

# **NJDEP – GOLDER SUBSURFACE VAPOR INTRUSION RESEARCH PROJECT**

**Report on:**

**INVESTIGATION OF INDOOR AIR QUALITY  
IN STRUCTURES LOCATED ABOVE  
VOC-CONTAMINATED  
GROUNDWATER, YEAR TWO  
PART 2:  
EVALUATION OF SOIL VAPOR INTRUSION  
AT WALL TOWNSHIP SITE, NEW JERSEY**

**Submitted to  
New Jersey Department of  
Environmental Protection**

**By  
Golder Associates  
July 2006**



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## SUMMARY

This report presents an evaluation of soil vapor intrusion into buildings located at Wall Township and Sea Girt Borough, Monmouth County, New Jersey. The evaluation has been completed as part of a research study titled “*Investigation of Indoor Air Quality in Structures Located Above VOC-Contaminated Groundwater*”, which is being conducted by Golder Associates Inc. (Golder) for the New Jersey Department of Environmental Protection (NJDEP).

In 1997, elevated concentrations of tetrachloroethylene (PCE) were first measured in irrigation wells located in Wall Township and Sea Girt Borough. Subsequent testing of groundwater indicated a PCE plume in groundwater that covered an area approximately 1.5 miles wide and 2 miles long. The source of the PCE plume has been reported by NJDEP to be two former dry cleaner sites near State Route 35. The focus of this study is evaluation of soil vapor intrusion into houses located down-gradient from one of the sources, the White Swan dry cleaner site. Through analysis of groundwater, soil vapor and indoor air data, valuable information on soil vapor attenuation factors was obtained.

The buildings in the study area consist of small- to medium-sized residential dwellings with basements. The vadose zone soils consist of sand, and the depth to the water table is about 17 to 22 feet below ground surface. While there is uncertainty in PCE concentrations near to the surface of the water table, the near-water table PCE concentrations in groundwater range as high as approximately 400 µg/L to 500 µg/L below several houses. The PCE concentrations decrease in the down-gradient groundwater flow direction, and there is evidence for a fresh-water lens.

A comprehensive evaluation of groundwater, soil vapor and indoor air data for the Wall Township site indicates a positive relationship between groundwater and indoor air PCE concentrations. This trend, together with a spatial evaluation that indicates a pattern of elevated indoor PCE concentrations in houses above the highest groundwater concentration areas, provides evidence for soil vapor intrusion. In addition, the measured indoor air PCE concentrations in a number of houses were significantly above typical background levels for PCE published in the literature (US EPA, 2006).

The measured groundwater alpha's for PCE at the site range from approximately  $1 \times 10^{-6}$  to  $1 \times 10^{-3}$ , although the maximum alpha values are uncertain. The filtered 90th percentile groundwater alpha ( $8 \times 10^{-4}$ ) is less than the alpha value that would be calculated for PCE using the NJDEP generic Groundwater Screening Level (GWSL) for the indoor inhalation pathway calculated for a contamination source at 1 m depth ( $1.06 \times 10^{-3}$ ). The 90th percentile alpha ( $8 \times 10^{-4}$ ) was similar to the predicted alpha ( $8.27 \times 10^{-4}$ ) calculated using the NJDEP generic GWSL defaults adjusted for a depth to groundwater of 3.2 m below the foundation level (i.e., the approximate depth to groundwater at the Wall Township site). The results of the study support the current generic GWSL in the NJDEP, which are not much higher than the 90th percentile level observed for this study.

The maximum filtered subslab alpha values for PCE were less than  $1.3 \times 10^{-2}$ , with all but one data point less than  $2.1 \times 10^{-3}$ . The filtered subslab alpha's were less than the default subslab alpha adopted by the NJDEP (2005) vapor intrusion guidance, which is  $2 \times 10^{-2}$ .

The shallow external soil vapor concentrations were not considered suitable for calculation of alpha's since they were obtained at or above the level of the building foundation base. The external soil vapor concentrations were significantly less than those measured below the building, a trend also observed at other sites (Hers et al., 2006; Wertz 2006).

There is significant variability in the alpha factors for individual homes. The data analysis for groundwater alpha's suggested that the alpha's were significantly higher for houses with sumps, compared to houses without, and were also higher for houses located along Laurel Street, compared to those on Willow Road. The reason for the higher alpha value for houses on Laurel is not known, but may be related to closer proximity to the contamination source zone, geology and/or house construction.



## **ACKNOWLEDGEMENTS**

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## 1.0 INTRODUCTION

This report presents an evaluation of soil vapor intrusion into buildings located at Wall Township and Sea Girt Borough, Monmouth County, New Jersey. The evaluation has been completed as part of a research study titled “*Investigation of Indoor Air Quality in Structures Located Above VOC-Contaminated Groundwater*”, which is being conducted by Golder Associates Inc. (Golder) for the New Jersey Department of Environmental Protection (NJDEP).

Elevated concentrations of tetrachloroethylene (PCE) were measured in 1997 in irrigation wells located in Wall Township and Sea Girt Borough. Subsequent testing of groundwater indicated a relatively large PCE plume in groundwater below a mostly residential area. The testing of indoor air quality in buildings located above the plume indicated elevated concentrations of PCE vapors in indoor air. Several phases of investigation, involving sampling and analysis of groundwater, soil vapor beside and below buildings, and indoor air, were completed at the site by NJDEP and US EPA.

The purpose of this study is to evaluate the degree to which soil vapor intrusion into buildings occurs and the processes and factors influencing vapor intrusion using the data available up to 2003. A key aspect of this work is to estimate vapor attenuation factors (indoor air concentration divided by the measured or predicted vapor concentration) for groundwater and subsurface vapor sources. This analysis is valuable for comparison to generic factors incorporated in the New Jersey guidance for the soil vapor intrusion pathway (NJDEP, 2005).

Although there were two sources of PCE contamination at the site, the analysis of empirical data presented in this report is focused on buildings down-gradient of the White Swan dry cleaner site. An assessment of health risk was outside the scope of this study.

## **2.0 BACKGROUND INFORMATION**

### **2.1 Overview**

In 1997, the Monmouth County Health Department (MCHD) was notified that private well testing of several irrigation wells on Magnolia Avenue in Wall Township had shown elevated levels of tetrachloroethylene (PCE). Subsequent sampling of other private irrigation wells in the area by MCHD indicated widespread PCE contamination in shallow groundwater, as well as lower levels of trichloroethylene (TCE). The PCE concentrations in irrigation wells ranged from less the laboratory reporting (detection) limit to 1,648 ppb. Subsequent testing of groundwater indicated a PCE plume in groundwater that covered an area approximately 1.5 miles wide and 2 miles long.

Several follow-up investigations were completed by NJDEP and US EPA between 1998 and 2003 to evaluate the extent of chlorinated solvent contamination in groundwater, and to assess indoor air quality above the chlorinated solvent groundwater plume. As of June 2004, the indoor air quality in over 250 buildings had been tested. Subslab depressurization (SSD) mitigation systems were installed in most houses where indoor PCE concentrations exceeded 6 µg/m<sup>3</sup>. Several rounds of post-mitigation testing of indoor air quality were subsequently completed.

Since the PCE concentrations in groundwater were present at concentrations that were much higher (one to three orders-of-magnitude) than breakdown products of PCE (e.g., TCE, cis-1,2-dichloroethylene, vinyl chloride), the main focus of evaluations at the Wall Township site was characterization of PCE.

### **2.2 Contamination Source Zone**

There are two known sources of PCE contamination at the site consisting of the former White Swan dry cleaners (now a Fleet Bank) and the former Sun Cleaners site.

White Swan Cleaners, located at 1322 Sea Girt Avenue, Wall Township, New Jersey began operations in 1964. In 1983, the White Swan facility ceased to operate as a dry cleaner and began operations as a drop off and pick up point for dry cleaning performed off-site. Extensive on-site soil and groundwater PCE contamination was confirmed at the White Swan Cleaners. In December 2001, Fleet Bank excavated and disposed of about 820 cubic yards of on-site contaminated soil.

Sun Cleaners, located at 2213 State Route 35, Wall Township, is a defunct dry cleaning establishment that began operations in 1960 as Circle Dry Cleaning Corporation (Lockhead/REAC, 2002). In 1991, Sun Cleaners ceased to operate as a dry cleaner and began operations as a drop off and pick up point for dry cleaning performed off-site. As

of March 2002, the building was abandoned. An initial investigation at the dry cleaner site in 1996 indicated PCE concentrations in soil equal to 7,400 mg/kg (ppm) at six-foot depth and 4,400 ppm at 12-foot depth. A subsequent borehole investigation indicated PCE concentrations as high as 1,200 ppm in soil from 12 to 14 feet depth.

### **2.3 Site Description**

The Wall Township site is located along state Route 35 in Wall Township, Monmouth County (Figure 1). The site extends from Route 35 eastward through Sea Girt Borough to the Atlantic Ocean. The northern limit of the site is hydraulically bounded by Hannabrand Brook. The southern limit of the site extends just south of Judas Creek (Figure 2).

The study area is situated in an essentially flat region of the New Jersey Coastal Physiographic province. The topography in the study area ranges from about 50 feet above sea level near Route 35 to sea level at the Atlantic Ocean. The natural topography in areas is altered slightly by human development, including the roads near Sun Cleaners, which were constructed on slightly raised embankments, and where existing streams were relocated.

Storm drains near Route 35 and Sea Girt Avenue discharge into Judas Creek. This creek acts like an intermittent stream that receives groundwater recharge to stream baseflow only during humid months of higher precipitation (usually in the spring season). There is a dam and gate to control sediment run-off on Judas Creek.

There are three groundwater pumping wells for municipal water supply located just east of State Route 71 (Figure 2).

### **2.4 Regional Geology**

The study area is underlain by the unconsolidated sediments of Cretaceous and Tertiary age with an estimated total thickness of 1,600 feet. The unconsolidated formations generally strike northeast-southwesterly and dip to the southeast at an angle of 10 to 60 feet per mile. The near surface deposits consist of the Kirkwood-Cohansey Sands of the Miocene Epoch. The upper stratigraphic layer of this unit extends from ground surface to 50 feet below ground surface and consists of gravelly coarse to fine sands. The lower stratigraphic layer of the Kirkwood-Cohansey Sands consists of silty sands, sandy silts and trace to some clayey silt.

## **2.5 Hydrogeology**

The Kirkwood-Cohansey Sands is a productive aquifer widely used for water supply purposes. It is predominantly under unconfined conditions and receives recharge directly from ground surface. As part of this review, no hydrogeologic test data for the site was available. However, test data for a nearby site (Waldic Aerospace site) indicates an upper stratigraphic unit hydraulic conductivity of  $8 \times 10^{-4}$  ft/sec and a lower stratigraphic unit hydraulic conductivity of  $2.7 \times 10^{-5}$  ft/sec. The average horizontal hydraulic gradient for both units was 0.005 ft/ft. Assuming an effective porosity of 0.33, an average linear groundwater velocity of 230 ft/year is calculated for the upper unit, based on the above parameters. Based on shallow and deep wells at the same location, the vertical gradients at the Waldic site range from approximately -0.05 ft/ft. downward in the summer months to 0.01 ft/ft upward in the spring months.

The depth to the water table down-gradient of the White Swan site is inferred to range from about 17 to 22 feet below ground surface based on observations during Geoprobe drive point installations.

### 3.0 GROUNDWATER QUALITY INVESTIGATION

The chlorinated solvent concentrations in groundwater were characterized through sampling of existing irrigation wells and other investigations where depth discrete groundwater samples were obtained using direct push Geoprobe technology. These groundwater investigations indicate that there are two dissolved PCE plumes in groundwater that originate from the contamination source area, which are the White Swan and Sun Cleaners site. The primary chemical of concern is PCE, with detectable TCE concentrations only measured in the immediate area of the source. The PCE concentrations in groundwater are shown on Figure 2, which is based on the following datasets:

- **BEMSA White Swan Geoprobe Investigation (Samples 1 to 34):** This investigation involved vertical profiling of PCE concentrations in groundwater using the Geoprobe method of sampling and was completed by March and October 1999. The shallowest groundwater sample was generally from between 17 and 20 feet, or 21 to 24 feet depth.
- **“MAG” Series Geoprobe Investigation:** This investigation was limited to collection of a shallow groundwater sample (21 and 24 feet or 22 and 24 feet) using the Geoprobe method. Since this investigation was conducted during a drought in July and August 2002, the water samples were reportedly obtained from near to the water table.
- **MCHD Home Well Sample Results (“HW” series):** These were irrigation wells that were sampled by the Monmouth County Health Department in the summer of 1998. The samples were obtained from varying depths. For this analysis, only PCE concentration from wells with recorded sample depths of less than 50 feet were used.
- **100-series samples:** These were limited to shallow groundwater samples obtained in April 2004 using the Geoprobe method of sampling.
- **BEMSA Sun Cleaners Investigation (GW-3 to GW-17):** This investigation involved vertical profiling of PCE concentrations in groundwater and was completed between January and September 2000. The shallowest groundwater sample was generally from between 16 and 20 feet, or 20 to 24 feet depth.

For completeness, the MCHD concentrations are included on Figure 2, although it is recognized that most samples were likely from screened intervals that were well below the water table. For the interpreted groundwater concentrations described below, the MCHD results were discounted and generally not used for contouring purposes.



The groundwater testing database is provided in Table 1. The maximum concentrations of chlorinated solvents were measured at Geoprobe samples obtained in the immediate vicinity of Sun Cleaners site. The maximum concentrations measured in groundwater were 15,500 µg/L of PCE, 1,517 µg/L of cis-1,2-dichloroethylene and 520 µg/L of TCE were measured in the groundwater (Figure 2). The next highest concentration was measured a short distance down-gradient of the Sun Cleaners site (drive point sample GW-101) where 4,998 µg/L of PCE, 658 µg/L of cis-1,2-dichloroethylene and 244 µg/L of TCE were measured in groundwater. The TCE concentrations in groundwater were considerably lower at other locations with the next highest measured concentration equal to 6.8 µg/L.

The geoprobe investigations provided information on the vertical variation in groundwater concentrations. The vertical concentration profile at selected locations is shown in Figure 3. The groundwater samples were obtained over 2 to 3 foot depth intervals. As shown, at wells closer to the dry cleaner sources, the highest concentrations were obtained near the water table and concentrations generally decreased with increasing depth; in contrast, with increasing down-gradient distance from the source, the shallow groundwater concentrations were relatively low, and concentrations were highest at some distance below the water table. The vertical profile results indicates a sinking plume with the formation of a non-contaminated lens of water near the water table ("fresh-water lens") that increases in thickness with increasing down-gradient distance from the contamination source zone.

There are several sources of variability including well spacing, the depths over which the samples were collected, and different time periods over which samples were collected. As a result, there is a relatively high level of uncertainty in the PCE concentrations in shallow groundwater, which is of interest for evaluation of vapor intrusion. There were several wells where concentrations were lower than expected (e.g., #10 and #34 near the White Swan dry cleaner source) and others where the concentrations were greater than expected (e.g., HW-20). The uncertainty in shallow groundwater concentrations increases in the down-gradient direction and toward the edges of the plume. The estimated PCE (hand-drawn from visual interpolation) concentrations in shallow groundwater shown as concentration contours for the plume that originates from the White Swan source are shown on Figure 2. Again, it is important to emphasize the uncertainty in the delineation of the plume, particularly in the down-gradient direction. The dissolved plumes from the White Swan and Sun Cleaners sites likely co-mingle in the area of Laurel Street east of Old Mill Road.

The concentrations shown in Figure 2 were also contoured using the ArcGIS with Spatial Analyst extension (version 9.0) software contouring package, as shown on Figure 4. An Inverse Distance Weighted (IDW) interpolation routine was used for the contouring. The purpose of the contouring was to obtain an approximate visual representation of the spatial variation in groundwater concentrations. The anomalous contour results for the southwest area of the site on Figure 4 is due to lack of data. The concentration plot shown on Figure 4 was not used for estimation of groundwater concentrations for evaluation of vapor attenuation factors described below.

## 4.0 INDOOR AIR QUALITY INVESTIGATION

An initial investigation of indoor air quality was completed by NJDEP between approximately October 2001 and April 2002. The indoor air samples were obtained over 24 hours using Summa canisters and were analyzed according to USEPA Method TO-15. Prior to sampling, a detailed questionnaire and survey describing the building and use and storage of chemicals was completed by NJDEP. Subslab depressurization (SSD) mitigation systems were subsequently installed in most houses where indoor PCE concentrations exceeded  $6 \mu\text{g}/\text{m}^3$ . Several rounds of post-mitigation testing of indoor air quality were subsequently completed. The NJDEP indoor air quality data is provided in Table 2, Figure 5 and Appendix I. The three highest indoor PCE concentrations in air were measured at three nearby houses on Laurel Street ( $1,896 \mu\text{g}/\text{m}^3$ ,  $223 \mu\text{g}/\text{m}^3$  and  $156 \mu\text{g}/\text{m}^3$ ). The PCE concentration in the house where  $1,896 \mu\text{g}/\text{m}^3$  was measured appears to be anomalously high since the indoor air concentration was almost one order-of-magnitude higher than other houses, and the groundwater alpha for this house was greater than  $1 \times 10^{-2}$ . The results for this house were not used for the vapor attenuation factor (alpha) analysis subsequently presented in this report.

A separate investigation of soil vapor and indoor air quality was completed by US EPA in early 2002. This investigation was limited to testing of soil vapor samples external to the building and/or subslab soil vapor samples, both obtained from a subset of the buildings. In most cases, indoor air samples were obtained concurrently with soil vapor sample collection. The external soil vapor samples were obtained at varying distances from the buildings at between 1.5 m and 2.6 m depth below ground surface. Since almost all houses had full basements, estimated to be about 2.1 m to 2.4 m below ground surface, the soil vapor samples were collected slightly below or up to 0.9 m above the elevation of the foundation. Subslab vapor samples were obtained within 0.3 m of the foundation slab. The soil vapor samples were obtained over a  $\frac{1}{2}$  hour duration using Summa canisters and analyzed using USEPA Method TO-15. Clay layers were noted at some locations during driving of probes. No other information on methodology for this investigation is available. The US EPA external soil vapor, subslab vapor and indoor air concentrations are provided in Table 3.

The indoor air, external soil vapor and subslab data, as well as estimated groundwater concentrations below houses within the White Swan study area are compiled in Table 4. The indoor air concentration is the best estimate concentration measured in the basement based on the combined NJDEP and USEPA datasets. For houses with multiple pre-mitigation air measurements, the arithmetic mean concentration was calculated for testing conducted in late 2001 and early 2002. The groundwater concentration is the best estimate interpolated concentration based on the contours shown in Figure 2.

The indoor air concentrations measured at houses are shown in Figures 5 and 6. Similar to groundwater, the indoor air data was also contoured using the ArcGIS computer software (IDW interpolation routine) for visualization purposes, but was not used for analysis purposes (Figure 7). The external soil vapor and subslab vapor concentrations are shown on Figures 8 and 9, respectively.

The groundwater characterization programs were completed in summer 1998 (MCHD), spring to fall 1999 (BEMSA), and summer 2002 (MAG). While groundwater data collection was not concurrent with indoor air testing, the groundwater plume moves slowly and therefore non-concurrent testing likely does not represent a large source of error.

For many houses with elevated indoor PCE concentrations, multiple indoor air samples were tested both before and after the subslab depressurization system (SSD) was installed. The results, provided in Appendix II, indicate that indoor air concentrations decreased significantly after mitigation systems were installed, although for some houses, the PCE concentrations were still elevated for the first post-mitigation sampling event, and continued to decrease during subsequent monitoring events. The reduction in pre- and post-mitigation concentrations calculated using the final post-mitigation sampling round was generally between 60 and 90 percent (Table II-1, Appendix II). It is noted that some of the post-SSD air concentrations may have been influenced by background sources of PCE. The monitoring data indicate that the SSD systems work reasonably well in reducing the indoor PCE concentrations.

The pre-mitigation air testing dataset, for buildings where multiple samples were obtained, also provide an opportunity to evaluate temporal variability in indoor air concentrations. The pre-mitigation air samples were generally obtained over a two- to six-month period. To characterize the indoor air variability, the relative percent difference (RPD) between the minimum and maximum concentration was calculated (i.e.,  $(\text{maximum} - \text{minimum}) / \text{average}$ ), with results presented in Appendix II. The minimum and maximum RPD's were 24 and 188 percent, while the arithmetic mean RPD was 87 percent. It is not possible to evaluate possible seasonal trends since most data was obtained between December and March.

## **5.0 DESCRIPTION OF BUILDINGS IN VAPOR INTRUSION STUDY AREA**

The buildings evaluated for this study were in almost all cases small- to medium- sized single family residences with basements. Two exceptions were 1316 Sea Girt (Garrison Autobody) and Sea Girt Lodge, which were commercial buildings that are believed to have slab-at-grade foundations. There were two houses with a partial basement and partial crawlspace (1310 Laurel and 2173 Old Mill Road). All buildings were described as having poured concrete floors with cinder concrete block walls, except 1200 and 1301 Sea Girt, where a partial dirt floor was observed. Several houses were observed to have sumps in the basement floor. The houses in this area are approximately 20 to 50 years old. The heating system for houses in this area are primarily forced-air furnaces supplied by natural gas. A detailed description of building characteristics is provided in Appendix III.

## 6.0 VAPOR ATTENUATION FACTOR ANALYSIS

The vapor attenuation factor (alpha) analysis consisted of calculation of three types of alpha's:

- Groundwater-to-indoor air ("groundwater alpha");
- Soil vapor-to-indoor air using shallow measurements external to the building ("soil vapor alpha"); and
- Subslab soil vapor-to-indoor air using subslab soil vapor measurements ("subslab alpha").

The measured alpha's were compared to regulatory alpha's incorporated in NJDEP (2005) and proposed USEPA (2006) guidance, different types of data were compared, and several factors potentially influencing the empirical alpha's were evaluated.

### 6.1 Groundwater Alpha

#### 6.1.1 Overview of the Alpha Calculation Process

The groundwater-to-indoor alpha was calculated by dividing the measured indoor air concentration by the predicted vapor phase concentrations (derived from the interpolated groundwater concentrations in Figure 2) below each building. All buildings were residential single family dwellings. The measured indoor air concentrations were based on measurements in late 2001 and early 2002, and the estimated concentrations in groundwater were based on investigations completed between 1998 and 2002. The houses selected for alpha calculations were in areas where the PCE groundwater concentrations were greater than 80 µg/L. This is because of the increased uncertainty in groundwater characterization near the edge of the plume. For statistical estimation of alpha, only data where groundwater concentrations exceeded 140 µg/L were used, based on the rationale described below.

#### 6.1.2 Filtering Criteria

The calculated groundwater alpha values were screened according to the data filtering criteria being developed for US EPA (2006) for empirical analysis of data, which is based on the concentration source strength. The filter discards data when there is a low potential that the indoor vapor concentrations will be greater than typical indoor background air concentrations, based on relatively conservative (high) estimates of the vapor attenuation factor. The tentatively proposed US EPA criteria for filtering groundwater data is as follows:

If  $C_{\text{vapor}} < 10,000 * C_{\text{background}}$ , then data is filtered

The source vapor concentration,  $C_{\text{vapor}}$ , is estimated from the groundwater concentration and the Henry's Law constant. The background concentration,  $C_{\text{background}}$ , is the 90th percentile of the literature background ( $6 \mu\text{g}/\text{m}^3$ ) based on an unpublished evaluation of data for US EPA (2006). Several studies providing data on background indoor air concentrations are provided in NJDEP Vapor Intrusion Guidance (NJDEP, 2005). The reported median PCE concentrations for different studies ranged between  $0.9$  to  $8.3 \mu\text{g}/\text{m}^3$  while the 90th percentile concentrations were between  $4$  and  $36 \mu\text{g}/\text{m}^3$ . The NYDOH (2005) report indoor air PCE concentrations that range between less than the detection limit (25th percentile) to  $1.2 \mu\text{g}/\text{m}^3$  (75th percentile).

The rationale for the 10,000X factor is that empirical data analysis completed for USEPA (2006) indicates that a filter based on an attenuation factor (AF) of  $1 \times 10^{-4}$  ( $1/10,000$ ) was found to be sufficient to remove the confounding effect of background based on dilution factor that is at least 1,000 multiplied by additional 10X factor to further reduce the influence of background.

The groundwater concentration cut-off ( $140 \mu\text{g}/\text{L}$ ) based on the above filtering criteria was calculated as follows:

$$C_{\text{gdw}} = C_{\text{background}} * 10,000 / (H' \text{ UCF}) \quad [1]$$

where  $C_{\text{gdw}}$  is the PCE groundwater concentration ( $\mu\text{g}/\text{L}$ ),  $H'$  is the temperature-adjusted Henry's Law constant (0.43) and UCF is a unit conversion factor ( $1,000 \mu\text{g}/\text{m}^3/\mu\text{g}/\text{L}$ ).

### 6.1.3 Calculated Alpha's

The vapor concentration calculated from the measured or interpolated groundwater concentration (i.e., from Henry's Law constant) below each house versus the measured indoor air concentration is plotted in Figure 10. While there is considerable scatter in the data, there appears to be a trend indicating increasing indoor PCE concentrations with increasing soil vapor (groundwater) concentrations.

The calculated groundwater alpha's, shown in Figure 11, range from approximately  $1 \times 10^{-6}$  to  $1 \times 10^{-3}$ . It should be recognized that the upper end of the alpha distribution may be populated with upwardly biased measurements due to uncertainty in the estimation of the groundwater concentrations below houses. Therefore, a statistical approach may be more appropriate for evaluation of alpha's, compared to one where the focus is on the maximum values. The 90th percentile of the alpha distribution may be a conservative, yet non-extreme value to account for possible errors and bias in the data.

The filtered 90th percentile alpha for data analyzed from the site is  $8 \times 10^{-4}$ . For comparison, the alpha incorporated in the NJDEP Groundwater Screening Levels (GWSL's) for the vapor intrusion pathway is  $1.06 \times 10^{-3}$ . The GWSLs are calculated for a depth to vapor source of 1 m below the foundation. If the approximate depth (3.2 m) from the foundation to the vapor source (groundwater) is substituted in the GWSL calculation, then the predicted alpha ( $8.27 \times 10^{-4}$ ) is close to the measured 90th percentile alpha ( $8 \times 10^{-4}$ ).

A comparison of groundwater alpha's, for houses with and without sumps, is shown on Figure 12. Although, the data is limited, it appears that a sump may influence vapor intrusion based on the difference in the median alpha's, which were  $2.6 \times 10^{-4}$  for houses with sumps and  $4.4 \times 10^{-5}$  for houses without.

A comparison of groundwater alpha's houses on Laurel Avenue and Willow Road are shown on Figure 13. Based on the difference in the median alpha's, which were  $1.6 \times 10^{-4}$  for houses on Laurel Avenue and  $2.8 \times 10^{-5}$  for houses on Willow Road, there may be a difference in vapor intrusion characteristics for these two sets of houses. Most houses along Laurel Road included in this analysis were closer to the contamination source. As a consequence, the groundwater concentrations below these houses may have been underestimated resulting in an upward bias in the alpha factor. There may also be unknown factors relating to differences in the geologic conditions or foundation properties for the two areas of houses.

## **6.2 External Soil Vapor Alpha**

The external soil vapor samples were obtained at or slightly above the foundation level and therefore are not considered suitable for prediction of indoor air concentrations. An in-progress assessment of soil vapor data for US EPA (2006) indicates that shallow external soil vapor data is unreliable for evaluation of soil vapor intrusion, and that deeper soil vapor data obtained from closer to the contamination source zone should be used. For example, there are several sites investigated in New York where shallow soil vapor concentrations in samples obtained at the foundation level were significantly less than subslab concentrations (Wertz, 2006; Anders, 2006). Shallow external soil vapor data tends to be highly variable and, in many cases, at lower concentrations than subslab data, due to soil disturbance, geological variability, differences between soil moisture below and adjacent to the building, and atmospheric pressure fluctuations. Shallow soil gas samples are also more prone to negative bias through short-circuiting of atmospheric air during soil gas sampling. A comparison of the PCE concentrations in shallow external soil vapor and subslab soil vapor samples indicates that in most cases the external concentrations were significantly lower than the subslab vapor concentrations (Figure 14).



Although there are limitations in this data set (Table 3), the external soil vapor concentrations were used to calculate soil vapor-to-indoor alpha's since this data is available and may provide some insight on soil vapor intrusion. The soil vapor alpha's calculated using the average soil vapor concentration measured adjacent to the building are shown in Figure 15, while the alpha's calculated using the maximum concentration (i.e., for multiple probes around a house) are shown in Figure 16. As shown, the soil vapor alpha's decrease with increasing source soil vapor concentrations. There are a number of possible reasons why alpha increases with decreasing source concentrations:

- In lower concentration areas (i.e., near the periphery of plume), there is greater lateral variability in soil vapor concentrations;
- As concentrations decrease, the background indoor PCE concentrations will have a proportionally greater influence on alpha; and,
- As concentrations decrease, the bias caused by possible dilution by ambient air during the soil gas collection process will increase.

