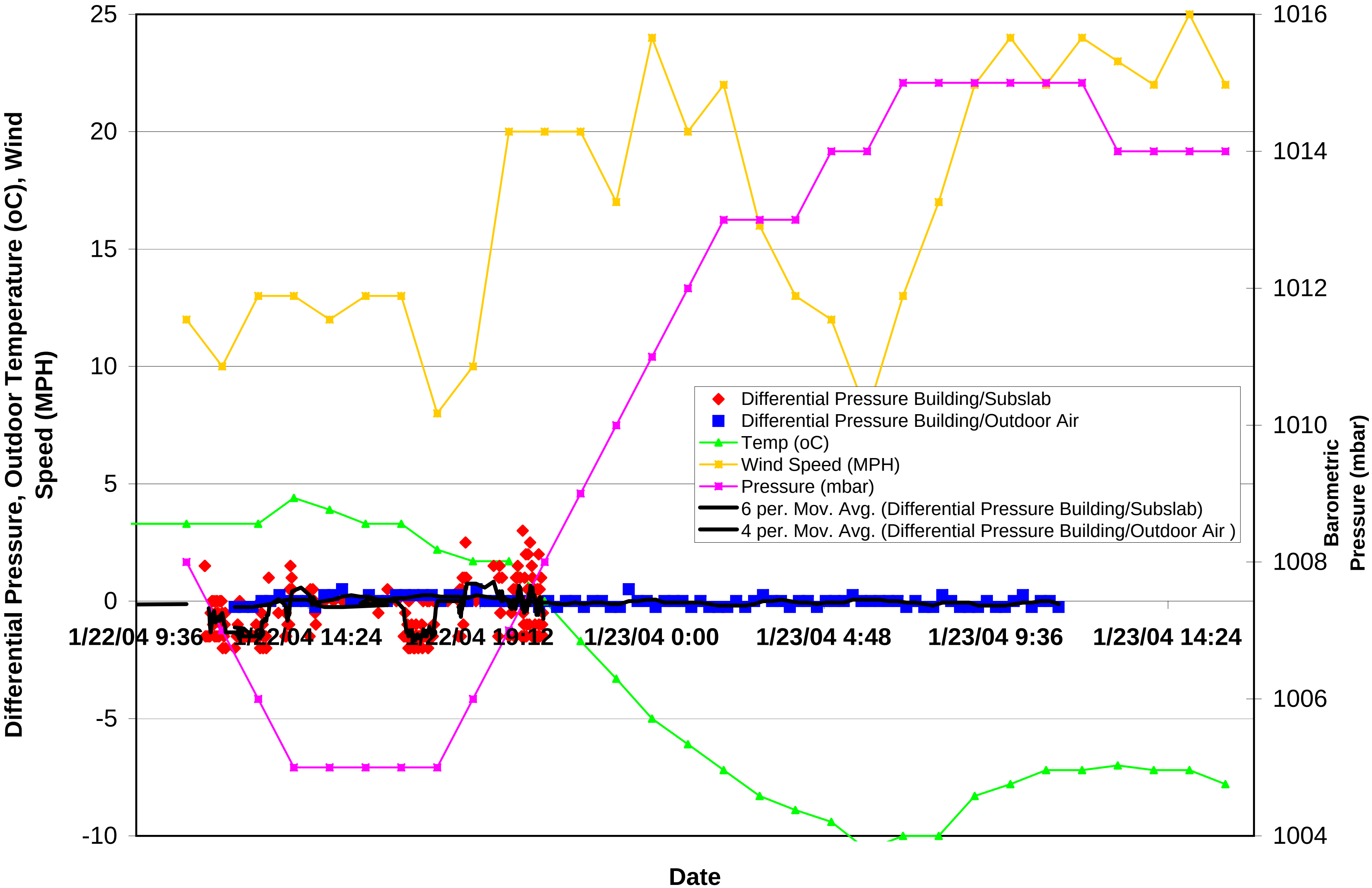



**Figure 4-2. Differential Pressure 73 Bay Avenue**

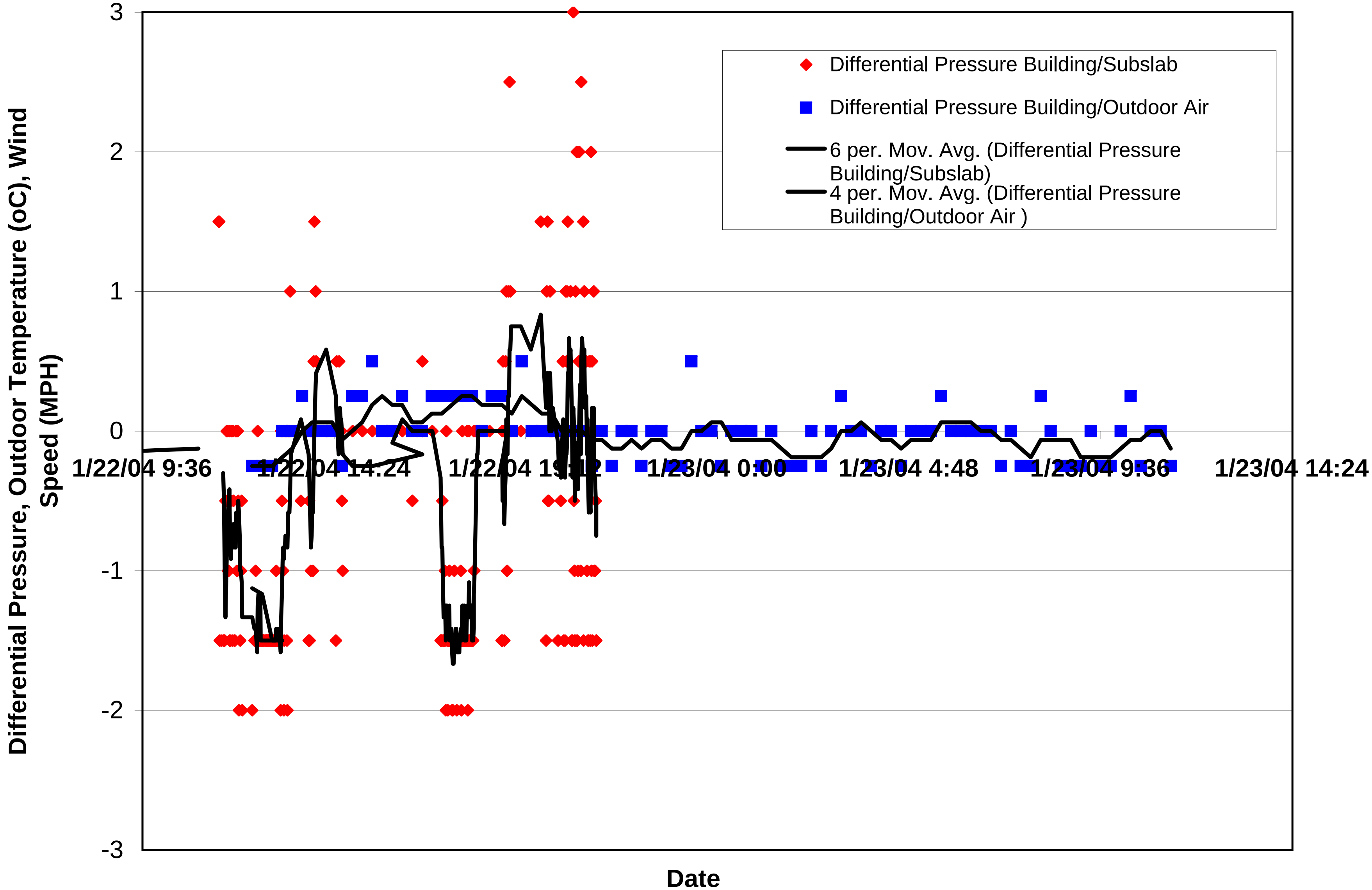
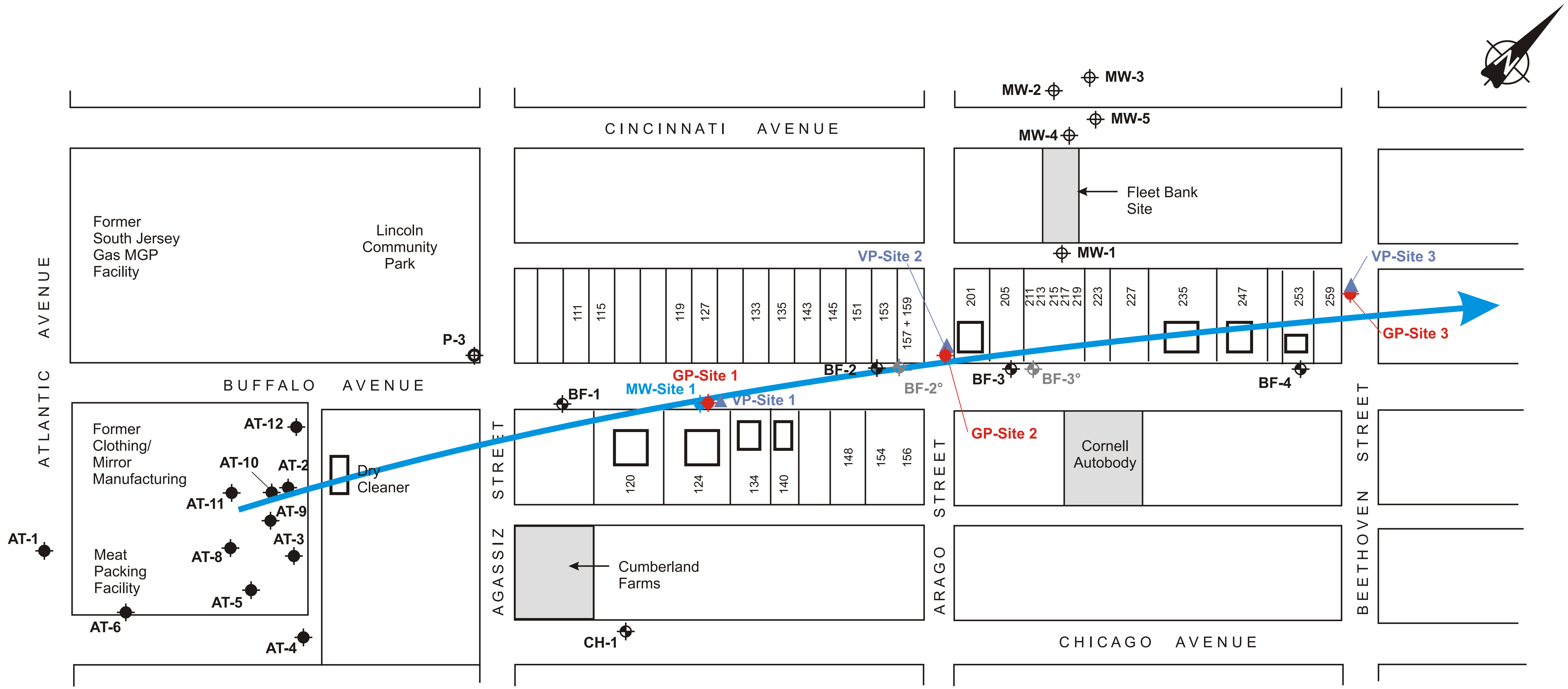



**Figure 4-3. Differential Pressure 73 Bay Avenue**




Not to Scale

**LEGEND:**

| | |
|---|---|
| BF-1 | NJDEP Geoprobe Approximate Location (February 2003) |
| BF-1° | Old Location |
| AT-1 | NJDEP Geoprobe Approximate Location (June 2003) |
| GP-Site 1 | Golder Geoprobe Approximate Location (December 2003) |
| MW-Site 1 | Golder Monitoring Well Approximate Location (January 2004) |
| VP-Site 1 | Golder Vapor Monitoring Probe Approximate Location (December 2003) |
| P-3 | South Jersey Gas MGP Piezometer Approximate Location (December 2003) |
| MW-1 | Fleet Bank Wells |
| | Approximate Tetrochloroethene Plume Centreline |

REVISION DATE:17-AUG-04 BY: SS COREL FILE:N:\Bur-Graphics\Projects\6000\2003\023-6124C\Plan 2.cdr

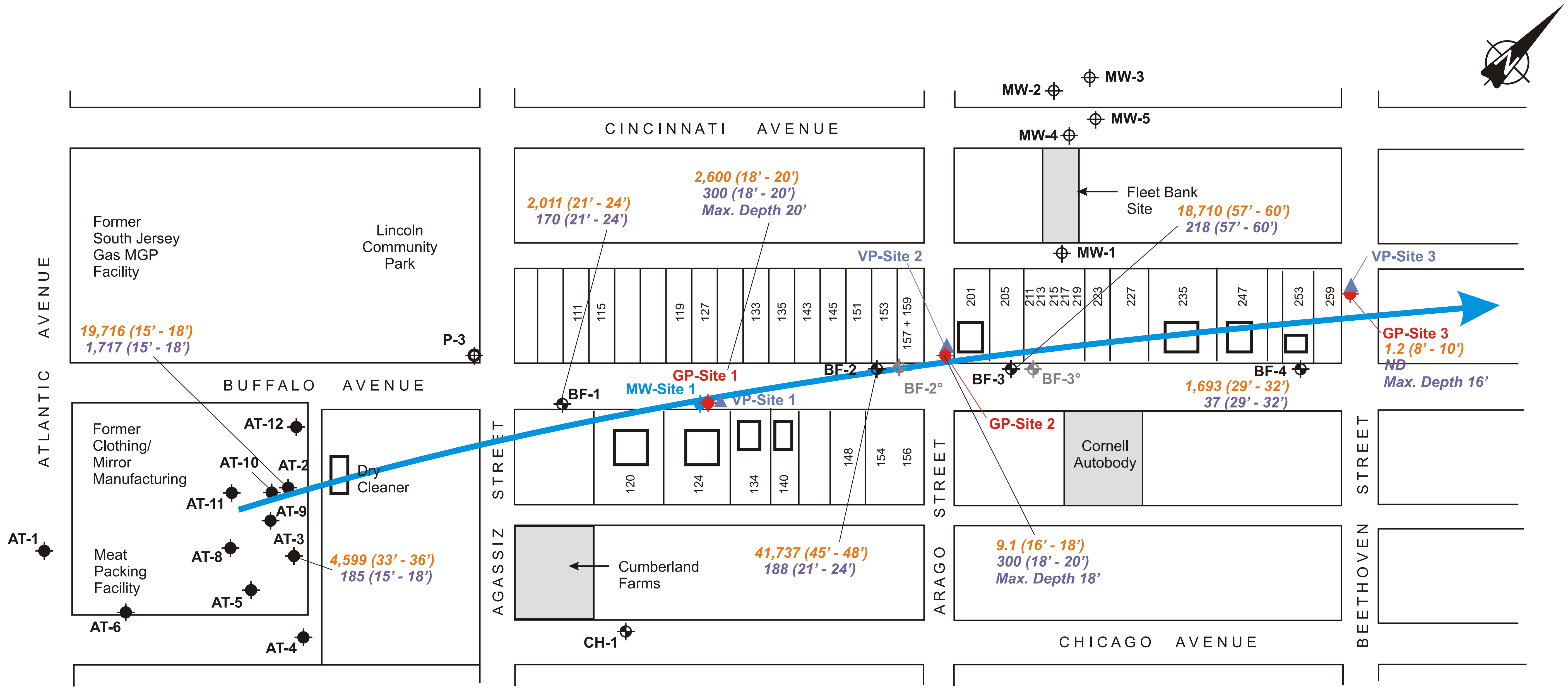
PROJECT: NJDEP VAPOR INTRUSION STUDY EGG HARBOR

TITLE: GROUNDWATER AND VAPOR SAMPLING LOCATIONS EGG HARBOR, NEW JERSEY

Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT No. | 023-6124C | | FILE No. | PLAN 2 |
| DESIGN | IH | 16AUG04 | SCALE NTS | REV. |
| CADD | SS | 16AUG04 | | |
| CHECK | IH | 16AUG04 | | |
| REVIEW | | | | |

**FIGURE 6-1**




Not to Scale

**LEGEND:**

| | |
|---|---|
| BF-1 | NJDEP Geoprobe Approximate Location (February 2003) |
| BF-1° | Old Location |
| AT-1 | NJDEP Geoprobe Approximate Location (June 2003) |
| GP-Site 1 | Golder Geoprobe Approximate Location (December 2003) |
| MW-Site 1 | Golder Monitoring Well Approximate Location (January 2004) |
| VP-Site 1 | Golder Vapor Monitoring Probe Approximate Location (December 2003) |
| P-3 | South Jersey Gas MGP Piezometer Approximate Location (December 2003) |
| MW-1 | Fleet Bank Wells |
| | Approximate Tetrachloroethene Plume Centreline |
| 19,716 (15' - 18') | Maximum PCE Concentration in Groundwater (mg/L) |
| 1,717 (15' - 18') | Maximum TCE Concentration in Groundwater (mg/L) |

REVISION DATE:17-AUG-04 BY: SS COREL FILE:N:\Bur-Graphics\Projects\6000\2003\023-6124C\Plan 2.cdr

PROJECT
NJDEP
VAPOR INTRUSION STUDY
EGG HARBOR

TITLE
MAXIMUM PCE + TCE
CONCENTRATIONS AT
SELECTED WELLS

Golder Associates

| | | |
|---|---|---|
| PROJECT No. | 023-6124C | FILE No. PLAN 2 |
| DESIGN | IH | 16AUG04 |
| CADD | SS | 16AUG04 |
| CHECK | IH | 16AUG04 |
| REVIEW | | |
| SCALE NTS | REV. | |

FIGURE 6-2

# APPENDIX I

# STAFFORD PRE-SAMPLING SURVEY RESULTS

*New Jersey Department of Environmental Protection*

# INDOOR AIR BUILDING SURVEY & SAMPLING FORM

Survey Completed by: M Lewis Date: 10/18/02

Site Name: Antique Store Case #: ______

**Part I - Occupants**

Building Address: 73 Bay Ave

Property Contact: Ray Dethy Owner / Renter / other: ______

Contact's Phone: home ( ) ______ work ( ) ______ cell ( ) ______

Building occupants: Children under age 13 NO living here Children age 13-18 ______ Adults ______

**Part II - Building Characteristics**

Building type: single-family residential / multi-family residential / office / strip mall / commercial / industrial

Describe building: Antique Store 1st Floor, Storage 2nd Floor

Number of floors - below grade: 1 (full basement / crawl space / slab) Partial w/ 2 crawl spaces at or above grade: ______

Basement size: ______ ft² Basement floor: concrete / dirt / floating / other (specify): ______

Foundation type: poured concrete / ~~cinder blocks~~ / stone / other (specify) not sure

Type of ground cover around outside of building: grass / concrete / asphalt / other (specify) ______

Basement sump present? Yes / No Sump pump? Yes / No not sure if so not in use

Type of heating system (circle all that apply):

| | | | | |
|---|---|---|---|---|
| hot air circulation | hot air radiation | wood | steam radiation | hot water radiation |
| kerosene heater | electric baseboard | heat pump | other (specify): ______ | |

Type of ventilation system (circle all that apply):

| | | | |
|---|---|---|---|
| central air conditioning | mechanical fans not used | bathroom ventilation fans | NO |
| individual air conditioning units 3 1st floor | kitchen range hood | air-to-air heat exchangers | |
| open windows | other (specify): ______ | | |

Type of fuel utilized (circle all that apply):
Natural gas / electric / fuel oil / wood / coal / solar / kerosene / outside (fresh) air intake

Existing subsurface depressurization (radon) system in place? Yes / No and running? Yes / No

**Part III - Outside Contaminant Sources**

NJDEP Comprehensive Site List (1000-ft. radius): ______

Other stationary sources nearby (gas stations, emission stacks, etc.): ______

Heavy vehicular traffic nearby (or other mobile sources): ______

Building address: ____________

## Part IV – Indoor Contaminant Sources

Identify all potential indoor sources found in the building (including attached garages), the location of the source (floor & room), and whether the item was removed from the building 48 hours prior to indoor air sampling event.