While there are a number of individual points with attenuation factors that exceed the alpha incorporated in the NJ GWSL, it is important to emphasize that this shallow data should not be used for screening purposes.

### **6.3 Subslab Soil Vapor Alpha**

The results of the subslab soil vapor-to-indoor alpha measurements (Table 3) are presented in Figure 17. The alpha was calculated by dividing the measured indoor air concentration by the measured subslab vapor concentration below each building. One subslab vapor sample per building was analyzed. All buildings were residential single family dwellings. The indoor air concentrations were from measurements in late 2001 and early 2002. The subslab vapor concentrations were based on investigations completed between 1998 and 2002.

The calculated subslab alpha values were screened according to the data filtering criteria being developed for US EPA, which is based on concentration source strength, as follows:

If  $C_{\text{vapor}} < 100 * C_{\text{background}}$ , then data is filtered

The maximum filtered subslab alpha values were less than  $1.3 \times 10^{-2}$ , with all but one data point less than  $2.1 \times 10^{-3}$ . The filtered subslab alpha's were less than the subslab vapor alpha adopted in the NJDEP (2005) vapor intrusion guidance, which is  $2 \times 10^{-2}$ .

## 7.0 SUMMARY AND CONCLUSIONS

There is a large dissolved PCE plume in groundwater that originates from two former dry cleaner sites in Wall Township. The focus of this study was to evaluate the potential for soil vapor intrusion into houses located down-gradient of one of the sources, the White Swan dry cleaner site. The buildings in the study area consist of small- to medium-sized residential dwellings with basements. The vadose zone soils consist of sand, and the depth the water table is about 17 to 22 feet below ground surface. While there is uncertainty in PCE concentrations in shallow groundwater just below the water table, the near-water table PCE concentrations range as high as 400 µg/L to 500 µg/L below several houses closest to the source. The shallow groundwater PCE concentrations decrease in the down-gradient groundwater flow direction, and there is evidence for a sinking plume with a fresh-water lens atop.

A comprehensive evaluation of groundwater, soil vapor and indoor air data for the Wall Township site indicates a positive relationship between groundwater and indoor air PCE concentrations. This trend, together with a spatial evaluation that indicates a pattern of elevated indoor PCE concentrations in houses above the highest groundwater concentration areas, provides evidence for soil vapor intrusion. In addition, the measured indoor PCE concentrations in a number of houses were significantly above typical background levels for PCE published in the literature, as discussed in Section 6.1.

The measured groundwater alpha's at the site range from approximately  $1 \times 10^{-6}$  to  $1 \times 10^{-3}$ , although the maximum alpha values are uncertain. The filtered 90th percentile groundwater alpha ( $8 \times 10^{-4}$ ) is less than the alpha value that would be calculated for PCE using the NJDEP generic GWSL for the indoor inhalation pathway calculated for a contamination source at 1 m depth ( $1.06 \times 10^{-3}$ ). The 90th percentile alpha ( $8 \times 10^{-4}$ ) was similar to the predicted alpha ( $8.27 \times 10^{-4}$ ) calculated using the NJDEP generic GWSL defaults adjusted for a depth to groundwater of 3.2 m below the foundation level (i.e., the approximate depth to groundwater at the Wall Township site).

The maximum filtered subslab alpha values were less than  $1.3 \times 10^{-2}$ , with all but one data point less than  $2.1 \times 10^{-3}$ . The filtered subslab alpha's were less than the default subslab alpha adopted by the NJDEP (2005) vapor intrusion guidance, which is  $2 \times 10^{-2}$ .

The shallow external soil vapor concentrations were not considered suitable for calculation of alpha's since they were obtained at or above the level of the building foundation base. The external soil vapor concentrations were significantly less than those measured below the building, a trend also observed at other sites.

There is significant variability in the alpha factors for individual homes. The data analysis for groundwater alpha's suggested that the alpha's were significantly higher for houses with sumps, compared to houses without, and were also higher for houses located along Laurel Street, compared to those on Willow Road. The reason for the higher alpha value for houses on Laurel is not known, but may be related to closer proximity to the contamination source zone, geology and/or house construction.

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Attachments

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## 8.0 REFERENCES

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## Wall Township - Summary of Groundwater Analytical Results

Sample Location/ State Plane Coordinates		Sample Date	NJDEP Sample ID	Depth range (ft)	Tetrachloro-ethylene Concentration (ug/L)	Trichloro-ethylene Concentration (ug/L)	Cis- 1,2-Dicloro-ethylene Concentration (ug/L)
X-dir	Y-dir						
<b>MCHD Home Well Sample Results</b>							
615512	476670	August 19, 1998	HW-1	unknown	0	0	
615526	476519	August 19, 1998	HW-2	unknown	0	0	
615407	476383	August 18, 1998	HW-3	unknown	0	0	
615512	476383	August 18, 1998	HW-4	unknown	0	0	
615257	476054	August 18, 1998	HW-5	40-48	0	0	
615091	475843	unknown	HW-6	unknown	0		
615122	475588	August 19, 1998	HW-7	<50	0	0	
615557	475408	August 19, 1998	HW-8	unknown	5.3	0	
615782	475632	September 1, 1998	HW-9	77-97	0	0	
616247	476114	August 19, 1998	HW-10	94-109	1.1	0	
614807	474913	August 18, 1998	HW-11	unknown	69.5	0.5	
614567	474626	August 19, 1998	HW-12	unknown	60.8	0	
615526	474297	September 1, 1998	HW-13	<50	4.2	0	
615676	474492	Between August and November 1998	HW-14	100-110	0		
615963	474386	September 1, 1998	HW-15	unknown	2.1	0	
616053	474357	September 1, 1998	HW-16	<50	1.7	0	
616171	474792	Between August and November 1998	HW-17	unknown	0		
616082	474987	August 25, 1998	HW-18	<50	460	3.8	
616893	474927	Between August and November 1998	HW-19	unknown	0	0	
616727	474642	August 18, 1998	HW-20	<50	1068	4	
616848	474386	August 15, 1998	HW-21	unknown	188	3	
616817	474252	August 25, 1998	HW-22	<50	12.5	0	
617088	474492	Between August and November 1998	HW-23	<50	120	0.6	
617462	474776	September 2, 1998	HW-24	<50	75.2	0	
618258	475648	August 19, 1998	HW-25	15-30	19.1	0	
619264	475993	unknown	HW-26	<50	0		
615932	473456	Between August and November 1998	HW-27	32-42	0	0	
616053	473441	Between August and November 1998	HW-28	30-40	0	0	
617178	473351	August 25, 1998	HW-29	>50, <120	181	2.4	
616983	473772	September 2, 1998	HW-30	<50	670	4.1	
617402	473907	September 2, 1998	HW-31	<50	912	6.4	10.5
618197	473546	Between August and November 1998	HW-32	unknown	186	1.4	2.5
617583	473217	Between August and November 1998	HW-33	unknown	96	0.8	1.7
617449	472961	Between August and November 1998	HW-34	30-40	0.9	0	
617838	472961	Between August and November 1998	HW-35	32-42	38.3	0	0.7
618258	471684	Between August and November 1998	HW-36	unknown	0	0	
619609	472645	Between August and November 1998	HW-37	unknown	100	0.6	
619564	472795	Between August and November 1998	HW-38	unknown	0		
<b>BEMSA White Swan Investigation</b>							
614083	474039	May 17, 1999	1	12-15	0	0	0
				24-27	0	0	0
				36-39	0	0	0
614661	474071	May 17, 1999	2	12-15	0	0	0
				24-27	0	0	0
				36-39	0	0	0
614827	474327	May 17, 1999	3	12-15	0	0	0
				24-27	0	0	0
				36-39	0	0	0
614414	474564	March 27, 1999	8	21-24	2.36	0	0
				45-48	0.41	0	0
614440	474637	March 27, 1999	9	21-24	61.47	0.99	0.6
				41-44	2.67	0	0
614466	474699	March 27, 1999	10	21-24	9.79	0	0
				41-44	6.57	0	0
614656	474579	March 30, 1999	11	17-20	3.69	0.55	0.21
				29-32	0	0	0
				41-44	0	0	0
614687	474649	March 30, 1999	12	17-20	8.09	0.7	2.04

## Wall Township - Summary of Groundwater Analytical Results

Sample Location/ State Plane Coordinates		Sample Date	NJDEP Sample ID	Depth range (ft)	Tetrachloro-ethylene Concentration (ug/L)	Trichloro-ethylene Concentration (ug/L)	Cis- 1,2-Dicloro-ethylene Concentration (ug/L)
X-dir	Y-dir						
				29-32	0	0	0
				41-44	0	0	0
619617	472620	March 24, 1999	13	17-20	78.9	0	0
				29-32	93.3	0	0
619550	472653	March 24, 1999	14	17-20	86	0	0
				29-32	188	0	0
619845	473876	March 23, 1999	16	17-20	0.52	0	0
				33-36	233.4	0	2.5
				45-48	0.48	0	1.2
				57-60	0.57	0	0
619927	474252	March 23, 1999	17	17-20	33.6	0.21	0.21
				29-32	216.1	2	2.5
				41-44	68.16	1.1	1.57
				52-55	4.95	0	0
615895	475003	March 29, 1999	18	17-20	203.3	3.8	4
				29-32	128.3	2.1	2
				36-38	22.08	0.44	0.41
615994	475264	March 29, 1999	19	17-20	51.53	0.52	0.22
				29-32	11.16	0	0
				37-40	24.28	0.5	0.65
615715	474578	March 27, 1999	20	21-24	1.69	0	0
		March 30, 1999		29-32	3.84	0	0
614933	474595	September 27, 1999	21	21-24	0.26	0	0
				33-36	0	0	0
				55-58	0	0	0
614639	474905	September 27, 1999	22	21-24	289.2	6.27	6.07
				33-36	0.32	0	0
				41-44	0	0	0
615390	474675	September 29, 1999	23	21-24	9.34	0	0
				29-32	11.31	0	0
				37-40	0	0	0
615144	475164	September 29, 1999	24	17-20	0	0	0
615684	474349	September 29, 1999	25	17-20	0	0	0
				21-24	0	0	0
				29-32	0	0	0
616076	474905	September 29, 1999	26	17-20	181.07	2.46	2.14
				25-28	43.11	1.4	1.73
				33-36	160.11	2.19	1.59
615226	476340	October 1, 1999	27	21-24	0	0	0
				25-28	0	0	0
				33-36	0	0	0
				13-16	0	0	0
614296	475003	September 27, 1999	28	29-32	0	0	0
				40-43	0	0	0
				55-58	0	0	0
614703	476161	October 1, 1999	32	13-16	0	0	0
				21-24	0	0	0
615545	473985	September 30, 1999	33	13-16	333.08	6.3	12.41
				21-24	0.35	0	0
614458	474672	September 30, 1999	34	21-24	30.8	0.59	0.34
				25-28	5.14	0	0
July/August 2002 "Cozzi- Lead" BGWPA/BSM Investigation							
614906	474749	8/1/2002	Mag1	21-24	16	0	0
614967	474720	8/1/2002	Mag2	21-24	0.86	0	0
614957	474778	8/1/2002	Mag3	21-24	200	1.3	0.97
614916	474700	8/1/2002	Mag4	21-24	0.8	0	0
614906	474798	8/1/2002	Mag6	21-24	380	2.5	3.8
614848	474671	8/1/2002	Mag8	21-24	0.22	0	0
614848	474888	7/31/2002	Mag11	22-24	27	0.46	0.43

## Wall Township - Summary of Groundwater Analytical Results

Sample Location/ State Plane Coordinates		Sample Date	NJDEP Sample ID	Depth range (ft)	Tetrachloro-ethylene Concentration (ug/L)	Trichloro-ethylene Concentration (ug/L)	Cis- 1,2-Dicloro-ethylene Concentration (ug/L)
X-dir	Y-dir						
614887	475005	7/31/2002	Mag12	22-24	0	0	0
615132	475083	7/31/2002	Mag13	22-24	0	0	0
615171	475182	7/31/2002	Mag14	22-24	0	0	0
614789	474856	7/31/2002	Mag15	22-24	440	18	12
615006	474778	7/31/2002	Mag16	21-24	460	4.9	5
615064	474769	7/31/2002	Mag17	22-24	0.29	0	0
615122	474749	7/31/2002	Mag18	22-24	540	6.2	4.3
615191	474730	7/31/2002	Mag19	22-24	280	2.8	2.2
<b>April 2003 "100- Series" BGWPA/BEMSA/BSM-Lead Investigation</b>							
614100	473775	4/1/2003	101	21-24	4998	243.88	657.87
614085	473830	4/1/2003	102	17-20	23.13	0.47	0
614070	473886	4/1/2003	103	17-20	0	0.59	1.21
614107	473709	4/1/2003	104	29-32	6.43	0.25	0.2
614657	473880	4/1/2003	105	29-32	15.63	1.37	3.53
614622	473755	4/1/2003	106	29-32	1.3	0	0
614580	473662	4/1/2003	107	33-36	0	0	0
615643	473404	4/2/2003	108	13-16	0	0	0
615963	473461	4/2/2003	109	17-20	0	0	0
615997	473737	4/2/2003	110	17-20	140.23	3.94	5.61
616090	473953	4/2/2003	111	17-20	286.79	6.8	9.57
617857	473275	4/3/2003	112	17-20	5.11	0	0
617811	473183	4/3/2003	113	21-24	15.8	0.3	0.38
617740	473041	4/3/2003	114	17-20	6.64	0	0
617673	472909	4/3/2003	115	13-16	0.28	0	0
617857	473828	4/3/2003	116	17-20	63.82	1.85	2.59
617914	473953	4/3/2003	117	17-20	12.52	0.41	0.36
617992	474138	4/3/2003	118	17-20	191.83	4.07	6
618070	474312	4/4/2003	119	17-20	218.03	4.09	6.34
618142	474473	4/4/2003	120	21-24	97.02	1.4	2.21
618217	474652	4/4/2003	121	17-20	6.07	0	0
618316	474858	4/4/2003	122	17-20	2.48	0	0
618400	475064	4/4/2003	123	17-20	7.29	0	0
618511	475310	4/4/2003	124	17-20	5.4	0	0
618620	475574	4/4/2003	125	17-20	1.19	0	0
619357	472883	4/10/2003	126	17-20	42.87	0.66	0.61
619308	472734	4/10/2003	127	13-16	3.66	0.36	0
619238	472563	4/10/2003	128	13-16	23.59	0.32	0
619149	472350	4/10/2003	129	13-16	15.44	0	0
619097	472223	4/10/2003	130	9-12	1.64	0	0
618989	471967	4/10/2003	131	9-12	0.57	0	0
617461	472491	4/10/2003	132	9-12	0	0	0
618255	475729	4/10/2003	133	17-20	0.41	0	0
617822	475819	4/10/2003	134	17-20	8.9	0	0
617448	475893	4/10/2003	135	17-20	19.08	0.22	0
619121	473236	4/21/2003	136	13-16	12.1	0	0
619257	473605	4/21/2003	137	13-16	0.34	0	0
619375	473966	4/21/2003	138	13-16	2.33	0	0
619497	474330	4/21/2003	139	17-20	12.44	0	0
619658	474682	4/21/2003	140	17-20	1.18	0	0
619816	475042	4/21/2003	141	17-20	32.19	0.29	0.31
620835	471908	4/22/2003	142	13-16	17.13	0	0
620960	472587	4/22/2003	143	13-16	74.75	0.54	0.34
621000	472950	4/22/2003	144	13-16	2.5	0	0
621085	473334	4/22/2003	145	13-16	0.51	0	0
621204	473819	4/22/2003	146	13-16	0.58	0	0
621304	474308	4/22/2003	147	13-16	0	0	0
621408	474802	4/22/2003	148	13-16	0.88	0	0
621478	475297	4/22/2003	149	13-16	0	0	0
621636	475957	4/22/2003	150	13-16	0	0	0

**Table 1**  
**Wall Township - Summary of Groundwater Analytical Results**

Sample Location/ State Plane Coordinates		Sample Date	NJDEP Sample ID	Depth range (ft)	Tetrachloro-ethylene Concentration (ug/L)	Trichloro-ethylene Concentration (ug/L)	Cis- 1,2-Dichloro-ethylene Concentration (ug/L)
X-dir	Y-dir						
621751	471176	4/23/2003	151	13-16	3.17	0	0
622392	470661	4/23/2003	152	13-16	0	0	0
623209	470534	4/23/2003	153	13-16	0	0	0
623383	470813	4/23/2003	154	13-16	0	0	0
623478	471513	4/23/2003	155	17-20	7.62	0	0
623820	473104	4/23/2003	156	17-20	0.74	0	0
624079	474193	4/23/2003	157	17-20	0.45	0	0
624274	474983	4/23/2003	158	17-20	0	0	0
615259	473903	4/24/2003	sw100		996.36	29.08	80.98
615713	473468	4/24/2003	sw101		149.3	6.04	14.1
615996	473187	4/24/2003	sw102		55.62	2.15	4.66
613512	473786	7/1/2003	sw103		0	0	0
614690	474075	7/1/2003	sw104		0	0	0
615335	473807	7/1/2003	sw105		85	7.3	33
615737	473453	7/1/2003	sw106		31	2.8	15
616004	473207	7/1/2003	sw107		14	1.4	6.4
<b>BEMSA Sun Cleaner Data Points</b>							
613758	473727	January 24-31,2000	GW-3	16-20	0.8	0	7
				28-32	450	28	120
				36-40	0	0	0
613715	473669	January 24-31,2000	GW-4	16-20	450	9	25
				28-32	12	0	0
613608	473651	January 24-31,2000	GW-7	16-20	3	0	0
				28-32	0.9	0	0
				36-40	0	0	0
613370	473564	January 24-31,2000	GW-5	20-24	0	0	0
				32-36	0	0	0
				40-44	0	0	0
613662	473739	January 24-31,2000	GW-1	20-24	430	16	21
				32-36	910	0	0
				44-48	12	0	0
				56-60			
613736	473698	August 1-2,2000	GW-13	21-24	15500	256	290
613840	473585	August 1-2,2000	GW-15	21-24	3.14	0	0
613820	473636	August 1-2, 2000	GW-14/16	21-24	277.46	12.33	23.26
		Sept. 1, 2000		28-32	4.79	0	0
		Sept. 1, 2000		36-40	1.57	0	0
613820	473692	Sept. 1, 2000	GW-17	21-24	2077	343	1817
				28-32	8121	519.8	1358
				36-40	1260	0	0
613840	473817	August 1-2,2000	GW-10	to 40'	0	0	0
613803	473839	August 1-2,2000	GW-11	to 52'	0	0	0
613791	473813	August 1-2,2000	GW-12	21-24	0.33		0
614081	473597	June 12, 2000	GW-2	to 60'	0	0	0
613711	473109	June 13, 2000	GW-3a	to 48'	0	0	0
615150	473708	June 13, 2000	GW-4a	12-15	1.53	0	0
				20-23	5.98	0	0
				32-35	0.27	0	0
				44-47	0.25	0	0
620551	475685	June 15, 2000	GW-9	17-20	17.79	0	0
				25-28	75.43	0	1.48
				33-36	136.53	3.15	2.76
				41-44	8.6	0.24	0.25
Note: Shaded data used for groundwater interpretation							



## Wall Township - NJDEP Indoor Air Database Monitoring Event 1

x (State Plane Feet)	y (State Plane Feet)	Block	Lot	Sump	Indoor Air Date 1	Indoor Air Location 1	Indoor Air PCE 1 (ug/m <sup>3</sup> )	Indoor Air TCE 1 (ug/m <sup>3</sup> )	Indoor Air Benzene 1 (ug/m <sup>3</sup> )
614586	473110			No	1/3/2002		ND		
614223	473279			Yes	12/27/2001		ND		
616808	474388			No-open soil	1/31/2002		3.66		
623187	473495			No	1/28/2002		0.47		
622438	473878			Yes	1/22/2002		ND		
620167	474317			No	1/14/2002		1.42		
622210	475271			Yes	1/22/2002		1.42		
621765	475347			No-Fl. Drain	1/24/2002		0.81		
621675	475575			Yes	1/21/2002		0.75		
620766	475812			No	1/21/2002		6.91		
614997	474578			No	1/10/2002		ND		
614902	474748	706	9.02	Yes	10/25/2001	Basement	7.44	ND(2.68)	18.47
615810	472679			No	1/10/2002		ND		
620883	473399			No	1/24/2002		0.41		
619635	473470			No	1/14/2002		ND		
619415	473678			No	1/16/2002		ND		
619272	473709			No	1/16/2002		ND		
615801	475455			No	1/10/2002		0.41		
615481	475369			Yes	1/3/2002		ND		
615209	475479			No	1/24/2002		1.29		
622508	474418			No	1/16/2002		ND		
622221	474475			Yes	1/17/2002		ND		
621962	474748			No	1/28/2002		0.61		
621633	474787			Yes	1/24/2002		4.67		
617772	475426			No	1/14/2002		1.83		
617529	475254			No	1/7/2002		4.9		
617094	475322			Yes	1/8/2002		1.35		
617342	475521				1/16/2003	Basement	10.17	ND(2.68)	
623108	474680			No	1/16/2002		ND		
622728	474964			No	1/17/2002		ND		
621256	475263			No	1/22/2002		1.29		
620763	475361			No	1/16/2002		3.39		
620299	475237			No-earthen pit	1/14/2002		3.05		
620175	475496			No	1/15/2002		5.08		
619913	475313			No	1/28/2002		1.63		
615905	473769	285	18	Yes	1/7/2002	Basement	15.37		
616084	473390			Yes	1/28/2002		2.03		
621146	472966			No	1/24/2002		0.54		
620842	473020			Yes	1/22/2002		ND		
620755	472797			Yes	1/22/2002		ND		
619747	473293			Yes	1/15/2002		ND		
619204	473335			No	1/28/2002		2.91		
617618	474002				6/18/2003	Basement	3.50		
619706	475204			No	1/9/2002		ND		
619174	473949			No-earthen area	1/9/2002		ND		
618229	475530			No	1/7/2002		1.56		
617770	474951			No	1/7/2002		0.47		
621985	475685			No	1/9/2002		ND		
618681	475010			Yes	1/10/2002		ND		
618498	474118	280	81	No	1/14/2002	Basement	34.80		
616715	475038	278	9		5/31/2002	Basement	12.34		
616461	475243	278.02	7	Yes	1/3/2002	Basement	23.15		
616485	475406				10/17/2002	Basement	ND (3.39U)	ND (2.69)	2.58
614637	475483			No	1/31/2002		ND		
614236	475264			No	1/31/2002		ND		
614035	474791			Yes	1/31/2002		ND		

## Wall Township - NJDEP Indoor Air Database Monitoring Event 1

x (State Plane Feet)	y (State Plane Feet)	Block	Lot	Sump	Indoor Air Date 1	Indoor Air Location 1	Indoor Air PCE 1 (ug/m <sup>3</sup> )	Indoor Air TCE 1 (ug/m <sup>3</sup> )	Indoor Air Benzene 1 (ug/m <sup>3</sup> )
619147	474305	715	4	No	1/14/2002	Basement	7.24		
618876	474394			No	1/14/2002		1.08		
615354	473363			No	1/21/2002		0.81		
615191	473284			No	1/3/2002		1.08		
614667	473526			Frch. Dr., no sump	1/3/2002		2.23		
617377	474103				2/27/2003		ND	ND	ND
616107	474342				12/10/2001	Basement	ND(3.38)	ND(2.68)	ND(1.59)
616205	474520	710	11	Yes	1/7/2002	Basement	22.07		
615905	474619				12/10/2001	Basement	4.13J, ND	ND(2.68)	ND(1.59)
615692	474672				12/10/2001	Basement	ND(3.38)	ND(2.68)	1.81
615543	474550			No	1/16/2002		ND		
615538	474730				12/10/2001	Basement	ND (3.38U)	ND(2.68)	2.39
615395	474593			No	1/10/2002		0.68		
615319	474611				12/10/2001	Basement	ND(3.38)	ND(2.68)	3.02
615256	474645				12/10/2001	Basement	ND(3.38)	ND(2.68)	2.32
615406	474761			No	12/10/2001	Basement	8.12	ND(2.68)	ND(1.60)
615327	474782	708	8	Yes	1/16/2002		29.11		
615184	474663				12/10/2001	Basement	ND(3.38)	ND(2.68)	3.06
615267	474797	708	7	First Floor	12/10/2001	Basement	11.50	ND(2.68)	4.14
615112	474687			No	1/16/2002		ND		
615199	474815			No	1/19/2002		64.31		
615041	474696			Yes	12/10/2001	Basement	4.06	ND(2.68)	2.45
615152	474835	708	5	No	12/10/2001	Basement	7.44	ND(2.68)	5.41
615087	474854	708	4	No	12/10/2001	Basement	28.42	ND(2.68)	ND(1.59)
615032	474869			Yes	12/10/2001	Basement	155.65	ND(2.68)	ND(1.59)
614839	474772	706	9.01	Yes	10/25/2001	Basement	22.33	ND(2.68)	1.88
614982	474886			No	1/19/2002		223.41		
614772	474797			Yes	10/25/2001	Basement	58.88	ND(2.68)	ND(1.59)
614924	474915			No	12/10/2001	Basement	26.39	ND(2.68)	14.64
614696	474817			Yes	12/10/2001	Basement	2,032.2D,1760	11.26	2.42
614715	475006			No	1/16/2002	Bldg. 1	ND		
617745	474426			No	1/8/2002		ND		
617160	474465			No	1/7/2002		2.3		
616789	474743	278.02	15		12/10/2001	Basement	9.47	ND(2.68)	ND(1.59)
616511	474848				12/10/2001	Basement	ND(3.38)	ND(2.68)	4.46
615751	474978	709	2		10/17/2002	Basement	7.36	ND(2.68)	ND(1.59)
615403	475114				10/17/2002	Basement	ND(3.38)		
613736	474137			No	1/31/2002		ND		
613263	474711			Mo	2/5/2002		ND		
616595	473231			No	1/8/2002		0.81		
622224	471123			No	1/28/2002		0.47		
615005	473543			No	1/2/2002		ND		
614935	473121			No	1/3/2002		ND		
621171	474306			No	1/23/2002		0.61		
621005	474537			No	1/22/2002		ND		
622838	473909			No	1/17/2002		ND		
620457	474461			No	1/15/2002		0.81		
619821	474762			No	1/15/2002		ND		
619736	474601			Yes	1/14/2002		ND		
615371	473090			No	1/8/2002		ND		
614349	473540			Yes	1/27/2001		ND		
614164	473614			Yes	1/27/2001		3.05		
617321	472395			No	2/4/2002		ND		
624076	474376			No	1/29/2002		1.22		
623257	470278			No	1/30/2002		ND		
616715	476654			No	1/28/2002		ND		

## Wall Township - NJDEP Indoor Air Database Monitoring Event 1

x (State Plane Feet)	y (State Plane Feet)	Block	Lot	Sump	Indoor Air Date 1	Indoor Air Location 1	Indoor Air PCE 1 (ug/m <sup>3</sup> )	Indoor Air TCE 1 (ug/m <sup>3</sup> )	Indoor Air Benzene 1 (ug/m <sup>3</sup> )
615810	474858	709	19		1/9/2002	Basement	11.71		
615770	474389			Yes	1/7/2002		0.54		
615640	474431			No	1/17/2002		0.41		
616485	477002			No	12/10/2001	Cafeteria	ND(3.38)	ND(2.68)	1.85
618146	473093			No	2/11/2002		ND		
614771	472420			No	2/4/2002		16.92		
613826	472845			No	2/4/2002		0.61		
621990	473611			Yes	1/17/2002		ND		
621557	473400			Yes	1/24/2002		1.42		
621605	473650			Yes	1/21/2002		ND		
620499	473850			No	1/22/2002		0.34		
619818	473991			Yes	1/15/2002		0.81		
614468	473614			No	12/27/2001		ND		
614164	472989			No	2/11/2002		0.61		
619197	474641			No	1/9/2002		ND		
615768	475937			No	1/3/2002		3.59		
616466	472859			No	2/11/2002		0.27		
621112	471821			Yes	1/24/2002		0.81		
619533	472938			Yes	1/17/2002		ND		
617226	473683			No	1/7/2002		6.23		
616583	473931	711	7	No	12/10/2001	Basement	5.75	ND(2.68)	1.59
616290	474044	711	5		6/5/2002	Basement	24.11		
615445	474140				10/17/2002	Basement	107.1	ND(2.68)	ND(1.60)
615087	474441			Yes	2/11/2002		0.88		
614947	474485				12/10/2001	Basement	ND(3.38)	ND(2.68)	3.18
614815	474522			No	1/31/2002		4.4		
614724	474585			No	1/31/2002		1489.4		
614507	474648	706	10	No	1/30/2002	Basement	7.79		
614602	474804			No	10/25/2001	Office	81.21	ND(2.68)	ND(1.59)
620043	473647			No	12/17/2001	Library	3.33,3.52		
623153	470619			Yes	1/30/2002		ND		
622821	470518			Yes	1/30/2002		ND		
622736	470703			No	1/30/2002		ND		
622483	470737			Yes	1/28/2002		ND		
621442	475927			No	1/23/2002		ND		
615405	475932			No	1/3/2002		ND		
623029	471145			Yes	1/28/2002		ND		
622173	471531			Yes	1/28/2002		ND		
621658	471432			Yes	2/5/2002		0.75		
618546	472980			No	1/14/2002		1.62		
619124	475080			No	1/10/2002		ND		
619253	474939			No	1/8/2002		ND		
618460	473521			Yes	1/10/2002		2.44		
623125	475496			Yes	1/23/2002		0.27		
622584	475648			Yes	1/22/2002		ND		
621591	476107			No	1/9/2002		0.74		
622680	471832			No	1/29/2002		0.95		
621701	472026			No	1/24/2002		1.08		
620924	472178			No	1/24/2002		0.88		
618229	474486			No	1/15/2002		0.81		
618412	474908			No	1/16/2002		2.71		
617852	474098			No	1/8/2002		0.81		
618603	475339			No	1/9/2002		0.61		
618426	475348				2/27/2003		ND(3.38)	ND(2.68)	3.19
620215	472541			Yes	1/23/2002		1.02		

## Wall Township - NJDEP Indoor Air Database Monitoring Event 1

x (State Plane Feet)	y (State Plane Feet)	Block	Lot	Sump	Indoor Air Date 1	Indoor Air Location 1	Indoor Air PCE 1 (ug/m <sup>3</sup> )	Indoor Air TCE 1 (ug/m <sup>3</sup> )	Indoor Air Benzene 1 (ug/m <sup>3</sup> )
619132	475469			No	1/9/2002		ND		
616810	475930			Yes	1/28/2002		0.47		
615575	475057			No-hole in floor	1/15/2002		0.68		
615489	475088			No	1/16/2002		4.2		
615322	475151			No-pipe in floor	1/28/2002		0.81		
614958	475307			No	1/7/2002		3.32		
615545	473400			No	1/3/2002		ND		
615593	474832			No	1/24/2002		5.08		
615566	474945			No	1/9/2002		ND		
615430	474843			No	1/10/2002		67.7		
615486	474986			No	1/9/2002		3.25		
615349	474876			No	1/9/2002		4.2		
615421	475002			No	1/16/2002		ND		
615301	474889				10/17/2002	Basement	2.08	ND (2.69)	3.82
615364	475019			No	1/9/2002		ND		
615243	474902			No	1/9/2002		ND		
615302	475043			No	1/10/2002		ND		
615252	475058			No	1/10/2002		ND		
615128	474943			No	1/9/2002		4.45		
615197	475078				10/16/2002		ND(3.38)	ND(2.68)	47.62
615063	474962			No	2/7/2002		ND		
615002	474984			Yes	1/9/2002		ND		
615017	475134			No-drain hole	2/7/2002		ND		
614958	474991			No	1/9/2002		3.25		
614865	475108				1/17/2003	Basement	8.82	ND(2.68)	ND(1.60)
614828	475032			Yes	1/10/2002		ND		
614808	474976			No	12/27/2001		2.1		
617912	472491			Yes	2/4/2002		ND		



= NJDEP data

= EPA data from March 2003 table

= NJDEP data, home remediated by NJDEP

= NJDEP/EPA data, home remediated by EPA

**TABLE 3: Wall Township - Groundwater, Soil Gas  
and Subslab Soil Gas Concentrations  
for Houses with Multiple Media Measurements**

Location	Foundation	Matrix	Date	Depth (m)	Location	PCE (Gdw: ug/L; Gas/Air:ug/m <sup>3</sup> )	TCE (Gdw: ug/L; Gas/Air: ug/m <sup>3</sup> )
						143	40
					Groundwater Source Strength Filter	6000	1000
					Soil Gas Source Strength Filter	600	100
x = 614902 y = 474748	Basement	Groundwater				192.00	NR
		Predicted Soil Gas				80640.00	NR
	Sump	Measured Soil Gas	4/19/2002	2.13	32' N SE corner, 2' E, hit clay layer @ 7'	33.00	ND
		Measured Soil Gas	4/19/2002	2.29	7 ft W 2 ft N NE corner	365.61	ND
		Measured Soil Gas	4/19/2002	2.44	57 ft S, 2 ft N NE corner	1.02	ND
		Measured Soil Gas	4/19/2002	2.44	57 ft S, 2 ft N NE corner	13.27	ND
		Measured Soil Gas	4/19/2002	2.44	8.5 ft N, 2 ft W SW corner	13.27	ND
		Average Measured Soil Gas				85.23	
		Measured Indoor Air	10/25/2001		Basement	7.44	ND(2.68)
		Measured Indoor Air	1/19/2002		Basement	16.93	ND(2.68)
		Measured Indoor Air	1/19/2002		Kitchen Fl.	6.57	ND
	Unfiltered	Measured/Predicted Soil Gas				N/A	N/A
		Groundwater Alpha				2.10E-04	N/A
		Soil Gas Alpha (avg. soil gas)				1.99E-01	N/A
		Soil Gas Alpha (max. soil gas)				4.63E-02	N/A
	Filtered	Groundwater Alpha				2.10E-04	N/A
		Soil Gas Alpha			Filtered		N/A

Note: Measured indoor air in basement on 19/01/2002 used for alpha calculation. Soil gas probes possibly installed in clay layer.

x = 618498 y = 474118	Basement	Groundwater					
		Predicted Soil Gas					
		Measured Soil Gas	5/1/2002	1.52	west side	513.38	1.5
		Measured Subslab Gas	5/1/2002	0.30		3248.98	23.17
		Measured Indoor Air	1/14/2002		basement	34.80	NR
		Measured Indoor Air	3/27/2002		basement	45.34	ND
		Measured Indoor Air	5/1/2002		basement	43.05	ND
		Measured Indoor Air	5/1/2002		first floor	13.9	ND
	Unfiltered	Measured/Predicted Soil Gas				N/A	N/A
		Soil Gas/Subslab Gas				0.16	0.065
		Groundwater Alpha				N/A	N/A
		Soil Gas Alpha				8.39E-02	N/A
	Filtered	Subslab Alpha				1.33E-02	N/A
		Groundwater Alpha				N/A	N/A
		Soil Gas Alpha			Filtered		N/A
		Subslab Alpha				1.33E-02	N/A

Note: Basement indoor air concentration on 01/05/2002 used for alpha calculation. SSD installed on 23/05/2002. Groundwater concentrations poorly characterised this area.

x = 616461 y = 475243	Basement	Groundwater				80.00	NR
		Predicted Soil Gas				33600.00	NR
		Measured Soil Gas	4/17/2002	2.44	5 ft south, 13 ft W SW corner	3723.58	7.51
		Measured Subslab Gas	4/17/2002			5177.41	19.78
		Measured Indoor Air	4/17/2002		First Floor	5.45	ND
		Measured Indoor Air	4/17/2002		Basement	10.48	ND
		Measured Indoor Air	4/17/2002		Basement	10.47	ND
		Measured Indoor Air	4/17/2002		Basement dup	10.58	ND
		Measured Indoor Air	4/17/2002		Basement dup	11.16	ND
		Average Measured Indoor Air	4/17/2002			10.67	N/A
	Unfiltered	Measured/Predicted Soil Gas				N/A	N/A
		Soil Gas/Subslab Gas				0.72	0.38
		Groundwater Alpha				3.18E-04	N/A
		Soil Gas Alpha				2.87E-03	N/A
	Filtered	Subslab Alpha				2.06E-03	N/A
		Groundwater Alpha				Filtered	N/A
		Soil Gas Alpha			Filtered		N/A
		Subslab Alpha				2.06E-03	N/A

Note: Average basement indoor air concentrations used for alpha calculation. Subslab and soil gas concentration unusually high based on estimated groundwater concentration, although plume poorly characterized in this area.

**TABLE 3: Wall Township - Groundwater, Soil Gas  
and Subslab Soil Gas Concentrations  
for Houses with Multiple Media Measurements**

Location	Foundation	Matrix	Date	Depth (m)	Location	PCE (Gdw: ug/L; Gas/Air:ug/m <sup>3</sup> )	TCE (Gdw: ug/L; Gas/Air: ug/m <sup>3</sup> )
						143	40
					Groundwater Source Strength Filter	6000	1000
					Soil Gas Source Strength Filter	600	100
					Subslab Source Strength Filter		
x = 619147 y = 474305	Basement?	Groundwater					
		Predicted Soil Gas					
		Measured Soil Gas	4/11/2002	1.78		128.12	ND
		Measured Subslab Gas	4/11/2002		15 ft W, 11.5 ft N SE corner	19.94	ND
		Measured Indoor Air	4/11/2002			3.67	ND
	Unfiltered	Measured Indoor Air	4/11/2002			10.17	ND
		Average Measured Indoor Air	4/11/2002			6.92	N/A
		Measured/Predicted Soil Gas				N/A	N/A
		Soil Gas/Subslab Gas				6.43	N/A
		Groundwater Alpha				N/A	N/A
	Filtered	Soil Gas Alpha				5.40E-02	N/A
		Subslab Alpha				3.47E-01	N/A
		Groundwater Alpha				N/A	N/A
		Soil Gas Alpha				Filtered	N/A
		Subslab Alpha				Filtered	N/A

x = 616205 y = 474520	Basement	Groundwater				80.00	NR
		Predicted Soil Gas				33600.00	NR
	Sump	Measured Soil Gas	4/12/2002	2.34	6 ft W, 22 ft 4 in N SW corner house	575.33	0.91
		Measured Subslab Gas	4/12/2002	0.30		34431.55	128.78
	Unfiltered	Measured Indoor Air	4/12/2002		First Floor	23.95	1.75
		Measured Indoor Air	4/12/2002		Basement	50.39	1.05
		Measured Indoor Air	4/12/2002		Basement	51.79	0.91
		Measured Indoor Air	4/12/2002		Basement dup	52.78	0.98
		Measured Indoor Air	4/12/2002		Basement dup	51.41	0.72
		Measured Indoor Air	4/12/2002		Average Basement	51.5925	0.915
		Measured Ambient	4/12/2002			ND	ND
		Measured/Predicted Soil Gas				1.71E-02	N/A
		Soil Gas/Subslab Gas				1.67E-02	7.07E-03
		Groundwater Alpha				1.54E-03	N/A
	Filtered	Soil Gas Alpha				8.97E-02	1.01E+00
		Subslab Alpha				1.50E-03	7.11E-03
		Groundwater Alpha				Filtered	Filtered
		Soil Gas Alpha				Filtered	Filtered
		Subslab Alpha				1.50E-03	7.11E-03

Note: Groundwater concentration uncertain, may be under estimated due to co-mingling plume from Sun Cleaner site. Subslab high compared to soil gas & groundwater.

x = 616074 y = 474564	Basement	Groundwater				85.00	NR
		Predicted Soil Gas				35700.00	NR
		Measured Soil Gas	4/26/2002	1.83	6 ft 5 in W SW corner, 7 ft 4 in N	55.46	ND
		Measured Soil Gas	4/26/2002	1.83	6 ft 5 in W SW corner, 7 ft 4 in N	58.04	ND
		Measured Soil Gas	4/26/2002		6 ft 5 in W SW corner, 7 ft 4 in N dup	36.88	ND
		Measured Soil Gas	4/26/2002		6 ft 5 in W SW corner, 7 ft 4 in N dup	41.36	ND
		Average Measured Soil Gas	4/26/2002			47.94	ND
		Measured Subslab Gas	4/26/2002	0.30		4414.9	5.4
		Measured Indoor Air	4/26/2002			3.25	ND
		Measured Indoor Air	4/26/2002		Basement	5.83	ND
		Average Measured Indoor Air				4.54	ND
	Unfiltered	Measured/Predicted Soil Gas				1.34E-03	N/A
		Soil Gas/Subslab Gas				1.09E-02	N/A
		Groundwater Alpha				1.63E-04	N/A
		Soil Gas Alpha				1.22E-01	N/A
		Subslab Alpha				1.32E-03	N/A
	Filtered	Groundwater Alpha				1.63E-04	N/A
		Soil Gas Alpha				Filtered	Filtered
		Subslab Alpha				1.32E-03	Filtered

Note: Alpha calculated using basement indoor air concentration for 26/04/2002. Groundwater concentration uncertain, may be under estimated due to co-mingled plume from Sun Cleaner site.

**TABLE 3: Wall Township - Groundwater, Soil Gas  
and Subslab Soil Gas Concentrations  
for Houses with Multiple Media Measurements**

Location	Foundation	Matrix	Date	Depth (m)	Location	PCE (Gdw: ug/L; Gas/Air:ug/m <sup>3</sup> )	TCE (Gdw: ug/L; Gas/Air: ug/m <sup>3</sup> )
						143	40
					Groundwater Source Strength Filter	6000	1000
					Soil Gas Source Strength Filter	600	100
x = 615267 y = 474797	Basement	Predicted Groundwater				405.00	NR
		Predicted Soil Gas				170100.00	NR
		Measured Soil Gas	4/24/2002	1.83	6.1 ft S NE corner, 1.6 E	1373.6	2.26
		Measured Soil Gas	4/24/2002	1.22	16.2 ft N NW corner, 3.6 ft W	35.1	ND
		Measured Soil Gas	4/24/2002	1.52	12.5 ft SE corner, 12 ft W	1272.8	2.32
		Measured Soil Gas	4/24/2002	1.52	12.5 ft SE corner, 12 ft W	1267.7	1.94
		Measured Soil Gas	4/24/2002	1.83	18 in W SW corner, 8.5 ft N	1038.5	1.46
		Average Measured Soil Gas	4/24/2002			997.5	2.00
		Measured Indoor Air	12/10/2001		Basement	11.50	ND(2.68)
		Measured Indoor Air	1/22/2002		Basement	33.99	
		Measured Indoor Air	6/7/2002		Basement	7.44J	ND
		Measured Indoor Air	7/31/2002		Basement	22.09	ND
		Measured Indoor Air	9/18/2002		2.81J	ND	ND
		Measured Indoor Air	9/24/2003		Basement	ND	ND
		Average Measured Indoor Air				22.7	1.34
	Unfiltered	Measured/Predicted Soil Gas				5.86E-03	N/A
		Groundwater Alpha				1.34E-04	N/A
		Soil Gas Alpha (avg soil gas)				2.28E-02	6.72E-01
		Soil Gas Alpha (max soil gas)				1.66E-02	5.93E-01
	Filtered	Groundwater Alpha				1.34E-04	N/A
		Soil Gas Alpha			Filtered	Filtered	Filtered

Note: Alpha calculated using average basement indoor air concentration for 10/12/2001 to 22/01/2002. SSD system installed on 16/04/2002.

x = 615152 y = 474835	Basement	Predicted Groundwater				425.00	NR
		Predicted Soil Gas				178500.00	NR
	Dirt floor	Measured Soil Gas	4/11/2002	1.73	7.5 ft w, 11.5 ft N NW corner	2255.1	5.04
		Measured Subslab Gas	4/11/2002	0.53	dirt basement floor	17004.24	12.63
		Measured Indoor Air	12/10/2001		basement	7.44	ND(2.68)
		Measured Indoor Air	1/8/2002		basement	16.72	NR
		Measured Indoor Air	4/11/2002		basement	12.52	ND
		Measured Indoor Air	4/11/2002		first floor	9.26	ND
		Averaged measured indoor air			basement	12.23	ND
		Measured Ambient Air	4/11/2002			1.78	ND
	Unfiltered	Measured/Predicted Soil Gas				1.26E-02	N/A
		Soil Gas/Subslab Gas				1.33E-01	3.99E-01
		Groundwater Alpha				6.85E-05	N/A
		Soil Gas Alpha				5.42E-03	N/A
		Subslab Alpha				7.19E-04	N/A
	Filtered	Groundwater Alpha				6.85E-05	N/A
		Soil Gas Alpha			Filtered out	Filtered out	Filtered out
		Subslab Alpha				7.19E-04	Filtered out

Note: Alpha calculated using average basement indoor air concentration for 10/12/2001 to 11/04/2002. SSD system installed on 17/04/2002.

x = 615087 y = 474854	Basement	Predicted Groundwater				410.00	NR
		Predicted Soil Gas				172200.00	NR
		Measured Soil Gas	4/12/2002	2.29	3.5 ft and 29 ft inc W NW corner	10381.2	41.4
		Measured Subslab	4/12/2002	0.33	concrete floor	22277.11	79.81
		Measured Indoor Air	12/10/2001		basement	28.42	ND(2.68)
		Measured Indoor Air	1/16/2002		basement	21.46	NR
		Measured Indoor Air	4/12/2002		basement	12.86	ND
		Measured Indoor Air	5/6/2002		basement	64.97	NR
		Measured Indoor Air	4/12/2002		NR	7.43	ND
		Average Indoor Air				31.93	N/A
	Unfiltered	Measured/Predicted Soil Gas				6.03E-02	N/A
		Soil Gas/Subslab Gas				4.66E-01	N/A
		Groundwater Alpha				1.85E-04	N/A
		Soil Gas Alpha				3.08E-03	N/A
		Subslab Alpha				1.43E-03	N/A
	Filtered	Groundwater Alpha				1.85E-04	N/A
		Soil Gas Alpha				3.08E-03	N/A
		Subslab Alpha				1.43E-03	N/A

Note: Alpha calculated using average basement indoor air concentration for 10/12/2001 to 06/05/2002. SSD system installed on 15/05/2002.

**TABLE 3: Wall Township - Groundwater, Soil Gas  
and Subslab Soil Gas Concentrations  
for Houses with Multiple Media Measurements**

Location	Foundation	Matrix	Date	Depth (m)	Location	PCE (Gdw: ug/L; Gas/Air:ug/m <sup>3</sup> )	TCE (Gdw: ug/L; Gas/Air: ug/m <sup>3</sup> )
						143	40
					Groundwater Source Strength Filter	6000	1000
					Soil Gas Source Strength Filter	600	100
x = 614839 y = 474772	Basement	Predicted Groundwater				390.00	NR
		Predicted Soil Gas				163800.00	NR
	Sump	Measured Soil Gas	4/18/2002	2.44	7 ft E first step to front door	743.36	ND
		Measured Soil Gas	4/18/2002	2.29	7.5 ft N south fence, 3 ft W end fence	49.97	ND
		Measured Soil Gas	4/18/2002	2.29	54.2 ft N south fence, 5.3 ft E west fence	17.63	ND
		Measured Soil Gas	4/18/2002	2.44	3.7 FT w, 9 ft N SW corner	35.16	ND
		Average Measured Soil Gas	4/18/2002			211.53	N/A
		Measured Indoor Air	10/25/2001		Living Room	ND(3.38)	ND(2.68)
		Measured Indoor Air	10/25/2001		Basement	22.33	ND(2.68)
		Measured Indoor Air	2/7/2002		Basement	8.12	NR
		Measured Indoor Air	2/7/2002		Basement	5.15	NR
		Measured Indoor Air	3/27/2002		Living Room	ND	ND
		Measured Indoor Air	3/27/2002		Living Room	ND	ND
		Measured Indoor Air	7/31/2002		Basement	12.72	ND
		Measured Indoor Air	1/23/2003		Basement	ND	ND
		Measured Indoor Air	9/23/2003		Basement	ND	NR
		Average Measured Indoor Air				14.4825	N/A
	Unfiltered	Measured/Predicted Soil Gas				1.29E-03	N/A
		Groundwater Alpha				8.84E-05	N/A
		Soil Gas Alpha (avg. soil gas)				6.85E-02	N/A
		Soil Gas Alpha (max. soil gas)				1.95E-02	N/A
	Filtered	Groundwater Alpha				8.84E-05	N/A
		Soil Gas Alpha				Filtered	N/A
							N/A

Note: Alpha calculated using average basement indoor air concentration for 25/10/2001 and 07/02/2002. Reason for relatively large differences in indoor air concentrations not known. SSD system installed on 27/02/2002. Soil gas measurements were obtained after SSD installed; therefore unreliable.

x = 614772 y = 474797	Basement	Predicted Groundwater				450.00	NR
		Predicted Soil Gas				189000.00	NR
	Sump	Measured Soil Gas	4/15/2002	2.44		628.76	0.67
		Measured Soil Gas	4/15/2002	2.44	NW	8438.46	15.11
		Measured Soil Gas	4/15/2002	2.59	10' E, 2' S of fence	16.57	ND
		Measured Soil Gas	4/15/2002	2.44	5' from W fence, 2' from S fence	306.6	ND
		Average Measured Soil Gas	4/15/2002			2347.5975	7.89
		Measured Indoor Air	10/25/2001		Basement	58.88	ND(2.68)
		Measured Indoor Air	12/5/2001		Dining Room	5.48	ND(2.68)
		Measured Indoor Air	12/10/2001		Basement	1.83	ND
	Unfiltered	Measured/Predicted Soil Vapor				1.24E-02	N/A
		Groundwater Alpha				3.12E-04	N/A
		Soil Gas Alpha (avg. soil gas)				2.51E-02	N/A
		Soil Gas Alpha (max. soil gas)				6.98E-03	N/A
	Filtered	Groundwater Alpha				3.12E-04	N/A
		Soil Gas Alpha (avg. soil gas)				Filtered	N/A
		Soil Gas Alpha (max. soil gas)				6.98E-03	N/A

Note: Basement indoor air concentration on 10/12/2001 used for alpha calculation. Reason for large discrepancy in indoor air concentrations not known. SSD installed on 18/01/2002

x = 614924 y = 474915	Basement	Predicted Groundwater				240.00	NR
		Predicted Soil Gas				100800.00	NR
		Measured Soil Gas	4/15/2002	2.44	3.2 ft Nw, 2.9 ft E NE corner house	1351.19	2.3
		Measured Soil Gas	4/15/2002	2.38	4 ft N NW corner house	1131.24	ND
		Measured Soil Gas	4/15/2002	2.38	5.3 ft E, 4 ft S SE corner house	33043.89	70.86
		Measured Soil Gas	4/15/2002	2.29	16.7 ft W, 32.1 ft S SW corner	3.6	ND
		Measured Soil Gas	4/15/2002	2.29	16.7 ft W, 32.1 ft S SW corner dup	146.405	ND
		Average Measured Soil Gas	4/15/2002			7135.265	36.58
		Measured Indoor Air	12/10/2001			26.39	ND(2.68)
		Measured Indoor Air	4/15/2002			78.4	NR
		Average Measured Indoor Air				52.395	ND
	Unfiltered	Measured/Predicted Soil Gas				7.08E-02	N/A
		Groundwater Alpha				5.20E-04	N/A
		Soil Gas Alpha (avg. soil gas)				7.34E-03	N/A
		Soil Gas Alpha (max. soil gas)				1.59E-03	N/A
	Filtered	Groundwater Alpha				5.20E-04	N/A
		Soil Gas Alpha (avg. soil gas)				7.34E-03	N/A
		Soil Gas Alpha (max. soil gas)				1.59E-03	N/A

Note: SSD system installed on 15/02/2002. Soil gas measurements obtained after SSD system installed; therefore may be unreliable.



**TABLE 3: Wall Township - Groundwater, Soil Gas  
and Subslab Soil Gas Concentrations  
for Houses with Multiple Media Measurements**

Location	Foundation	Matrix	Date	Depth (m)	Location	PCE (Gdw: ug/L; Gas/Air:ug/m <sup>3</sup> )	TCE (Gdw: ug/L; Gas/Air:ug/m <sup>3</sup> )
						143	40
					Groundwater Source Strength Filter	6000	1000
					Soil Gas Source Strength Filter	600	100
					Subslab Source Strength Filter		
x = 614696 y = 474817	Basement	Predicted Groundwater				405.00	NR
	Sump	Predicted Soil Gas				170100.00	NR
		Measured Soil Gas	4/17/2002	2.29	6 ft N SW corner, 3.5 ft W	2293.95	15.94
		Measured Soil Gas	4/17/2002	2.44	27 ft W east fence, 10 ft N south fence	1602.59	1.08
		Measured Soil Gas	4/17/2002	1.52	SW corner property, hit clay layer at 5 ft	43.35	ND
		Measured Soil Gas	4/17/2002	2.29	52 ft south, 10 ft W SW corner	662.95	0.8
		Average Measured Soil Gas	4/17/2002			1150.71	5.94
		Measured Indoor Air	12/10/2001		Basement	1896.1	11.26
	Unfiltered	Measured/Predicted Soil Gas				6.76E-03	N/A
		Groundwater Alpha				1.11E-02	N/A
		Soil Gas Alpha (avg. soil gas)				1.65E+00	N/A
		Soil Gas Alpha (max. soil gas)				8.27E-01	N/A
	Filtered	Groundwater Alpha				6.76E-03	N/A
		Soil Gas Alpha (avg. soil gas)				1.11E-02	N/A
		Soil Gas Alpha (max. soil gas)				1.65E+00	N/A

Note: SSD system installed on 7/01/2002. Soil gas measurements obtained after SSD system installed; therefore may be unreliable. Indoor air concentration unusually high.

x = 616789 y = 474743	Basement	Predicted Groundwater				220.00	NR
		Predicted Soil Gas				92400.00	NR
		Measured Soil Gas	4/12/2002	2.44		614.95	1.61
		Measured Subslab	4/12/2002	0.61		484.93	0.9
		Measured Indoor Air	4/12/2002			11.9	ND
		Measured Indoor Air	4/12/2002			12.47	ND
		Measured Indoor Air	12/10/2001		Basement	9.47	ND(2.68)
		Measured Indoor Air	1/17/2002		Basement	22.68	NR
		Measured Indoor Air	6/5/2002		Basement	ND	ND
		Measured Indoor Air	1/23/2003		Basement	ND	ND
		Measured Indoor Air	9/23/2003		Basement	ND	ND
		Average Measured Indoor Air				14.13	ND
	Unfiltered	Measured/Predicted Soil Gas				6.66E-03	N/A
		Soil Gas / Subslab Soil Gas				1.27E+00	1.79E+00
		Groundwater Alpha				1.53E-04	N/A
		Soil Gas Alpha				2.30E-02	N/A
		Subslab Alpha				2.91E-02	N/A
	Filtered	Groundwater Alpha				1.53E-04	N/A
		Soil Gas Alpha			Filtered		N/A
		Subslab Alpha			Filtered		N/A

Note: SSD system installed on 24/04/2002. Alpha calculated using average indoor air from 10/12/2001 to 12/04/2002.

x = 615751 y = 474978	Basement	Predicted Groundwater				240.00	NR
		Predicted Soil Gas				100800.00	NR
		Measured Soil Gas	4/30/2002	1.83	6.2ft SE corner, 3.5 ftN	6733.15	12.09
		Measured Soil Gas	4/30/2002	2.44	12.9 ft N, 3.1 ft W NE corner	1668.35	1.5
		Measured Soil Gas	4/30/2002	2.44	28 ft from SW corner, 17.1 ft E	3205.58	4.07
		Measured Soil Gas	4/30/2002	1.83	13 ft SW corner, 3.4 ft N	2514.43	3.26
		Average Measured Soil Gas	4/30/2002			3530.3775	5.23
		Measured Indoor Air	5/2/2002		First Floor	2.71	ND
		Measured Indoor Air	5/2/2002		crawlspace	13.83	ND
		Measured Indoor Air	10/17/2002		Basement	7.36	ND(2.68)
		Measured Indoor Air	1/23/2003		Basement	1.76	ND(2.68)
	Unfiltered	Measured/Predicted Soil Gas				3.50E-02	N/A
		Groundwater Alpha				7.30E-05	N/A
		Soil Gas Alpha (avg. soil gas)				2.08E-03	N/A
		Soil Gas Alpha (avg. soil gas)				1.09E-03	N/A
	Filtered	Groundwater Alpha				7.30E-05	N/A
		Soil Gas Alpha (avg. soil gas)			Filtered		N/A
		Soil Gas Alpha (max. soil gas)			Filtered	1.09E-03	N/A

Note: SSD system installed in 07/01/2003. Alpha calculated using indoor air measured on 17/10/2002.