| Potential Sources | Location(s) | Removed Prior to Sampling? (Yes / No / NA) |
|---|---|---|
| Gasoline storage cans | NO | |
| Gas-powered equipment | NO | |
| Kerosene storage cans | NO | |
| Paints / thinners / strippers | ~~Not currently~~ – Basement | |
| Cleaning solvents | 1st Floor | |
| Oven cleaners | NO | |
| Carpet / upholstery cleaners | NO | |
| Other house cleaning products | 1st Floor | |
| Moth balls | NO | |
| Polishes / waxes | 1st Floor | |
| Insecticides | NO – grass Killer never opened 1st Floor | |
| Furniture / floor polish | 1st Floor | |
| Nail polish / polish remover | NO ~~usually~~ | |
| Hairspray | NO | |
| Cologne / perfume | 1st Floor | |
| Air fresheners | 1st Floor | |
| Fuel tank (inside building) | Basement | NA |
| Wood stove or fireplace | NO | NA |
| New furniture / upholstery | NO | NA |
| New carpeting / flooring | NO | NA |
| Recent painting in building? | 1 yr ago 1st Floor – shelves | NA |
| Hobbies - glues, paints, etc. | 1st Floor | |

## Part V – Miscellaneous Items

Do any occupants of the building smoke? Yes / No How often? ____________

Has anyone smoked within the building within the last 48 hours? Yes / No

Does the building have an attached garage? Yes / No

If so, is a car usually parked in the garage? Yes / No

Do the occupants of the building have their clothes dry-cleaned? Yes / No

When were dry-cleaned clothes last brought into the building? ____________

Have the occupants ever noticed any usual odors in the building? Yes / No

Describe (with location): ____________

Any known spills of a chemical immediately outside or inside the building? Yes / No

Describe (with location): ____________

Have any pesticides/herbicides been applied around the building foundation or in the yard/gardens? — Yes / No

If so, when and which chemicals? 7/2001 inside – for termites

may be treated again before

*New Jersey Department of Environmental Protection*

# INDOOR AIR BUILDING SURVEY & SAMPLING FORM

Survey Completed by: M Lewis Date: 10/18/02

Site Name: 22 Park Ave Case #: ______

## Part I - Occupants

Building Address: 22 Park Ave

Property Contact: ______ Owner / Renter / other: ______

Contact's Phone: home ( ) ______ work ( ) ______ cell ( ) ______

Building occupants: Children under age 13 1 Children age 13-18 0 Adults 3 (1 travels Frequently

## Part II – Building Characteristics

Building type: single-family residential / multi-family residential / office / strip mall / commercial / industrial

Describe building: ______

Number of floors - below grade: ______ (full basement / crawl space / slab) at or above grade: 2

Basement size: ______ ft² Basement floor: concrete / dirt / floating / other (specify): sand

Foundation type: poured concrete / cinder blocks / stone / other (specify) ______

Type of ground cover around outside of building: grass / concrete / asphalt / other (specify) gravel dri ✓

Basement sump present? Yes / No Sump pump? Yes / No

Type of heating system (circle all that apply):

| | | | | |
|---|---|---|---|---|
| hot air circulation | hot air radiation | wood | steam radiation | hot water radiation |
| kerosene heater | electric baseboard | heat pump | other (specify): ______ | |

Type of ventilation system (circle all that apply):

| | | |
|---|---|---|
| central air conditioning | mechanical fans | bathroom ventilation fans 1st Floor 1 |
| individual air conditioning units 1 in 1st Floor | kitchen range hood | air-to-air heat exchangers |
| open windows | other (specify): ______ | |

Type of fuel utilized (circle all that apply):
Natural gas / electric / fuel oil / wood / coal / solar / kerosene / outside (fresh) air intake

Existing subsurface depressurization (radon) system in place? Yes / No and running? Yes / No

## Part III - Outside Contaminant Sources

NJDEP Comprehensive Site List (1000-ft. radius): ______

Other stationary sources nearby (gas stations, emission stacks, etc.): ______

Heavy vehicular traffic nearby (or other mobile sources): ______

Building address: ______________

**Part IV – Indoor Contaminant Sources**

Identify all potential indoor sources found in the building (including attached garages), the location of the source (floor & room), and whether the item was removed from the building 48 hours prior to indoor air sampling event.

| Potential Sources | Location(s) | Removed Prior to Sampling? (Yes / No / NA) |
|---|---|---|
| Gasoline storage cans | no | |
| Gas-powered equipment | no | |
| Kerosene storage cans | no | |
| Paints / thinners / strippers | 1st Floor | |
| Cleaning solvents | 1st Floor, ~~poss. 2nd Floor~~ | |
| Oven cleaners | no | |
| Carpet / upholstery cleaners | 1st Floor | |
| Other house cleaning products | 1st Floor, poss 2nd | |
| Moth balls | 2nd Floor | |
| Polishes / waxes | no | |
| Insecticides | 1st Floor | |
| Furniture / floor polish | 1 & 2 Floors | |
| Nail polish / polish remover | 1 & 2 Floors | |
| Hairspray | 2nd Floor | |
| Cologne / perfume | 1 & 2 Floors | |
| Air fresheners | 1 & 2 Floors | |
| Fuel tank (inside building) | no | NA |
| Wood stove or fireplace | no | NA |
| New furniture / upholstery | no | NA |
| New carpeting / flooring | Tile Floors 1st Floor | NA |
| Recent painting in building? | no | NA |
| Hobbies - glues, paints, etc. | 2nd Floor | |

**Part V – Miscellaneous Items**

Do any occupants of the building smoke? Yes / No — How often? Travelling Occupant currently away

Has anyone smoked within the building within the last 48 hours? Yes / No

Does the building have an attached garage? Yes / No

If so, is a car usually parked in the garage? Yes / No

Do the occupants of the building have their clothes dry-cleaned? Yes / No - use dryell cleaner

When were dry-cleaned clothes last brought into the building? ______________

Have the occupants ever noticed any usual odors in the building? Yes / No

Describe (with location): ______________

Any known spills of a chemical immediately outside or inside the building? Yes / No — 1 yr ago

Describe (with location): Dropped latex paint 2nd Floor last winter

Have any pesticides/herbicides been applied around the building foundation or in the yard/gardens? Yes / No

If so, when and which chemicals? yard guard ~2 weeks ago

*New Jersey Department of Environmental Protection*

# INDOOR AIR BUILDING SURVEY & SAMPLING FORM

Survey Completed by: M Lewis Date: 10/18/02

Site Name: 18 Park Ave Case #: ____

**Part I - Occupants**

Building Address: above

Property Contact: Dan Smith Owner / Renter / other: Owner

Contact's Phone: home 609 978-0109 work ( ) ____ cell ( ) ____

Building occupants: Children under age 13 1 Children age 13-18 0 Adults ~~2~~ 3

**Part II - Building Characteristics**

Building type: single-family residential / multi-family residential / office / strip mall / commercial / industrial

Describe building: ____

Number of floors - below grade: 1 (full basement / crawl space / slab) at or above grade: 1+

Basement size: ____ ft$^2$ Basement floor: concrete / dirt / floating / other (specify): ____

Foundation type: poured concrete / cinder blocks / stone / other (specify) ____

Type of ground cover around outside of building: grass / concrete / asphalt / other (specify) Gravel Drive

Basement sump present? Yes / No Sump pump? Yes / No

Type of heating system (circle all that apply):

hot air circulation hot air radiation wood steam radiation hot water radiation
kerosene heater electric baseboard heat pump other (specify): ____

Type of ventilation system (circle all that apply):

central air conditioning mechanical fans bathroom ventilation fans
individual air conditioning units kitchen range hood air-to-air heat exchangers
open windows other (specify): ____

Type of fuel utilized (circle all that apply):

Natural gas / electric / fuel oil / wood / coal / solar / kerosene / outside (fresh) air intake

Existing subsurface depressurization (radon) system in place? Yes / No and running? Yes / No

**Part III - Outside Contaminant Sources**

NJDEP Comprehensive Site List (1000-ft. radius): ____

Other stationary sources nearby (gas stations, emission stacks, etc.): ____

Heavy vehicular traffic nearby (or other mobile sources): ____

Building address: ____________

## Part IV – Indoor Contaminant Sources

Identify all potential indoor sources found in the building (including attached garages), the location of the source (floor & room), and whether the item was removed from the building 48 hours prior to indoor air sampling event.

| Potential Sources | Location(s) | Removed Prior to Sampling? (Yes / No / NA) |
|---|---|---|
| Gasoline storage cans | Garage | |
| Gas-powered equipment | NO | |
| Kerosene storage cans | empty | |
| Paints / thinners / strippers | were painting ~ week ago | |
| Cleaning solvents | 1 can stripper in garage | |
| Oven cleaners | Oven-OFF - Kitchen | |
| Carpet / upholstery cleaners | Not sure | |
| Other house cleaning products | 1st floor | |
| Moth balls | Yes 1st Floor | |
| Polishes / waxes | yes 1st Floor | |
| Insecticides | yes 1st Floor | |
| Furniture / floor polish | yes 1st Floor | |
| Nail polish / polish remover | yes 1st Floor | |
| Hairspray | yes 1st Floor | |
| Cologne / perfume | " " | |
| Air fresheners | " " | |
| Fuel tank (inside building) | No | NA |
| Wood stove or fireplace | No | NA |
| New furniture / upholstery | No | NA |
| New carpeting / flooring | No | NA |
| Recent painting in building? | yes 1st floor | NA |
| Hobbies - glues, paints, etc. | no | |

## Part V – Miscellaneous Items

Do any occupants of the building smoke? **Yes** / No  How often? 10-15

Has anyone smoked within the building within the last 48 hours? **Yes** / No

Does the building have an attached garage? **Yes** / No

If so, is a car usually parked in the garage? Yes / **No**

Do the occupants of the building have their clothes dry-cleaned? Yes / **No**

When were dry-cleaned clothes last brought into the building? ____________

Have the occupants ever noticed any usual odors in the building? Yes / **No**

Describe (with location): ____________

Any known spills of a chemical immediately outside or inside the building? Yes / **No**

Describe (with location): ____________

Have any pesticides/herbicides been applied around the building foundation or in the yard/gardens? Yes / **No**

If so, when and which chemicals? ____________

*New Jersey Department of Environmental Protection*

# INDOOR AIR BUILDING SURVEY & SAMPLING FORM

Survey Completed by: M Lewis Date: 10/18/02

Site Name: 14 Park Ave Case #: ______

**Part I - Occupants**

Building Address: 14 Park Ave

Property Contact: Jack Thode Owner / Renter / other: ______

Contact's Phone: home (609 597 6855 work ( ) ______ cell ( ) ______

Building occupants: Children under age 13 0 Children age 13-18 1 Adults 4

**Part II – Building Characteristics**

Building type: single-family residential / multi-family residential / office / strip mall / commercial / industrial

Describe building: ______

Number of floors - below grade: 1 (full basement / crawl space / slab) at or above grade: 2

Basement size: ______ ft² Basement floor: concrete / dirt / floating / other (specify): ______

Foundation type: poured concrete / cinder blocks / stone / other (specify) ______

Type of ground cover around outside of building: grass / concrete / asphalt / other (specify) gravel

Basement sump present? Yes / No Sump pump? Yes / No

Type of heating system (circle all that apply):

hot air circulation hot air radiation wood steam radiation hot water radiation
kerosene heater electric baseboard heat pump other (specify): ______

Type of ventilation system (circle all that apply):

central air conditioning mechanical fans bathroom ventilation fans
individual air conditioning units not now kitchen range hood air-to-air heat exchangers
open windows other (specify): ______

Type of fuel utilized (circle all that apply):

Natural gas / electric / fuel oil / wood / coal / solar / kerosene / outside (fresh) air intake

Existing subsurface depressurization (radon) system in place? Yes / No and running? Yes / No

**Part III - Outside Contaminant Sources**

NJDEP Comprehensive Site List (1000-ft. radius): ______

Other stationary sources nearby (gas stations, emission stacks, etc.): ______

Heavy vehicular traffic nearby (or other mobile sources): ______

Building Address: ______________________

**Part IV – Indoor Contaminant Sources**

Identify all potential indoor sources found in the building (including attached garages), the location of the source (floor & room), and whether the item was removed from the building 48 hours prior to indoor air sampling event.

| Potential Sources | Location(s) | Removed Prior to Sampling? (Yes / No / NA) |
|---|---|---|
| Gasoline storage cans | no | |
| Gas-powered equipment | no | |
| Kerosene storage cans | no | |
| Paints / thinners / strippers | Basement | |
| Cleaning solvents | Basement | |
| Oven cleaners | Kitchen - 1st Floor | |
| Carpet / upholstery cleaners | Basement | |
| Other house cleaning products | 1st & Second Floor | |
| Moth balls | not presently | |
| Polishes / waxes | 1st and Basement | |
| Insecticides | Basement, 1st Floor | |
| Furniture / floor polish | 1st Floor | |
| Nail polish / polish remover | 1st Floor, 2nd Floor | |
| Hairspray | 1st Floor, 2nd Floor | |
| Cologne / perfume | 1st & 2nd Floors | |
| Air fresheners | 1st Floor | |
| Fuel tank (inside building) | no | NA |
| Wood stove or fireplace | not used (1st Floor) | NA |
| New furniture / upholstery | no | NA |
| New carpeting / flooring | in Front of door 1st Floor | NA |
| Recent painting in building? | 1st Floor | NA |
| Hobbies - glues, paints, etc. | no | |

**Part V – Miscellaneous Items**

Do any occupants of the building smoke? Yes / No How often? ______________

Has anyone smoked within the building within the last 48 hours? Yes / No

Does the building have an attached garage? Yes / No

If so, is a car usually parked in the garage? Yes / No

Do the occupants of the building have their clothes dry-cleaned? Yes / No

When were dry-cleaned clothes last brought into the building? ______________

Have the occupants ever noticed any usual odors in the building? Yes / No — Deisel ~~Floor~~ odor few times year

Describe (with location): ______________

Any known spills of a chemical immediately outside or inside the building? Yes / No

Describe (with location): ______________

Have any pesticides/herbicides been applied around the building foundation or in the yard/gardens? Yes / No

If so, when and which chemicals? Spring - 6mo ago pesticide

*New Jersey Department of Environmental Protection*

# INDOOR AIR BUILDING SURVEY & SAMPLING FORM

Survey Completed by: MCL Date: 11/4/02

Site Name: Briggs Bicycle Shop Case #: ______

## Part I - Occupants

Building Address: 63 E Bay Ave

Property Contact: Peter Briggs Owner / Renter / other: Owner

Contact's Phone: home 609 597-5598 work ( ) same cell ( ) ______

Building occupants: works Children under age 13 0 Children age 13-18 1 Adults 2

## Part II – Building Characteristics

Building type: single-family residential / multi-family residential / office / strip mall / commercial / industrial

Describe building: ______

Number of floors - below grade: ______ (full basement / crawl space / slab) at or above grade: 1

Basement size: NA ft² Basement floor: concrete / dirt / floating / other (specify): ______

Foundation type: poured concrete / cinder blocks / stone / other (specify) ______

Type of ground cover around outside of building: grass / concrete / asphalt / other (specify) asphalt and soil

Basement sump present? Yes / No Sump pump? Yes / No NA

Type of ~~heating system~~ (circle all that apply):

hot air circulation | hot air radiation | wood | steam radiation | hot water radiation
kerosene heater | electric baseboard | heat pump | other (specify): ______

Type of ventilation system (circle all that apply):

central air conditioning | mechanical fans Portable in summer | bathroom ventilation fans
individual air conditioning units | kitchen range hood | air-to-air heat exchangers
open windows | other (specify): ______

Type of ~~fuel utilized~~ (circle all that apply):

Natural gas / electric / fuel oil / wood / coal / solar / kerosene / outside (fresh) air intake

Existing subsurface depressurization (radon) system in place? Yes / No and running? Yes / No

## Part III - Outside Contaminant Sources

NJDEP Comprehensive Site List (1000-ft. radius): ______

Other stationary sources nearby (gas stations, emission stacks, etc.): ______

Heavy vehicular traffic nearby (or other mobile sources): ______

Building address: ____________

**Part IV – Indoor Contaminant Sources**

Identify all potential indoor sources found in the building (including attached garages), the location of the source (floor & room), and whether the item was removed from the building 48 hours prior to indoor air sampling event.

| Potential Sources | Location(s) | Removed Prior to Sampling? (Yes / No / NA) |
|---|---|---|
| Gasoline storage cans | nO | |
| Gas-powered equipment | NO | |
| Kerosene storage cans | First Floor Bathroom | |
| Paints / thinners / strippers | No | |
| Cleaning solvents | Kerosene will not use ~~for~~ 24hrs | |
| Oven cleaners | NO | |
| Carpet / upholstery cleaners | NO | |
| Other house cleaning products | Fantastik / Windex | |
| Moth balls | NO | |
| Polishes / waxes | ~~Not~~ currently using | |
| Insecticides | No | |
| Furniture / floor polish | No | |
| Nail polish / polish remover | yes not using | |
| Hairspray | No | |
| Cologne / perfume | No | |
| Air fresheners | NO | |
| Fuel tank (inside building) | NO | NA |
| Wood stove or fireplace | No | NA |
| New furniture / upholstery | No | NA |
| New carpeting / flooring | NO | NA |
| Recent painting in building? | No | NA |
| Hobbies - glues, paints, etc. | No – | |

**Part V – Miscellaneous Items**

Do any occupants of the building smoke? Yes / No How often? ____________

Has anyone smoked within the building within the last 48 hours? Yes / No

Does the building have an attached garage? Yes / No

If so, is a car usually parked in the garage? Yes / No

Do the occupants of the building have their clothes dry-cleaned? Yes / No

When were dry-cleaned clothes last brought into the building? ____________

Have the occupants ever noticed any usual odors in the building? Yes / No

Describe (with location): ____________

Any known spills of a chemical immediately outside or inside the building? Yes / No

Describe (with location): occasionally small kerosene spills 3-4 mo. ago

Have any pesticides/herbicides been applied around the building foundation or in the yard/gardens? Yes / No

If so, when and which chemicals? weed killer ~6 mo. ago

# APPENDIX II

# STAFFORD SITE PHOTOGRAPHS


**PHOTOGRAPH 1**

73 Bay Avenue.


**PHOTOGRAPH 2**

63 Bay Avenue.

**PHOTOGRAPH 3**

14 Park Avenue.

**PHOTOGRAPH 4**

18 Park Avenue.

**PHOTOGRAPH 5**

22 Park Avenue.

**PHOTOGRAPH 6**

Gas Station across street from 63 and 73 Bay Avenue.

**PHOTOGRAPH 7**

22 Park Avenue.

**PHOTOGRAPH 8**

Inside 18 Park Avenue.

**PHOTOGRAPH 9**

Geoprobe soil gas implant.

**PHOTOGRAPH 10**

Gas station acroos street from 63 and 73 Bay Avenue.

**PHOTOGRAPH 11**

Groundwater screen from well near 63 Bay Avenue.

# APPENDIX III

## STAFFORD RESULTS OF ORGANIC MATTER AND WATER RETENTION TESTING

RECEIVED JAN 1 3 2003

SOILCON
LABORATORIES LTD.

275 – 11780 River Rd, Richmond BC, V6X 1Z7
TEL: 604-278-5535 FAX: 604-278-0517

# ANALYTICAL RESULTS

| | |
|---|---|
| **Date:** | January 7, 2003 |
| **Attention:** | Ian Hers |
| **Email:** | IHers@golder.com |
| **Phone:** | 604-298-6623 |
| **From:** | Natasha Smyth |
| **Report to:** | Golder Associates<br>500 – 4260 Still Creek Drive<br>Burnaby BC V5C 6C6 |
| **Report on:** | Fraction of Organic Carbon, 6 pt Water Retention |
| **Project #** | 023-6124C |
| **Soilcon Job #:** | 02-514 |
| **Samples received:** | October 18, 2002 |

**SAMPLES WILL BE DISPOSED OF IN 60 DAYS**
**UNLESS NOTIFICATION IS RECEIVED**

**Soilcon LABORATORIES LTD.**

275 - 11780 RIVER ROAD, RICHMOND, B.C. V6X 1Z7 • TEL: (604) 278-5535 • FAX: (604) 278-0517
E-MAIL: soilcon@soilconlabs.com • WEB SITE: www.soilconlabs.com

**Water Retention - 6 point curve**

**Water Retention Results**
**Percent Retained By Volume**

| | | # & Depth (cm) | Lab # | 5 J/kg | 10 J/kg | 33 J/kg | 100 J/kg | 300 J/kg | 1500 J/kg | Bulk Density kg/m$^3$ |
|---|---|---|---|---|---|---|---|---|---|---|
| **Company:** | Golder Associates Inc. | BH2 2-3' | 02-514-2 | 10.2 | 7.0 | 4.7 | 3.6 | 2.7 | 1.7 | 1576 |
| **Contact:** | Ian Hers | BH2 6-7' | 02-514-4 | 7.7 | 6.1 | 4.3 | 1.2 | 0.8 | 0.5 | 1721 |
| **Project ID:** | 023-6124C | | | | | | | | | |
| **Soilcon Job#** | 02-514 | | | | | | | | | |
| **Analysis:** | Water Retention - 6 Point Curve | | | | | | | | | |
| **Date Completed:** | 7-Jan-03 | | | | | | | | | |

1/7/2003 WR-6pt&4pt&3pt02 WR-6pt
Liability is limited to testing fee paid.

Initials: JM

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**Water Retention - 6 point curve**

| | | # & Depth (cm) | Lab # | Assumed Particle Density kg/m$^3$ | Estimated Total Porosity % vol | Estimated Calculated Campbell 'b' | Estimated Air Entry Tension J/kg | Estimated Aeration Porosity at 5 J/kg % by vol | Estimated Aeration Porosity at 10 J/kg % by vol | AWSC Available $H_2O$ Storage Capacity % |
|---|---|---|---|---|---|---|---|---|---|---|
| **Company:** | Golder Associates Inc. | BH2 2-3' | 02-514-2 | 2650 | 40.5 | 3.3 | 0.04 | 30.3 | 33.5 | 3.0 |
| **Contact:** | Ian Hers | BH2 6-7' | 02-514-4 | 2650 | 35.1 | 1.8 | 0.41 | 27.4 | 29.0 | 3.8 |
| **Project ID:** | 023-6124C | | | | | | | | | |
| **Soilcon Job#** | 02-514 | | | | | | | | | |
| **Analysis:** | Water Retention - 6 Point Curve | | | | | | | | | |
| **Date Completed:** | 7-Jan-03 | | | | | | | | | |

1/7/2003 WR-6pt&4pt&3pt02 WR-6pt
Liability is limited to testing fee paid.

Initials: Jm

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E-MAIL: soilcon@soilconlabs.com • WEB SITE: www.soilconlabs.com

| Water Retention - 6 point curve | | # & Depth (cm) | Lab # | Comments |
|---|---|---|---|---|
| **Company:** | Golder Associates Inc. | BH2 2-3' | 02-514-2 | ---samples arrived loose, |
| **Contact:** | Ian Hers | BH2 6-7' | 02-514-4 | ---in bags. Compacted as per |
| **Project ID:** | 023-6124C | | | ---ASTM 2325 #6 |
| **Soilcon Job#** | 02-514 | | | ---for disturbed samples. |
| **Analysis:** | Water Retention - 6 Point Curve | | | |
| **Date Completed:** | 7-Jan-03 | | | |

1/7/2003 WR-6pt&4pt&3pt02 WR-6pt
Liability is limited to testing fee paid.

Initials: JM

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| Total Organic Carbon (TOC) | | Sample ID | Lab # | Total Carbon % | Total Organic Carbon (TOC) % | Fraction Organic Carbon % | Comments |
|---|---|---|---|---|---|---|---|
| **Company:** | Golder Associates Inc. | BH2 (0-1') | 02-514-1 | 0.55 | 0.68 | 124 | TOC is estimated to be half |
| **Contact:** | Ian Hers | BH2 (2-3') | 02-514-2 | 0.07 | 0.15 | 212 | of organic matter lost on |
| **Project ID:** | 023-6124C | BH2 (4-5') | 02-514-3 | 0.15 | 0.12 | 82 | ignition |
| **Soilcon Job#** | 02-514 | BH2 (6-7') | 02-514-4 | 0.03 | 0.04 | 129 | Total carbon is by Leco |
| **Analysis:** | TOC | | | | | | |
| **Date Completed:** | 18-Nov-02 | | | | | | |

NC = Not Calculated
1/7/2003
02LOI&TOC TOC
Liability is limited to testing fee paid.

Initials: MB

# Soilcon LABORATORIES LTD.

| LOSS ON IGNITION | | | | Organic Matter by Loss on Ignition (%) | Estimate of Total Org. C *assume 50% C in org. matter | % Ash |
|---|---|---|---|---|---|---|
| | | Sample ID | Lab # | | | |
| **Company:** | Golder Associates | BH2 (0-1') | 02-514-1 | 1.36 | 0.7 | 98.6 |
| **Contact:** | Ian Hers | BH2 (2-3') | 02-514-2 | 0.30 | 0.1 | 99.7 |
| **Project ID:** | 023-6124C | BH2 (4-5') | 02-514-3 | 0.25 | 0.1 | 99.8 |
| **Soilcon Job#** | 02-514 | BH2 (6-7') | 02-514-4 | 0.08 | 0.0 | 99.9 |
| **Analysis:** | LOI | | | | | |
| **Date Completed:** | 5-Nov-02 | | | | | |

1/7/2003
02LOI&TOC LOI
Liability is limited to testing fee paid.

Initials: MB

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# APPENDIX IV

# ADDITIONAL VAPOR ATTENUATION FACTOR CALCULATIONS FOR STAFFORD SITE

# SITE SPECIFIC MODELING NJDEP STAFFORD SITE GROUNDWATER TO INDOOR AIR

GW-ADV
Version 3.0; 02/03

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ X ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [ ]

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Initial groundwater conc., $C_W$ (μg/L) | Chemical |
|---|---|---|
| 9000001 | | Cyclohexane |

MORE ↓

| ENTER Average soil/ groundwater temperature, $T_S$ (°C) | ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Depth below grade to water table, $L_{WT}$ (cm) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum directly above water table, (Enter A, B, or C) | ENTER SCS soil type directly above water table | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ (cm²) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of $L_{WT}$ (cell G28) | | | | | | | |
| 15 | 168 | 335 | 251 | 84 | 0 | B | S | | | 1.00E-07 |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ (g/cm³) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ (cm³/cm³) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ (g/cm³) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ (cm³/cm³) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ (g/cm³) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ (cm³/cm³) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.60 | 0.378 | 0.028 | | 1.6 | 0.378 | 0.046 | | 1.5 | 0.43 | 0.3 |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ (g/cm-s²) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 6 | 426.7 | 855.2 | 213.4 | 1.54 | 0.47 | 0.61 |

MORE ↓

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) | ENTER Target risk for carcinogens, TR (unitless) | ENTER Target hazard quotient for noncarcinogens, THQ (unitless) |
|---|---|---|---|---|---|
| 70 | 30 | 30 | 350 | 1.0E-06 | 1 |

Used to calculate risk-based groundwater concentration.

END

# SITE SPECIFIC MODELING NJDEP STAFFORD SITE SOIL GAS TO INDOOR AIR

SG-ADV
Version 2.0; 02/03

Reset to Defaults

Soil Gas Concentration Data

| ENTER Chemical CAS No. (numbers only, no dashes) | ENTER Soil gas conc., $C_g$ ($\mu g/m^3$) | OR | ENTER Soil gas conc., $C_g$ (ppmv) | Chemical |
|---|---|---|---|---|
| 9000001 | | | 2.00E+01 | Cyclohexane |

MORE ↓

| ENTER Depth below grade to bottom of enclosed space floor, $L_F$ (cm) | ENTER Soil gas sampling depth below grade, $L_s$ (cm) | ENTER Average soil temperature, $T_S$ (°C) | ENTER Thickness of soil stratum A, $h_A$ (cm) | ENTER Thickness of soil stratum B, (Enter value or 0) $h_B$ (cm) | ENTER Thickness of soil stratum C, (Enter value or 0) $h_C$ (cm) | ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability) | OR | ENTER User-defined stratum A soil vapor permeability, $k_v$ ($cm^2$) |
|---|---|---|---|---|---|---|---|---|
| | | | Totals must add up to value of Ls (cell F24) | | | | | |
| 168 | 335 | 15 | 251 | 84 | 0 | | | 1.00E-07 |

MORE ↓

| ENTER Stratum A SCS soil type (Lookup Soil Parameters) | ENTER Stratum A soil dry bulk density, $\rho_b^A$ ($g/cm^3$) | ENTER Stratum A soil total porosity, $n^A$ (unitless) | ENTER Stratum A soil water-filled porosity, $\theta_w^A$ ($cm^3/cm^3$) | ENTER Stratum B SCS soil type (Lookup Soil Parameters) | ENTER Stratum B soil dry bulk density, $\rho_b^B$ ($g/cm^3$) | ENTER Stratum B soil total porosity, $n^B$ (unitless) | ENTER Stratum B soil water-filled porosity, $\theta_w^B$ ($cm^3/cm^3$) | ENTER Stratum C SCS soil type (Lookup Soil Parameters) | ENTER Stratum C soil dry bulk density, $\rho_b^C$ ($g/cm^3$) | ENTER Stratum C soil total porosity, $n^C$ (unitless) | ENTER Stratum C soil water-filled porosity, $\theta_w^C$ ($cm^3/cm^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1.6 | 0.378 | 0.028 | | 1.6 | 0.378 | 0.046 | | 1.5 | 0.43 | 0.3 |

MORE ↓

| ENTER Enclosed space floor thickness, $L_{crack}$ (cm) | ENTER Soil-bldg. pressure differential, $\Delta P$ ($g/cm\text{-}s^2$) | ENTER Enclosed space floor length, $L_B$ (cm) | ENTER Enclosed space floor width, $W_B$ (cm) | ENTER Enclosed space height, $H_B$ (cm) | ENTER Floor-wall seam crack width, w (cm) | ENTER Indoor air exchange rate, ER (1/h) | ENTER Average vapor flow rate into bldg. OR Leave blank to calculate $Q_{soil}$ (L/m) |
|---|---|---|---|---|---|---|---|
| 10 | 6 | 426.7 | 855.2 | 213.4 | 1.54 | 0.47 | 2 |

| ENTER Averaging time for carcinogens, $AT_C$ (yrs) | ENTER Averaging time for noncarcinogens, $AT_{NC}$ (yrs) | ENTER Exposure duration, ED (yrs) | ENTER Exposure frequency, EF (days/yr) |
|---|---|---|---|
| 70 | 30 | 30 | 350 |

END

# STAFFORD SITE HOUSE VAPOR INTRUSION TRACER STUDY (63 Bay)

| | Oct-02 Ground-water VP-13 (ug/L) | Henry's Law Constant (-) | Oct-02 Predicted Deep Vapour ($ug/m^3$) | | Conver-sion $ug/m^3$ to ppbV | Oct-02 Predicted Deep Vapour (ppbV) | Adj House Measured Soil Vapor VP-13 10-5 - 11' (ppbV) | Measured Sub-slab Vapor Conc. 0.3-0.5' (ppbV) | Measured First Floor Conc. (ppbV) | Alpha Predicted Deep Vapor/ First Floor | Alpha Measured Deep Vapor/ First Floor | Local Back-ground (ppbV) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ⁄ITBE | 190000 | 0.0204 | 3876000 | | 3.706 | 1045872 | 120,000 | 0.71 | 0.77 | N/A | N/A | 0.62 to 2.6 |
| ı-Hexane | NT | 75.4 | N/A | | 3.622 | N/A | 990,000 | <10 | 0.51 | N/A | N/A | <0.5 to 2.1 |
| ı-Heptane | NT | 86.0 | N/A | | 4.253 | N/A | 330,000 | <10 | <0.5 | N/A | N/A | <0.5 to 1.1 |
| ›yclohexane | <5000 | 8.00 | 20000000 | 1 | 3.54 | 5649718 | 200,000 | <10 | <0.5 | N/A | N/A | <0.5 |
| ;,2,4-TriMethylPentane | NT | 126.4 | N/A | | 4.8 | N/A | 500,000 | <10 | <0.5 | N/A | N/A | <0.5 to 2.3 |
| ›enzene | 7500 | 0.228 | 1710000 | | 3.281 | 521183 | 120,000 | <10 | <0.5 | N/A | N/A | <0.5-1.2 |
| 'oluene | 14000 | 0.272 | 3808000 | | 3.873 | 983217 | 140,000 | <10 | 0.85 | N/A | N/A | 3.6 to 8.7 |
| :thylbenzene | 4200 | 0.323 | 1356600 | | 4.462 | 304034 | <15,000 | <10 | <0.5 | N/A | N/A | <0.5 to 1.3 |
| ⁄I&P-Xylene | NT | 0.307 | N/A | | 4.462 | N/A | 22,000 | 12 | 0.65 | N/A | N/A | 1.8 to 4.4 |
| )-Xylene | NT | 0.213 | N/A | | 4.462 | N/A | <15,000 | <10 | <0.5 | N/A | N/A | 0.63 to 1.3 |
| 'otal Xylenes | 20000 | 0.26 | 5200000 | | 4.462 | 1165397 | NT | NT | NT | NT | NT | NT |
| )xygen | | | | | | | 0.2 to 0.5 % | | | | | |
| ‰ LEL | | | | | | | 12 to 100 | | | | | |

lotes:
. Estimated using 1/2 detection limit for cyclohexane
ł = Retention Time, NQ = Not quantified, N/A = Not applicable, NT = Not tested
›ackground based on indoor air concentrations measured at two nearby off-plume houses

## STAFFORD SITE HOUSE VAPOR INTRUSION TRACER STUDY (73 Bay Avenue)

| | | | Predicted Deep Vapor | | | | | | Adjacent to House (Oct-02) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sep-02 Ground-water BH-2 (ug/L) | Oct-02 Ground-water VP-9 (ug/L) | Henry's Law Constant (-) | Sep-02 Predicted Deep soil Vapour ($ug/m^3$) | Oct-02 Predicted Deep Vapour ($ug/m^3$) | Conver-sion ug/m3 to ppbV | Sep-02 Predicted Deep soil Vapour (ppbV) | Oct-02 Predicted Deep soil Vapour (ppbV) | Measured Deep Vapor VP-9D 10-5 - 11' (ppbV) | Measured Mid Vapor VP-9M 6.5 - 7' (ppbV) | Measured Shallow Vapor VP-9S 2.5-3' (ppbV) | Measured Sub-slab Vapor Conc. 5.5-6' (ppbV) | Measured Basement Conc. (ppbV) | Measured Basement Conc. Duplicate (ppbV) | Measured Base-ment Avg Conc. (ppbV) | Measured First Floor Conc. (ppbV) | Alpha Predicted Deep Vapor/ Basement | Alpha Measured Deep Vapor/ Basement | Alpha Measured Subslab Vapor/ Basement | Ratio Base-ment / First floor | Local Back-ground (ppbV) |
| MTBE | 520086 | 590000 | 0.0204 | 10609754 | 12036000 | 3.706 | 2862858.7 | 3247706 | 1,600,000 | 450,000 | <500 | 5,000 | 33 | 38 | 36 | 14 | 1.1E-05 | 2.2E-05 | 7.1E-03 | 2.5 | 0.62 to 2.6 |
| n-Hexane | NT | NT | 75.4 | N/A | N/A | 3.622 | N/A | N/A | 1,700,000 | 860,000 | 5,000 | <300 | <2.5 | <2.5 | <2.5 | <0.5 | N/A | N/A | N/A | N/A | <0.5 to 2.1 |
| n-Heptane | NT | NT | 86.0 | N/A | N/A | 4.253 | N/A | N/A | 320,000 | 160,000 | 550 | <300 | <2.5 | <2.5 | <2.5 | <0.5 | N/A | N/A | N/A | N/A | <0.5 to 1.1 |
| Cyclohexane | NT | 12500 | 8.00 | N/A | 100000000 | 3.54 | N/A | 28248588 | 300,000 | 150,000 | 2,900 | 4,300 | 36 | 38 | 36 | 7.4 | 1.3E-06 | 1.2E-04 | 8.4E-03 | 4.9 | <0.5 |
| 2,2,4-TriMethylPentane | NT | NT | 126.4 | N/A | N/A | 4.8 | N/A | N/A | 400,000 | 210,000 | 11,000 | 20,000 | 140 | 150 | 145 | 34 | N/A | 3.6E-04 | 7.3E-03 | 4.3 | <0.5 to 2.3 |
| Unknown Alkane R ~ 5.05 | NT | NT | N/A | N/A | N/A | N/A | N/A | N/A | 1,200,000 | 660,000 | ND | 11,000 | 100 | 85 | 63 | 23 | N/A | 5.3E-05 | 5.8E-03 | 2.8 | NQ |
| Unknown Alkane R ~ 6.08 | NT | NT | N/A | N/A | N/A | N/A | N/A | N/A | 450,000 | 250,000 | 13,000 | 22,000 | 130 | 120 | 65 | 33 | N/A | 1.9E-04 | 3.9E-03 | 2.6 | NQ |
| Unknown Alkane R ~ 6.65 | NT | NT | N/A | N/A | N/A | N/A | N/A | N/A | 800,000 | 370,000 | 12,000 | 17,000 | 120 | 110 | 79 | NQ | N/A | 9.9E-05 | 4.6E-03 | N/A | NQ |
| Unknown Alkane R ~ 6.73 | NT | NT | N/A | N/A | N/A | N/A | N/A | N/A | 1,900,000 | NQ | 20,000 | 15,000 | 120 | 120 | 82 | 33 | N/A | 4.3E-05 | 5.5E-03 | 2.5 | NQ |
| Average | | | | | | | | | | | | | | | | | | 1.3E-04 | 6.1E-03 | 3.2 | |
| Benzene | 12286 | 12000 | 0.228 | 2801208 | 2736000 | 3.281 | 853766.53 | 833892 | 200,000 | 77,000 | <500 | <300 | <2.5 | <2.5 | <2.5 | <0.5 | < 1.5E-06 | < 6.3E-06 | < N/A | N/A | <0.5-1.2 |
| Toluene | 31981 | 43000 | 0.272 | 8698832 | 11696000 | 3.873 | 2246019.1 | 3019881 | 290,000 | 150000 J | 260 J | <300 | <2.5 | <2.5 | <2.5 | 12.0 | < 4.1E-07 | < 4.3E-06 | < N/A | N/A | 3.6 to 8.7 |
| Ethylbenzene | 2869 | 3500 | 0.323 | 926687 | 1130500 | 4.462 | 207684.22 | 253362 | < 33000 | < 15000 | <500 | <300 | <2.5 | <2.5 | <2.5 | 2.4 | < 4.9E-06 | N/A | N/A | N/A | <0.5 to 1.3 |
| M&P-Xylene | 14629 | NT | 0.307 | 4491103 | N/A | 4.462 | 1006522.4 | N/A | < 33000 | 14,400 | <500 | <300 | 3.2 | 2.7 | 3.0 | 8.9 | N/A | N/A | N/A | N/A | 1.8 to 4.4 |
| O-Xylene | 6116 | NT | 0.213 | 1303134 | N/A | 4.462 | 292051.55 | N/A | < 33000 | < 15000 | <500 | <300 | <2.5 | <2.5 | <2.5 | 3.8 | N/A | N/A | N/A | N/A | 0.63 to 1.3 |
| Total Xylenes | 20747 | 24000 | 0.26 | 5394220 | 6240000 | 4.462 | 1208924.2 | 1398476 | < 33000 | < 15000 | <500 | <300 | | | 4.25 | 6.35 | N/A | N/A | N/A | N/A | NT |
| Oxygen | | | | | | | | | <1.0 % | 0.9 to 1.6 % | 8.3-10.2 % | NT | | | | | | | | | |
| % LEL | | | | | | | | | N/A | 25-100 % | 35 to 37 % | NT | | | | | | | | | |

Notes:
1. Estimated using 1/2 detection limit for cyclohexane
R = Retention Time, NQ = Not quantified, N/A = Not applicable, NT = Not tested
Background based on indoor air concentrations measured at two nearby off-plume houses