**TABLE 3: Wall Township - Groundwater, Soil Gas  
and Subslab Soil Gas Concentrations  
for Houses with Multiple Media Measurements**

Location	Foundation	Matrix	Date	Depth (m)	Location	PCE (Gdw: ug/L; Gas/Air:ug/m <sup>3</sup> )	TCE (Gdw: ug/L; Gas/Air: ug/m <sup>3</sup> )
						143	40
					Groundwater Source Strength Filter	6000	1000
					Soil Gas Source Strength Filter	600	100
x = 615403 y = 475114	Basement	Predicted Groundwater				128.00	NR
		Predicted Soil Gas				53760.00	NR
		Measured Soil Gas	5/1/2002	2.44	1.3 ft NE corner, 3.4 ft S	2.85	ND
		Measured Soil Gas	5/1/2002	2.44	1.3 ft NE corner, 3.4 ft S	2.64	ND
		Measured Soil Gas	5/1/2002	2.44	1.3 ft NE corner, 3.4 ft S dup	1.15	ND
		Measured Soil Gas	5/1/2002	2.44	1.3 ft NE corner, 3.4 ft S dup	1.36	ND
		Measured Soil Gas	5/1/2002	2.44		1.83	ND
		Measured Soil Gas	5/1/2002	2.44	15.6 ft SW corner, 12.2 ft S	1.08	ND
		Measured Soil Gas	5/1/2002		12 ft NW corner, 9 ft out	0.95	ND
		Average Measured Soil Gas	5/1/2002			1.69	ND
		Measured Indoor Air	5/1/2002		First Floor	54.38	ND
		Measured Indoor Air	5/1/2002		crawlspace	12.14	ND
		Measured Indoor Air	10/17/2002		Basement	ND(3.38)	NR
		Measured Indoor Air	1/23/2003		Basement	ND(3.38)	ND(2.68)
	Unfiltered	Measured/Predicted Soil Gas				3.15E-05	N/A
		Groundwater Alpha				1.01E-03	N/A
		Soil Gas Alpha				3.21E+01	N/A
	Filtered	Groundwater Alpha				Filtered	N/A
		Soil Gas Alpha				Filtered	N/A

Note: Alpha calculated using first floor concentration on 01/05/2002. Indoor air concentration seems unusually high.

x = 616715 y = 476654	Basement	Predicted Groundwater				?	NR
		Predicted Soil Gas				N/A	NR
		Measured Soil Gas	4/16/2002	2.29	15.6 ft S NE corner, 2 ft E	0.24	ND
		Measured Soil Gas	4/16/2002	2.44	10 ft E NW corner, 10.5 ft N	0.41	ND
		Measured Soil Gas	4/16/2002	2.44	12 ft W SE corner, 2.2 ft S	1.81	0.61
		Measured Soil Gas	4/16/2002	2.44	12 ft W SE corner, 2.2 ft S	1.81	0.48
		Measured Soil Gas	4/16/2002	2.44	12 ft W SE corner, 2.2 ft S	1.43	0.7
		Measured Soil Gas	4/16/2002	2.44	12 ft W SE corner, 2.2 ft S	1.66	ND
		Measured Soil Gas	4/16/2002	2.44	ft N SW corner, 7.2 ft straight out from hous	1.76	0.84
		Average Measured Soil Gas	4/16/2002			1.30	0.66
		Indoor Air	4/16/2002		first floor	9.76	ND
		Indoor Air	4/16/2002		basement	2.71	ND
		Ambient	4/16/2002			ND	ND
		Indoor Air	10/17/2002		Basement	ND (3.39)	ND (2.69)
	Unfiltered	Measured/Predicted Soil Gas				N/A	N/A
		Groundwater Alpha				N/A	N/A
		Soil Gas Alpha				2.08E+00	N/A
	Filtered	Groundwater Alpha				Filtered	N/A
		Soil Gas Alpha				Filtered	N/A

x = 615810 y = 474858	Basement	Predicted Groundwater				270.00	NR
	Part	Predicted Soil Gas				113400.00	NR
	Crawlspace	Measured Indoor Air	3/27/2002		Basement	20.30	ND(2.68)
		Measured Indoor Air	4/9/2002		first floor	14.22	ND
		Measured Indoor Air	4/9/2002		basement	29.61	ND
		Measured Indoor Air	6/5/2002		Basement	58.88	ND
		Measured Indoor Air	7/31/2002		Basement	25.44	5.31
		Measured Indoor Air	9/18/2002		1st Floor	ND	ND
		Measured Indoor Air	9/18/2002		Basement	ND	ND
		Measured Indoor Air	1/23/2003		Basement	ND	ND
		Measured Indoor Air	9/23/2003		Basement	ND	NR
		Average Measured Indoor Air				36.26	ND
	Unfiltered	Groundwater Alpha				3.20E-04	N/A
	Filtered	Groundwater Alpha				3.20E-04	N/A

Note: SSD system installed on 22/05/2002. Alpha calculated using average air concentration measured on 27/03/2002, 09/04/2002 and 05/06/2002.

**TABLE 3: Wall Township - Groundwater, Soil Gas  
and Subslab Soil Gas Concentrations  
for Houses with Multiple Media Measurements**

Location	Foundation	Matrix	Date	Depth (m)	Location	PCE (Gdw: ug/L; TCE (Gdw: ug/L; Gas/Air:ug/m <sup>3</sup> ) Gas/Air: ug/m <sup>3</sup> )	
						143	40
					Groundwater Source Strength Filter	6000	1000
					Soil Gas Source Strength Filter	600	100
					Subslab Source Strength Filter		
x = 614771 y = 474420	Basement?	Predicted Groundwater				?	NR
		Predicted Soil Gas				N/A	NR
		Measured Soil Gas	4/23/2002	1.52	11 ft NE corner, 7.5 N	12.93	ND
		Measured Soil Gas	4/23/2002	1.52	16.3 ft SW corner, 9 ft W	ND	ND
		Average Measured Soil Gas				12.93	ND
		Measured Subslab Gas	4/23/2002	0.30		2.04	ND
		Measured Indoor Air	4/23/2002		living room	0.48	ND
		Measured Indoor Air	4/23/2002			0.48	ND
		Measured Indoor Air	2/4/2002			16.32	ND
		Unfiltered Measured/Predicted Soil Gas				N/A	N/A
		Soil Gas / Subslab Gas				6.34E+00	N/A

Note: Indoor air concentration greater than subslab soil gas concentration and soil gas concentrations. Considered unreliable for calculation of alpha.

x = 617226 y = 473683	Basement	Predicted Groundwater				?	NR
		Predicted Soil Gas				N/A	NR
		Measured Soil Gas	04/09/02	2.44	t west house, 42.5 ft diagonal SW corner ho	258.69	0.47 U
		Measured Soil Gas	4/9/2002	2.44	W and 42.5ft Diagonal from SW corner of ho	258.69	0.47
		Measured Subslab	04/09/02	0.30		7.70	<0.1 ppbV
		Measured Subslab	4/9/2002	0.30		7.7	ND
		Measured Indoor Air	1/7/2002		Basement	6.23	NR
		Measured Indoor Air	4/9/2002		Basement	0.52	ND
		Measured Indoor Air	4/9/2002		Basement	0.6	ND
		Measured Indoor Air	4/9/2002		Basement	14.95	ND
		Measured Indoor Air	4/9/2002		First Floor	8.02	ND
		Average Indoor Air	4/9/2002		Basement	5.575	ND
		Unfiltered Measured/Predicted Soil Gas				N/A	N/A
		Soil Gas/Subslab Gas				3.36E+01	N/A
		Groundwater Alpha				N/A	N/A
		Soil Gas Alpha				2.16E-02	N/A
		Subslab Alpha				7.24E-01	N/A
Filtered		Groundwater Alpha					N/A
		Soil Gas Alpha				Filtered	N/A
		Subslab Alpha				Filtered	N/A

Note: Alpha calculated using average indoor air concentration calculated between 7/01/2002 and 09/04/2002.

x = 616583 y = 473931	Basement	Predicted Groundwater				?	NR
		Predicted Soil Gas				N/A	NR
		Measured Subslab Gas	4/9/2002	0.30		383.63	1.33
		Measured Indoor Air	4/9/2002		family room	ND	ND
		Measured Indoor Air	4/9/2002		basement	ND	ND
		Measured Indoor Air	4/9/2002		basement	ND	ND
		Measured Indoor Air	12/10/2001		Basement	5.75	ND(2.68)
		Measured Indoor Air	1/21/2002		Basement	10.22	NR
		Measured Indoor Air	7/31/2002		Basement	5.36	ND
		Measured Indoor Air	1/23/2003		Basement	2.92	ND
		Average measured indoor air				7.99	ND
		Unfiltered Measured/Predicted Soil Gas				N/A	N/A
		Groundwater Alpha				N/A	N/A
		Subslab Alpha				2.08E-02	N/A
Filtered		Groundwater Alpha				N/A	N/A
		Subslab Alpha				Filtered	N/A

Note: SSD installed on 17/06/2002. Alpha calculated using average indoor air concentration from 10/12/2001 and 21/01/2002.

**TABLE 3: Wall Township - Groundwater, Soil Gas  
and Subslab Soil Gas Concentrations  
for Houses with Multiple Media Measurements**

Location	Foundation	Matrix	Date	Depth (m)	Location	PCE (Gdw: ug/L; Gas/Air:ug/m <sup>3</sup> )	TCE (Gdw: ug/L; Gas/Air: ug/m <sup>3</sup> )
						143	40
					Groundwater Source Strength Filter	6000	1000
					Soil Gas Source Strength Filter	600	100
					Subslab Source Strength Filter		
x = 615445 y = 474140	Dirt	Predicted Groundwater				200.00	NR
	Basement	Predicted Soil Gas				84000.00	NR
		Measured Soil Gas	4/11/2002	2.44		2475.65	0.98
		Measured Subslab Gas	4/11/2002	0.61	Dirt basement	15823.16	41.23
		Measured Subslab Gas	4/11/2002	0.61	Dirt basement	15592.64	42.25
		Measured Subslab Gas	4/11/2002	0.61	Dirt basement dup	11837.2	35.36
		Measured Subslab Gas	4/11/2002	0.61	Dirt basement dup	13785.06	35.54
		Average Measured Subslab	4/11/2002		Dirt basement	14259.515	38.6
		Measured Indoor Air	4/11/2002		First Floor	6.6	ND
		Measured Indoor Air	4/11/2002			36.67	ND
		Measured Indoor Air	10/17/2002		Basement	107.1	ND(2.68)
	Unfiltered	Measured/Predicted Soil Gas				2.95E-02	N/A
		Groundwater Alpha				1.28E-03	N/A
		Soil Gas Alpha				4.33E-02	N/A
		Subslab Alpha				7.51E-03	N/A
	Filtered	Groundwater Alpha				1.28E-03	N/A
		Soil Gas Alpha			Filtered		N/A
		Subslab Alpha				7.51E-03	N/A

Note: Groundwater concentration uncertain. This building is located above Sun Cleaner plume.

x = 614724 y = 474585		Predicted Groundwater				<50 ?	NR
		Predicted Soil Gas				N/A	NR
		Measured Subslab Gas	4/18/2002	0.46		321.49	0.78
		Measured Subslab Gas	4/18/2002	0.46	dup above	337.9	0.87
		Measured Subslab Gas	4/18/2002	2.29	6.3 ft N, 11.3 E NW corner	265.89	2.09
		Measured Subslab Gas	4/18/2002	2.29	41 ft S, 11.6 W NW corner	129.92	0.94
		Average Measured Subslab	4/18/2002			263.8	1.17
		Measured Indoor Air	1/31/2002			1489.4	NR
	Unfiltered	Measured/Predicted Soil Gas				N/A	N/A
		Groundwater Alpha				N/A	N/A
		Subslab Alpha				5.65E+00	N/A
	Filtered	Groundwater Alpha				Filtered	N/A
		Subslab Alpha				Filtered	N/A

Note: The groundwater concentration is uncertain, this building does not appear to be above the PCE plume, but is close to the source. The indoor PCE concentration is anomalously high and the indoor air concentration is higher than the subslab concentration suggesting background indoor air source. Not considered reliable for calculation of alpha.

x = 615430 y = 474843	Basement?	Predicted Groundwater				360.00	50
		Predicted Soil Gas				151200.00	12500.00
		Measured Soil Gas	4/25/2002	1.83	9 ft 8 in S NE corner, 2 ft E	1556.11	2.37
		Measured Soil Gas	4/25/2002	1.83	5 ft 10 in N NW corner, 20 ft 1 in E	3398.92	10.35
		Measured Soil Gas	4/25/2002		16. 8 ft S SW corner, 10 ft E	38.64	ND
		Measured Soil Gas	4/25/2002		16. 8 ft S SW corner, 10 ft E	33	ND
		Measured Soil Gas	4/25/2002	2.26	16. 8 ft S SW corner, 10 ft E dup	2928.4	5.82
		Measured Soil Gas	4/25/2002	2.26	16. 8 ft S SW corner, 10 ft E dup	2779.28	5.34
		Measured Soil Gas	4/25/2002	1.52	11ft 8 in from SW corner, 3 ft W	38.51	ND
		Average Measured Soil Gas	4/25/2002			1538.98	5.97
		Measured Indoor Air	1/10/2002			67.7	NR
	Unfiltered	Measured/Predicted Soil Gas				1.02E-02	4.78E-04
		Groundwater Alpha				4.48E-04	N/A
		Soil Gas Alpha (avg. soil gas)				4.40E-02	N/A
		Soil Gas Alpha (max. soil gas)				1.99E-02	N/A
	Filtered	Groundwater Alpha				4.48E-04	N/A
		Soil Gas Alpha (avg. soil gas)			Filtered		N/A
		Soil Gas Alpha (max. soil gas)			Filtered		N/A

Note: SSD system installed on 13/02/2002. Soil gas data collected after SSD installation, therefore not reliable.

**TABLE 3: Wall Township - Groundwater, Soil Gas  
and Subslab Soil Gas Concentrations  
for Houses with Multiple Media Measurements**

Location	Foundation	Matrix	Date	Depth (m)	Location	PCE (Gdw: ug/L; Gas/Air:ug/m <sup>3</sup> )	TCE (Gdw: ug/L; Gas/Air: ug/m <sup>3</sup> )
						143	40
					Groundwater Source Strength Filter	6000	1000
					Soil Gas Source Strength Filter	600	100
					Subslab Source Strength Filter		
x = 615301 y = 474889	basement?	Predicted Groundwater				360.00	NR
		Predicted Soil Gas				151200.00	NR
		Measured Indoor Air	4/23/2002			12.65	ND
		Measured Indoor Air	4/23/2002			11.91	ND
		Measured Indoor Air	4/23/2002			11.91	ND
		Measured Indoor Air	4/23/2002			12.99	ND
		Measured Indoor Air	10/17/2002		Basement	2.08	ND (2.69)
		Measured Indoor Air	1/23/2003		Basement	ND(3.38)	ND(2.68)
		Average measured indoor air				12.365	ND
	Unfiltered	Groundwater Alpha				8.18E-05	N/A
	Filtered	Soil Gas Alpha				8.18E-05	N/A

Note: Average measured indoor air concentration measured on 23/04/2002.

x = 615364 y = 475019	Crawl-space?	Predicted Groundwater				370.00	NR
		Predicted Soil Gas				155400.00	NR
		Measured Soil Gas	4/24/2002	1.22	12.3 ft N SE corner, 1.3 ft E	81.71	ND
		Measured Soil Gas	4/24/2002	1.34	north side, hit clay at 4.4 ft depth	1.97	ND
		Measured Soil Gas	4/24/2002		south side, 8.5 ft from SW corner, 11.8 ft E	110.28	ND
		Measured Soil Gas	4/24/2002	1.22	4.5 ft N SW corner, 12 ft W	30.00	ND
		Measured Soil Gas	4/17/2002	1.83	5.4 ft S, 11.3 ft E SE corner	17.75	ND
		Average Measured Soil Gas	4/24/2002			48.34	ND
		Measured Indoor Air	4/24/2002		First Floor	0.27	ND
		Measured Indoor Air	4/24/2002		crawlspace	0.48	ND
		Ambient Air	4/24/2002			0.75	ND
	Unfiltered	Measured/Predicted Soil Gas				3.11E-04	N/A
		Groundwater Alpha				1.74E-06	N/A
		Soil Gas Alpha (avg. soil gas)				5.59E-03	N/A
		Soil Gas Alpha (max. soil gas)				2.45E-03	N/A
	Filtered	Groundwater Alpha				1.74E-06	N/A
		Soil Gas Alpha (avg. soil gas)			Filtered		N/A
		Soil Gas Alpha (max. soil gas)			Filtered		N/A

Note: Used first floor indoor air concentration for calculation of alpha.

x = 615243 y = 474902	Basement	Predicted Groundwater				360.00	NR
		Predicted Soil Gas				151200.00	NR
		Measured Soil Gas	4/17/2002	1.83	5.4 ft S, 11.3 ft E SE corner	17.75	ND
		Measured Subslab Gas	4/17/2002	0.46	concrete	5348.06	18.79
		Measured Indoor Air	1/9/2002		Basement	ND	
		Measured Indoor Air	4/17/2002		family room	1.23	ND
		Measured Indoor Air	4/17/2002		basement	12.2	ND
		Measured Indoor Air	10/17/2002		Basement	5.82	ND(2.69)
		Measured Indoor Air	1/23/2003		Basement	ND	ND
	Unfiltered	Measured/Predicted Soil Gas				1.17E-04	N/A
		Soil Gas/Subslab Gas				3.32E-03	N/A
		Groundwater Alpha				3.85E-05	N/A
		Soil Gas Alpha				3.28E-01	N/A
		Subslab Alpha				1.09E-03	N/A
	Filtered	Groundwater Alpha				1.17E-04	N/A
		Soil Gas Alpha			Filtered		N/A
		Subslab Alpha			Filtered		N/A

Note: Heavy rain during sampling on 09/01/2002. Used indoor concentration on 17/10/2002 for calculation of alpha.

**TABLE 3: Wall Township - Groundwater, Soil Gas  
and Subslab Soil Gas Concentrations  
for Houses with Multiple Media Measurements**

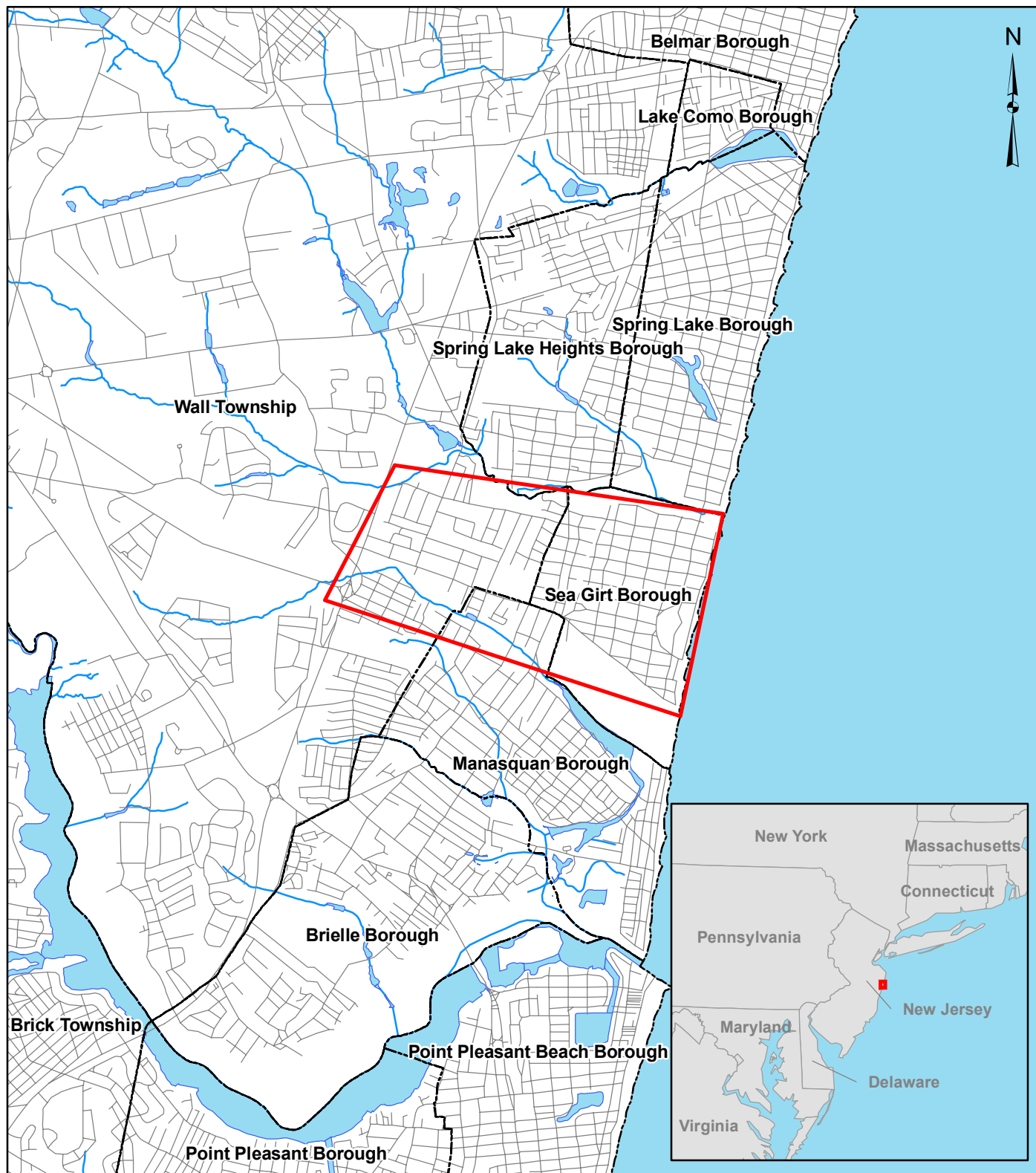
Location	Foundation	Matrix	Date	Depth (m)	Location	PCE (Gdw: ug/L; Gas/Air:ug/m <sup>3</sup> )	TCE (Gdw: ug/L; Gas/Air: ug/m <sup>3</sup> )
						143	40
					Groundwater Source Strength Filter	6000	1000
					Soil Gas Source Strength Filter	600	100
x = 615080 y = 475117		Predicted Groundwater				95.00	NR
		Predicted Soil Gas				39900.00	NR
		Measured Soil Gas	4/30/2002			2.51	ND
		Measured Soil Gas	4/30/2002			3.05	ND
		Measured Soil Gas	4/30/2002			ND	ND
		Measured Soil Gas	4/30/2002			ND	ND
		Average Measured Soil Gas				2.78	ND
		Measured Subslab Gas	4/30/2002	0.30		4.95	ND
		Measured Indoor Air	4/30/2002			ND	ND
		Measured Indoor Air	4/30/2002			0.54	ND
	Unfiltered	Measured/Predicted Soil Gas				6.97E-05	N/A
		Groundwater Alpha				1.35E-05	N/A
		Soil Gas Alpha				1.94E-01	N/A
		Subslab Alpha				1.09E-01	N/A
	Filtered	Groundwater Alpha				N/A	N/A
		Soil Gas Alpha				Filtered	N/A
		Subslab Alpha				Filtered	N/A
x = N/A y = N/A	Basement	Predicted Groundwater				65.00	NR
		Predicted Soil Gas				27300.00	NR
		Measured Soil Gas	5/7/2002	2.44	.3ft S and 5.8ft W of the SW corner of house	12.61	ND
		Measured Subslab	5/7/2002	0.30		2.37	ND
		Measured Indoor Air	5/7/2002			ND	ND
		Measured Indoor Air	5/7/2002		First Floor	ND	ND
		Measured Indoor Air	5/7/2002		basement	ND	ND
		Measured Ambient Air	5/7/2002		back deck	ND	ND
	Unfiltered	Measured/Predicted Soil Gas				4.62E-04	N/A
		Groundwater Alpha				N/A	N/A
		Soil Gas Alpha				N/A	N/A
		Subslab Alpha				N/A	N/A
	Filtered	Groundwater Alpha				N/A	N/A
		Soil Gas Alpha				N/A	N/A
		Subslab Alpha				N/A	N/A
x = 614865 y = 475108		Predicted Groundwater				75.00	NR
		Predicted Soil Gas				31500.00	NR
		Measured Soil Gas	5/7/2002	2.59	4.5ft W of SW corner of shed	32.75	ND
		Measured Soil Gas	5/7/2002	2.44	5ft S of NW corner and 1.1ft out from the ho	27.73	ND
		Measured Soil Gas	5/7/2002	3.05	55.5ft S of SW corner of house	14.1	ND
		Average Measured Soil Gas	5/7/2002			24.86	ND
		Measured Indoor Air	1/17/2003		Basement	8.82	ND(2.68)
		Measured Indoor Air	6/18/2003		Basement	4.80	NR
	Unfiltered	Measured/Predicted Soil Gas				7.89E-04	N/A
		Groundwater Alpha				1.52E-04	N/A
		Soil Gas Alpha				1.93E-01	N/A
	Filtered	Groundwater Alpha				Filtered	N/A
		Soil Gas Alpha				Filtered	N/A

Table 4. Wall Township - Groundwater, Soil Vapor and Indoor Air Concentrations Used for Alpha Analysis

x (State Plane Feet)	y (State Plane Feet)	Sump	SSD System Installed	PCE Estimated Groundwater Conc. (ug/L)	PCE Predicted Deep Vapor Conc. (ug/m <sup>3</sup> )	Best Estimate PCE Indoor Air Conc. (ug/m <sup>3</sup> )	Groundwater Alpha (unfiltered)	Groundwater Alpha (filtered)	Best Estimate PCE Indoor Air Conc. (ug/m <sup>3</sup> )	PCE Average Soil Vapor Conc. (ug/m <sup>3</sup> )	PCE Maximum Soil Vapor Conc. (ug/m <sup>3</sup> )	PCE Subslab Vapor (ug/m <sup>3</sup> )
614902	474748	Yes	2/11/2002	192.00	80640.00	16.93	2.10E-04	2.10E-04	16.93	85.20	365.00	
616461	475243	Yes	5/16/2002	80.00	33600.00	10.67	3.18E-04		10.67	3724.00		5177.40
616205	474520	Yes	4/18/2002	80.00	33600.00	51.60	1.54E-03		51.60	575.00		34431.00
616074	474564			85.00	35700.00	4.54	1.27E-04		4.54	48.00	58.00	
615692	474672			100.00	42000.00	1.69E+00	4.02E-05		1.69E+00			
615538	474730			190.00	79800.00	1.69E+00	2.12E-05	2.12E-05	1.69E+00			
615406	474761	No		220.00	92400.00	8.12	8.79E-05	8.79E-05	8.12			
615327	474782	Yes	4/23/2002	370.00	155400.00	29.11	1.87E-04	1.87E-04	29.11			
615267	474797	First Floor	4/16/2002	405.00	170100.00	22.70	1.33E-04	1.33E-04	22.70	998.00	1374.00	
615112	474687	No		90.00	37800.00	1.69E+00	4.47E-05		1.69E+00			
615199	474815	No	2/8/2002	430.00	180600.00	64.31	3.56E-04	3.56E-04	64.31			
615041	474696	Yes		115.00	48300.00	4.06	8.41E-05		4.06			
615152	474835	No	4/17/2002	425.00	178500.00	12.23	6.85E-05	6.85E-05	12.23	2255.00		17004.00
615087	474854	No	5/15/2002	410.00	172200.00	31.93	1.85E-04	1.85E-04	31.93	10381.00		22277.00
615032	474869	Yes	1/11/2002	405.00	170100.00	155.65	9.15E-04	9.15E-04	155.65			
614839	474772	Yes	2/27/2002	390.00	163800.00	14.50	8.85E-05	8.85E-05	14.50	212.00	743.00	
614982	474886	No	2/6/2002	370.00	155400.00	223.41	1.44E-03	1.44E-03	223.41			
614772	474797	Yes	1/18/2002	450.00	189000.00	58.88	3.12E-04	3.12E-04	58.88	2348.00	8438.00	
614924	474915	No	2/15/2002	240.00	100800.00	52.4	5.20E-04	5.20E-04	52.4	7135.00	33044.00	
614696	474817	Yes	1/7/2002	405.00	170100.00	1896.00	1.11E-02	1.11E-02	1896.00	1151.00	2293.00	
617160	474465	No		200.00	84000.00	2.3	2.74E-05	2.74E-05	2.3			
616789	474743		4/24/2002	220.00	92400.00	14.15	1.53E-04	1.53E-04	14.15	615.00		485.00
616702	474770			220.00	92400.00	3.14	3.40E-05	3.40E-05	3.14			
616511	474848			210.00	88200.00	1.69	1.92E-05	1.92E-05	1.69			
615751	474978		1/7/2003			7.36			7.36	6733.00	3530.00	
615403	475114					54.38			54.38	1.69		
615810	474858		5/22/2002	270.00	113400.00	36.26	3.20E-04	3.20E-04	36.26			
617226	473683	No				5.58			5.58	259.00		7.70
616583	473931	No	6/17/2002			7.99			7.99			384.00
615445	474140			200.00	84000.00	107.00	1.27E-03	1.27E-03	107.00	2477.00		14259.00
614602	474804	No		400.00	168000.00	81.21	4.83E-04	4.83E-04	81.21			
615593	474832	No		300.00	126000.00	5.08	4.03E-05	4.03E-05	5.08			
615566	474945	No		235.00	98700.00	1.69	1.71E-05	1.71E-05	1.69			
615430	474843	No	2/13/2002	360.00	151200.00	67.70	4.48E-04	4.48E-04	67.70	1539.00	3399.00	
615486	474986	No		205.00	86100.00	3.25	3.77E-05	3.77E-05	3.25			
615349	474876	No		370.00	155400.00	4.2	2.70E-05	2.70E-05	4.2			
615421	475002	No		185.00	77700.00	1.69	2.18E-05	2.18E-05	1.69			
615301	474889			360.00	151200.00	12.37	8.18E-05	8.18E-05	12.37			
615364	475019	No		370.00	155400.00	0.27	1.74E-06	1.74E-06	0.27	48.40	110.30	
615243	474902	No		360.00	151200.00	5.82	3.85E-05	3.85E-05	5.82	18.00		5348.00
615302	475043	No		150.00	63000.00	1.69	2.68E-05	2.68E-05	1.69			
615252	475058	No		140.00	58800.00	1.69	2.87E-05		1.69			
615128	474943	No		240.00	100800.00	4.45	4.41E-05	4.41E-05	4.45			
615197	475078			120.00	50400.00	1.69	3.35E-05		1.69			
615063	474962	No		195.00	81900.00	1.69	2.06E-05	2.06E-05	1.69			
615080	475117			95.00	39900.00	0.05	1.35E-06		0.05	3.00		5.00
614958	474991	No		160.00	67200.00	3.25	4.84E-05	4.84E-05	3.25			