## STAFFORD SITE HOUSE VAPOR INTRUSION TRACER STUDY (14 Park)

| | | | | | | | | | | | Adjacent to House (Oct-02) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sep-02 Ground-water BH-3 (ug/L) | Oct-02 Ground-water VP-10 (ug/L) | Oct-02 Ground-water VP-11 (ug/L) | Average Oct-02 Ground-water VP-10&11 (ug/L) | Henry's Law Constant (-) | Sep-02 Predicted Deep soil Vapour (ug/m³) | Oct-02 Predicted Deep Vapour (ug/m³) | Conver-sion ug/m³ to ppbV | Sep-02 Predicted Deep soil Vapour (ppbV) | Oct-02 Predicted Deep Vapour (ppbV) | Measured Soil Vapor VP-10D 10.5 - 11' (ppbV) | Measured Soil Vapor VP-10M 6.5 - 7' (ppbV) | Measured Soil Vapor VP-10S 2.5-3' (ppbV) | Measured Sub-slab Vapor Conc. 5.5-6' (ppbV) | Basement Conc. (ppbV) | Basement Conc. Duplicate (ppbV) | Measured Base-ment Conc. (ppbV) | Measured First Floor Conc. (ppbV) | Alpha Predicted Deep Vapor/ Basement | Alpha Measured Deep Vapor/ Basement | Alpha Measured Subslab Vapor/ Basement | Ratio Base-ment / First floor | Local Back-ground (ppbV) |
| ITBE | 237563 | 310000 | 1300 | 155650 | 0.0204 | 4846285 | 3175260 | 3.706 | 1307686 | 856789 | 15,000 | 86 | 4.8 | <1 | <0.5 | <0.5 | <0.5 | <0.5 | N/A | N/A | N/A | N/A | 0.62 to 2.6 |
| -Hexane | NT | NT | NT | NT | 75.4 | N/A | N/A | 3.622 | N/A | N/A | 360 J | 190 | 28 | <1 | 0.55 | 0.51 | 0.53 | <0.5 | N/A | N/A | N/A | N/A | <0.5 to 2.1 |
| -Heptane | NT | NT | NT | NT | 88.0 | N/A | N/A | 4.253 | N/A | N/A | <640 | 140 | 13 | 1.0 | <0.5 | 0.77 | 0.51 | 0.73 | N/A | N/A | N/A | N/A | <0.5 to 1.1 |
| yclohexane | NT | <25000 | <50 | 6262.5 | 8.00 | N/A | 50100000 | 3.54 | N/A | 14152542 | <640 | 45 | 7.3 | <1 | <0.5 | <0.5 | <0.5 | <0.5 | N/A | N/A | N/A | N/A | <0.5 |
| ,2,4-TriMethylPentane | NT | NT | NT | NT | 126.4 | N/A | N/A | 4.8 | N/A | N/A | 350 J | 150 | 16 | <1 | <0.5 | <0.5 | <0.5 | <0.5 | N/A | N/A | N/A | N/A | <0.5 to 2.3 |
| lenzene | 4518 | 6000 | 100 | 3050 | 0.228 | 1030104 | 695400 | 3.281 | 313960 | 211948 | <640 | 21 | 1.6 J | <1 | <0.5 | <0.5 | <2.5 | <0.5 | N/A | N/A | N/A | N/A | <0.5-1.2 |
| oluene | 301 | <12000 | <50 | 6013 | 0.272 | 81872 | 1635400 | 3.873 | 21139 | 422257 | 860 | 230 | 11 | 9.4 | 2.4 | 4.4 | <2.5 | 2.4 | N/A | N/A | N/A | N/A | 3.6 to 8.7 |
| thylbenzene | 1597 | 2200 | <40 | 1110 | 0.323 | 515831 | 358530 | 4.462 | 115605 | 80352 | <640 | 60 | 3.1 | 3.4 | 0.84 | 1.6 | <2.5 | 0.7 | N/A | N/A | N/A | N/A | <0.5 to 1.3 |
| I&P-Xylene | 2970 | NT | NT | NT | 0.307 | 911790 | N/A | 4.462 | 204346 | N/A | 650 | 200 | 12 | 12 | 3.1 | 5.7 | 4.4 | 2.7 | N/A | N/A | N/A | N/A | 1.8 to 4.4 |
| )-Xylene | 20 | NT | NT | NT | 0.213 | 4260 | N/A | 4.462 | 955 | N/A | <640 | 63 | 4.2 | 4.9 | 1.2 | 2.2 | <2.5 | 1.2 | N/A | N/A | N/A | N/A | 0.63 to 1.3 |
| otal Xylenes | NT | 3300 | <50 | 1663 | 0.26 | N/A | 432250 | 4.462 | N/A | 95874 | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT | NT |
| Dxygen | | | | | | | | | | | | | | | | | | | | | | | |
| 6 LEL | | | | | | | | | | | | | | | | | | | | | | | |

lotes:
. Estimated using 1/2 detection limit for cyclohexane
t = Retention Time, NQ = Not quantified, N/A = Not applicable, NT = Not tested
lackground based on indoor air concentrations measured at two nearby off-plume houses

# STAFFORD SITE HOUSE VAPOR INTRUSION TRACER STUDY (18 Park)

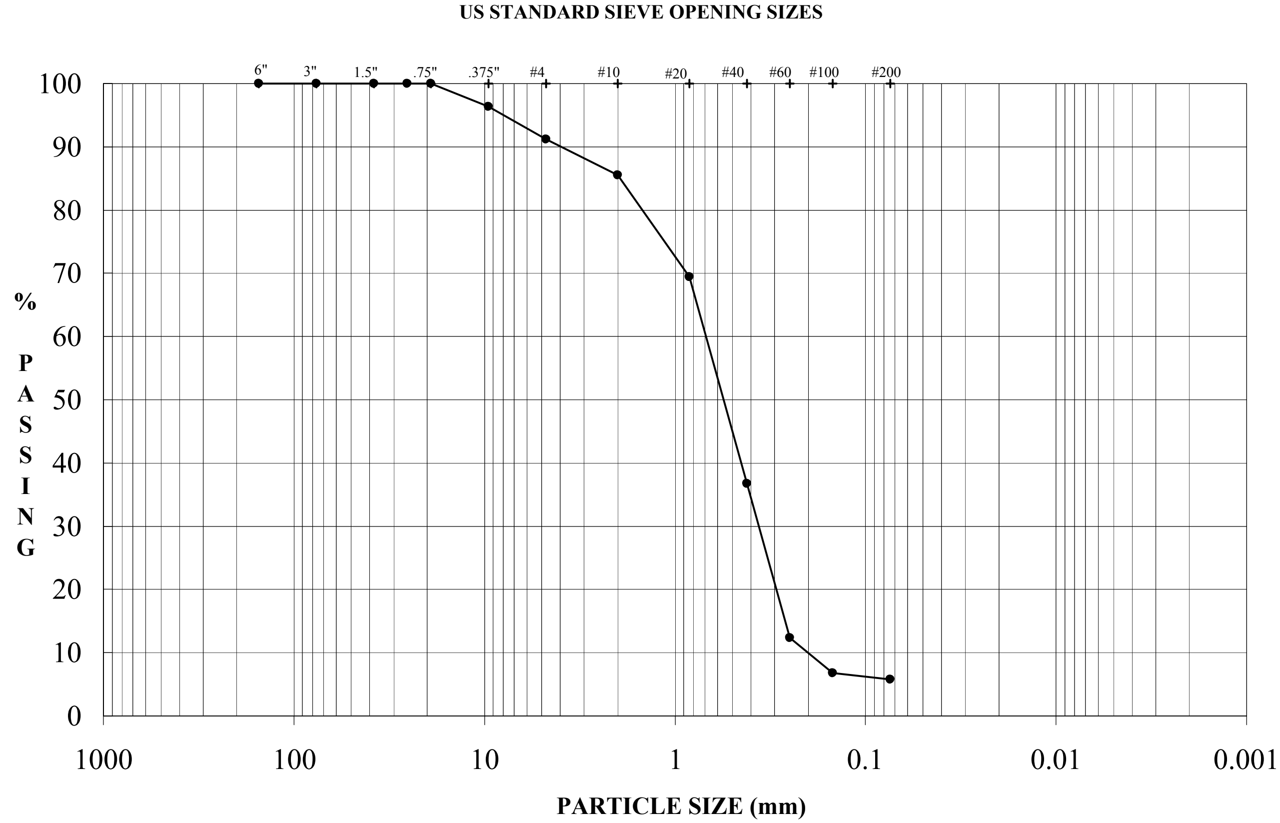
| | Oct-02 Ground-water VP-11 (ug/L) | Henry's Law Constant (-) | Oct-02 Predicted Deep soil Vapour (ug/m³) | | Conver-sion ug/m³ to ppbV | Oct-02 Predicted Deep Vapour (ppbV) | Adj House Measured Soil Vapor VP-11 10-5 - 11' (ppbV) | Measured Sub-slab Vapor Conc. 5.5-6' (ppbV) | Measured Base-ment Conc. (ppbV) | Measured First Floor Conc. (ppbV) | Alpha Predicted Deep Vapor/ Basement | Alpha Measured Deep Vapor/ Basement | Alpha Measured Subslab Vapor/ Basement | Ratio Base-ment / First floor | Local Back-ground (ppbV) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MTBE | 1300 | 0.0204 | 26520 | | 3.706 | 7156 | <2.8 | 1.4 | 2.6 | 1.4 | N/A | N/A | N/A | N/A | 0.62 to 2.6 |
| n-Hexane | NT | 75.4 | N/A | | 3.622 | N/A | 5.2 | 0.5 | 0.68 | 2.1 | N/A | N/A | N/A | N/A | <0.5 to 2.1 |
| n-Heptane | NT | 86.0 | N/A | | 4.253 | N/A | 2.8 | 1.6 | 0.57 | 1.100 | N/A | N/A | N/A | N/A | <0.5 to 1.1 |
| Cyclohexane | <50 | 8.00 | 200000 | 1 | 3.54 | 56497 | <2.8 | <0.5 | <0.5 | <0.5 | N/A | N/A | N/A | N/A | <0.5 |
| 2,2,4-TriMethylPentane | NT | 126.4 | N/A | | 4.8 | N/A | 6.5 | 1.1 | 2.3 | 0.94 | N/A | N/A | N/A | N/A | <0.5 to 2.3 |
| Benzene | 100 | 0.228 | 22800 | | 3.281 | 6949 | 2.8 | 0.63 | 1.2 | 0.9 | N/A | N/A | N/A | N/A | <0.5-1.2 |
| Toluene | <50 | 0.272 | 6800 | 1 | 3.873 | 1756 | 3.3 | 9.9 | 8.7 | 5.5 | N/A | N/A | N/A | N/A | 3.6 to 8.7 |
| Ethylbenzene | <40 | 0.323 | 6460 | 1 | 4.462 | 1448 | <2.8 | 4.0 | 1.3 | 0.91 | N/A | N/A | N/A | N/A | <0.5 to 1.3 |
| M&P-Xylene | NT | 0.307 | N/A | | 4.462 | N/A | 3.0 | 16 | 4.4 | 3.1 | N/A | N/A | N/A | N/A | 1.8 to 4.4 |
| O-Xylene | NT | 0.213 | N/A | | 4.462 | N/A | <2.8 | 5.0 | 1.3 | 0.910 | N/A | N/A | N/A | N/A | 0.63 to 1.3 |
| Total Xylenes | <50 | 0.26 | 6500 | 1 | 4.462 | 1457 | NT | NT | NT | NT | NT | NT | NT | NT | NT |
| Oxygen | | | | | | | 20.3 | | | | | | | | |
| % LEL | | | | | | | 0.0 | | | | | | | | |

Notes:
1. Estimated using 1/2 detection limit for groundwater concentration
R = Retention Time, NQ = Not quantified, N/A = Not applicable, NT = Not tested
Background based on indoor air concentrations measured at two nearby off-plume houses

# APPENDIX V

# STAFFORD GRAIN SIZE AND MOISTURE CONTENT TESTING

# PARTICLE-SIZE DISTRIBUTION ASTM D 422




| COBBLE | GRAVEL | | SAND | | | FINES |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Cor | Med | Fine | Silt or Clay |

| Sample Data | |
|---|---|
| % Gravel | 8.8 |
| % Sand | 85.5 |
| % Fines | 5.7 |
| $C_C$ | 0.9 |
| $C_U$ | 3.4 |
| LL | - |
| PL | - |
| PI | - |
| USCS | SP-SM |
| w (%) | 0.4 |

| Percent Finer | |
|---|---|
| 3" | 100.0% |
| 1 1/2" | 100.0% |
| 1" | 100.0% |
| 3/4" | 100.0% |
| 3/8" | 96.4% |
| #4 | 91.2% |
| #10 | 85.5% |
| #20 | 69.4% |
| #40 | 36.7% |
| #60 | 12.3% |
| #100 | 6.8% |
| #200 | 5.7% |

**COMMENTS:**

## DESCRIPTION

**Sample:** 73 Bay

**Depth:** -

**Wet Color:** Light yellowish brown

**Description:** Poorly graded sand with silt

**Date:** 06/10/04

**Technician:** KL

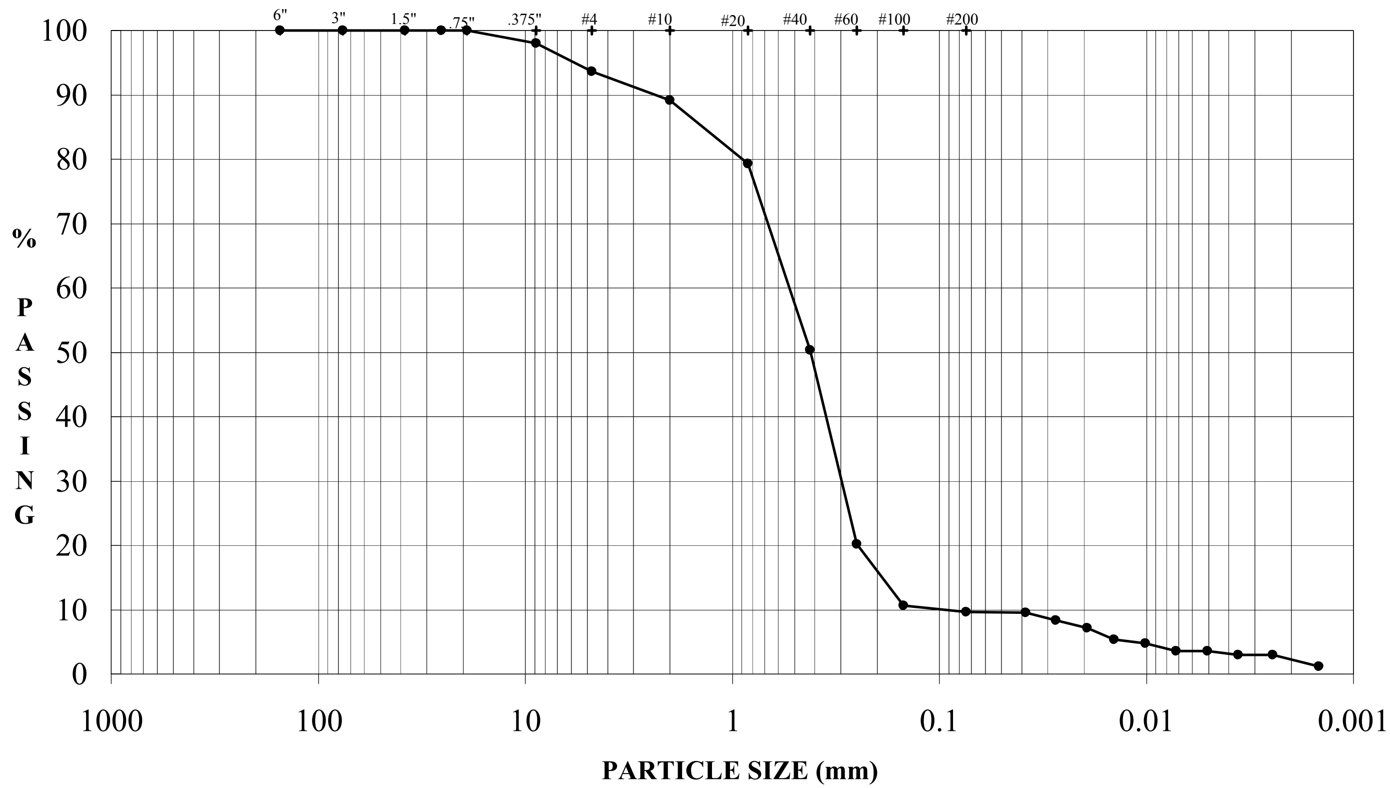
**Reviewer:** RMW

NJDEP/INDOOR AIR QUALITY/NJ
023-6124.0001

GOLDER ASSOCIATES INC.
CHERRY HILL, NEW JERSEY

# PARTICLE-SIZE DISTRIBUTION ASTM D 422

US STANDARD SIEVE OPENING SIZES




| COBBLE | GRAVEL | | SAND | | | FINES |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Cor | Med | Fine | Silt or Clay |

**Sieve Data**

| Particle Diameter | % Finer |
|---|---|
| 3" | 100.0% |
| 1 1/2" | 100.0% |
| 1" | 100.0% |
| 3/4" | 100.0% |
| 3/8" | 98.0% |
| #4 | 93.7% |
| #10 | 89.2% |
| #20 | 79.3% |
| #40 | 50.4% |
| #60 | 20.2% |
| #100 | 10.6% |
| #200 | 9.6% |

**Hydrometer Data**

| Particle Diameter | % Finer |
|---|---|
| 0.038 | 9.5% |
| 0.027 | 8.3% |
| 0.019 | 7.1% |
| 0.014 | 5.4% |
| 0.010 | 4.8% |
| 0.007 | 3.6% |
| 0.005 | 3.6% |
| 0.004 | 3.0% |
| 0.002 | 3.0% |
| 0.001 | 1.2% |

**DESCRIPTION**

| | | | |
|---|---|---|---|
| Sample: | East | Depth: | 0'-4' |
| | | USCS: | SW-SM |
| Wet Color: | Dark olive brown | | |
| Description: | Well graded sand with silt | | |
| Comments: | | | |

**SAMPLE DATA**

| | | | | |
|---|---|---|---|---|
| $W_C$ (%): | 9.7 | | $C_C$ | 2.1 |
| $G_S$: | 2.65 | (ASSUMED) | $C_U$ | 7.0 |
| % Gravel | 6.3 | | LL | - |
| % Sand | 84.0 | | PL | - |
| % Fines | 9.6 | | PI | - |

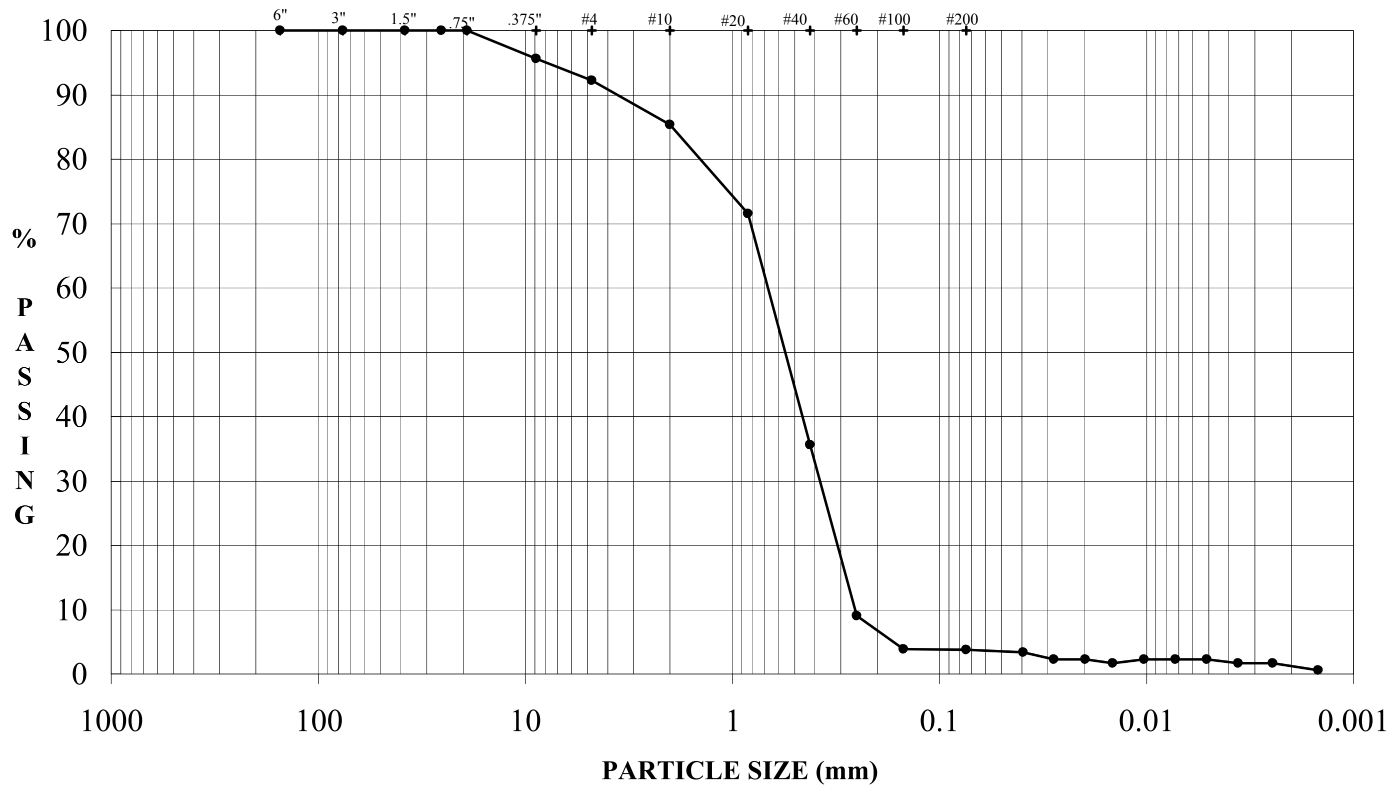
| | |
|---|---|
| Date: | 06/15/04 |
| Technician: | GD |
| Reviewer: | RMW |

NJDEP/INDOOR AIR QUALITY/NJ
023-6124.0001

GOLDER ASSOCIATES INC.
CHERRY HILL, NEW JERSEY

# PARTICLE-SIZE DISTRIBUTION ASTM D 422

US STANDARD SIEVE OPENING SIZES




| COBBLE | GRAVEL | | SAND | | | FINES |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Cor | Med | Fine | Silt or Clay |

**Sieve Data**

| Particle Diameter | % Finer |
|---|---|
| 3" | 100.0% |
| 1 1/2" | 100.0% |
| 1" | 100.0% |
| 3/4" | 100.0% |
| 3/8" | 95.6% |
| #4 | 92.3% |
| #10 | 85.4% |
| #20 | 71.6% |
| #40 | 35.6% |
| #60 | 9.0% |
| #100 | 3.8% |
| #200 | 3.7% |

**Hydrometer Data**

| Particle Diameter | % Finer |
|---|---|
| 0.039 | 3.4% |
| 0.028 | 2.3% |
| 0.020 | 2.3% |
| 0.015 | 1.7% |
| 0.010 | 2.3% |
| 0.007 | 2.3% |
| 0.005 | 2.3% |
| 0.004 | 1.7% |
| 0.002 | 1.7% |
| 0.001 | 0.6% |

**DESCRIPTION**

| | | | |
|---|---|---|---|
| Sample: | East | Depth: | 4'-8' |
| | | USCS: | SP |
| Wet Color: | Olive / yellowish brown | | |
| Description: | Poorly graded sand | | |
| Comments: | | | |

**SAMPLE DATA**

| | | | | |
|---|---|---|---|---|
| $W_C$ (%): | 3.1 | | $C_C$ | 0.8 |
| $G_S$: | 2.65 | (ASSUMED) | $C_U$ | 2.8 |
| % Gravel | 7.7 | | LL | - |
| % Sand | 88.5 | | PL | - |
| % Fines | 3.7 | | PI | - |

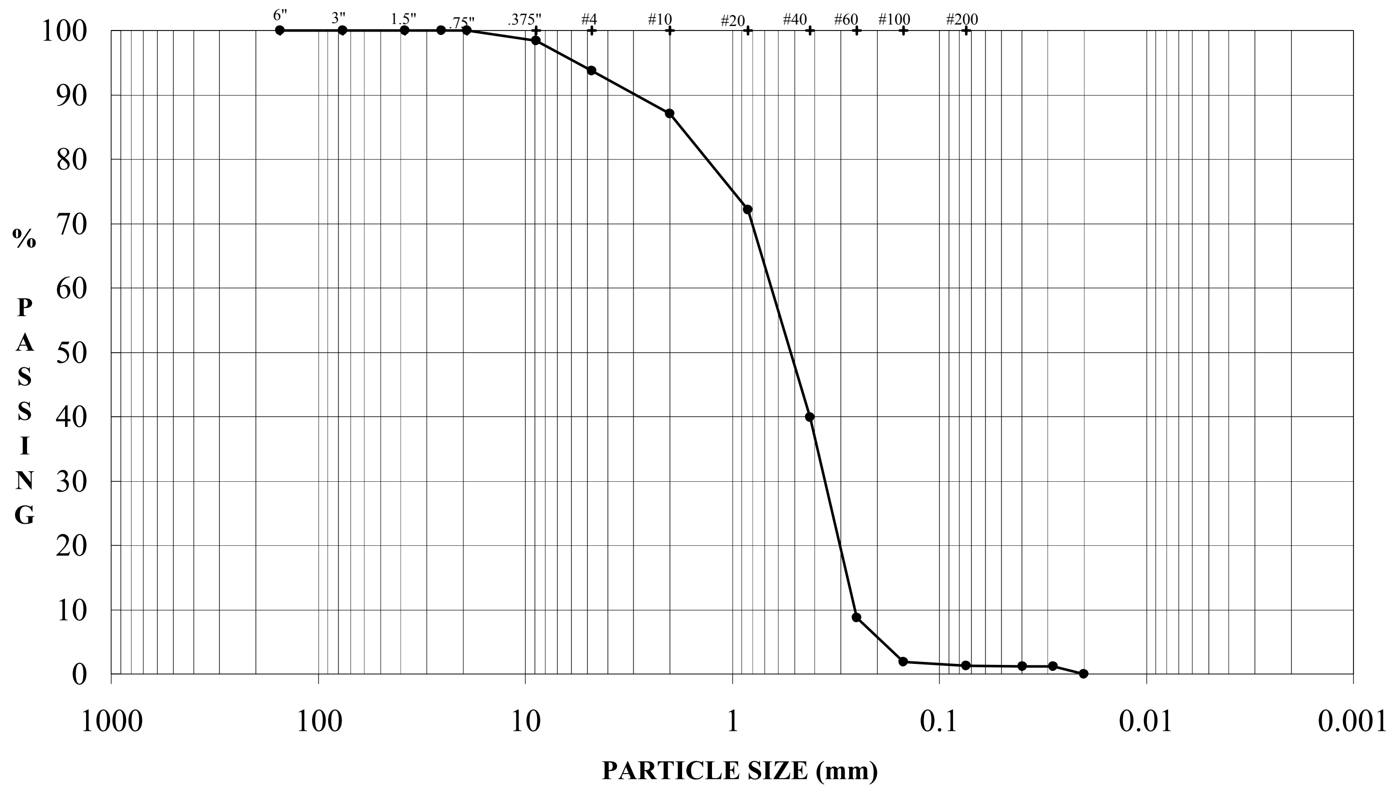
Date: 06/15/04
Technician: GD
Reviewer: RMW

NJDEP/INDOOR AIR QUALITY/NJ
023-6124.0001

GOLDER ASSOCIATES INC.
CHERRY HILL, NEW JERSEY

## PARTICLE-SIZE DISTRIBUTION ASTM D 422

US STANDARD SIEVE OPENING SIZES




| COBBLE | GRAVEL | | SAND | | | FINES |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Cor | Med | Fine | Silt or Clay |

**Sieve Data**

| Particle Diameter | % Finer |
|---|---|
| 3" | 100.0% |
| 1 1/2" | 100.0% |
| 1" | 100.0% |
| 3/4" | 100.0% |
| 3/8" | 98.4% |
| #4 | 93.7% |
| #10 | 87.1% |
| #20 | 72.1% |
| #40 | 39.9% |
| #60 | 8.7% |
| #100 | 1.9% |
| #200 | 1.3% |

**Hydrometer Data**

| Particle Diameter | % Finer |
|---|---|
| 0.040 | 1.2% |
| 0.028 | 1.2% |
| 0.020 | 0.0% |

**DESCRIPTION**

| | | | |
|---|---|---|---|
| Sample: | East | Depth: | 8'-11.4' |
| | | USCS: | SP |
| Wet Color: | Yellow | | |
| Description: | Poorly graded sand | | |
| Comments: | | | |

**SAMPLE DATA**

| | | | | |
|---|---|---|---|---|
| $W_C$ (%): | 7.0 | | $C_C$ | 0.8 |
| $G_S$: | 2.65 | (ASSUMED) | $C_U$ | 2.7 |
| % Gravel | 6.3 | | LL | - |
| % Sand | 92.4 | | PL | - |
| % Fines | 1.3 | | PI | - |

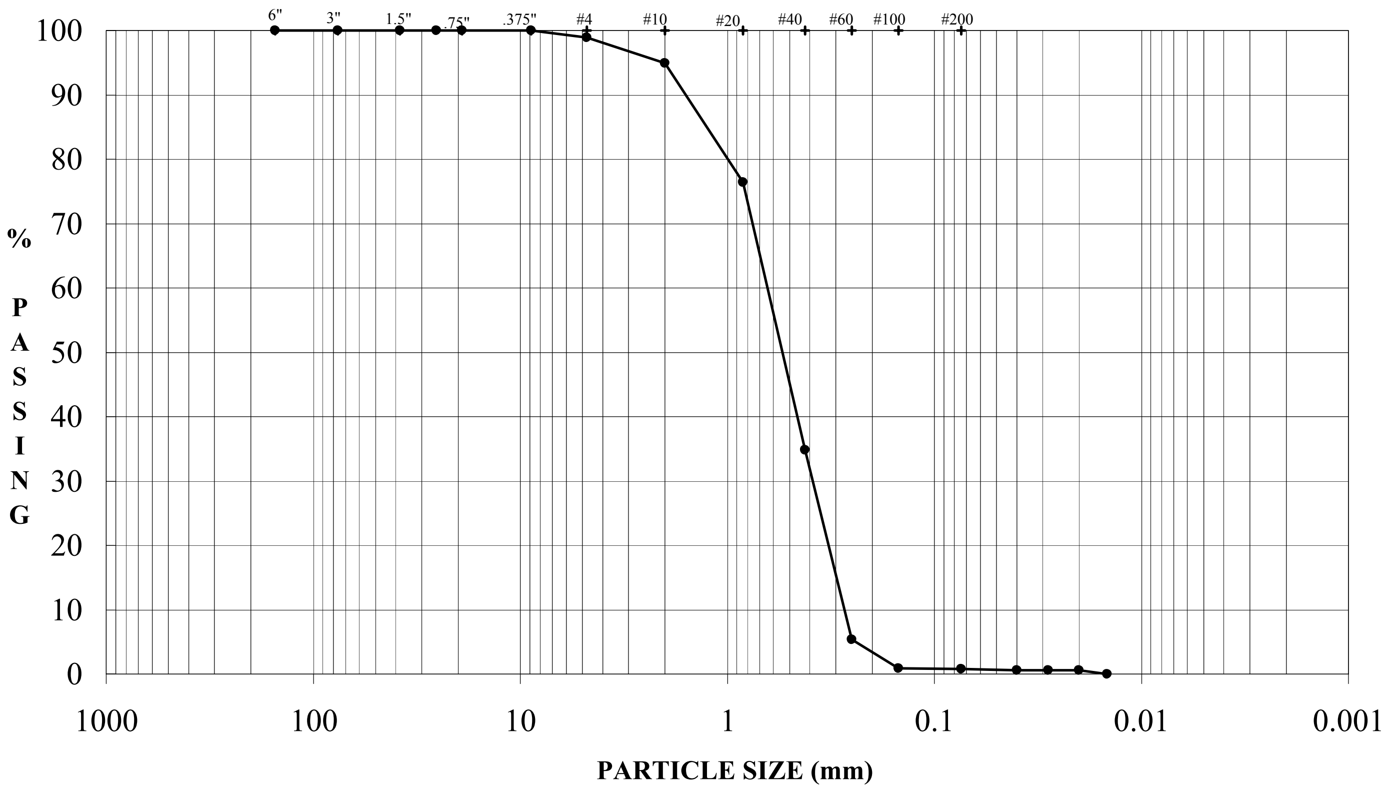
| | |
|---|---|
| Date: | 06/15/04 |
| Technician: | GD |
| Reviewer: | RMW |

NJDEP/INDOOR AIR QUALITY/NJ
023-6124.0001

GOLDER ASSOCIATES INC.
CHERRY HILL, NEW JERSEY

# PARTICLE-SIZE DISTRIBUTION ASTM D 422

US STANDARD SIEVE OPENING SIZES




| COBBLE | GRAVEL | | SAND | | | FINES |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Cor | Med | Fine | Silt or Clay |

**Sieve Data**

| Particle Diameter | % Finer |
|---|---|
| 3" | 100.0% |
| 1 1/2" | 100.0% |
| 1" | 100.0% |
| 3/4" | 100.0% |
| 3/8" | 100.0% |
| #4 | 98.9% |
| #10 | 94.9% |
| #20 | 76.4% |
| #40 | 34.9% |
| #60 | 5.4% |
| #100 | 0.9% |
| #200 | 0.8% |

**Hydrometer Data**

| Particle Diameter | % Finer |
|---|---|
| 0.040 | 0.6% |
| 0.028 | 0.6% |
| 0.020 | 0.6% |
| 0.015 | 0.0% |

**DESCRIPTION**

| | | | |
|---|---|---|---|
| Sample: | East | Depth: | 11.4'-12' |
| | | USCS: | SP |
| Wet Color: | Light gray | | |
| Description: | Poorly graded sand | | |
| Comments: | | | |

**SAMPLE DATA**

| | | | | |
|---|---|---|---|---|
| $W_C$ (%): | 15.0 | | $C_C$ | 0.8 |
| $G_S$: | 2.65 | (ASSUMED) | $C_U$ | 2.5 |
| % Gravel | 1.1 | | LL | - |
| % Sand | 98.1 | | PL | - |
| % Fines | 0.8 | | PI | - |

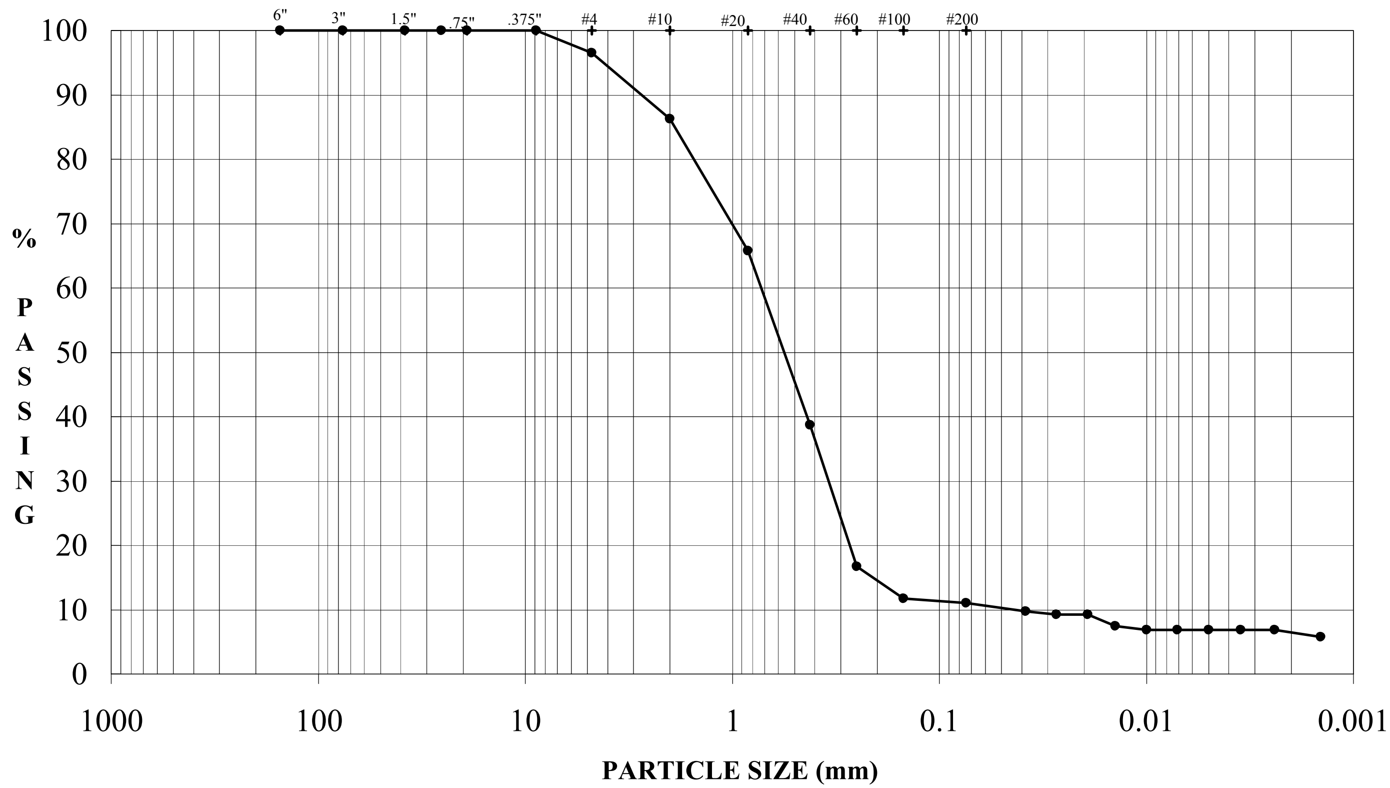
| | |
|---|---|
| Date: | 06/15/04 |
| Technician: | GD |
| Reviewer: | RMW |

NJDEP/INDOOR AIR QUALITY/NJ
023-6124.0001

GOLDER ASSOCIATES INC.
CHERRY HILL, NEW JERSEY

# PARTICLE-SIZE DISTRIBUTION ASTM D 422

US STANDARD SIEVE OPENING SIZES




| COBBLE | GRAVEL | | SAND | | | FINES |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Cor | Med | Fine | Silt or Clay |

**Sieve Data**

| Particle Diameter | % Finer |
|---|---|
| 3" | 100.0% |
| 1 1/2" | 100.0% |
| 1" | 100.0% |
| 3/4" | 100.0% |
| 3/8" | 100.0% |
| #4 | 96.5% |
| #10 | 86.3% |
| #20 | 65.8% |
| #40 | 38.7% |
| #60 | 16.7% |
| #100 | 11.7% |
| #200 | 11.1% |

**Hydrometer Data**

| Particle Diameter | % Finer |
|---|---|
| 0.038 | 9.8% |
| 0.027 | 9.2% |
| 0.019 | 9.2% |
| 0.014 | 7.5% |
| 0.010 | 6.9% |
| 0.007 | 6.9% |
| 0.005 | 6.9% |
| 0.004 | 6.9% |
| 0.002 | 6.9% |
| 0.001 | 5.8% |

**DESCRIPTION**

| | | | |
|---|---|---|---|
| Sample: | Site 1 | Depth: | 5'-6' |
| | | USCS: | SP-SM |
| Wet Color: | Light olive brown | | |
| Description: | Poorly graded sand with silt | | |
| Comments: | | | |

**SAMPLE DATA**

| | | | | |
|---|---|---|---|---|
| $W_C$ (%): | 8.1 | | $C_C$ | 4.1 |
| $G_S$: | 2.65 | (ASSUMED) | $C_U$ | 17.1 |
| % Gravel | 3.5 | | LL | - |
| % Sand | 85.4 | | PL | - |
| % Fines | 11.1 | | PI | - |