Note: Filter criteria for groundwater are data points with calculated vapor concentrations from Henry's law above 60,000 ug/m3

	= NJDEP data	Statistics	Med	8.48E-05
	= EPA data from March 2003 table		90th	7.96E-04
	= NJDEP data, home remediated by NJDEP		95th	1.33E-03
	= NJDEP/EPA data, home remediated by EPA			
	= EPA Edison data only			




#### LEGEND

- Study Area
- Municipal Boundary
- Road
- Watercourse
- Waterbody

#### REFERENCE

New Jersey Department of Environmental Protection, ESRI  
Datum: NAD 83 Projection: State Plane, New Jersey (feet)

1,000 500 0 1,000  
Meters  
Scale - 1:50,000

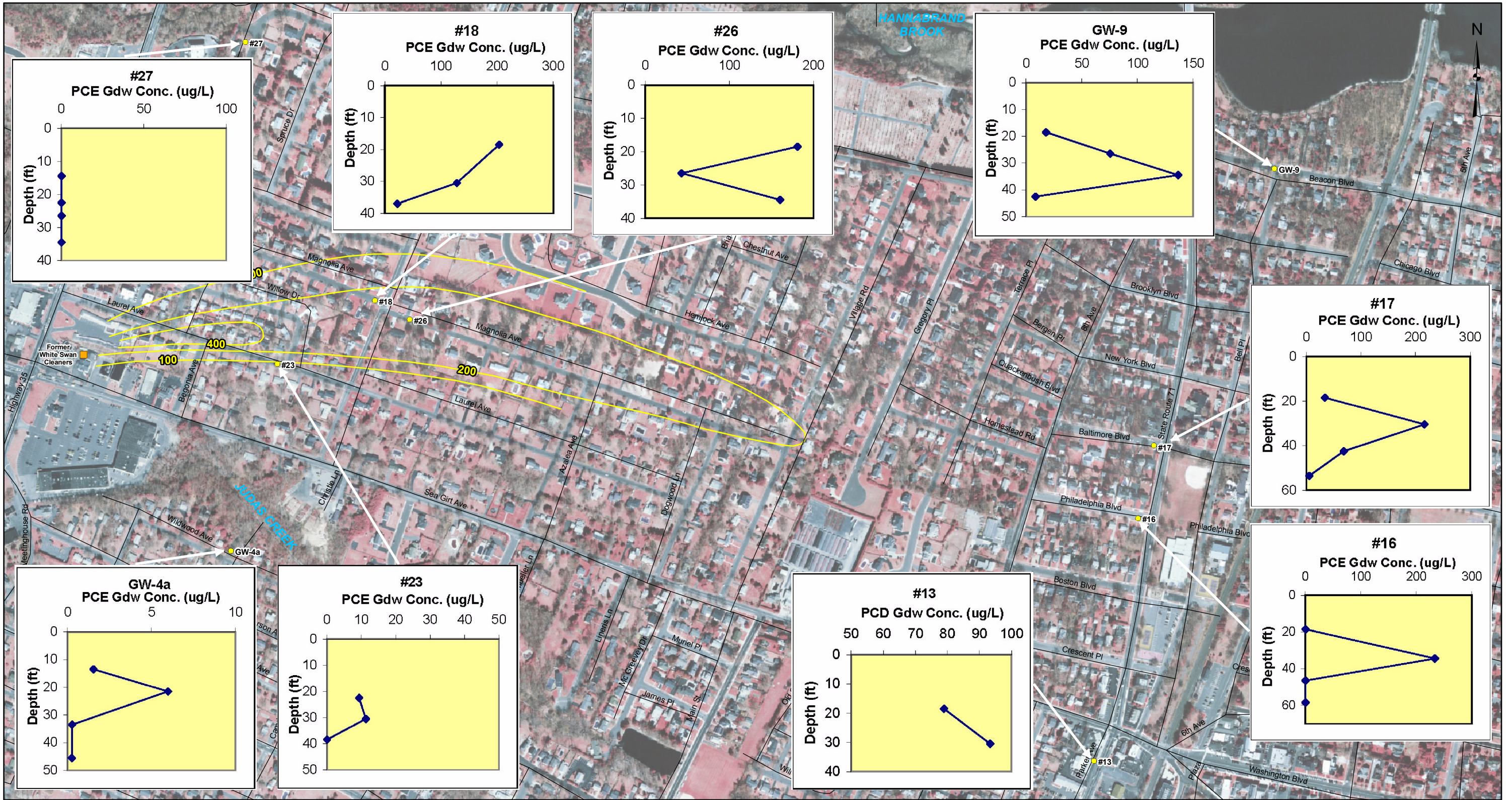
PROJECT		NJDEP - GOLDER		
		VAPOR INTRUSION RESEARCH PROJECT		
		NEW JERSEY, U.S.A		
TITLE		KEY PLAN		
		PROJECT No. 023-6124C		SCALE AS SHOWN
		DESIGN	IH 29 Mar. 2006	FIGURE 1
		GIS	CDB 29 Mar. 2006	
		CHECK	IH 29 Mar. 2006	
		REVIEW		







N:\Bur-Graphics\Projects\6000\023-6124C\GIS\aprs\Draft\figure-03\_vertical-concentration-profiles.mxd



- LEGEND**
- Source Location
  - Street Address
  - Approximate Center of Building
  - Road
  - Estimated Shallow PCE Groundwater Concentration Contour (ug/L)

**REFERENCE**  
New Jersey Department of Environmental Protection, Orthophotos (February-April, 2002)  
Datum: NAD 83 Projection: State Plane, New Jersey (feet)

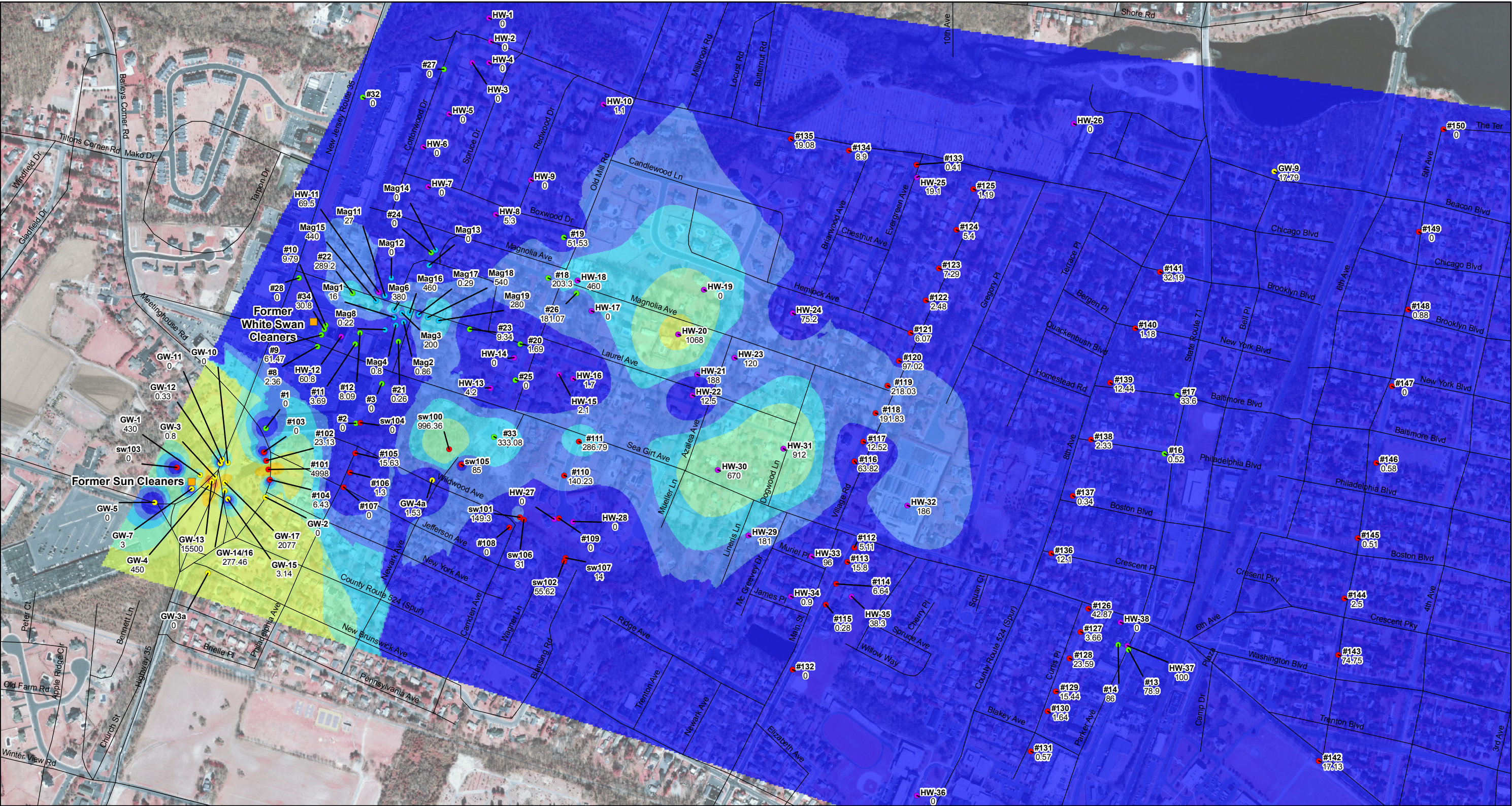
120 60 0 120  
Meters  
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**NOTE**  
Depth to water table ranges between approximately 13 and 21 feet below ground.

PROJECT	NJDEP - GOLDER VAPOR INTRUSION RESEARCH PROJECT NEW JERSEY, U.S.A		
TITLE	VERTICAL GROUNDWATER CONCENTRATION PROFILES WALL TOWNSHIP SITE		
PROJECT No. 023-6124C		SCALE AS SHOWN	REV. 1
DESIGN	IH	27 Mar. 2006	FIGURE 3
GIS	CDB	27 Mar. 2006	
CHECK	IH	27 Mar. 2006	
REVIEW			







**LEGEND**

Source Location

Approximate Well Location

PCE Concentration in Groundwater (g/L)

April 2003 "100- Series" BGWPA/BEMSA/BSM-Lead Investigation

BEMSA Sun Cleaner Data Points

BEMSA White Swan Investigation

July/August 2002 "Cozzi- Lead" BGWPA/BSM Investigation

MCHD Home Well Sample Results

Road

Interpolated Shallow PCE Concentration in Groundwater (g/L)

0 - 100

100 - 250

250 - 500

500 - 1000

1000 - 2000

2000 - 5000


5000 - 10000

> 10000

**REFERENCE**

New Jersey Department of Environmental Protection, Orthophotos (February-April, 2002)

Datum: NAD 83 Projection: State Plane, New Jersey (feet)

PROJECT	NJDEP - GOLDER VAPOR INTRUSION RESEARCH PROJECT NEW JERSEY, U.S.A																						
TITLE	<b>COMPUTER SIMULATED PCE CONCENTRATIONS IN GROUNDWATER WALL TOWNSHIP SITE</b>																						
		<table><tr><td>PROJECT No.</td><td>023-6124C</td><td>SCALE AS SHOWN</td><td>REV. 0</td></tr><tr><td>DESIGN</td><td>IH 29 Mar. 2006</td><td></td><td></td></tr><tr><td>GIS</td><td>CDB 29 Mar. 2006</td><td></td><td></td></tr><tr><td>CHECK</td><td>IH 29 Mar. 2006</td><td></td><td></td></tr><tr><td>REVIEW</td><td></td><td></td><td></td></tr></table>	PROJECT No.	023-6124C	SCALE AS SHOWN	REV. 0	DESIGN	IH 29 Mar. 2006			GIS	CDB 29 Mar. 2006			CHECK	IH 29 Mar. 2006			REVIEW				<b>FIGURE 4</b>
PROJECT No.	023-6124C	SCALE AS SHOWN	REV. 0																				
DESIGN	IH 29 Mar. 2006																						
GIS	CDB 29 Mar. 2006																						
CHECK	IH 29 Mar. 2006																						
REVIEW																							







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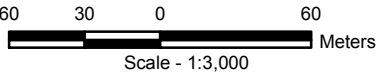


**LEGEND**

- Source Location
- Approximate Center of Building
- PCE Concentration in Indoor Air ( $\mu\text{g}/\text{m}^3$ )
- Road
- Estimated Shallow PCE Groundwater Concentration Contour ( $\mu\text{g}/\text{L}$ )

**REFERENCE**

New Jersey Department of Environmental Protection, Orthophotos (February-April, 2002)  
Datum: NAD 83 Projection: State Plane, New Jersey (feet)




PROJECT

NJDEP - GOLDER  
VAPOR INTRUSION RESEARCH PROJECT  
NEW JERSEY, U.S.A

TITLE

PCE CONCENTRATIONS IN INDOOR AIR  
WALL TOWNSHIP SITE



PROJECT No. 023-6124C

SCALE AS SHOWN

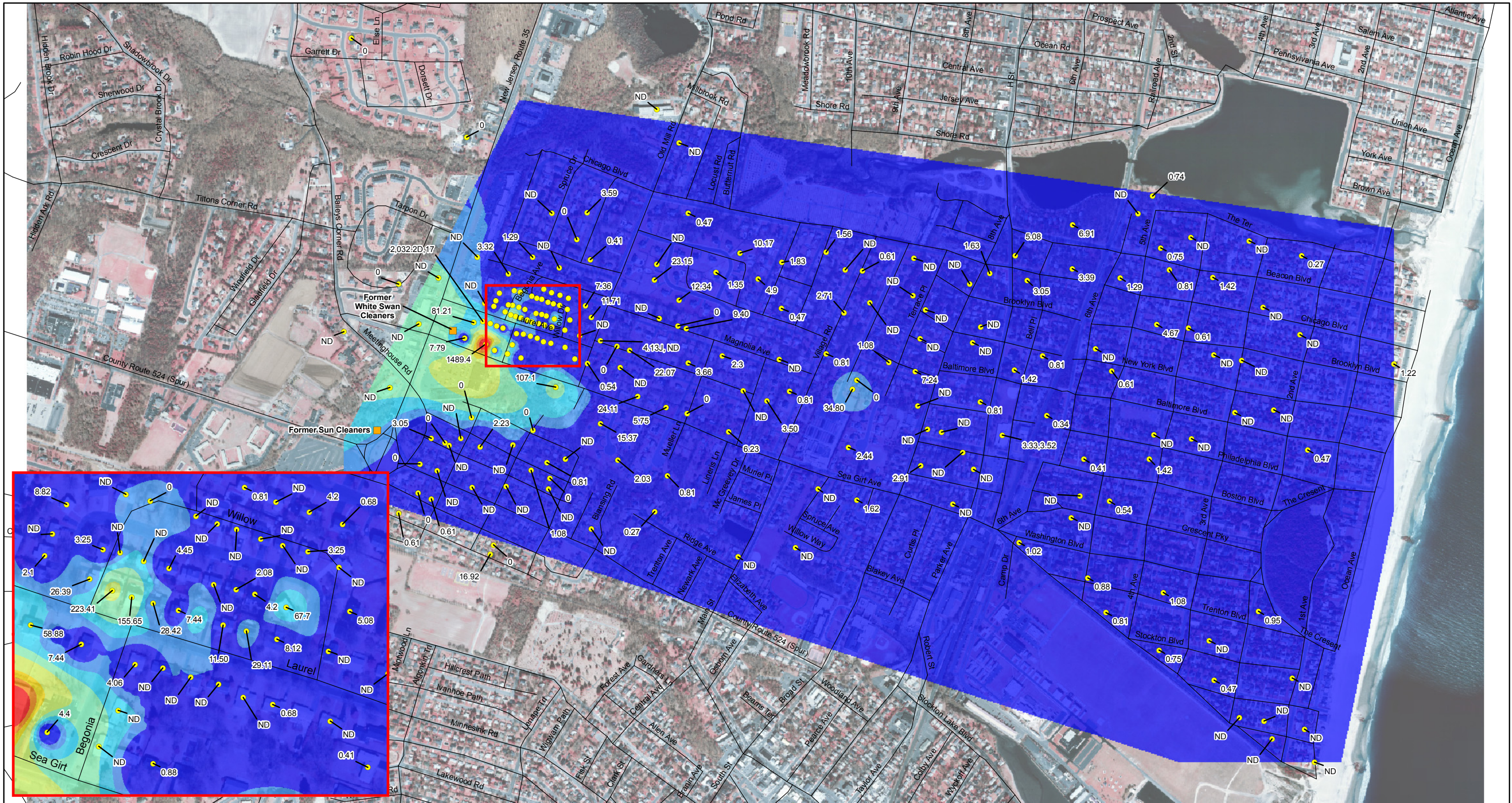
REV. 1

DESIGN	IH	27 Mar. 2006
GIS	CDB	22 Jun. 2006
CHECK	IH	27 Mar. 2006
REVIEW		

FIGURE 6



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#### LEGEND

- Source Location
- Approximate Center of Building
- PCE Concentration in Indoor Air ( $\mu\text{g}/\text{m}^3$ )
- Road

Interpolated PCE Concentration in Indoor Air ( $\mu\text{g}/\text{m}^3$ )

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 200
- 200 - 600
- 600 - 900
- 900 - 1200
- 1200 - 1500

300 150 0 300  
Scale - 1:12,000  
Meters

#### REFERENCE

New Jersey Department of Environmental Protection, Orthophotos (February-April, 2002)  
Datum: NAD 83 Projection: State Plane, New Jersey (feet)

PROJECT  
NJDEP - GOLDER  
VAPOR INTRUSION RESEARCH PROJECT  
NEW JERSEY, U.S.A

TITLE  
**COMPUTER SIMULATED  
PCE CONCENTRATIONS IN INDOOR AIR  
WALL TOWNSHIP SITE**



PROJECT No. 023-6124C	SCALE AS SHOWN	REV. 1
DESIGN IH 29 Mar. 2006		
GIS CDB 29 Mar. 2006		
CHECK IH 29 Mar. 2006		
REVIEW		

**FIGURE 7**



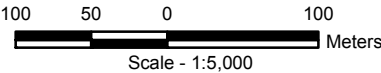


**LEGEND**

- Source Location
- Approximate Center of Building
- Measured PCE Concentration in Shallow External Soil Vapor Near House ( $\mu\text{g}/\text{m}^3$ )
- Road
- Estimated Shallow PCE Groundwater Concentration Contour ( $\mu\text{g}/\text{L}$ )

**REFERENCE**

New Jersey Department of Environmental Protection, Orthophotos (February-April, 2002)  
Datum: NAD 83 Projection: State Plane, New Jersey (feet)




PROJECT

NJDEP - GOLDER  
VAPOR INTRUSION RESEARCH PROJECT  
NEW JERSEY, U.S.A

TITLE

PCE CONCENTRATIONS IN SHALLOW SOIL VAPOR  
WALL TOWNSHIP SITE

Golder Associates  
Burnaby, B.C.

PROJECT No. 023-6124C	SCALE AS SHOWN	REV. 1
DESIGN IH 27 Mar. 2006		
GIS CDB 27 Mar. 2006		
CHECK IH 27 Mar. 2006		
REVIEW		

FIGURE 8



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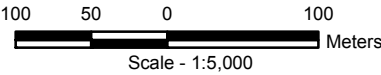


**LEGEND**

- Source Location
- Approximate Center of Building
- Measured PCE Concentration in Subslab Soil Vapor Below House ( $\mu\text{g}/\text{m}^3$ )
- Road
- Estimated Shallow PCE Groundwater Concentration Contour ( $\mu\text{g}/\text{L}$ )

**REFERENCE**

New Jersey Department of Environmental Protection, Orthophotos (February-April, 2002)  
Datum: NAD 83 Projection: State Plane, New Jersey (feet)




**PROJECT**

NJDEP - GOLDER  
VAPOR INTRUSION RESEARCH PROJECT  
NEW JERSEY, U.S.A

**TITLE**

PCE CONCENTRATIONS IN SUBSLAB SOIL VAPOR  
WALL TOWNSHIP SITE

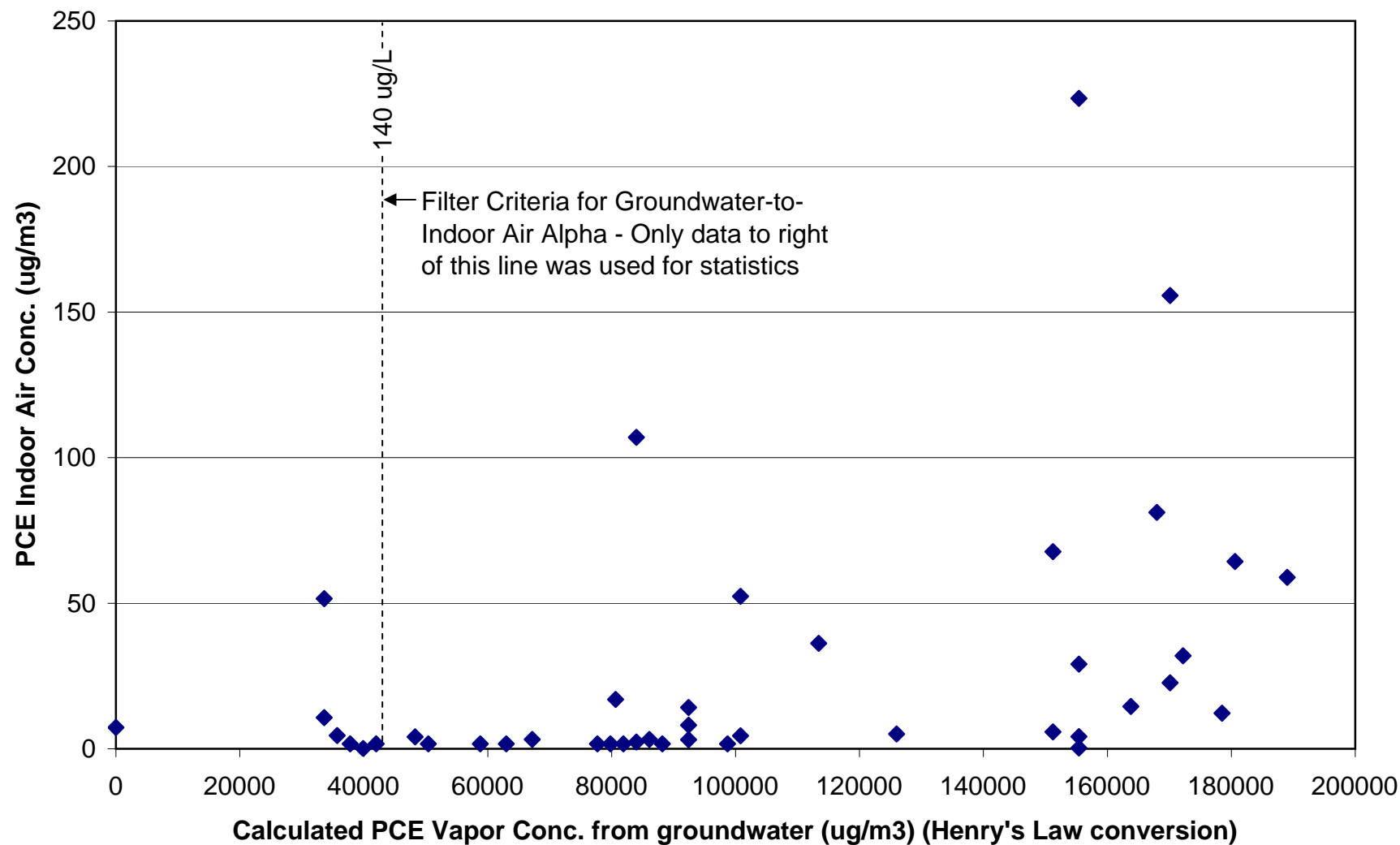


Golder Associates  
Burnaby, B.C.

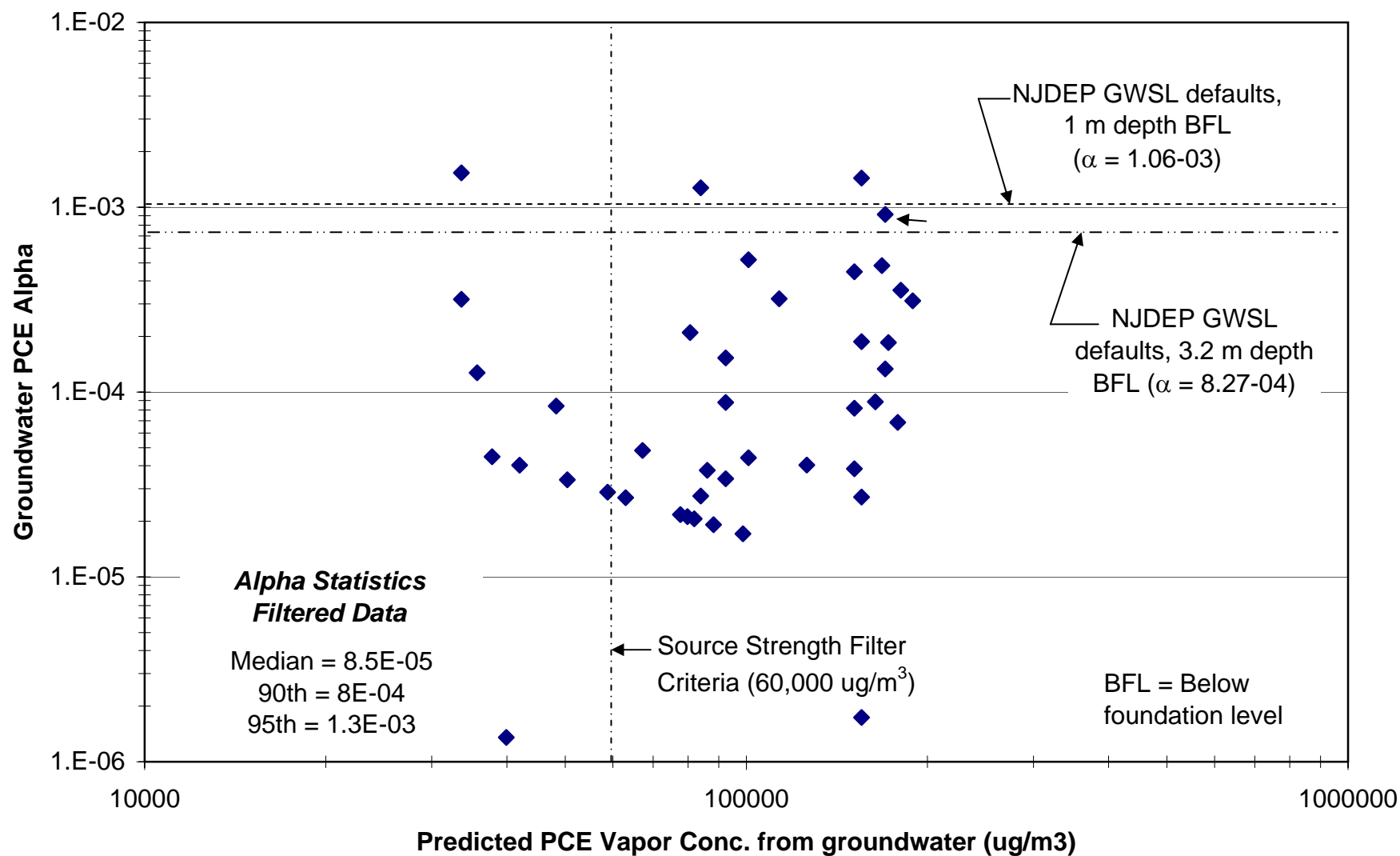
PROJECT No.	023-6124C	SCALE AS SHOWN	REV. 1
DESIGN	IH 27 Mar. 2006		
GIS	CDB 27 Mar. 2006		
CHECK	IH 27 Mar. 2006		
REVIEW			

**FIGURE 9**

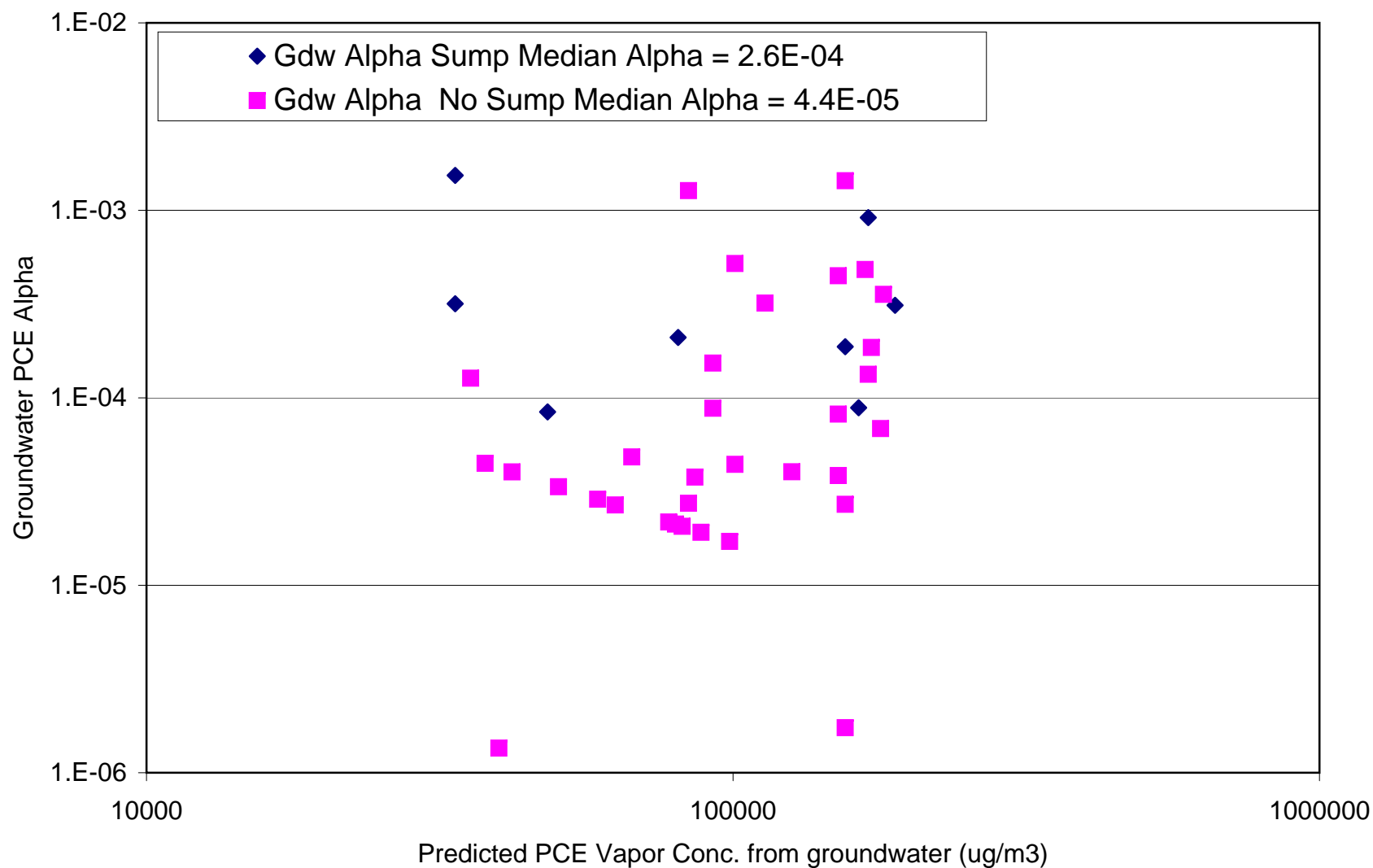




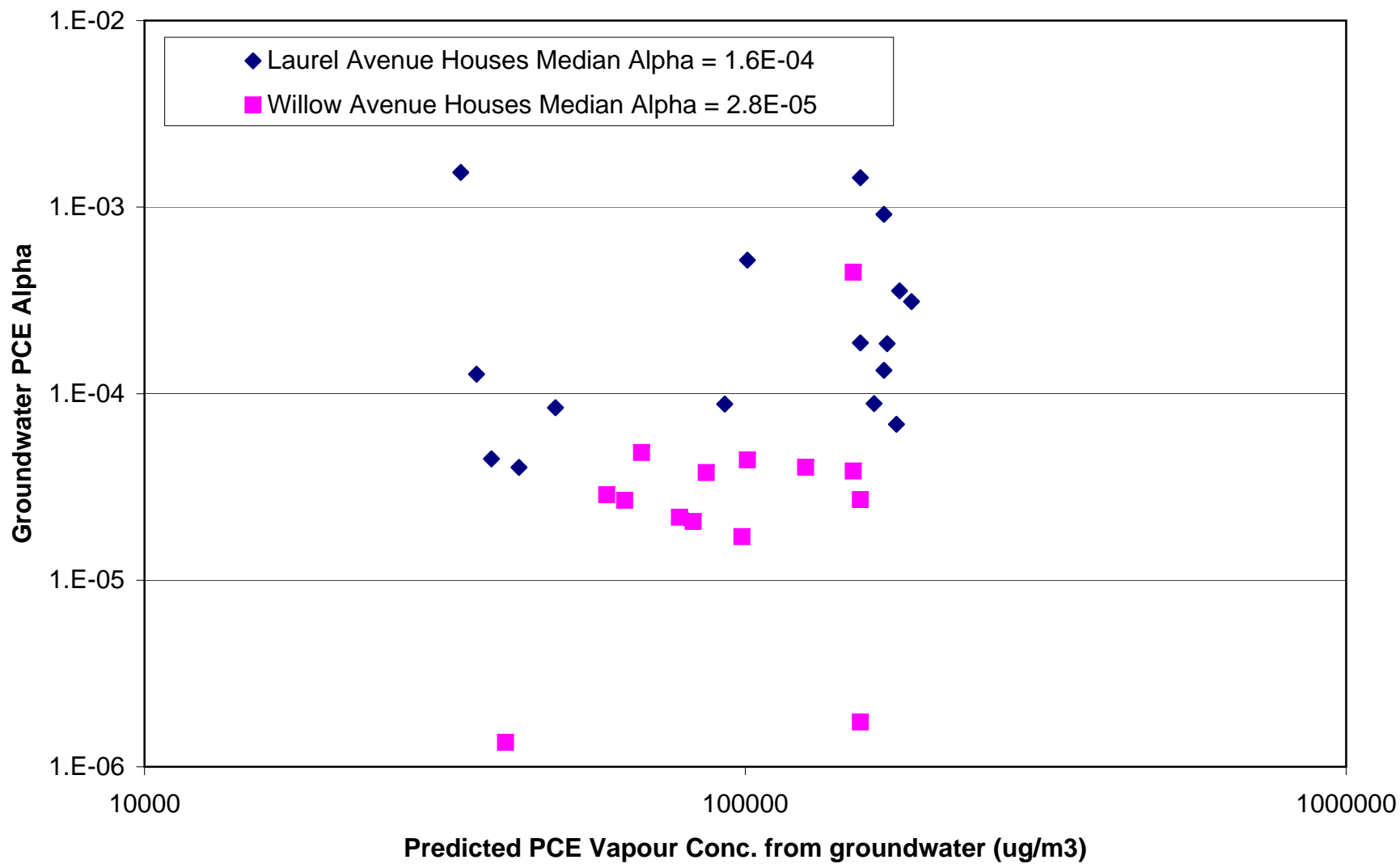
**Figure 10. Wall Township - Paired Predicted Vapor and Indoor PCE Concentrations**



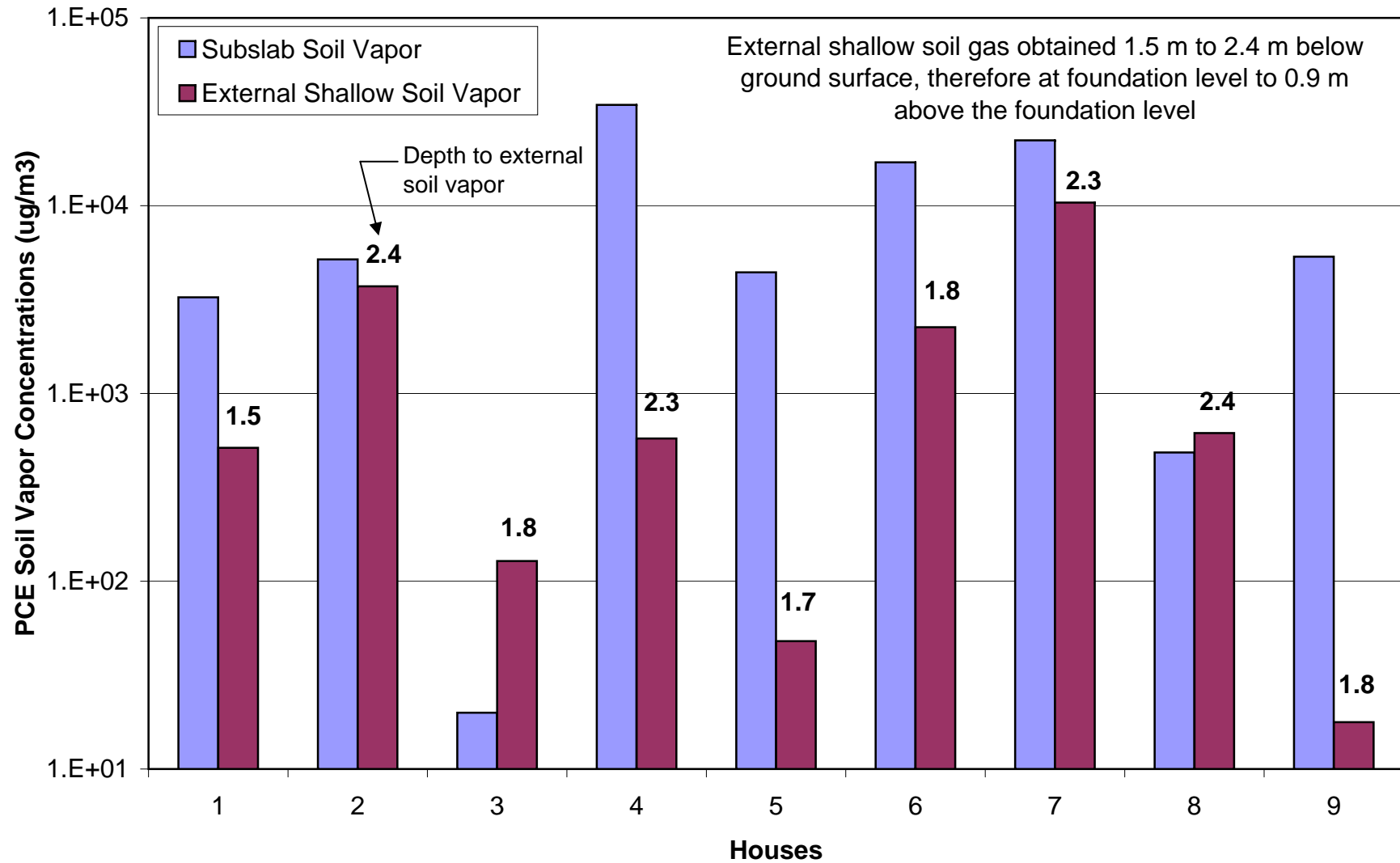
**Figure 11. Wall Township - Groundwater Alpha**



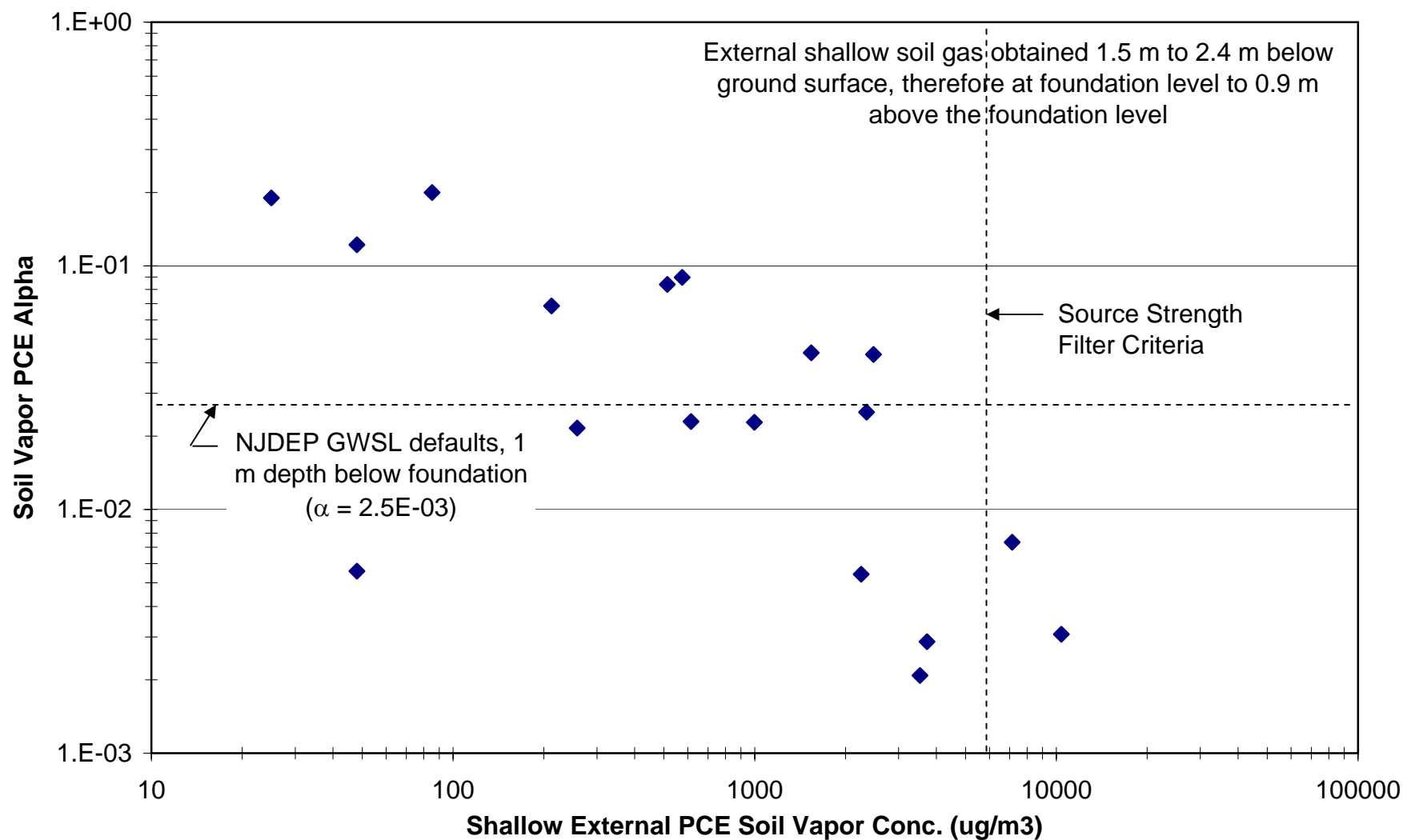
**Figure 12. Wall Township - Groundwater Alpha for Houses with and without Sump**



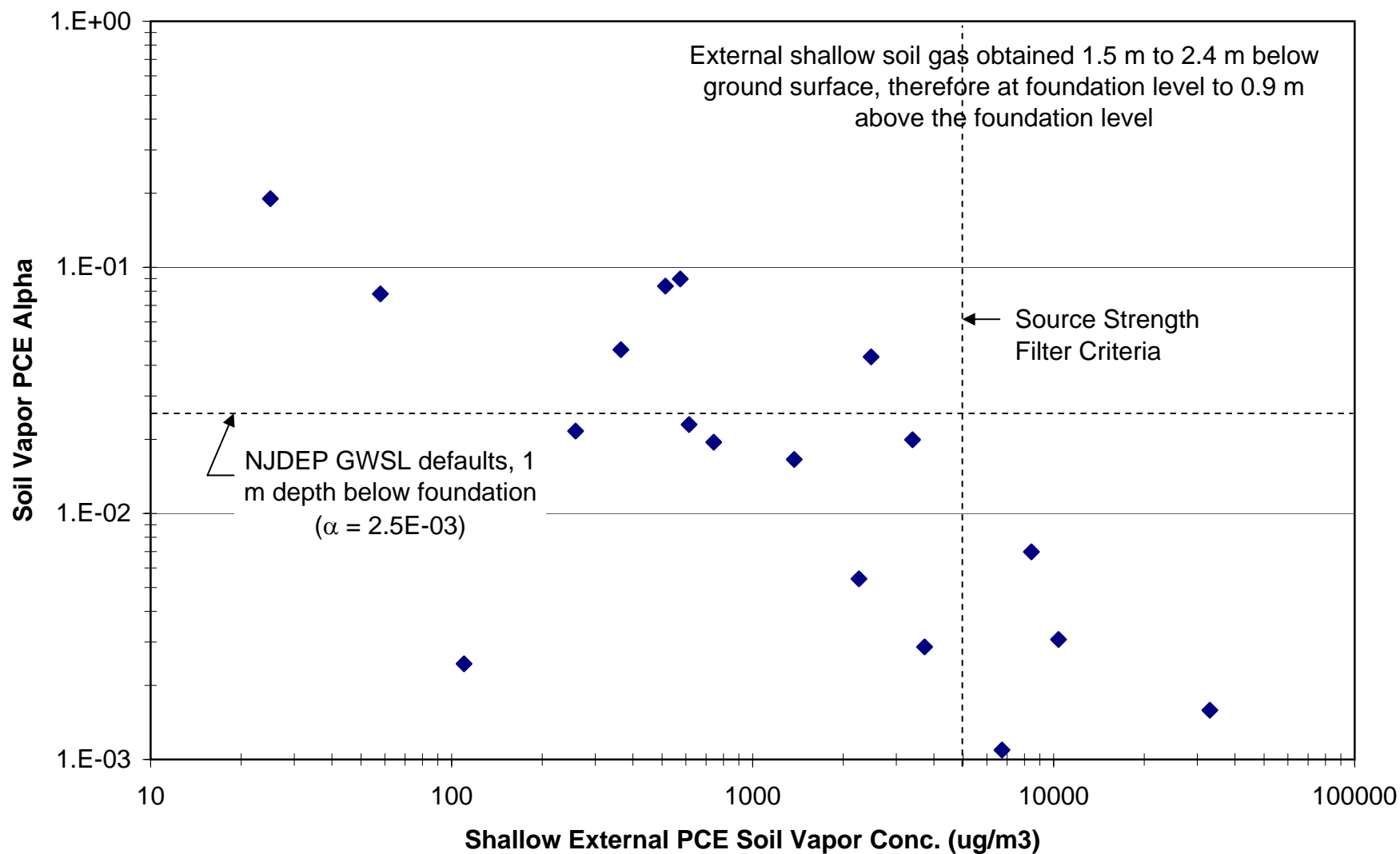
**Figure 13. Wall Township - Comparison of Alpha's for Laurel & Willow Avenue Houses**



**Figure 14. Wall Township - Comparison of Shallow External and Subslab Soil Vapor Concentrations**



**Figure 15. Wall Township - External Soil Vapor Alpha**  
**(Average soil vapor concentration where multiple points surrounding building)**



**Figure 16. Wall Township - External Soil Vapor Alpha  
(Maximum soil vapor concentration where multiple points)**

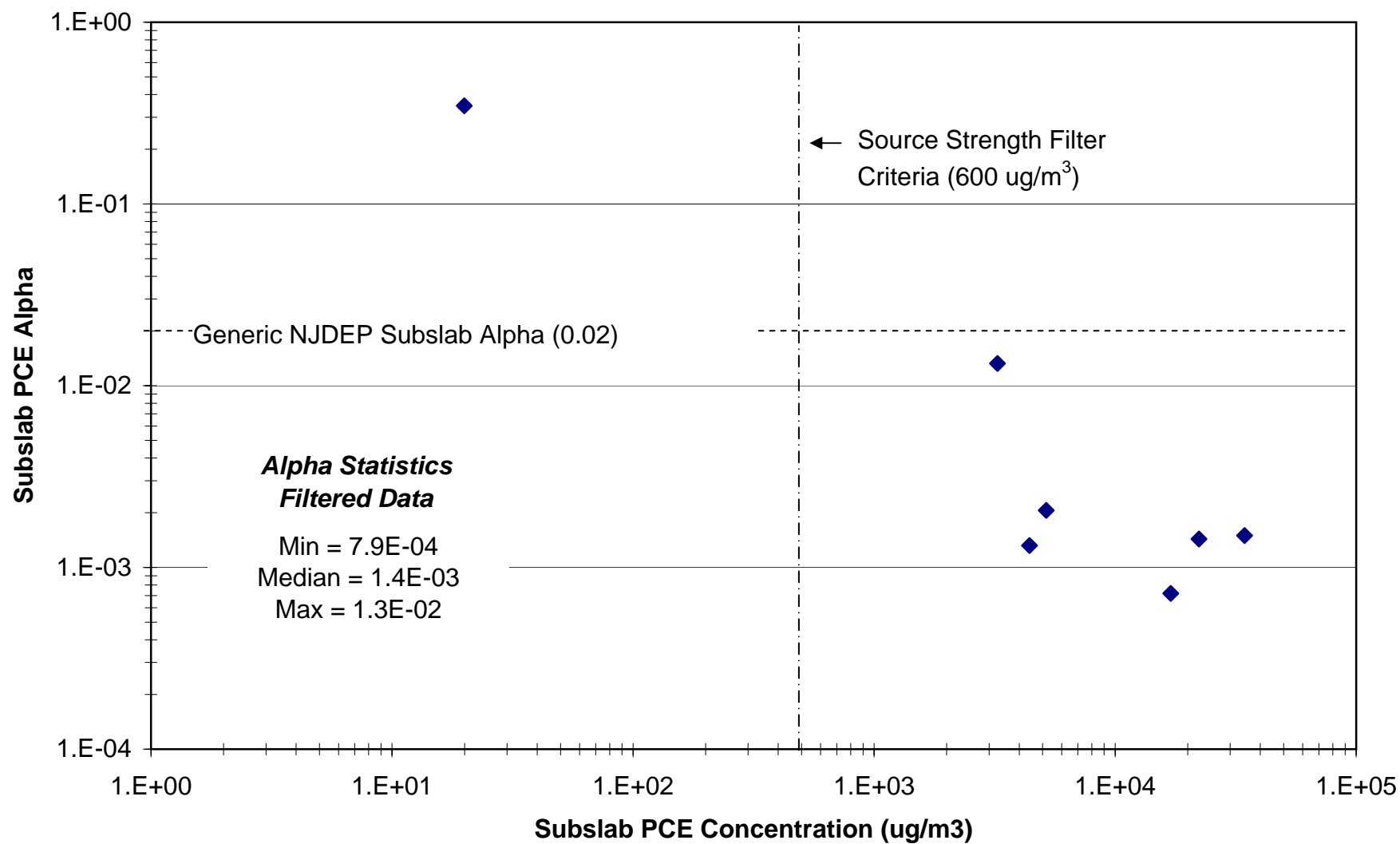


Figure 17. Wall Township - Subslab Vapor Alpha's



**APPENDIX I**

**NJDEP INDOOR AIR QUALITY DATABASE**

x (State Plane Feet)	y (State Plane Feet)	SSD System Installed	Indoor Air Date 1	Indoor Air Location 1	Indoor Air PCE 1 (ug/m3)	Indoor Air TCE 1 (ug/m3)	Indoor Air Benzene 1 (ug/m3)	Indoor Air Date 2	Indoor Air Location 2	Indoor Air PCE 2 (ug/m3)	Indoor Air TCE 2 (ug/m3)	Indoor Air Benzene 2 (ug/m3)	Indoor Air MTBE 2 (ug/m3)	Indoor Air Date 3	Indoor Air Location 3	Indoor Air PCE 3 (ug/m3)	Indoor Air TCE 3 (ug/m3)	Indoor Air Benzene 3 (ug/m3)	Indoor Air MTBE 3 (ug/m3)
614586	473110	No	1/3/2002		ND														
614223	473279	Yes	12/27/2001		ND														
614048	473349																		
616808	474388	No-open soil	1/31/2002		3.66														
623187	473495	No	1/28/2002		0.47			1/28/2002		0.34									
622438	473878	Yes	1/22/2002		ND			1/22/2002		ND									
620167	474317	No	1/14/2002		1.42														
622210	475271	Yes	1/22/2002		1.42														
621765	475347	No-Fl. Drain	1/24/2002		0.81														
621675	475575	Yes	1/21/2002		0.75														
620766	475812	No refused	1/21/2002		6.91			1/21/2002		7.04				3/27/2002	Basement	5.35	ND	ND	
614997	474578	No	1/10/2002		ND														
614902	474748	Yes	2/11/2002	10/25/2001	Basement	7.44	ND(2.68)	18.47	1/19/2002	Basement	16.93	ND(2.68)	13.69	1/19/2002	Kitchen Fl.	6.57	ND	15.28	
615810	472679	No	1/10/2002		ND														
620883	473399	No	1/24/2002		0.41			1/24/2002		0.41									
619635	473470	No	1/14/2002		ND														
619415	473678	No	1/16/2002		ND														
619272	473709	No	1/16/2002		ND														
615801	475455	No	1/10/2002		0.41														
615481	475369	Yes	1/3/2002		ND														
615209	475479	No	1/24/2002		1.29														
622508	474418	No	1/16/2002		ND														
622221	474475	Yes	1/17/2002		ND														
621962	474748	No	1/28/2002		0.61														
621633	474787	Yes	1/24/2002		4.67														
617772	475426	No	1/14/2002		1.83														
617529	475254	No	1/7/2002		4.9														
617094	475322	Yes	1/8/2002		1.35														
617342	475521		8/20/2003	1/16/2003	Basement	10.17	ND(2.68)	6/18/2003	Basement	18.00	ND(2.68)	1.60		9/23/2003	Basement	ND	ND	ND	
623108	474680	No	1/16/2002		ND														
622728	474964	No	1/17/2002		ND														
621256	475263	No	1/22/2002		1.29														
620763	475361	No	1/16/2002		3.39														
620299	475237	No-earthen pit	1/14/2002		3.05														
620175	475496	No	1/15/2002		5.08														
619913	475313	No	1/28/2002		1.63														
615905	473769	Yes	5/21/2002	1/7/2002	Basement	15.37		3/27/2002	Basement	19.63	ND(2.68)	ND(1.60)		6/6/2002	Basement	ND	ND	4.14	
616084	473390	Yes	1/28/2002		2.03														
621146	472966	No	1/24/2002		0.54														
620842	473020	Yes	1/22/2002		ND														
620755	472797	Yes	1/22/2002		ND														
619747	473293	Yes	1/15/2002		ND														
619204	473335	No	1/28/2002		2.91														
617618	474002		6/18/2003	Basement	3.50														
619706	475204	No	1/9/2002		ND														
619174	473949	No-earthen area	1/9/2002		ND														
618229	475530	No	1/7/2002		1.56														
617770	474951	No	1/7/2002		0.47														
621985	475685	No	1/9/2002		ND														
613342	477737																		
618681	475010	Yes	1/10/2002		ND														
618547	474213																		
618498	474118	No	5/23/2002	1/14/2002	Basement	34.80		1/14/2002	Basement	29.3				3/27/2002	Basement	45.34	ND	10.51	
616715	475038		12/5/2002	5/31/2002	Basement	12.34		10/17/2002	Basement	23.43	ND(2.68)	9.55		1/23/2003	Basement	ND	ND	11.18	ND
616461	475243	Yes	5/16/2002	1/3/2002	Basement	23.15		3/27/2002	Basement	42.63	ND(2.68)	ND(1.60)		3/27/2002	Basement	1.69	ND	1.75	
616485	475406		10/17/2002	Basement	ND (3.39U)	ND (2.69)	2.58	1/23/2003	Basement	ND(3.38)	ND(2.68)	ND(1.60)							
614527	476715																		
614637	475483	No	1/31/2002		ND			1/31/2002		ND									
614236	475264	No	1/31/2002		ND														