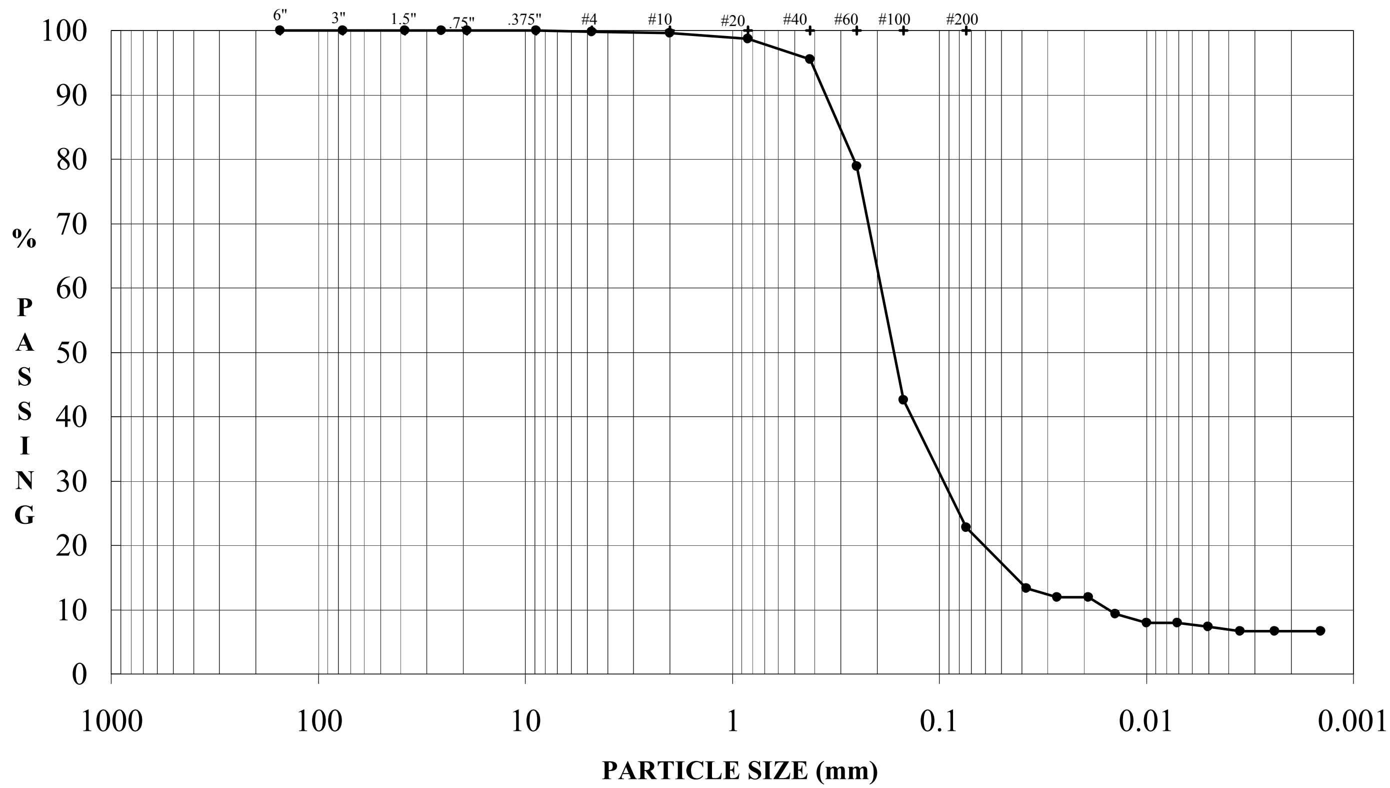
| | |
|---|---|
| Date: | 06/15/04 |
| Technician: | GD |
| Reviewer: | RMW |

NJDEP/INDOOR AIR QUALITY/NJ
023-6124.0001

GOLDER ASSOCIATES INC.
CHERRY HILL, NEW JERSEY

# PARTICLE-SIZE DISTRIBUTION ASTM D 422

US STANDARD SIEVE OPENING SIZES




| COBBLE | GRAVEL | | SAND | | | FINES |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Cor | Med | Fine | Silt or Clay |

**Sieve Data**

| Particle Diameter | % Finer |
|---|---|
| 3" | 100.0% |
| 1 1/2" | 100.0% |
| 1" | 100.0% |
| 3/4" | 100.0% |
| 3/8" | 100.0% |
| #4 | 99.8% |
| #10 | 99.6% |
| #20 | 98.7% |
| #40 | 95.6% |
| #60 | 78.9% |
| #100 | 42.5% |
| #200 | 22.8% |

**Hydrometer Data**

| Particle Diameter | % Finer |
|---|---|
| 0.038 | 13.3% |
| 0.027 | 12.0% |
| 0.019 | 12.0% |
| 0.014 | 9.3% |
| 0.010 | 8.0% |
| 0.007 | 8.0% |
| 0.005 | 7.3% |
| 0.004 | 6.7% |
| 0.002 | 6.7% |
| 0.001 | 6.7% |

**DESCRIPTION**

| | | | |
|---|---|---|---|
| Sample: | Site 1 | Depth: | 7.5'-16' |
| | | USCS: | - |
| Wet Color: | Pale yellow | | |
| Description: | f Sand, some fines, trace gravel | | |
| Comments: | | | |

**SAMPLE DATA**

| | | | | |
|---|---|---|---|---|
| $W_C$ (%): | 16.0 | | $C_C$ | N/A |
| $G_S$: | 2.65 | (ASSUMED) | $C_U$ | N/A |
| % Gravel | 0.2 | | LL | - |
| % Sand | 77.0 | | PL | - |
| % Fines | 22.8 | | PI | - |

| | |
|---|---|
| Date: | 06/15/04 |
| Technician: | GD |
| Reviewer: | RMW |

NJDEP/INDOOR AIR QUALITY/NJ
023-6124.0001

GOLDER ASSOCIATES INC.
CHERRY HILL, NEW JERSEY

# APPENDIX VI

# EGG HARBOR NJDEP SITE INVESTIGATION DATA

GZA
GeoEnvironmental, Inc.

*Engineers and Scientists*

December 7, 2001

Mr. Paul Smith
New Jersey Department of Environmental Protection
Bureau of State Case Management
401 East State Street - CN 028
Trenton, NJ 08625-0028

DEC 10 2001

**RE: Domestic Well Sampling**
**South Jersey Gas Company**
**Egg Harbor City Former MGP Site**

Dear Mr. Smith:

856 So. White Horse Pike
Suite 1
Hammonton
New Jersey 08037
609-567-9330
FAX 609-567-9335
http://www.gza.net

Please find enclosed one copy of the laboratory data package and two copies of the analytical Form Ones for water samples collected from the following properties in Egg Harbor City.

| | |
|---|---|
| Property Owner: | Chas Mueller |
| Property Address: | 436 Liverpool Avenue<br>Egg Harbor City, NJ 08215 |
| Block/Lot: | 209/4C |
| Property Owner: | William Westervelt |
| Property Address: | 324 Cincinnati Avenue<br>Egg Harbor City, NJ 08215 |
| Block/Lot: | 323/5 |
| Property Owner: | Ed Willey |
| Property Address: | 259 Buffalo Avenue<br>Egg Harbor City, NJ 08215 |
| Block/Lot: | 322/7A |
| Property Owner: | Francis Mohr |
| Property Address: | 703 Beethoven Avenue<br>Egg Harbor City, NJ 08215 |
| Block/Lot: | 323/1 |
| Property Owner: | Janet Jiampetti |
| Property Address: | 440 Liverpool Avenue<br>Egg Harbor City, NJ 08215 |
| Block/Lot: | 209/5 |
| Property Owner: | John Baxter |
| Property Address: | 428 Liverpool Avenue<br>Egg Harbor City, NJ 08215 |
| Block/Lot: | 209/4B |

A Subsidiary of GZA
GeoEnvironmental
Technologies, Inc.

Property Owner: Donald LaMonaca
Property Address: 418 Liverpool Avenue
Egg Harbor City, NJ 08215
Block/Lot: 209/2C

Please feel free to call me at (609) 567-9330 if you have any questions regarding the enclosed documents.

Sincerely,

Tara Wickes
Engineer 1

cc: Bruce Scamoffa, SJG
Mike Halter, SJG

# EGG HARBOR CITY UNCONFIRMED SOURCE CHLORINATED ORGANIC PLUME DATA SUMMARY

| WELL | LOCATION | | | | |
|---|---|---|---|---|---|
| | | | | | |
| CAMILLO, sampled July 1998 ** | 259 Buffalo Ave.; (corner of Buffalo & Beethoven); Lot 7A/Block 322 | PCE<br>6100 | TCE<br>45 | Cis-1,2-DCE<br>0.6 | 1,2-DCA<br>1 |
| | | | | | |
| North<br>JIAMPETTI, Sampled July 1998 *** | 440 Liverpool Ave; (between Buerger & Campe); Lot 5/Block 209 | PCE<br>0.7 | TCE<br>0.4 | Cis-1,2-DCE<br>0.6 | 1,2-DCA<br>1 |
| | | | | | |
| CAMILLO, sampled July 1997 **** | 259 Buffalo Ave.; Lot 7A/Block 322 | PCE<br>5900 | TCE<br>73 | | |
| | | | | | |
| FLATH, sampled May 1997 | 218 Cincinnati Ave; (between Arago & Beethoven); Lot 2.B / Block 322 | PCE<br>2 | | | |
| | | | | | |
| North<br>GUERRIERI, sampled May 1997 | 504 Campe St.; (between Liverpool & Philadelphia); Lot 6 / Block 209 | PCE<br>3 | | | |
| | | | | | |
| PONZETTI, sampled May 1997 | 205 Buffalo Ave; (2nd house from corner of Buffalo & Arago); Lot 12.A / Block 322 | PCE<br>1800 | TCE<br>73 | | |
| | | | | | |
| | | | | | |
| ~~SB-75-82 *****~~ Sample depth 27'-32' | ~~Southeast corner of Claudius & 6th~~ Terrace | PCE<br>22.1 | | | |
| | | | | | |

| WELL | LOCATION | | | | |
|---|---|---|---|---|---|
| | | | | | |
| SB-75-82 Sample depth 37'-42' | Southeast corner of Claudius & 6th Terrace | PCE 462 | TCE 8.3 | | |
| | | | | | |
| SB-75-82 Sample depth 47'-52' | Southeast corner of Claudius & 6th Terrace | PCE 168 | TCE 1.7 | | |
| | | | | | |
| SB-75-82 Sample depth 57'-62' | Southeast corner of Claudius & 6th Terrace | PCE 492 | | | |
| | | | | | |
| SB-75-82 Sample depth 67'-72' | Southeast corner of Claudius & 6th Terrace | PCE 360 | TCE 4.2 | | |
| | | | | | |
| SB-75-82 Sample depth 77'-82' | Southeast corner of Claudius & 6th Terrace | PCE 28 | | | |

* all concentrations in parts per billion (ppb)

** Camillo well sampled July 1998 also detected benzene (75 ppb), chloroform (2 ppb), 1,2-Dibromoethane (1 ppb), o-xylene (3 ppb), isopropylbenzene (0.6 ppb), and naphthalene (5 ppb)

*** Jiampetti well sampled July 1998 also detected benzene (76 ppb), chloroform (2 ppb), 1,2-Dibromoethane (1 ppb), o-xylene (4 ppb), isopropylbenzene (0.5 ppb), and naphthalene (5 ppb)

**** Camillo well sampled July 1997 also detected benzene (27 ppb), 1,2,4-trichlorobenzene (21 ppb), and naphthalene (90 ppb)

***** SB-75-82 was a temporary well point, sampled at multiple depths, from the South Jersey Gas Company Egg Harbor Former Manufactured Gas Plant remedial investigation.

**Potential sources:**

Dry Cleaner (located in shopping center approximately at corner of Buffalo Ave. & Route 30 / White Horse Ave.)
Napa Auto Parts (located on Cincinnati Ave., between Arago & Beethoven)
Cornell's Carstar Autobody (located on Buffalo Ave., between Arago & Beethoven)

| SJG Boring/Groundwater Locations – 1996 to 2002 | | | | | |
|---|---|---|---|---|---|
| Boring Number | Sample Interval (feet bgs) | Sample Date | Boring Depth (feet) | Location Street Name | Cross-Street Name |
| SB70 | 17 to 22 | Nov-96 | 72 | Beethoven | 6th Terrace |
| SB71 | 18 to 23 | Nov-96 | 54 | Beethoven | 5th Terrace |
| | 38 to 43 | | | | |
| | 48 to 53 | | | | |
| SB72 | 31 to 36 | Nov-96 | 86 | Buerger | Philadelphia |
| SB75 | 27 to 32 | Jan-97 | 82 | Claudius | 6th Terrace |
| | 37 to 42 | | | | |
| | 47 to 52 | | | | |
| | 57 to 62 | | | | |
| | 67 to 72 | | | | |
| | 77 to 82 | | | | |

| SJG Boring/Groundwater Locations – 1996 to 2002 | | | | | |
|---|---|---|---|---|---|
| Boring Number | Sample Interval (feet bgs) | Sample Date | Boring Depth (feet) | Location Street Name | Cross-Street Name |
| SB76 | 53 to 58 | Jan-97 | 88 | Campe | Philadelphia |
| | 73 to 78 | | | | |
| SB108 | 28 to 33 | May-99 | 113 | 5th Terrace | Campe |
| SB118 | 91 to 96 | Oct-01 | 106 | Philadelphia | Buerger |
| SB120 | 35 to 40 | Oct-01 | 70 | Campe | Liverpool |
| SB121 | 32 to 37 | Nov-01 | 107 | Philadelphia | Campe |
| | 42 to 47 | | | | |
| | 52 to 57 | | | | |
| SB122 | 32 to 37 | Nov-01 | 117 | Philadelphia | Campe |
| | 42 to 47 | | | | |
| | 52 to 57 | | | | |
| | 62 to 67 | | | | |
| | 72 to 77 | | | | |
| | 91 to 96 | | | | |
| SB126 | 35 to 40 | Jan-02 | 120 | Claudius | 5th Terrace |
| | 115 to 120 | | | | |
| SB128 | 25 to 30 | Jan-02 | 120 | Claudius | 5th Terrace |
| | 35 to 40 | | | | |
| | 45 to 50 | | | | |
| | 55 to 60 | | | | |
| SB129 | 35 to 40 | Feb-02 | 120 | Claudius | Liverpool |
| | 45 to 50 | | | | |
| | 55 to 60 | | | | |
| | 65 to 70 | | | | |
| | 105 to 110 | | | | |
| | 115 to 120 | | | | |
| SB130 | 25 to 30 | Mar-02 | 120 | Liverpool | Claudius |
| | 95 to 100 | | | | |
| | 105 to 110 | | | | |
| | 115 to 120 | | | | |
| SB131 | 65 to 70 | Apr-02 | 100 | Liverpool | Diesterweg |
| | 75 to 80 | | | | |
| | 85 to 90 | | | | |
| | 95 to 100 | | | | |
| SB132 | 95 to 100 | May-02 | 120 | Liverpool | Claudius |
| | 105 to 110 | | | | |
| | 115 to 120 | | | | |
| SB133 | 20 to 25 | May-02 | 85 | Liverpool | Claudius |
| | 30 to 35 | | | | |

| SJC Boring/Groundwater Locations – 1996 to 2002 | | | | | |
|---|---|---|---|---|---|
| Boring Number | Sample Interval (feet bgs) | Sample Date | Boring Depth (feet) | Location Street Name | Cross-Street Name |
| SB135 | 1 to 11 | Jun-02 | 74 | Duerer | Liverpool |
| | 19 to 24 | | | | |
| | 59 to 64 | | | | |
| | 69 to 74 | | | | |
| SB139 | 25 to 30 | Jun-02 | 80 | Liverpool | Duerer |
| SB140 | 0 to 10 | Jun-02 | 84 | Duerer | Liverpool |
| | 19 to 24 | | | | |

| SJG Boring Groundwater Analytical Data – 1996 to 2002 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sample Number | Sample Interval (feet bgs) | Carbon Disulfide | 1,1-DCA | 1,2-DCA | 1,1-DCE | PCE | TCE | 1,1,1-TCA |
| GWQS (ppb) | | 800 | 50 | 2 | 2 | 1 | 1 | 30 |
| SB70 | 17 to 22 | | | | | 3.2 | | |
| SB71 | 18 to 23 | | | | | 2.2 | | |
| | 38 to 43 | | 1.3 | | | | | |
| | 48 to 53 | | 2 | | | | | |
| SB72 | 31 to 36 | | | | | 3.2 | | |
| SB75 | 27 to 32 | 36.8 | | | | 22.1 | | |
| | 37 to 42 | | | | | 462 | 8.3 | |
| | 47 to 52 | | | | | 168 | 1.7 | |
| | 57 to 62 | | | | | 492 | | |
| | 67 to 72 | | | | | 360 | 4.2 | |
| | 77 to 82 | 1.7 | | | | 28 | | |
| SB76 | 53 to 58 | | | | | 1.6 | | |
| | 73 to 78 | | | | | | 1.8 | |
| SB108 | 28 to 33 | | | | | 0.5 | | |
| SB118 | 91 to 96 | | 1.4 | | | | | |
| SB120 | 35 to 40 | | | 0.5 | | | | |
| SB121 | 32 to 37 | | | | | 0.6 | | |
| | 42 to 47 | | | | | 0.7 | | |
| | 52 to 57 | | | | | 0.8 | | |
| SB122 | 32 to 37 | | | | | 3.9 | | |
| | 42 to 47 | | | | | 6.2 | | |
| | 52 to 57 | | | | | 20 | | |
| | 62 to 67 | | | | | 14 | | |
| | 72 to 77 | | | | | 6.5 | | |
| | 91 to 96 | | | | | 0.4 | | |
| SB126 | 35 to 40 | | | | | 0.5 | | |
| | 115 to 120 | | 0.8 | | | | | |

| SJG Boring/Groundwater Analytical Data – 1996 to 2002 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sample Number | Sample Interval (feet bgs) | Carbon Disulfide | 1,1-DCA | 1,2-DCA | 1,1-DCE | PCE | TCE | 1,1,1-TCA |
| GWQS (ppb) | | 800 | 50 | 2 | 2 | 1 | 1 | 30 |
| SB128 | 25 to 30 | | | | | 0.5 | | |
| | 35 to 40 | | | | | **13** | | |
| | 45 to 50 | | | | | **20** | | |
| | 55 to 60 | | | | | **22** | | |
| SB129 | 35 to 40 | | | | | 0.4 | | |
| | 45 to 50 | | | | | **2.1** | | |
| | 55 to 60 | | | | | **13** | | |
| | 65 to 70 | | | | | **3.7** | | |
| | 105 to 110 | | 1.4 | | | | | |
| | 115 to 120 | | 1.6 | | | 0.3 | | |
| SB130 | 25 to 30 | | | | | 0.3 | | |
| | 95 to 100 | | 2.1 | | 0.4 | 0.4 | | 0.3 |
| | 105 to 110 | | 1.5 | | 0.3 | 0.3 | | |
| | 115 to 120 | | 1 | | | | | |
| SB131 | 65 to 70 | | 1.1 | | | | | |
| | 75 to 80 | | 1.2 | | | | | |
| | 85 to 90 | | 1.5 | | | 0.3 | | |
| | 95 to 100 | | 1.7 | | 0.7 | 0.3 | 0.2 | 0.3 |
| SB132 | 95 to 100 | | 3.4 | | 1.4 | 0.2 | 0.2 | 1 |
| | 105 to 110 | | 4.7 | | 1.8 | 0.4 | 0.3 | 1.3 |
| | 115 to 120 | | 4.3 | | 0.8 | 0.5 | | 0.8 |
| SB133 | 20 to 25 | | | | | **12** | | |
| | 30 to 35 | | | | | **4.2** | | |
| SB135 | 1 to 11 | | | | | **15** | 0.3 | |
| | 19 to 24 | | | | | **46** | | |
| | 59 to 64 | | | | | **1.1** | | |
| | 69 to 74 | | | | | **1** | | |
| SB139 | 25 to 30 | | | | | **3.2** | | |
| SB140 | 0 to 10 | | | | | 0.9 | | |
| | 19 to 24 | | | | | **120** | 0.5 | |

Notes:

Concentrations are in parts per billion (ppb)
Blank spaces indicate contaminant not detected
Bold values exceed NJDEP Groundwater Quality Standard (GWQS)
1,1-DCA = 1,1-Dichloroethane
1,2-DCA = 1,2-Dichloroethane
1,1-DCE = 1,1-Dichloroethene
PCE = Tetrachloroethene
TCE = Trichloroethene
1,1,1-TCA = 1,1,1-Trichloroethane

| Cumberland Farms Groundwater Analytical Data - 1993 to 1995 | | | | |
|---|---|---|---|---|
| Sample Number | Sample Date | PCE | TCE | cis/trans-1,2-DCE |
| GWQS (ppb) | | 1 | 1 | 70 |
| MW1 | May-93 | 3.15 | | |
| MW1 | Dec-94 | 9.2 | | |
| MW1 | May-95 | 2 | | |
| MW2 | May-93 | | | |
| MW2 | Dec-94 | | | |
| MW2 | May-95 | 14 | 3.3 | 4 |
| MW3 | May-93 | | | |
| MW3 | Dec-94 | 6.7 | | 5.6 |
| MW3 | May-95 | 4.8 | | |
| MW4 | May-93 | 15.8 | | |
| MW4 | Dec-94 | 6.4 | | |
| MW5 | Dec-94 | 7.8 | | |
| MW6 | Dec-94 | | | |

| Cumberland Farms Groundwater Analytical Data - 1993 to 1995 | | | | |
|---|---|---|---|---|
| Sample Number | Sample Date | PCE | TCE | cis/trans-1,2-DCE |
| GWQS (ppb) | | 1 | 1 | 70 |
| B1 | Apr-95 | | | |
| B2 | Apr-95 | | | |
| B3 | Apr-95 | | | |
| B4 | Apr-95 | | | |

Notes:

Concentrations are in ppb (parts per billion)

Blank spaces indicate contaminant not detected

Bold values exceed NJDEP Groundwater Quality Standard (GWQS)