x (State Plane Feet)	y (State Plane Feet)	SSD Sump	System Installed	Indoor Air Date 1	Indoor Air Location 1	Indoor Air PCE 1 (ug/m3)	Indoor Air TCE 1 (ug/m3)	Indoor Air Benzene 1 (ug/m3)	Indoor Air Date 2	Indoor Air Location 2	Indoor Air PCE 2 (ug/m3)	Indoor Air TCE 2 (ug/m3)	Indoor Air Benzene 2 (ug/m3)	Indoor Air MTBE 2 (ug/m3)	Indoor Air Date 3	Indoor Air Location 3	Indoor Air PCE 3 (ug/m3)	Indoor Air TCE 3 (ug/m3)	Indoor Air Benzene 3 (ug/m3)	Indoor Air MTBE 3 (ug/m3)
614035	474791	Yes		1/31/2002		ND														
619147	474305	No	11/9/2002	1/14/2002	Basement	7.24			3/27/2002	Basement	5.82	ND(2.68)	2.58		7/31/2002	Basement	11.38	ND	5.41	
618876	474394	No		1/14/2002		1.08														
615385	473203																			
615354	473363	No		1/21/2002		0.81														
615191	473284	No		1/3/2002		1.08														
614667	473526	ch. Dr., no sump		1/3/2002		2.23			1/3/2002		1.63									
613829	475201																			
617377	474103			2/27/2003		ND	ND	ND												
616107	474342			12/10/2001	Basement	ND(3.38)	ND(2.68)	ND(1.59)												
616205	474520	Yes	4/18/2002	1/7/2002	Basement	22.07			1/7/2002	Basement	20.38				3/27/2002	Basement	48.05	ND	3.50	
616074	474564																			
615905	474619			12/10/2001	Basement	4.13J, ND	ND(2.68)	ND(1.59)												
615692	474672			12/10/2001	Basement	ND(3.38)	ND(2.68)	1.81												
615543	474550	No		1/16/2002		ND														
615538	474730			12/10/2001	Basement	ND (3.38U)	ND(2.68)	2.39												
615395	474593	No		1/10/2002		0.68														
615319	474611			12/10/2001	Basement	ND(3.38)	ND(2.68)	3.02												
615256	474645			12/10/2001	Basement	ND(3.38)	ND(2.68)	2.32												
615406	474761	No		12/10/2001	Basement	8.12	ND(2.68)	ND(1.60)	1/8/2002		4.7				9/24/2003	Basement	6.60			
615327	474782	Yes	4/23/2002	1/16/2002		29.11			3/27/2002	Basement	47.37	ND(2.68)	ND(1.59)		7/31/2002	Basement	10.04	ND	6.05	
615184	474663			12/10/2001	Basement	ND(3.38)	ND(2.68)	3.06												
615267	474797	First Floor	4/16/2002	12/10/2001	Basement	11.50	ND(2.68)	4.14	1/22/2002	Basement	33.99				6/7/2002	Basement	7.44J	ND	ND	
615112	474687	No		1/16/2002		ND														
615199	474815	No	2/8/2002	1/19/2002		64.31														
615041	474696	Yes		12/10/2001	Basement	4.06	ND(2.68)	2.45	1/17/2002		4.94									
615152	474835	No	4/17/2002	12/10/2001	Basement	7.44	ND(2.68)	5.41	1/8/2002	Basement	16.72				1/8/2002	Basement	16.32			
615087	474854	No	5/15/2002	12/10/2001	Basement	28.42	ND(2.68)	ND(1.59)	1/16/2002	Basement	21.46				5/6/2002	Basement	64.97	ND	ND	
615032	474869	Yes	1/11/2002	12/10/2001	Basement	155.65	ND(2.68)	ND(1.59)												
614839	474772	Yes	2/27/2002	10/25/2001	Basement	22.33	ND(2.68)	1.88	10/25/2001	Living Room	ND(3.38)	ND(2.68)	ND(1.59)		2/7/2002	Basement	8.12			
614982	474886	No	2/6/2002	1/19/2002		223.41														
614772	474797	Yes	1/18/2002	10/25/2001	Basement	58.88	ND(2.68)	ND(1.59)	12/5/2001	Dining Room	5.48	ND(2.68)	1.72		12/10/2001	Basement	1.83J	ND	1.59	
614924	474915	No	2/15/2002	12/10/2001	Basement	26.39	ND(2.68)	14.64	1/15/2002		78.4									
614696	474817	Yes	1/7/2002	12/10/2001	Basement	2,032.2D,1760	11.26	2.42												
614715	475006	No		1/16/2002	Bldg. 1	ND			1/16/2002	Bldg. 1	ND(3.38)				1/16/2002	Bldg. 3	ND			
617745	474426	No		1/8/2002		ND														
617160	474465	No		1/7/2002		2.3														
616789	474743		4/24/2002	12/10/2001	Basement	9.47	ND(2.68)	ND(1.59)	1/17/2002	Basement	22.68				6/5/2002	Basement	ND	ND	ND	
616702	474770			5/1/2002		3.14	ND	0.64												
616511	474848			12/10/2001	Basement	ND(3.38)	ND(2.68)	4.46												
615751	474978		1/7/2003	10/17/2002	Basement	7.36	ND(2.68)	ND(1.59)	1/23/2003	Basement	1.76J	ND(2.68)	ND(1.59)	ND						
615403	475114			10/17/2002	Basement	ND(3.38)			1/23/2003	Basement	ND(3.38)	ND(2.68)	ND(1.60)							
613736	474137	No		1/31/2002		ND														
613263	474711	Mo		2/5/2002		ND			2/5/2002		ND									
616595	473231	No		1/8/2002		0.81														
622224	471123	No		1/28/2002		0.47														
615005	473543	No		1/2/2002		ND														
614935	473121	No		1/3/2002		ND														
614805	472516																			
614026	473053																			
621171	474306	No		1/23/2002		0.61														
621005	474537	No		1/22/2002		ND														
622838	473909	No		1/17/2002		ND			1/17/2002		ND									
620457	474461	No		1/15/2002		0.81			1/15/2002		0.75									
619821	474762	No		1/15/2002		ND														
619736	474601	Yes		1/14/2002		ND														
615371	473090	No		1/8/2002		ND														
614349	473540	Yes		1/27/2001		ND														
614304	473568																			

x (State Plane Feet)	y (State Plane Feet)	SSD System Installed	Indoor Air Date 1	Indoor Air Location 1	Indoor Air PCE 1 (ug/m3)	Indoor Air TCE 1 (ug/m3)	Indoor Air Benzene 1 (ug/m3)	Indoor Air Date 2	Indoor Air Location 2	Indoor Air PCE 2 (ug/m3)	Indoor Air TCE 2 (ug/m3)	Indoor Air Benzene 2 (ug/m3)	Indoor Air MTBE 2 (ug/m3)	Indoor Air Date 3	Indoor Air Location 3	Indoor Air PCE 3 (ug/m3)	Indoor Air TCE 3 (ug/m3)	Indoor Air Benzene 3 (ug/m3)	Indoor Air MTBE 3 (ug/m3)
614164	473614	Yes	1/27/2001		3.05														
617321	472395	No	2/4/2002		ND														
624076	474376	No	1/29/2002		1.22			1/29/2002		2.57									
623257	470278	No	1/30/2002		ND														
616715	476654	No	1/28/2002		ND			10/17/2002	Basement	ND (3.39)	ND (2.69)	21.01							
615810	474858		5/22/2002	1/9/2002	Basement	11.71		3/27/2002	Basement	20.30	ND(2.68)	ND(1.60)		6/5/2002	Basement	58.88	ND	ND	
615770	474389	Yes	1/7/2002		0.54														
615640	474431	No	1/17/2002		0.41														
616485	477002	No	12/10/2001	Cafeteria	ND(3.38)	ND(2.68)	1.85	12/10/2001	Elevator Shaft	ND(3.38)	ND(2.68)	1.62		1/19/2002	Attic Shaft(6)	ND			
618146	473093	No	2/11/2002		ND														
614771	472420	No	2/4/2002		16.92			2/4/2002		15.71									
613826	472845	No	2/4/2002		0.61														
621990	473611	Yes	1/17/2002		ND														
621557	473400	Yes	1/24/2002		1.42														
621605	473650	Yes	1/21/2002		ND														
620499	473850	No	1/22/2002		0.34														
619818	473991	Yes	1/15/2002		0.81														
614577	473827																		
614468	473614	No	12/27/2001		ND														
614164	472989	No	2/11/2002		0.61														
619197	474641	No	1/9/2002		ND														
615768	475937	No	1/3/2002		3.59														
615663	475660																		
616466	472859	No	2/11/2002		0.27														
621112	471821	Yes	1/24/2002		0.81														
619533	472938	Yes	1/17/2002		ND														
617226	473683	No	1/7/2002		6.23														
616798	473872																		
616583	473931	No	6/17/2002	12/10/2001	Basement	5.75	ND(2.68)	1.59	1/21/2002	Basement	10.22			7/31/2002	Basement	5.36	ND	4.46	
616290	474044		12/6/2002	6/5/2002	Basement	24.11			10/17/2002	Basement	10.04	ND(2.68)	ND(1.60)	1/23/2003	Basement	2.51J	ND	ND	ND
615445	474140			10/17/2002	Basement	107.1	ND(2.68)	ND(1.60)											
615087	474441	Yes	2/11/2002		0.88														
614947	474485			12/10/2001	Basement	ND(3.38)	ND(2.68)	3.18											
614815	474522	No	1/31/2002		4.4														
614724	474585	No	1/31/2002		1489.4														
614507	474648	No	5/31/2002	1/30/2002	Basement	7.79		3/27/2002	Basement	35.87	ND(2.68)	ND(1.60)		7/31/2002	Back Room	27.44	4.62	8.6	
614602	474804	No	10/25/2001	Office	81.21	ND(2.68)	ND(1.59)	10/25/2001	Basement	87.98	ND(2.68)	ND(1.60)		10/25/2001	SW Crawl	1421.1	4.93	ND	
620043	473647	No	12/17/2001	Library	3.33,3.52			12/17/2001	Office	6.43				12/24/2001	Gym	2.84J			
623153	470619	Yes	1/30/2002		ND														
622821	470518	Yes	1/30/2002		ND														
622736	470703	No	1/30/2002		ND														
622483	470737	Yes	1/28/2002		ND														
621442	475927	No	1/23/2002		ND														
615405	475932	No	1/3/2002		ND														
623029	471145	Yes	1/28/2002		ND														
622173	471531	Yes	1/28/2002		ND														
621658	471432	Yes	2/5/2002		0.75														
618546	472980	No	1/14/2002		1.62														
619124	475080	No	1/10/2002		ND														
619253	474939	No	1/8/2002		ND														
618460	473521	Yes	1/10/2002		2.44														
623125	475496	Yes	1/23/2002		0.27														
622584	475648	Yes	1/22/2002		ND														
621591	476107	No	1/9/2002		0.74														
622680	471832	No	1/29/2002		0.95														
621701	472026	No	1/24/2002		1.08														
620924	472178	No	1/24/2002		0.88														
618229	474486	No	1/15/2002		0.81														

x (State Plane Feet)	y (State Plane Feet)	SSD System Installed	Indoor Air Date 1	Indoor Air Location 1	Indoor Air PCE 1 (ug/m3)	Indoor Air TCE 1 (ug/m3)	Indoor Air Benzene 1 (ug/m3)	Indoor Air Date 2	Indoor Air Location 2	Indoor Air PCE 2 (ug/m3)	Indoor Air TCE 2 (ug/m3)	Indoor Air Benzene 2 (ug/m3)	Indoor Air MTBE 2 (ug/m3)	Indoor Air Date 3	Indoor Air Location 3	Indoor Air PCE 3 (ug/m3)	Indoor Air TCE 3 (ug/m3)	Indoor Air Benzene 3 (ug/m3)	Indoor Air MTBE 3 (ug/m3)
618412	474908	No	1/16/2002		2.71			1/16/2002		2.84									
617852	474098	No	1/8/2002		0.81														
618603	475339	No	1/9/2002		0.61			1/9/2002		0.61									
618426	475348		2/27/2003		ND(3.38)	ND(2.68)	3.19												
620215	472541	Yes	1/23/2002		1.02														
619132	475469	No	1/9/2002		ND														
616810	475930	Yes	1/28/2002		0.47														
615575	475057	No-hole in floor	1/15/2002		0.68														
615489	475088	No	1/16/2002		4.2														
615322	475151	No-pipe in floor	1/28/2002		0.81														
614958	475307	No	1/7/2002		3.32														
615545	473400	No	1/3/2002		ND														
615213	473698																		
615593	474832	No	1/24/2002		5.08														
615566	474945	No	1/9/2002		ND														
615430	474843	No	2/13/2002	1/10/2002	67.7														
615486	474986	No	1/9/2002		3.25														
615349	474876	No	1/9/2002		4.2														
615421	475002	No	1/16/2002		ND														
615301	474889		10/17/2002	Basement	2.08	ND (2.69)	3.82	1/23/2003	Basement	ND(3.38)	ND(2.68)	1.69							
615364	475019	No	1/9/2002		ND														
615243	474902	No	1/9/2002		ND			10/17/2002	Basement	5.82	ND(2.69)	ND(1.6)		1/23/2003	Basement	ND	ND	2.11	ND
615302	475043	No	1/10/2002		ND														
615252	475058	No	1/10/2002		ND														
615128	474943	No	1/9/2002		4.45			1/9/2002		ND									
615197	475078		10/16/2002		ND(3.38)	ND(2.68)	47.62												
615063	474962	No	2/7/2002		ND														
615080	475117																		
615002	474984	Yes	1/9/2002		ND														
615017	475134	No-drain hole	2/7/2002		ND														
614958	474991	No	1/9/2002		3.25														
614865	475108		1/17/2003	Basement	8.82	ND(2.68)	ND(1.60)	6/18/2003	Basement	4.80									
614828	475032	Yes	1/10/2002		ND														
614808	474976	No	12/27/2001		2.1														
617912	472491	Yes	2/4/2002		ND														

= NJDEP data

= EPA data from March 2003 table

= NJDEP data, home remediated by NJDEP

= NJDEP/EPA data, home remediated by EPA

= EPA Edison data only

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x (State Plane Feet)	y (State Plane Feet)	Indoor Air Date 4	Indoor Air Location 4	Indoor Air PCE 4 (ug/m3)	Indoor Air TCE 4 (ug/m3)	Indoor Air Benzene 4 (ug/m3)	Indoor Air MTBE 4 (ug/m3)	Indoor Air Date 5	Indoor Air Location 5	Indoor Air PCE 5 (ug/m3)	Indoor Air TCE 5 (ug/m3)	Indoor Air Benzene 5 (ug/m3)	Indoor Air MTBE 5 (ug/m3)	Indoor Air Date 6	Indoor Air Location 6	Indoor Air PCE 6 (ug/m3)	Indoor Air TCE 6 (ug/m3)	Indoor Air Benzene 6 (ug/m3)	Indoor Air MTBE 6 (ug/m3)	Indoor Air Date 7	Indoor Air Location 7	Indoor Air PCE 7 (ug/m3)
614035	474791																					
619147	474305	1/23/2003	ND	ND	ND	ND	ND	9/23/2003	Basement	ND	ND	3.8	NT									
618876	474394																					
615385	473203																					
615354	473363																					
615191	473284																					
614667	473526																					
613829	475201																					
617377	474103																					
616107	474342																					
616205	474520	6/5/2002	Basement	12.18	ND	ND	ND	7/31/2002	Basement	4.08	ND	ND	ND	9/23/2003	Basement	ND	ND	ND	ND			
616074	474564																					
615905	474619																					
615692	474672																					
615543	474550																					
615538	474730																					
615395	474593																					
615319	474611																					
615256	474645																					
615406	474761	1/23/2003	Basement	7.46	3.49	ND	ND	9/24/2003	Basement	6.6	ND	ND	ND									
615327	474782	10/17/2002	Basement	2.68	ND	ND	ND	1/26/2003	Basement	ND	ND	ND	ND	1/26/2003	Basement	ND	ND	ND	ND	9/23/2003	Basement	ND
615184	474663																					
615267	474797	7/31/2002	Basement	22.09	ND	3.5	ND	9/18/2002	2.81J	ND	ND	ND	ND	9/24/2003	Basement	ND	ND	ND	ND			
615112	474687																					
615199	474815																					
615041	474696																					
615152	474835	7/31/2002	Basement	5.42	ND	3.82	ND	1/23/2003	Basement	ND	ND	ND	ND	1/23/2003	Basement	ND	ND	ND	ND			
615087	474854	7/31/2002	Basement	ND	ND	ND	ND	1/23/2003	Basement	ND	ND	ND	ND									
615032	474869																					
614839	474772	2/7/2002	Basement	5.15				3/27/2002	Living Room	ND	ND	4.14	ND	3/27/2002	Living Room	ND	ND	ND	ND	7/31/2002	Basement	12.72
614982	474886																					
614772	474797																					
614924	474915																					
614696	474817																					
614715	475006																					
617745	474426																					
617160	474465																					
616789	474743	1/23/2003	Basement	ND	ND	ND	ND	9/23/2003	Basement	ND	ND	3.2	NT									
616702	474770																					
616511	474848																					
615751	474978																					
615403	475114																					
613736	474137																					
613263	474711																					
616595	473231																					
622224	471123																					
615005	473543																					
614935	473121																					
614805	472516																					
614026	473053																					
621171	474306																					
621005	474537																					
622838	473909																					
620457	474461																					
619821	474762																					
619736	474601																					
615371	473090																					
614349	473540																					
614304	473568																					

x (State Plane Feet)	y (State Plane Feet)	Indoor Air Date 4	Indoor Air Location 4	Indoor Air PCE 4 (ug/m3)	Indoor Air TCE 4 (ug/m3)	Indoor Air Benzene 4 (ug/m3)	Indoor Air MTBE 4 (ug/m3)	Indoor Air Date 5	Indoor Air Location 5	Indoor Air PCE 5 (ug/m3)	Indoor Air TCE 5 (ug/m3)	Indoor Air Benzene 5 (ug/m3)	Indoor Air MTBE 5 (ug/m3)	Indoor Air Date 6	Indoor Air Location 6	Indoor Air PCE 6 (ug/m3)	Indoor Air TCE 6 (ug/m3)	Indoor Air Benzene 6 (ug/m3)	Indoor Air MTBE 6 (ug/m3)	Indoor Air Date 7	Indoor Air Location 7	Indoor Air PCE 7 (ug/m3)
614164	473614																					
617321	472395																					
624076	474376																					
623257	470278																					
616715	476654																					
615810	474858	7/31/2002	Basement	25.44	5.31	13.05		9/18/2002	1st Floor	ND	ND	ND		9/18/2002	Basement	ND	ND	ND		1/23/2003	Basement	ND
615770	474389																					
615640	474431																					
616485	477002	1/19/2002	Café(6066)	ND				1/19/2002	Room 128 (621	ND				1/19/2002	Library (6171	ND						
618146	473093																					
614771	472420																					
613826	472845																					
621990	473611																					
621557	473400																					
621605	473650																					
620499	473850																					
619818	473991																					
614577	473827																					
614468	473614																					
614164	472989																					
619197	474641																					
615768	475937																					
615663	475660																					
616466	472859																					
621112	471821																					
619533	472938																					
617226	473683																					
616798	473872																					
616583	473931	1/23/2003	Basement	2.92]	ND	ND	ND															
616290	474044	1/23/2003	Basement	ND	ND	ND	ND	1/23/2003	Basement	ND	ND	ND	ND									
615445	474140																					
615087	474441																					
614947	474485																					
614815	474522																					
614724	474585																					
614507	474648	9/18/2002	Backroom	8.03	ND	1.59		1/23/2003	Basement	3.39	ND	1.60	ND	6/18/2003	Basement	12	ND	4.5		9/23/2003	Basement	5.5
614602	474804	10/25/2001	SE Crawl	257.16				12/12/2001	Room 32	365.44				12/24/2001	Room 32	67.67				12/24/2001	Room 21	6.77
620043	473647	12/24/2001	Office	2.50]				12/24/2001	Library	ND				12/24/2001	Classroom 7	3.79				12/27/2001		ND
623153	470619																					
622821	470518																					
622736	470703																					
622483	470737																					
621442	475927																					
615405	475932																					
623029	471145																					
622173	471531																					
621658	471432																					
618546	472980																					
619124	475080																					
619253	474939																					
618460	473521																					
623125	475496																					
622584	475648																					
621591	476107																					
622680	471832																					
621701	472026																					
620924	472178																					
618229	474486																					



x (State Plane Feet)	y (State Plane Feet)	Indoor Air Date 4	Indoor Air Location 4	PCE 4 (ug/m3)	TCE 4 (ug/m3)	Benzene 4 (ug/m3)	MTBE 4 (ug/m3)	Indoor Air Date 5	Indoor Air Location 5	PCE 5 (ug/m3)	TCE 5 (ug/m3)	Benzene 5 (ug/m3)	MTBE 5 (ug/m3)	Indoor Air Date 6	Indoor Air Location 6	PCE 6 (ug/m3)	TCE 6 (ug/m3)	Benzene 6 (ug/m3)	MTBE 6 (ug/m3)	Indoor Air Date 7	Indoor Air Location 7	PCE 7 (ug/m3)
618412	474908																					
617852	474098																					
618603	475339																					
618426	475348																					
620215	472541																					
619132	475469																					
616810	475930																					
615575	475057																					
615489	475088																					
615322	475151																					
614958	475307																					
615545	473400																					
615213	473698																					
615593	474832																					
615566	474945																					
615430	474843																					
615486	474986																					
615349	474876																					
615421	475002																					
615301	474889																					
615364	475019																					
615243	474902																					
615302	475043																					
615252	475058																					
615128	474943																					
615197	475078																					
615063	474962																					
615080	475117																					
615002	474984																					
615017	475134																					
614958	474991																					
614865	475108																					
614828	475032																					
614808	474976																					
617912	472491																					



## Appendix I : Wall Township - NJDEP Indoor Air Database

x (State Plane Feet)	y (State Plane Feet)	Indoor Air TCE 7 (ug/m3)	Indoor Air Benzene 7 (ug/m3)	Indoor Air MTBE 7 (ug/m3)	Indoor Air Date 8	Indoor Air Location 8	Indoor Air Air PCE 8 (ug/m3)	Indoor Air Date 9	Indoor Air Location 9	Indoor Air Air PCE 9 (ug/m3)	Indoor Air Date 10	Indoor Air Location 10	Indoor Air PCE 10 (ug/m3)	Indoor Air Date 11	Indoor Air PCE 11 (ug/m3)	Indoor Air Date 12	Indoor Air PCE 12 (ug/m3)	Indoor Air Date 13	Indoor Air PCE 13 (ug/m3)
614586	473110																		
614223	473279																		
614048	473349																		
616808	474388																		
623187	473495																		
622438	473878																		
620167	474317																		
622210	475271																		
621765	475347																		
621675	475575																		
620766	475812																		
614997	474578																		
614902	474748																		
615810	472679																		
620883	473399																		
619635	473470																		
619415	473678																		
619272	473709																		
615801	475455																		
615481	475369																		
615209	475479																		
622508	474418																		
622221	474475																		
621962	474748																		
621633	474787																		
617772	475426																		
617529	475254																		
617094	475322																		
617342	475521																		
623108	474680																		
622728	474964																		
621256	475263																		
620763	475361																		
620299	475237																		
620175	475496																		
619913	475313																		
615905	473769																		
616084	473390																		
621146	472966																		
620842	473020																		
620755	472797																		
619747	473293																		
619204	473335																		
617618	474002																		
619706	475204																		
619174	473949																		
618229	475530																		
617770	474951																		
621985	475685																		
613342	477737																		
618681	475010																		
618547	474213																		
618498	474118	ND	5.8																
616715	475038																		
616461	475243																		
616485	475406																		
614527	476715																		
614637	475483																		
614236	475264																		

## Appendix I : Wall Township - NJDEP Indoor Air Database

x (State Plane Feet)	y (State Plane Feet)	Indoor Air TCE 7 (ug/m3)	Indoor Air Benzene 7 (ug/m3)	Indoor Air MTBE 7 (ug/m3)	Indoor Air Date 8	Indoor Air Location 8	Indoor Air PCE 8 (ug/m3)	Indoor Air Date 9	Indoor Air Location 9	Indoor Air PCE 9 (ug/m3)	Indoor Air Date 10	Indoor Air Location 10	Indoor Air PCE 10 (ug/m3)	Indoor Air Date 11	Indoor Air PCE 11 (ug/m3)	Indoor Air Date 12	Indoor Air PCE 12 (ug/m3)	Indoor Air Date 13	Indoor Air PCE 13 (ug/m3)
614035	474791																		
619147	474305																		
618876	474394																		
615385	473203																		
615354	473363																		
615191	473284																		
614667	473526																		
613829	475201																		
617377	474103																		
616107	474342																		
616205	474520																		
616074	474564																		
615905	474619																		
615692	474672																		
615543	474550																		
615538	474730																		
615395	474593																		
615319	474611																		
615256	474645																		
615406	474761																		
615327	474782	ND	ND	NT															
615184	474663																		
615267	474797																		
615112	474687																		
615199	474815																		
615041	474696																		
615152	474835																		
615087	474854																		
615032	474869																		
614839	474772	ND	7		1/23/2003	Basement	ND		ND	9/23/2003	Basement	ND							
614982	474886																		
614772	474797																		
614924	474915																		
614696	474817																		
614715	475006																		
617745	474426																		
617160	474465																		
616789	474743																		
616702	474770																		
616511	474848																		
615751	474978																		
615403	475114																		
613736	474137																		
613263	474711																		
616595	473231																		
622224	471123																		
615005	473543																		
614935	473121																		
614805	472516																		
614026	473053																		
621171	474306																		
621005	474537																		
622838	473909																		
620457	474461																		
619821	474762																		
619736	474601																		
615371	473090																		
614349	473540																		
614304	473568																		

## Appendix I : Wall Township - NJDEP Indoor Air Database

x (State Plane Feet)	y (State Plane Feet)	Indoor Air TCE 7 (ug/m3)	Indoor Air Benzene 7 (ug/m3)	Indoor Air MTBE 7 (ug/m3)	Indoor Air Date 8	Indoor Air Location 8	Indoor Air PCE 8 (ug/m3)	Indoor Air Date 9	Indoor Air Location 9	Indoor Air PCE 9 (ug/m3)	Indoor Air Date 10	Indoor Air Location 10	Indoor Air PCE 10 (ug/m3)	Indoor Air Date 11	Indoor Air PCE 11 (ug/m3)	Indoor Air Date 12	Indoor Air PCE 12 (ug/m3)	Indoor Air Date 13	Indoor Air PCE 13 (ug/m3)
614164	473614																		
617321	472395																		
624076	474376																		
623257	470278																		
616715	476654																		
615810	474858	ND	ND	ND	9/23/2003	Basement	ND												
615770	474389																		
615640	474431																		
616485	477002																		
618146	473093																		
614771	472420																		
613826	472845																		
621990	473611																		
621557	473400																		
621605	473650																		
620499	473850																		
619818	473991																		
614577	473827																		
614468	473614																		
614164	472989																		
619197	474641																		
615768	475937																		
615663	475660																		
616466	472859																		
621112	471821																		
619533	472938																		
617226	473683																		
616798	473872																		
616583	473931																		
616290	474044																		
615445	474140																		
615087	474441																		
614947	474485																		
614815	474522																		
614724	474585																		
614507	474648	ND	2.4																
614602	474804				12/24/2001	Room 27	6.56	12/24/2001	Room 31	115.04	12/24/2001	Room 33	12.86	12/27/2001	4.6	12/27/2001	3.72	12/27/2001	79.75
620043	473647																		
623153	470619																		
622821	470518																		
622736	470703																		
622483	470737																		
621442	475927																		
615405	475932																		
623029	471145																		
622173	471531																		
621658	471432																		
618546	472980																		
619124	475080																		
619253	474939																		
618460	473521																		
623125	475496																		
622584	475648																		
621591	476107																		
622680	471832																		
621701	472026																		
620924	472178																		
618229	474486																		

x (State Plane Feet)	y (State Plane Feet)	Indoor Air TCE 7 (ug/m3)	Indoor Air Benzene 7 (ug/m3)	Indoor Air MTBE 7 (ug/m3)	Indoor Air Date 8	Indoor Air Location 8	Indoor Air Air PCE 8 (ug/m3)	Indoor Air Date 9	Indoor Air Location 9	Indoor Air Air PCE (ug/m3)	Indoor Air Date 10	Indoor Air Location 10	Indoor Air PCE 10 (ug/m3)	Indoor Air Date 11	Indoor Air PCE 11 (ug/m3)	Indoor Air Date 12	Indoor Air PCE 12 (ug/m3)	Indoor Air Date 13	Indoor Air PCE 13 (ug/m3)
618412	474908																		
617852	474098																		
618603	475339																		
618426	475348																		
620215	472541																		
619132	475469																		
616810	475930																		
615575	475057																		
615489	475088																		
615322	475151																		
614958	475307																		
615545	473400																		
615213	473698																		
615593	474832																		
615566	474945																		
615430	474843																		
615486	474986																		
615349	474876																		
615421	475002																		
615301	474889																		
615364	475019																		
615243	474902																		
615302	475043																		
615252	475058																		
615128	474943																		
615197	475078																		
615063	474962																		
615080	475117																		
615002	474984																		
615017	475134																		
614958	474991																		
614865	475108																		
614828	475032																		
614808	474976																		
617912	472491																		