PCE = Tetrachloroethene

TCE = Trichlorothene

cis/trans-1,2-DCE = cis/trans-1,2-dichloroethene

| NJDEP Off-Site Geoprobe Groundwater Locations – March 2003 | | |
|---|---|---|
| Sample Number | Sample Interval (feet bgs) | Location Relative to Site |
| BF1-12 | 9 to 12 | Buffalo Ave. Right of Way (ROW), across from residential property at 111 Buffalo Ave., ~395 feet from the Pembroke Clothing facility |
| BF1-24 | 21 to 24 | |
| BF1-36 | 33 to 36 | |
| BF1-48 | 45 to 48 | |
| BF2-12 | 9 to 12 | Buffalo Ave. ROW, in front of residential property at 153 Buffalo Ave., ~830 feet from the Pembroke Clothing facility, DUP0310 is a duplicate of BF2-18 |
| BF2-18 | 15 to 18 | |
| DUP0310 | 15 to 18 | |
| BF2-24 | 21 to 24 | |
| BF2-36 | 33 to 36 | |
| BF2-48 | 45 to 48 | |
| BF2-60 | 57 to 60 | |
| BF2-65 | 62 to 65 | |
| BF3-12 | 9 to 12 | Buffalo Ave. ROW, in front of residential properties at 201/205 Buffalo Ave. with contaminated irrigation well, ~1023 feet from the Pembroke Clothing facility |
| BF3-18 | 15 to 18 | |
| BF3-24 | 21 to 24 | |
| BF3-36 | 33 to 36 | |
| BF3-48 | 45 to 48 | |
| BF3-60 | 57 to 60 | |
| BF3-65 | 62 to 65 | |
| BF4-12 | 9 to 12 | Buffalo Ave. ROW, in front of residential property at 253 Buffalo Ave., adjacent properties 249 and 259 Buffalo Ave. with contaminated irrigation wells, ~1493 feet from the Pembroke Clothing facility, DUP0304 is a duplicate of BF4-60 |
| BF4-24 | 21 to 24 | |
| BF4-32 | 29 to 32 | |
| BF4-36 | 33 to 36 | |
| BF4-48 | 45 to 48 | |
| BF4-60 | 57 to 60 | |
| DUP0304 | 57 to 60 | |
| BF4-68 | 65 to 68 | |
| CH1-12 | 9 to 12 | Chicago Ave. ROW, in front of residential property at 111 Chicago Ave., ~434 feet from the Pembroke Clothing facility, sidegradient of suspected source area, DUP0312 is a duplicate of CH1-24 |
| CH1-18 | 15 to 18 | |
| CH1-24 | 21 to 24 | |
| DUP0312 | 21 to 24 | |
| CH1-36 | 33 to 36 | |
| CH1-48 | 45 to 48 | |
| CH1-60 | 57 to 60 | |

| NJDEP Off-Site Geoprobe Groundwater Analytical Data - March 2003 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sample Number | Sample Interval (feet bgs) | 1,1-DCE | cis-1,2-DCE | PCE | TCE | 1,1,2-TCA | 1,1,2,2-TCA | Vinyl Chloride |
| GWQS (ppb) | | 2 | 70 | 1 | 1 | 3 | 1 | 5 |
| BF1-12 | 9 to 12 | | | | | | | |
| BF1-24 | 21 to 24 | 2.55 J | 128.83 D | 2,011.42 D | 170.49 D | 5.8 | | 24.15 JD |
| BF1-36 | 33 to 36 | | 5.9 | 125.95 D | 7.84 | 0.41 | | 0.4 |
| BF1-48 | 45 to 48 | 0.21 J | 4.88 | 250.74 D | 7.65 | 0.44 | | 0.41 |
| BF2-12 | 9 to 12 | | | | | | | |
| BF2-18 | 15 to 18 | | 86.67 | 1,932.18 D | 124.83 D | 5.53 | | 8.33 |
| DUP0310 | 15 to 18 | | 85.6 | 1,944.86 D | 123.13 D | 5.4 | | 8.6 |
| BF2-24 | 21 to 24 | 3.41 J | 133.19 | 4,013.18 D | 187.88 D | 14.6 | 2.26 J | 16.12 |
| BF2-36 | 33 to 36 | | | 4,028.91 D | 7.88 | | | |
| BF2-48 | 45 to 48 | | | 41,731.11 D | | | | |
| BF2-60 | 57 to 60 | | | 2,529.55 D | 8.17 | | | |
| BF2-65 | 62 to 65 | | | 716.82 D | 4.71 | | | |

| NJDEP Off-Site Geoprobe Groundwater Analytical Data - March 2003 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sample Number | Sample Interval (feet bgs) | 1,1-DCE | cis-1,2-DCE | PCE | TCE | 1,1,2-TCA | 1,1,2,2-TCA | Vinyl Chloride |
| GWQS (ppb) | | 2 | 70 | 1 | 1 | 3 | 1 | 5 |
| BF3-12 | 9 to 12 | | | | | | | |
| BF3-18 | 15 to 18 | | 7.72 | **159.43 D** | **14** | 0.73 | | |
| BF3-24 | 21 to 24 | **3.15 J** | **100.05 D** | **3,255.42 D** | **178.2 D** | **14.82** | **2.78 J** | **7.67** |
| BF3-36 | 33 to 36 | | 10.9 | **3,170.75 D** | **41.92** | 7.21 | | |
| BF3-48 | 45 to 48 | | | **5,631.66 D** | **22.24 J** | | | |
| BF3-60 | 57 to 60 | | | **18,710.44 D** | **218.87** | | | |
| BF3-65 | 62 to 65 | | | **11,555.24 D** | **147.02** | | | |
| BF4-12 | 9 to 12 | | | | | | | |
| BF4-24 | 21 to 24 | | | | | | | |
| BF4-32 | 29 to 32 | | 12.81 | **1,692.96 D** | **37.37** | **3.35 J** | | |
| BF4-36 | 33 to 36 | | 5.21 | **1,470.82 D** | **21.4 JD** | | | |
| BF4-48 | 45 to 48 | | | **922.26 D** | | | | |
| BF4-60 | 57 to 60 | | | **910.67 D** | | | | |
| DUP0304 | 57 to 60 | | | **809.48 D** | | | | |
| BF4-68 | 65 to 68 | | | **88.47 D** | 0.82 | | | |
| CH1-12 | 9 to 12 | | | 0.61 | | | | |
| CH1-18 | 15 to 18 | | | 0.61 | | | | |
| CH1-24 | 21 to 24 | | | 0.8 | 0.3 J | | | |
| DUP0312 | 21 to 24 | | | 0.8 | 0.3 J | | | |
| CH1-36 | 33 to 36 | | | | | | | |
| CH1-48 | 45 to 48 | | | | | | | |
| CH1-60 | 57 to 60 | | | 0.25 J | | | | |

Notes:

Concentrations are in parts per billion (ppb)
Blank spaces indicate contaminant not detected
Bold values exceed NJDEP Groundwater Quality Standard (GWQS)
D = Diluted sample
J = Estimated value
1,1-DCE = 1,1-Dichloroethene
cis-1,2-DCE = cis-1,2-Dichloroethene
PCE = Tetrachloroethene
TCE = Trichloroethene
1,1,2-TCA = 1,1,2-Trichloroethane
1,1,2,2-TCA = 1,1,2,2-Tetrachloroethane

| NJDEP On-Site Geoprobe Groundwater Locations - March 2003 | | |
|---|---|---|
| Sample Number | Sample Interval (feet bgs) | Location Relative to Site |
| AT1-7 | 4 to 7 (no water) | Atlantic Ave. ROW, between Buffalo and Chicago Aves., near Pembroke Clothing irrigation well, adjacent to railroad tracks and parking area |
| AT1-12 | 9 to 12 (no water) | |
| AT1-18 | 15 to 18 | |
| AT1-24 | 21 to 24 | |
| AT1-36 | 33 to 36 | |
| AT1-48 | 45 to 48 | |
| AT1-52 | 49 to 52 | |
| AT2-7 | 4 to 7 | Pembroke Clothing parking lot, northeastern edge of property, adjacent to Steuben Alley, behind shopping center and Won Cleaners, near former storage area |
| AT2-12 | 9 to 12 | |
| AT2-18 | 15 to 18 | |
| AT2-24 | 21 to 24 (no water) | |
| AT2-36 | 33 to 36 | |
| AT2-48 | 45 to 48 | |
| AT2-60 | 57 to 60 | |
| AT2-68 | 65 to 68 | |

| NJDEP On-Site Geoprobe Groundwater Locations - March 2008 | | |
|---|---|---|
| Sample Number | Sample Interval (feet bgs) | Location Relative to Site |
| AT3-7 | 4 to 7 | Pembroke Clothing parking lot, northeastern edge of property, adjacent to Steuben Alley, behind shopping center near former chemical storage area |
| AT3-12 | 9 to 12 (no water) | |
| AT3-18 | 15 to 18 | |
| AT3-24 | 21 to 24 | |
| AT3-36 | 33 to 36 | |
| AT3-48 | 45 to 48 | |

NJDEP On-Site Geoprobe Groundwater Analytical Data – March 2003

| Sample Number | Sample Interval (feet bgs) | 1,1-DCA | 1,2-DCA | 1,1-DCE | cis-1,2-DCE | trans-1,2-DCE | PCE | TCE | 1,1,2-TCA | 1,1,1-TCA | 1,1,2,2-TCA | VC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GWQS (ppb) | | 50 | 2 | 2 | 70 | 100 | 1 | 1 | 3 | 30 | 1 | 5 |
| AT1-18 | 15 to 18 | | | | | | 0.21 J | | | | | |
| AT1-24 | 21 to 24 | | | | | | | | | | | |
| AT1-36 | 33 to 36 | | | | | | | | | | | |
| AT1-48 | 45 to 48 | | | | | | | | | | | |
| AT1-52 | 49 to 52 | | | | | | | | | | | |
| AT2-7 | 4 to 7 | | | | 4.03 | 0.36 J | | 0.27 J | | | | 0.81 |
| AT2-12 | 9 to 12 | | | | 92.54 D | 2.49 JD | 5.27 D | 14.56 D | | | | 12.17 D |
| AT2-18 | 15 to 18 | | 3.6 J | 23.6 JD | 1,426.22 D | 14.21 | 19,716.11 D | 1,717.51 D | 70.84 D | 4.92 | 4.58 | 160.92 D |
| AT2-36 | 33 to 36 | | | | 5.45 | | 1,419.69 D | 19.27 | | | | |
| AT2-48 | 45 to 48 | | | | | | 101.04 D | 1.43 | | | | |
| AT2-60 | 57 to 60 | | | 0.2 | 2.48 | | 337.24 D | 7.52 | 1.51 | | 0.2 | |
| AT2-68 | 65 to 68 | | | | 7.5 | | 707.68 D | 20.63 JD | 3.74 J | | | |
| AT3-7 | 4 to 7 | | | | 7.51 | 0.41 | 0.84 | 2.01 | | | | 5.96 |
| AT3-18 | 15 to 18 | 2.17 J | | | 163.89 | 3.13 J | 1,453.66 D | 184.94 | 5.91 | | | 4.02 |
| AT3-24 | 21 to 24 | 0.74 | | 0.55 | 0.33 J | | 81.1 D | 0.46 | | | | |
| AT3-36 | 33 to 36 | | | | | | 4,599.05 D | | | | | |
| AT3-48 | 45 to 48 | 0.92 | | | 0.7 | | 14.63 | 0.26 J | | | | |

Notes:
Concentrations are in parts per billion (ppb)
Blank spaces indicate contaminant not detected
Bold values exceed NJDEP Groundwater Quality Standard (GWQS)
D=Diluted Sample
J= Estimated value
1,1 or 1,2-DCA = 1,1- or 1,2-Dichloroethane
1,1-DCE = 1,1-Dichloroethene
cis or trans 1,2-DCE = cis or trans 1,2-dichloroethene
PCE = Tetrachloroethene
TCE = Trichloroethene
1,1,2 or 1,1,1-TCA = 1,1,2- or 1,1,1-Trichloroethane
1,1,2,2-TCA = 1,1,2,2-Tetrachloroethane
VC = Vinyl Chloride

| NJDEP On-Site Geoprobe Groundwater Analytical Data – March 2003 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Number | Sample Interval (feet bgs) | Benzene | n-BB | sBB | Chloroform | 1,2-DB | 1,4-DB | IPB | 4-IPT | MTBE | MC | NPH | 1,2,4-TMB | Toluene | o-Xylene |
| GWQS (ppb) | | 1 | NA | NA | 6 | 600 | 75 | NA | NA | 70 | 3 | 300 | 100 | 1000 | 1000 |
| AT1-18 | 15 to 18 | | | | | | | | | | | | | | |
| AT1-24 | 21 to 24 | | | | | | | | | | | | | | |
| AT1-36 | 33 to 36 | | | | | | | | | | | | | | |
| AT1-48 | 45 to 48 | | | | 0.75 | | | | | | | | | | |
| AT1-52 | 49 to 52 | | | | | | | | | | | | | | |
| AT2-7 | 4 to 7 | | | | | | | | | | | | | | |
| AT2-12 | 9 to 12 | | | | | | | | | | | | | | |
| AT2-18 | 15 to 18 | | | | 2.79 J | | | | | | 2.07 J | 14.24 | | 2.01 J | |
| AT2-36 | 33 to 36 | | | | | | | | | | | 2.03 J | | | |
| AT2-48 | 45 to 48 | | | | | | | | | | | | | | |
| AT2-60 | 57 to 60 | 0.34 | | | | | | | | | | 0.36 | | 0.49 | |
| AT2-68 | 65 to 68 | | | | | | | | | | | | | | |
| AT3-7 | 4 to 7 | | | | | | | | | | | | | | |
| AT3-18 | 15 to 18 | **1,230.33 D** | 2.05 J | 2.96 J | | | | 3.94 J | 3.01 J | | | 14.97 | 2.52 J | 2.07 J | 52.48 |
| AT3-24 | 21 to 24 | **2.19** | | | | | | | | | | | | | |
| AT3-36 | 33 to 36 | | | | | | | | | | | | | | |
| AT3-48 | 45 to 48 | 0.41 | | | 0.21 J | 2.36 | 0.59 | | | 1.12 J | | | | | |

Notes:

Concentrations are in parts per billion (ppb)
Blank spaces indicate contaminant not detected
Bold values exceed NJDEP Groundwater Quality Standard (GWQS)
NA = No applicable GWQS available
D = Diluted sample
J= Estimated value
n- or s-BB = n-butylbenzene or sec-butylbenzene
1,2- or 1,4-DB = 1,2-dichlorobenzene or 1,4-dichlorobenzene
IPB = isopropylbenzene
4-IPT = 4-isopropyltoluene
MTBE = Methyl Tertiary Butyl Ether
MC = Methylene chloride
NPH = Naphthalene
1,2,4-TMB = 1,2,4-trimethylbenzene

| NJDEP On-Site Geoprobe Groundwater Locations - June/July 2003 | | |
|---|---|---|
| Sample Number | Sample Interval (feet bgs) | Location Relative to Site |
| AT4-GW1 | 4 to 7 | Chicago Ave. ROW, east of Pembroke Clothing, loading dock area, sidegradient of suspected contaminant plume |
| AT4-GW3 | 15 to 18 | |
| AT4-GW4 | 21 to 24 | |
| AT5-GW1 | 4 to 7 | Pembroke Clothing, parking lot, adjacent to main loading docks, east side of building |
| AT5-GW2 | 9 to 12 (no water) | |
| AT5-GW3 | 15 to 18 | |
| AT5-GW4 | 21 to 24 (no water) | |
| AT5-GW5 | 27 to 30 | |

| NJDEP On-Site Geoprobe Groundwater Locations - June/July 2003 | | |
|---|---|---|
| Sample Number | Sample Interval (feet bgs) | Location Relative to Site |
| AT6-GW1 | 4 to 7 | Pembroke Clothing, former loading area, large bay doors, southeast side of building, intersection of Chicago and Atlantic Aves., DUP1-GW is a duplicate of AT6-GW5 |
| AT6-GW2 | 9 to 12 (no water) | |
| AT6-GW3 | 15 to 18 (no water) | |
| AT6-GW4 | 21 to 24 | |
| AT6-GW5 | 28 to 31 | |
| DUP1-GW | 28 to 31 | |
| AT7-GW1 | 4 to 7 | Atlantic Ave. ROW intersection with Chicago Ave., adjacent to railroad tracks and parking area, upgradient of Pembroke Clothing |
| AT7-GW2 | 9 to 12 (no water) | |
| AT7-GW3 | 15 to 18 | |
| AT7-GW4 | 21 to 24 | |
| AT7-GW6 | 33 to 36 | |
| AT7-GW7 | 45 to 48 | |
| AT7-GW8 | 57 to 60 | |
| AT8-GW1 | 4 to 7 (no water) | Pembroke Clothing, fenced area, within L-shaped wing of building, adjacent to inner loading dock area |
| AT8-GW2 | 9 to 12 (no water) | |
| AT8-GW3 | 15 to 18 | |
| AT8-GW4 | 21 to 24 | |
| AT8-GW6 | 33 to 36 | |
| AT8-GW7 | 45 to 48 | |
| AT8-GW8 | 57 to 60 | |
| AT9-GW1 | 4 to 7 | Pembroke Clothing, parking lot, near fence gate, south of water and sewer lines, near former chemical storage area, DUP4-GW is a duplicate of AT9-GW3 |
| AT9-GW2 | 9 to 12 (no water) | |
| AT9-GW3 | 15 to 18 | |
| DUP4-GW | 15 to 18 | |
| AT9-GW4 | 21 to 24 | |
| AT9-GW10 | 24 to 27 | |
| AT10-GW1 | 4 to 7 | Pembroke Clothing facility, corner of fenced area, northwest of water and sewer lines, near former storage area |
| AT10-GW2 | 9 to 12 (no water) | |
| AT10-GW3 | 15 to 18 | |
| AT10-GW4 | 21 to 24 | |
| AT10-GW6 | 33 to 36 | |
| AT10-GW10 | 41 to 44 | |
| AT11-GW1 | 4 to 7 | Pembroke Clothing facility, along fence line, north of new loading dock, approximate location of former storage area, DUP3-GW is a duplicate of AT11-GW3 |
| AT11-GW2 | 9 to 12 (no water) | |
| AT11-GW3 | 15 to 18 | |
| DUP3-GW | 15 to 18 | |
| AT11-GW4 | 21 to 24 | |
| AT11-GW6 | 33 to 36 | |
| AT11-GW7 | 45 to 48 | |
| AT11-GW8 | 57 to 60 | |

| NJDEP On-Site Geoprobe Groundwater Locations - June/July 2003 | | |
|---|---|---|
| Sample Number | Sample Interval (feet bgs) | Location Relative to Site |
| AT12-GW1 | 4 to 7 | Pembroke Clothing facility parking lot, northernmost corner of property, intersection of Buffalo Ave. and Steuben Alley, sidegradient of suspected contaminant plume |
| AT12-GW2 | 9 to 12 | |
| AT12-GW3 | 15 to 18 | |
| AT12-GW4 | 21 to 24 | |
| AT12-GW6 | 33 to 36 | |
| AT12-GW10 | 39 to 42 | |

| NJDEP On-Site Geoprobe Groundwater Analytical Data – June/July 2003 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Number | Sample Interval (feet bgs) | 1,1-DCA | 1,2-DCA | 1,1-DCE | cis-1,2-DCE | trans-1,2-DCE | PCE | TCE | 1,1,2-TCA | 1,1,1-TCA | 1,1,2,2-TCA | VC |
| GWQS (ppb) | | 50 | 2 | 2 | 70 | 100 | 1 | 1 | 3 | 30 | 1 | 5 |
| AT4-GW1 | 4 to 7 | | | | | | | | | | | |
| AT4-GW3 | 15 to 18 | | | | | | | | | | | |
| AT4-GW4 | 21 to 24 | | | | 5 J | | | 1 J | | | | |
| AT5-GW1 | 4 to 7 | | | | 24 | | 130 | 19 | | | | |
| AT5-GW3 | 15 to 18 | | | | 6 J | | 42 | 12 | | | | |
| AT5-GW5 | 27 to 30 | | | | | | 1 J | | | | | |
| AT6-GW1 | 4 to 7 | | | | | | | | | | | |
| AT6-GW4 | 21 to 24 | | | | | | | | | | | |
| AT6-GW5 | 28 to 31 | | | | | | | | | | | |
| DUP1-GW | 28 to 31 | | | | | | | | | | | |
| AT7-GW1 | 4 to 7 | | | | | | | | | | | |
| AT7-GW3 | 15 to 18 | | | | | | | | | | | |
| AT7-GW4 | 21 to 24 | | | | | | | | | | | |
| AT7-GW6 | 33 to 36 | | | | | | | | | | | |
| AT7-GW7 | 45 to 48 | | | | | | | | | | | |
| AT7-GW8 | 57 to 60 | | | | | | | | | | | |
| AT8-GW3 | 15 to 18 | 24 | | 11 | 6 J | | 1,600 D | 57 | | | | |
| AT8-GW4 | 21 to 24 | | | | | | 52 | | | | | |
| AT8-GW6 | 33 to 36 | | | | | | 27 | | | | | |
| AT8-GW7 | 45 to 48 | | | | 2 J | | 80 | 2 J | | | | |
| AT8-GW8 | 57 to 60 | | | | | | 11 | | | | | |
| AT9-GW1 | 4 to 7 | | | | 80 | 1 J | | 2 J | | | | 16 |
| AT9-GW3 | 15 to 18 | 10 J | | 7 J | 52 | 1 J | 8,500 D | 290 J | 46 J | | 9 J | |
| DUP4-GW | 15 to 18 | 12 | | 7 J | 64 | | 10,000 D | 290 J | | | | |
| AT9-GW4 | 21 to 24 | | | | | | 14,000 D | 37 | | 2 J | | |
| AT9-GW10 | 24 to 27 | | | | | | 13,000 D | 29 | | 2 J | | |
| AT10-GW1 | 4 to 7 | | | | 16 | 1 J | | 2 J | | | | 11 |
| AT10-GW3 | 15 to 18 | | | 76 | 880 J | 10 | 84,000 D | 850 J | 170 | 30 | 40 | 71 |
| AT10-GW4 | 21 to 24 | | 5 J | 9 J | 320 J | 3 J | 7,300 D | 200 J | 130 | | 18 | 14 |

**NJDEP On-Site Geoprobe Groundwater Analytical Data – June/July 2003**

| Sample Number | Sample Interval (feet bgs) | 1,1-DCA | 1,2-DCA | 1,1-DCE | cis-1,2-DCE | trans-1,2-DCE | PCE | TCE | 1,1,2-TCA | 1,1,1-TCA | 1,1,2,2-TCA | VC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GWQS (ppb) | | 50 | 2 | 2 | 70 | 100 | 1 | 1 | 3 | 30 | 1 | 5 |
| AT10-GW6 | 33 to 36 | | | | 3 J | | 1,300 D | 6 J | | | | |
| AT10-GW10 | 41 to 44 | | | 2 J | 41 | | 6,200 D | 55 | 15 | | 2 J | |
| AT11-GW1 | 4 to 7 | | | | | | | | | | | 1 J |
| AT11-GW3 | 15 to 18 | | 3 J | 20 J | 250 J | 4 J | 17,000 D | 1,000 D | 69 J | 9 J | 5 J | 17 J |
| DUP3-GW | 15 to 18 | | | 13 J | 170 J | 3 J | 10,000 D | 670 J | 46 J | 6 J | 3 J | 12 J |
| AT11-GW4 | 21 to 24 | | | 4 J | 61 J | | 11,000 D | 160 J | 27 J | 3 J | 2 J | 2 J |
| AT11-GW6 | 33 to 36 | | | | | | 40 | | | | | |
| AT11-GW7 | 45 to 48 | | | 1 J | 14 | | 2,300 D | 40 | 9 J | | | |
| AT11-GW8 | 57 to 60 | | | | | | 120 | 3 J | | | | |
| AT12-GW1 | 4 to 7 | | | | | | | | | | | |
| AT12-GW2 | 9 to 12 | | | | | | | | | | | |
| AT12-GW3 | 15 to 18 | | | | | | | | | | | |
| AT12-GW4 | 21 to 24 | | | | | | | | | | | |
| AT12-GW6 | 33 to 36 | | | | | | | | | | | |
| AT12-GW10 | 39 to 42 | | | | | | | | | | | |

Notes:
Concentrations are in parts per billion (ppb)
Blank spaces indicate contaminant not detected
Bold values exceed NJDEP Groundwater Quality Standard (GWQS)
D = Diluted sample
J= Estimated value
1,1- or 1,2-DCA = 1,1- or 1,2-Dichloroethane
1,1-DCE = 1,1-Dichloroethene
cis or trans 1,2-DCE = cis or trans 1,2-dichloroethene
PCE = Tetrachloroethene
TCE = Trichloroethene
1,1,1- or 1,1,2-TCA = 1,1,1- or 1,1,2-Trichloroethane
1,1,2,2-TCA = 1,1,2,2-Tetrachloroethane
VC = Vinyl Chloride

| NJDEP On-Site Geoprobe Groundwater Analytical Data – June/July 2003 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Number | Sample Interval (feet bgs) | AT | Benz-ene | CB | CF | CM | 1,2-DBE | 1,2-DB | 1,4-DB | EB | IPB | MCH | Sty-rene | Tol-uene | Xylene (total) |
| GWQS (ppb) | | 700 | 1 | 50 | 6 | 30 | NA | 600 | 75 | 700 | NA | NA | 100 | 1000 | 1000 |
| AT4-GW1 | 4 to 7 | | | | | | | | | | | | | | |
| AT4-GW3 | 15 to 18 | | | | | | | | | | | | | | |
| AT4-GW4 | 21 to 24 | | | | | | | | | | | | | | |
| AT5-GW1 | 4 to 7 | | | | | | | | | | | | | | |
| AT5-GW3 | 15 to 18 | | 2 J | | | | | | | | | | | | |
| AT5-GW5 | 27 to 30 | 73 | | | | | | | | | | | | | |
| AT6-GW1 | 4 to 7 | | | | | | | | | | | | | | |
| AT6-GW4 | 21 to 24 | | | | | | | | | | | | | | |
| AT6-GW5 | 28 to 31 | | | | | | | | | | | | | | |
| DUP1-GW | 28 to 31 | | | | | | | | | | | | | | |
| AT7-GW1 | 4 to 7 | | | | | | | | | | | | | | |
| AT7-GW3 | 15 to 18 | | | | | | | | | | | | | | |
| AT7-GW4 | 21 to 24 | | | | | | | | | | | | | | |
| AT7-GW6 | 33 to 36 | | | | | | | | | | | | | | |
| AT7-GW7 | 45 to 48 | | | | | | | 15 | 2 J | | | | | | |
| AT7-GW8 | 57 to 60 | | | | | 4 J | | | | | | | | | |
| AT8-GW3 | 15 to 18 | | | | | | | | | | | | | | |
| AT8-GW4 | 21 to 24 | | | | | | | | | | | | | | |
| AT8-GW6 | 33 to 36 | | | | | | | | | | | | | | |
| AT8-GW7 | 45 to 48 | | | | | | | | | | | | | | |
| AT8-GW8 | 57 to 60 | | | | | | | | | | | | | | |
| AT9-GW1 | 4 to 7 | | 130 | | | | | | | 20 | 1 J | | | | 23 |
| AT9-GW3 | 15 to 18 | | 18 J | | | | | | | | 3 J | 2 J | | 1 J | 14 J |
| DUP4-GW | 15 to 18 | | 22 | | 1 J | | | | | | 3 J | 2 J | | | 14 |
| AT9-GW4 | 21 to 24 | | | | | | | | | | | | | | |
| AT9-GW10 | 24 to 27 | | | | | | | | | | | | | 1 J | |
| AT10-GW1 | 4 to 7 | | | | | | | | | | | | | | |
| AT10-GW3 | 15 to 18 | | 2 J | 2 J | 11 | | 7 J | | | | | | 2 J | 26 | |
| AT10-GW4 | 21 to 24 | | 1 J | | 3 J | | | | | | | | | 8 J | |
| AT10-GW6 | 33 to 36 | | | | | | | | | | | | | | |

| NJDEP On-Site Geoprobe Groundwater Analytical Data - June/July 2003 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Number | Sample Interval (feet bgs) | AT | Benz-ene | CB | CF | CM | 1,2-DBE | 1,2-DB | 1,4-DB | EB | IPB | MCH | Sty-rene | Tol-uene | Xylene (total) |
| GWQS (ppb) | | 700 | 1 | 50 | 6 | 30 | NA | 600 | 75 | 700 | NA | NA | 100 | 1000 | 1000 |
| AT10-GW10 | 41 to 44 | | | | | | | | | | | | | 2 J | |
| AT11-GW1 | 4 to 7 | | | | | | | | | | | | | | |
| AT11-GW3 | 15 to 18 | | | | 3 J | | 2 J | | | | | | | 6 J | |
| DUP3-GW | 15 to 18 | | | | 2 J | | 1 J | | | | | | | 4 J | |
| AT11-GW4 | 21 to 24 | | | | | | | | | | | | | 3 J | |
| AT11-GW6 | 33 to 36 | | | | | | | | | | | | | | |
| AT11-GW7 | 45 to 48 | | | | | | | | | | | | | 1 J | |
| AT11-GW8 | 57 to 60 | | | | | | | | | | | | | | |
| AT12-GW1 | 4 to 7 | | 2 J | | | | | | | | | | | | |
| AT12-GW2 | 9 to 12 | | | | | | | | | | | | | | |
| AT12-GW3 | 15 to 18 | | | | | | | | | | | | | | |
| AT12-GW4 | 21 to 24 | | | | | | | | | | | | | | |
| AT12-GW6 | 33 to 36 | | | | | | | | | | | | | | |
| AT12-GW10 | 39 to 42 | | | | | | | | | | | | | | |

Notes:
Concentrations are in parts per billion (ppb)
Blank spaces indicate contaminant not detected
Bold values exceed NJDEP Groundwater Quality Standard (GWQS)
NA = No applicable GWQS available
J = Estimated value
AT = acetone
CB = chlorobenzene
CF = chloroform
CM = chloromethane
1,2-DBE = 1,2-dibromoethane
1,2 or 1,4-DB = 1,2-dichlorobenzene or 1,4-dichlorobenzene
EB = ethylbenzene
IPB = isopropylbenzene
MCH = methylcyclohexane

# APPENDIX VII

# EGG HARBOR GOLDER BOREHOLE LOGS AND GROUNDWATER SAMPLING FORMS

# LOG OF WELL Site 1

(Page 1 of 1)

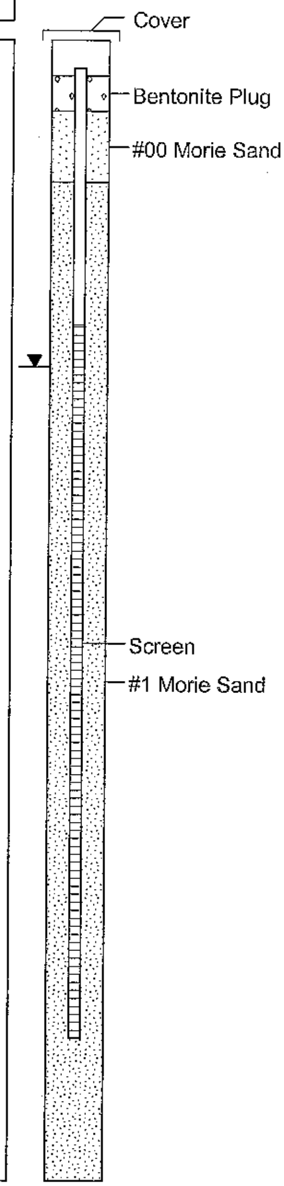
| | |
|---|---|
| Depth of Hole | : 16 |
| Depth of Soil Drill | : 16 |
| # Dist Samples | : 8 |
| # Undist. Samples | : 0 |
| Northing / Easting | : NM |

| | |
|---|---|
| Project | : NJ DEP Air |
| Drilling Method | : Hollow Stem Augers |
| Drilling Company | : ERC |
| Driller | : Jay |
| Drill Rig | : B-61 |
| GA Inspector | : JSM |
| Weather | : Cloudy |
| Temp. | : 35 degrees F |
| Hours Productive | : 1 |
| Hours Delayed | : 0 |

| | |
|---|---|
| Started | : 0920 1/12/04 |
| Completed | : 1035 1/12/04 |
| Depth of Water Level | : 4.59 |
| Time of WL reading | : 1240 1/12/04 |
| Surface Elevation | : NM |
| Datum | : MSL |
| Outer Casing Elev | : NM |
| Riser Elev | : NM |

| Depth in | GRAPHIC | DESCRIPTION | Blows/foot | Samples | Sample Type | Blow Count | % Recovery | REMARKS |
|---|---|---|---|---|---|---|---|---|
| 0–2 | | Grey loose SILTY SAND, some medium Gravel | 9 | 1 | SS | 10-7-2-2 | 25% | Locking riser cap and flushmount casing installed. |
| 2–4 | | Yellowish brown compact fine SAND | 11 | 2 | SS | 3-5-6-6 | 85% | |
| 4–6 | | Yellowish brown compact SAND, little medium rounded Gravel | 16 | 3 | SS | 8-9-7-7 | 100% | |
| 6–8 | | Grey stiff CLAY, little perched water | 13 | 4 | SS | 5-6-7-8 | 90% | |
| 8–14 | | Grey very stiff CLAY, some tan fine Sand streaks, becoming saturated by 13' bgs | 27 | 5 | SS | 8-12-15-17 | 75% | |
| | | | 34 | 6 | SS | 12-19-15-17 | 90% | 2' diameter PVC 0.010 slot screen and PVC riser used. |
| | | | 19 | 7 | SS | 10-7-12-15 | 90% | |
| 14–16 | | Grey compact moist SILTY SAND, trace Clay | 22 | 8 | SS | 12-12-10-15 | 85% | |

Well: Well Site 1




NJ DEP Air

Made by: J. McLaughlin

Checked by: MLL 8/24/04

LOG OF WELL Site 1

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# LOG OF BORING Site 1

(Page 1 of 1)

| | |
|---|---|
| Depth of Hole | : 20 |
| Depth of Soil Drill | : 20 |
| Depth of Rock Core | : NA |
| # Dist Samples | : 5 |
| # Undist. Samples | : 0 |
| Approx. North/East | : NA |

| | |
|---|---|
| Project | : NJ DEP Air |
| Drilling Method | : Power probe |
| Drilling Company | : S2C2 |
| Driller | : Matt |
| Drill Rig | : Truck mount |
| GA Inspector | : MLL |
| Weather | : P. sunny |
| Temp. | : 25 degrees F |
| Hours Productive | : 1 |
| Hours Delayed | : 0 |

| | |
|---|---|
| Started | : 0902 12/02/03 |
| Completed | : 1000 12/02/03 |
| Approx. Surface Elev | : NA |
| Datum | : NA |

| Depth in | USCS | GRAPHIC | DESCRIPTION | Samples | Percent Recovery | PID (ppm) | REMARKS |
|---|---|---|---|---|---|---|---|
| 0 | SM | | Dark brown loose SILTY SAND, dry | | | | |
| | SW | | Light brown fine SAND | | | | |
| | SW | | Dark brown fine SAND | | | | |
| 2 | SW | | Light brown fine SAND | 1 | 68% | 1.6 | |
| 4 | SW | | Light brown fine-medium SAND | | | | |
| 6 | CL | | Light grey firm to stiff CLAY | 2 | 95% | 0.0 | |
| 8 | SW | | Tan SAND | | | | |
| | SW | | Dark brown to black SAND | | | | |
| | CL | | Grey CLAY | | | | |
| 10 | CL | | Grey SANDY CLAY | 3 | 100% | 0.7 | Water Table at 10' BGS |
| | SC | | Light tan SANDY CLAY, moist to wet | | | | |
| 12 | SM | | Light tan SILTY SAND, wet | 4 | 100% | 0.0 | |
| | SW | | Light tan fine SAND | | | | |
| 16 | SM | | Light grey SILTY SAND, wet | 5 | 46% | 3.1 | |
| 20 | | | | | | | |

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Golder Associates

NJ DEP - Air
Egg Harbor Twp Site
023-6124

Made by: JMcL 1/15/04
Checked by: MLL 8/20/04

LOG OF BORING Site 1

(Page 1 of 1)

# LOG OF BORING Site 2

(Page 1 of 1)

| | |
|---|---|
| Depth of Hole | : 18 |
| Depth of Soil Drill | : 18 |
| Depth of Rock Core | : NA |
| # Dist Samples | : 5 |
| # Undist. Samples | : 0 |
| Approx. North/East | : NA |

| | |
|---|---|
| Project | : NJ DEP Air |
| Drilling Method | : Power probe |
| Drilling Company | : S2C2 |
| Driller | : Matt |
| Drill Rig | : Truck mount |
| GA Inspector | : MLL |
| Weather | : Sunny |
| Temp. | : 32 degrees F |
| Hours Productive | : 0.5 |
| Hours Delayed | : 0 |

| | |
|---|---|
| Started | : 1229 12/02/03 |
| Completed | : 1300 12/02/03 |
| Approx. Surface Elev | : NA |
| Datum | : NA |

| Depth in | USCS | GRAPHIC | DESCRIPTION | Samples | Percent Recovery | PID (ppm) | REMARKS |
|---|---|---|---|---|---|---|---|
| 0 | SM | | Brown SILTY SAND, some fine roots | | | | |
| | SC | | Tan SANDY CLAY, wet | | | | |
| 2 | SC | | Tan stiff SANDY CLAY, dry | 1 | 79% | 0.0 | Surficial aquifer at 2' |
| | SW | | Tan fine loose SAND, dry | | | | |
| 4 | SW | | Light tan loose SAND , some yellowish brown dense Sand lenses | | | | |
| 6 | | | | 2 | 100% | 0.0 | |
| | SW | | Tan compact SILTY SAND | | | | |
| 8 | SW | | Light tan compact SAND, wet | | | | Water Table at 8' BGS |
| | SW | | White and grey compact SAND, wet | | | | |
| 10 | | | | 3 | 79% | 0.0 | |
| 12 | | | | | | | |
| 14 | | | | 4 | 77% | 0.0 | |
| 16 | | | | | | | |
| | | | | 5 | 67% | 0.0 | |
| 18 | | | | | | | |

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Checked by: MLL 8/20/04

LOG OF BORING Site 2

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# LOG OF BORING Site 3

(Page 1 of 1)

| | | | |
|---|---|---|---|
| Depth of Hole | : 16 | Project | : NJ DEP Air |
| Depth of Soil Drill | : 16 | Drilling Method | : Power probe |
| Depth of Rock Core | : NA | Drilling Company | : S2C2 |
| # Dist Samples | : 4 | Driller | : Matt |
| # Undist. Samples | : 0 | Drill Rig | : Truck mount |
| Approx. North/East | : NA | GA Inspector | : MLL |
| | | Weather | : Sunny |
| | | Temp. | : 32 degrees F |
| | | Hours Productive | : 0.5 |
| | | Hours Delayed | : 0 |

| | |
|---|---|
| Started | : 1528 12/02/03 |
| Completed | : 1600 12/02/03 |
| Approx. Surface Elev | : NA |
| Datum | : NA |

| Depth in | USCS | GRAPHIC | DESCRIPTION | Samples | Percent Recovery | PID (ppm) | REMARKS |
|---|---|---|---|---|---|---|---|
| 0 | SM | | Dark brown loose SILTY SAND, dry | | | | |
| | SW | | Grey loose fine SAND | | | | |
| 2 | SW | | Light brown compact SAND, dry | 1 | 79% | 0.0 | |
| | SW | | Light brown compact SAND, wet | | | | |
| | SC | | Light brown compact SANDY CLAY, some Gravel, moist | | | | |
| 4 | SC | | Light brown compact SANDY CLAY, moist | | | | |
| | CL | | Light grey stiff SILTY CLAY, dry | | | | |
| 6 | CL | | Light tan stiff SILTY CLAY, dry | 2 | 100% | 0.0 | |
| | CL | | Light grey stiff SILTY CLAY, dry | | | | |
| 8 | CL | | Tan compact SANDY CLAY, moist | | | | Water Table at 8' BGS |
| | SM | | White compact SILTY SAND, wet | | | | |
| 10 | | | | 3 | 73% | 0.0 | |
| 12 | | | | | | | |
| 14 | | | | 4 | 63% | 0.0 | |
| 16 | | | | | | | |

Golder Associates

NJ DEP - Air
Egg Harbor Twp Site
023-6124

Made by: JMcL 1/15/04
Checked by: MLL 8/20/04

LOG OF BORING Site 3

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# APPENDIX VIII

# EGG HARBOR PHOTOGRAPHS

**PHOTOGRAPH 1**

General area near Site 1.