## **APPENDIX II**

### **PRE- AND POST MITIGATION INDOOR AIR QUALITY DATA**

**Table II-1. Comparison of Pre-Mitigation and Post-Mitigation Indoor PCE Concentrations**

Jun-06

023-6124C

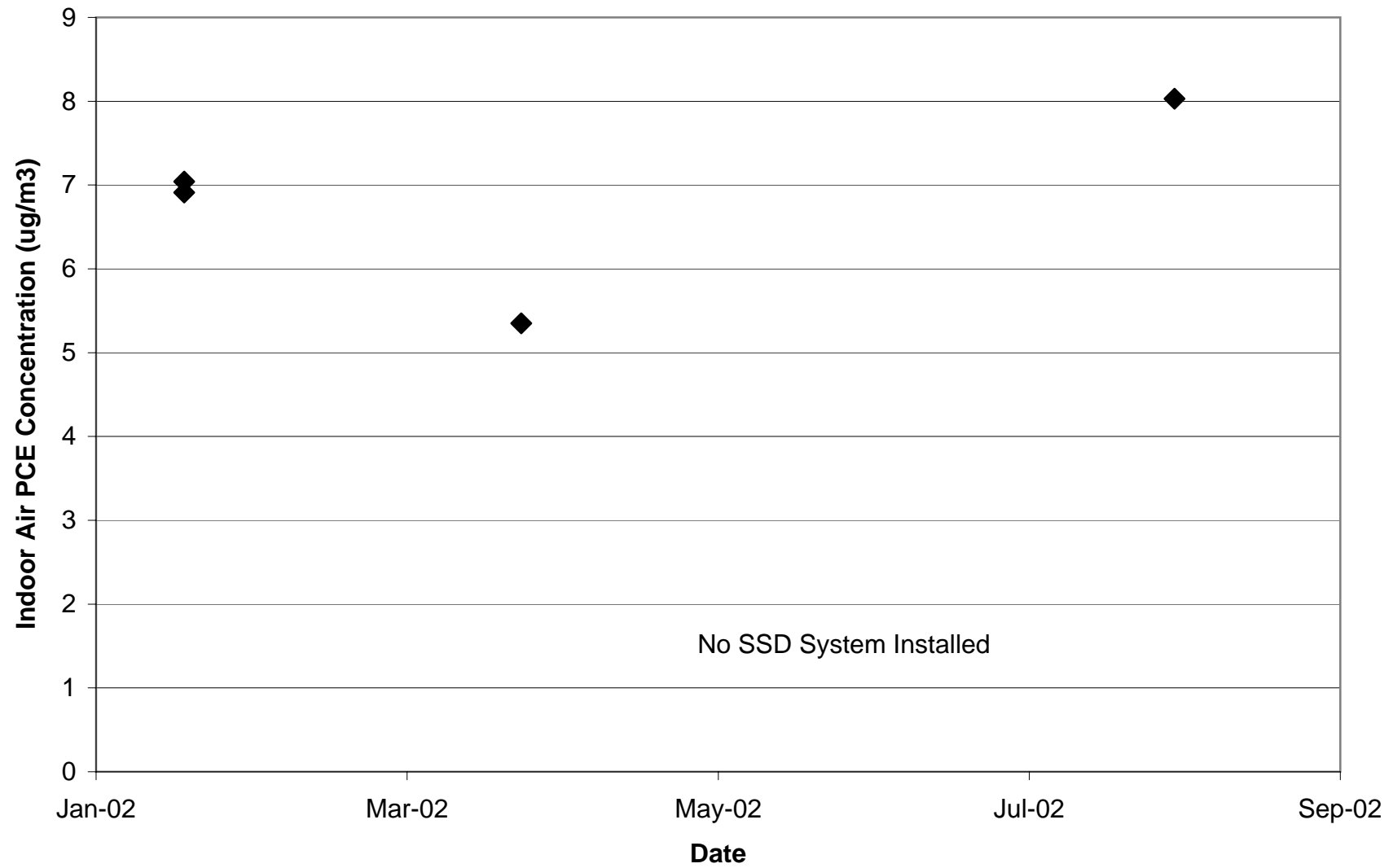
x (State Plane ft.)	y (State Plane ft.)	Indoor PCE concentration before SSD system installed (ug/m³)							Indoor PCE Concentration after SSD System installed (ug/m3)							% Reduction		
		R1	R2	R3	Max	Min	Average	RPD %	R1	R2	R3	R4	R5	Max	Min			RPD %
614902	474748	7.44	16.93	-	16.93	7.44	12.2	77.9	-	-	-	-	-	-	-	-	-	
617342	475521	10.17	18.00	-	18.00	10.17	14.1	55.6	ND	-	-	-	-	-	-	-	-	> 76
615905	473769	15.37	19.63	-	19.63	15.37	17.5	24.3	ND	ND	5.2	-	-	-	-	-	-	70
618498	474118	34.80	29.3	45.34	45.34	29.3	36.5	43.0	18.07	10.71	4.48	ND	-	18.07	4.48	120.5	>	91
616715	475038	12.34	23.43	-	23.43	12.34	17.9	62.0	ND	ND	-	-	-	-	-	-	-	> 81
616461	475243	23.15	42.63	1.69	42.63	1.69	22.5	184.7	ND	-	-	-	-	-	-	-	-	> 85
619147	474305	7.24	5.82	11.38	11.38	5.82	8.1	64.7	ND	ND	-	-	-	-	-	-	-	> 59
616205	474520	22.07	20.38	48.05	48.05	20.38	30.2	80.9	12.18	4.08	ND	-	-	12.18	4.08	99.6	>	89
615327	474782	29.11	47.37	-	47.37	29.11	38.2	47.8	10.04	2.68	ND	ND	ND	10.04	2.68	115.7	>	91
615267	474797	11.50	33.99	-	33.99	11.50	22.7	98.9	7.44	22.09	ND	ND	-	22.09	7.44	99.2	>	85
615152	474835	7.44	16.72	16.32	16.72	7.44	13.5	76.8	5.42	ND	ND	-	-	-	-	-	-	> 75
615087	474854	28.42	21.46	64.97	64.97	21.46	38.3	100.7	ND	ND	-	-	-	-	-	-	-	> 91
614839	474772	22.33	8.12	5.15	22.33	5.15	11.9	125.0	12.72	ND	ND	-	-	-	-	-	-	> 72
614772	474797	58.88	1.83	-	58.88	1.83	30.4	187.9	-	-	-	-	-	-	-	-	-	-
614924	474915	26.39	78.4	-	78.4	26.39	52.4	99.3	-	-	-	-	-	-	-	-	-	-
616789	474743	9.47	22.68	-	22.68	9.47	16.1	82.2	ND	ND	ND	-	-	-	-	-	-	> 79
615810	474858	11.71	20.30	-	20.30	11.71	16.0	53.7	58.88	25.44	ND	ND	ND	58.88	25.44	79.3	>	79
616583	473931	5.75	10.22	-	10.22	5.75	8.0	56.0	5.36	2.92	-	-	-	5.36	2.92	58.9	-	63
616290	474044	24.11	10.04	-	24.11	10.04	17.1	82.4	2.51	ND	ND	-	-	-	-	-	-	> 80
614507	474648	7.79	35.87	-	35.87	7.79	21.8	128.6	3.39	12	5.5	-	-	12	3.39	111.9	-	75

Notes:

1. ND = Non detect. Detection limit equal to 3.38. When concentration below detection limit, detection limit used for calculation
2. The % reduction was calculated using the PCE concentration measured for the final post-mitigation round, and the average pre-mitigation concentration.

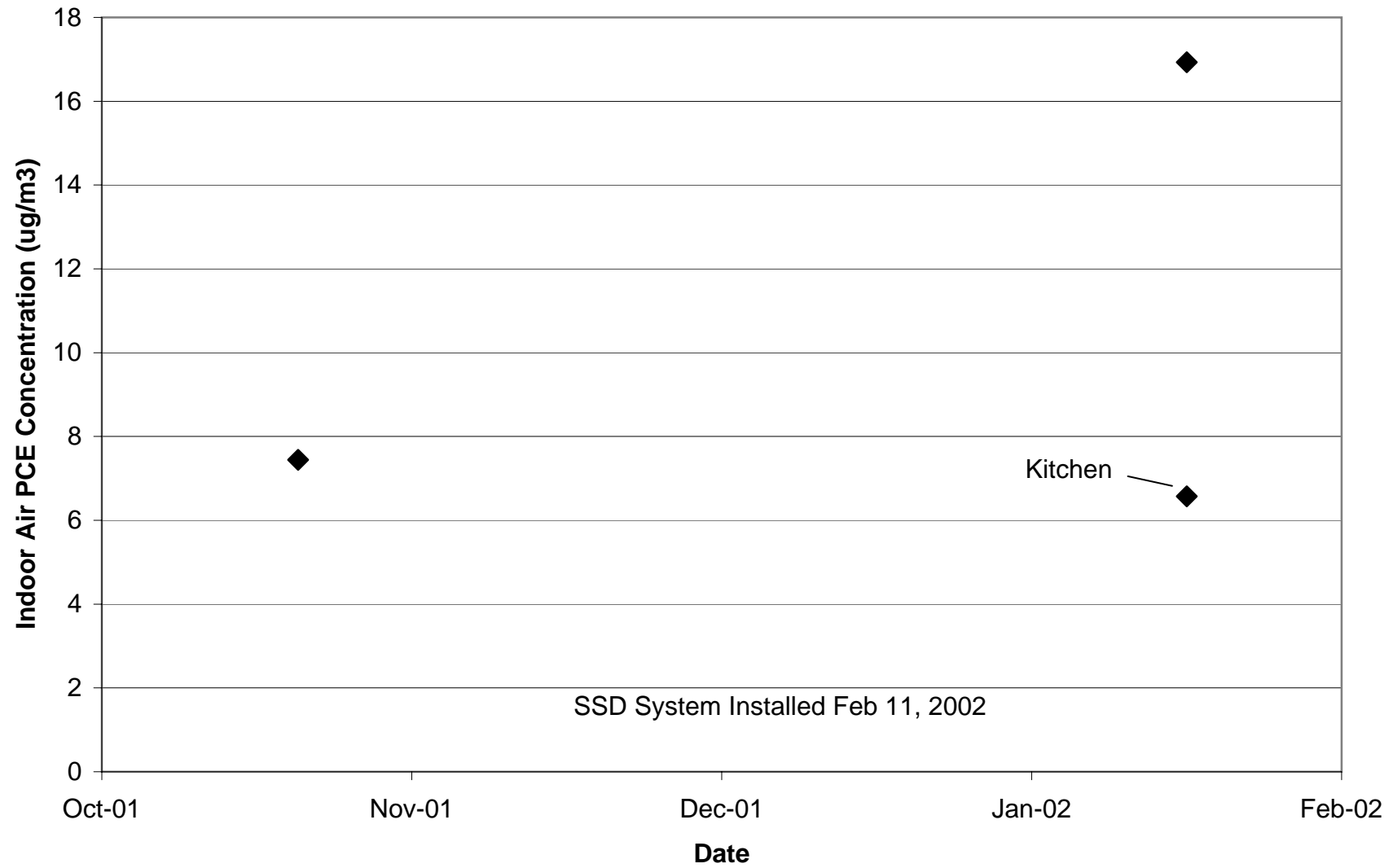
Min 59  
Max 91  
Average 79

**x = 620766, y = 475812**  
**Indoor Air PCE Basement**

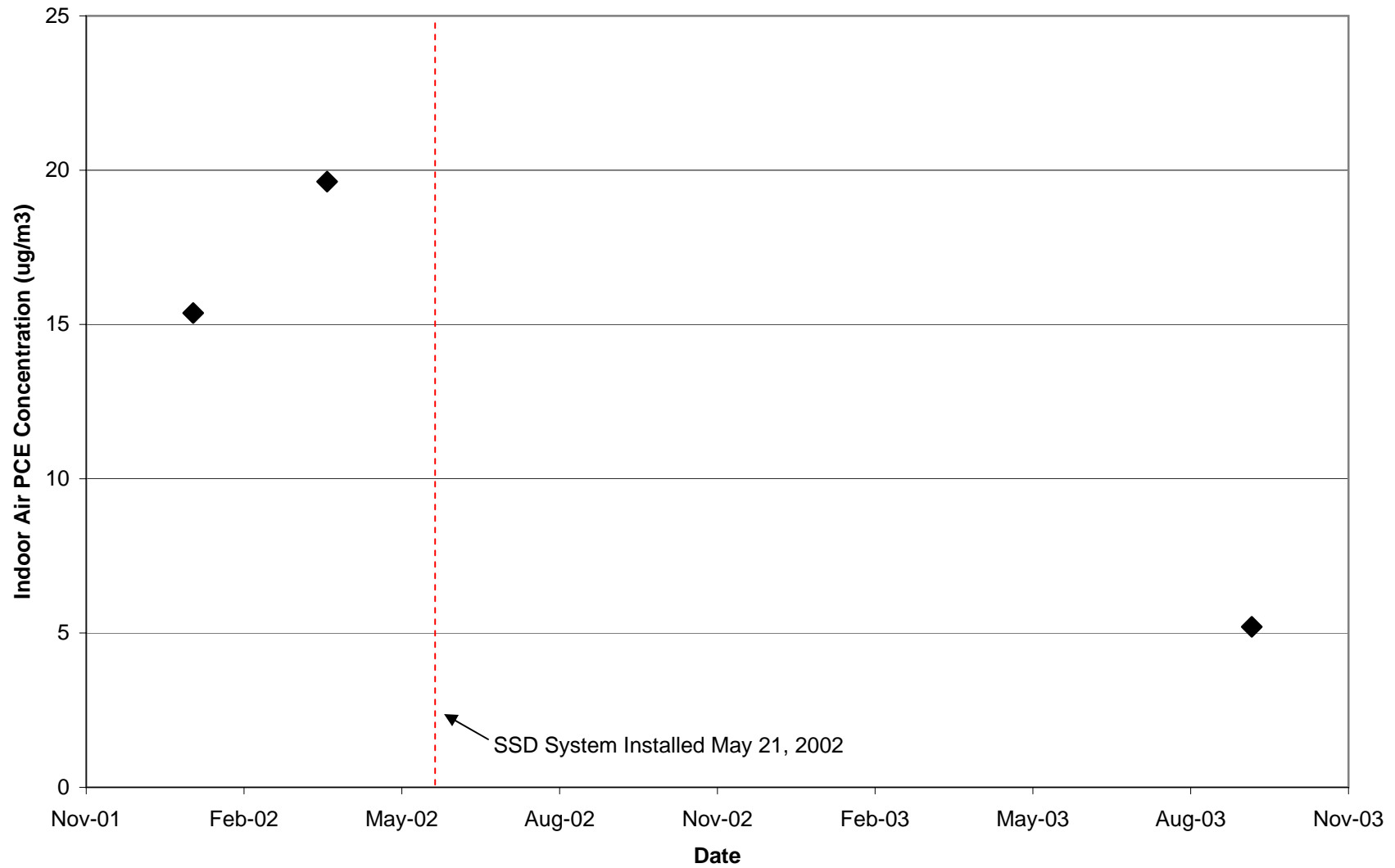




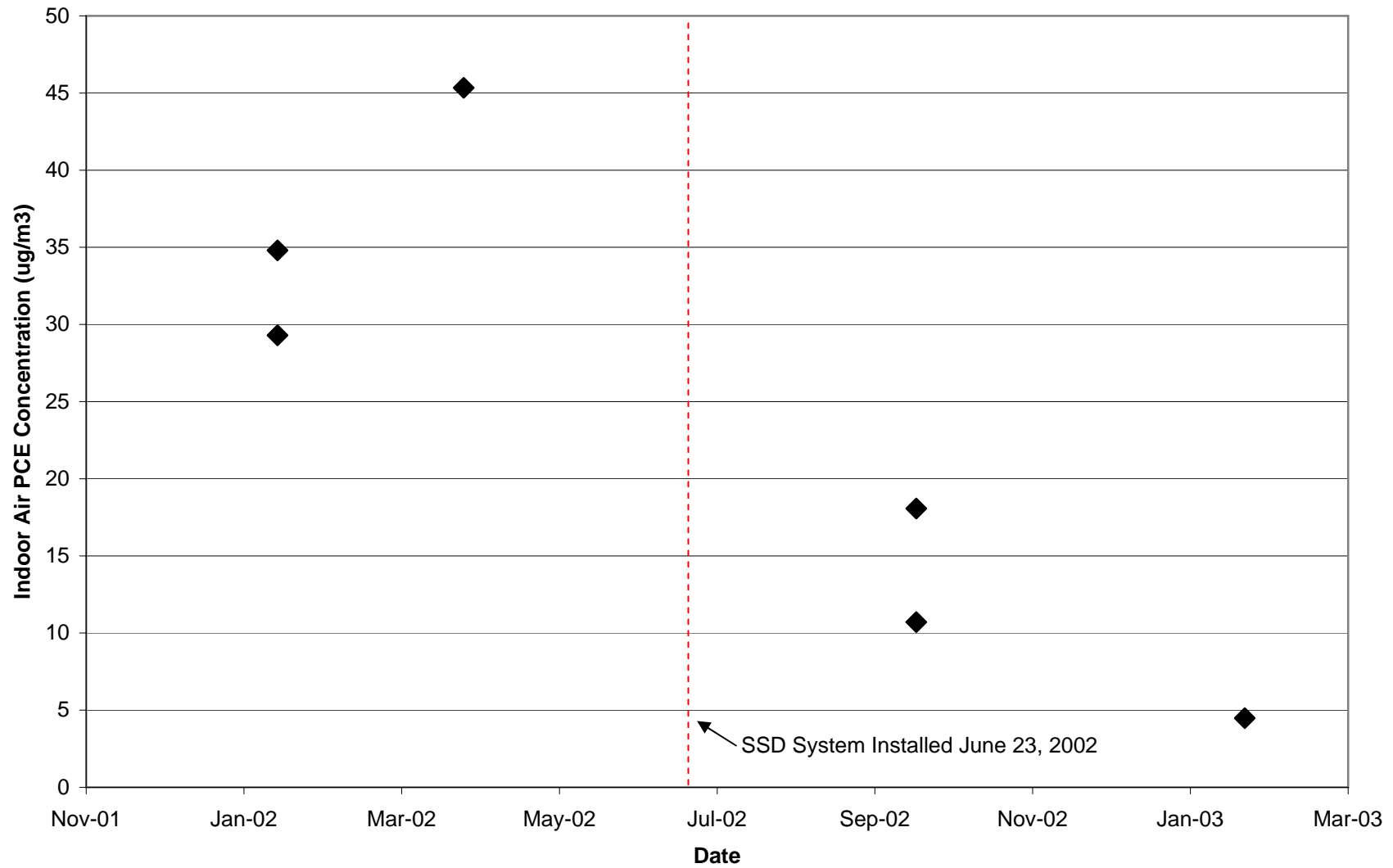
**x=614902, y = 474748**  
**Indoor Air PCE Basement**



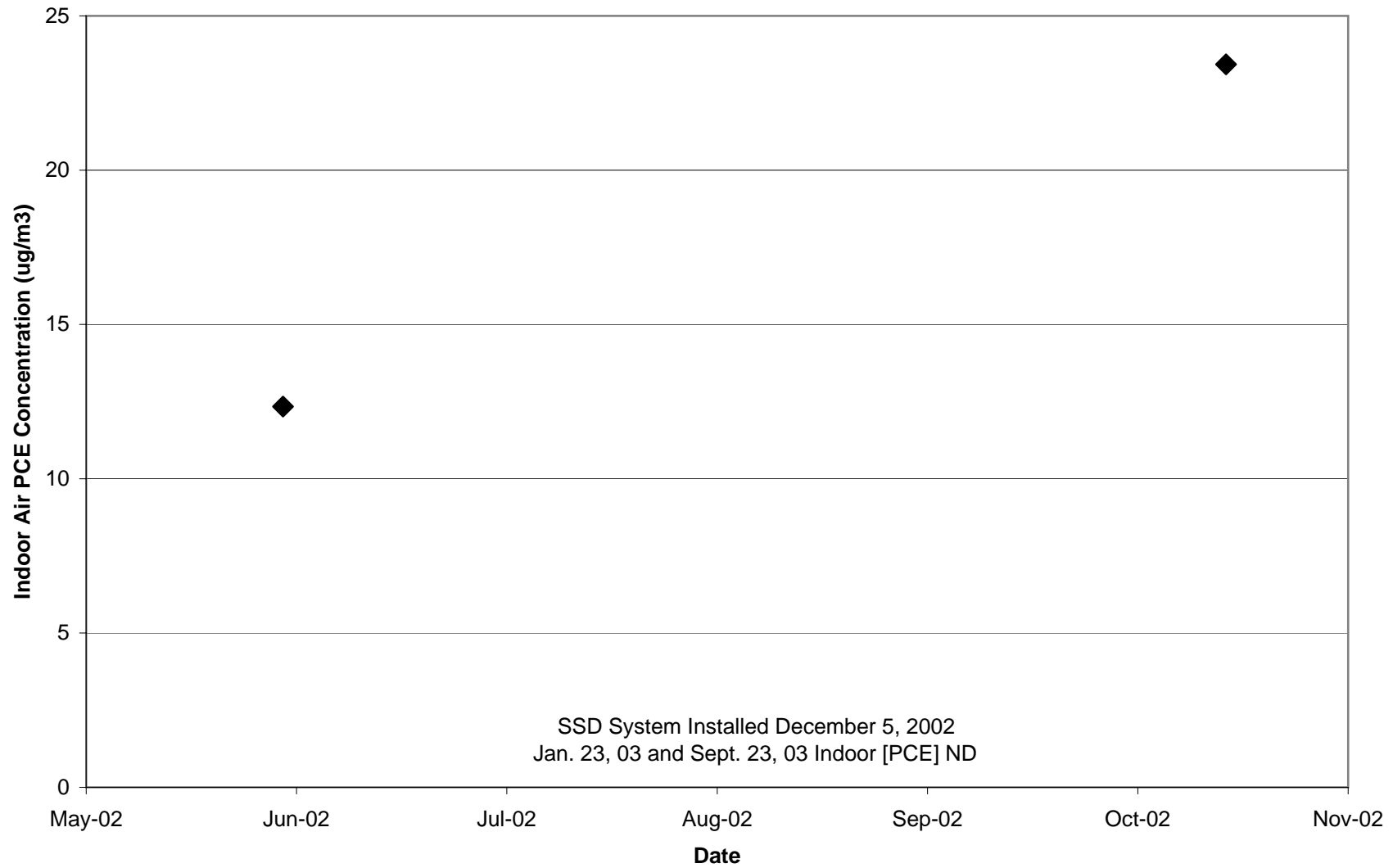
**x = 615905, y = 473769**  
**Indoor Air PCE Basement**



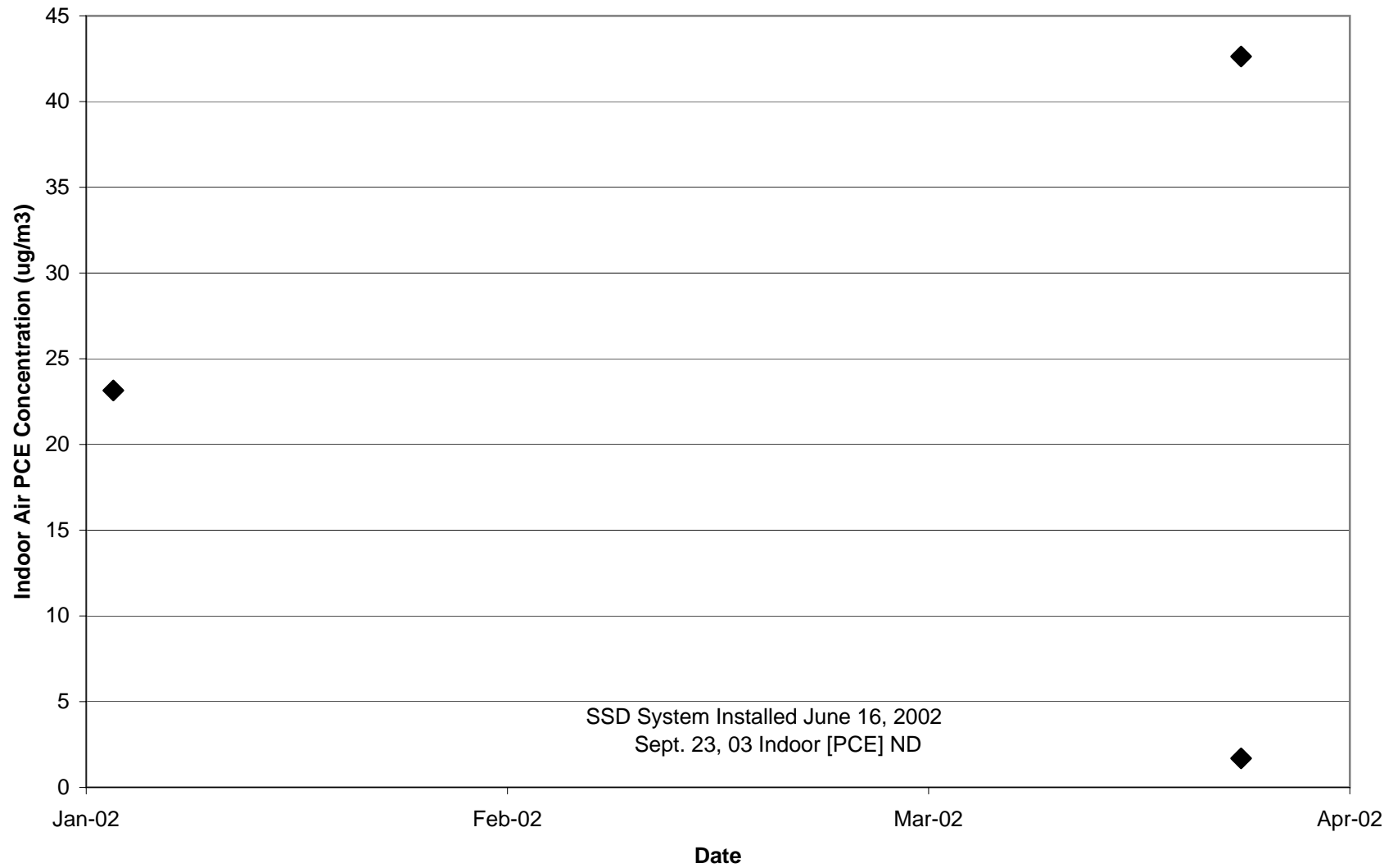
**x = 619498, y = 474118**  
**Indoor Air PCE Basement**



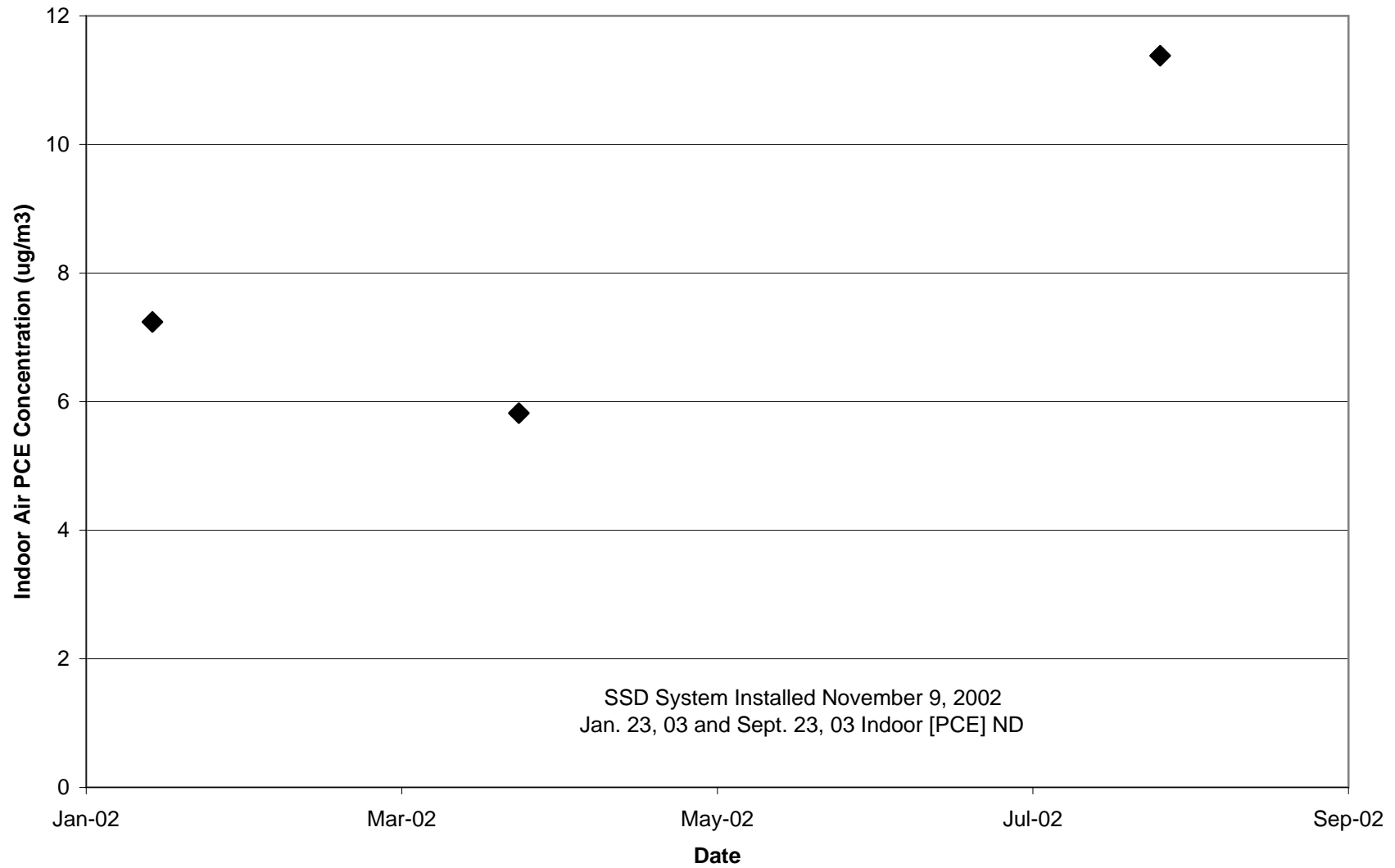
**x = 616715, y = 475038**  
**Indoor Air PCE Basement**



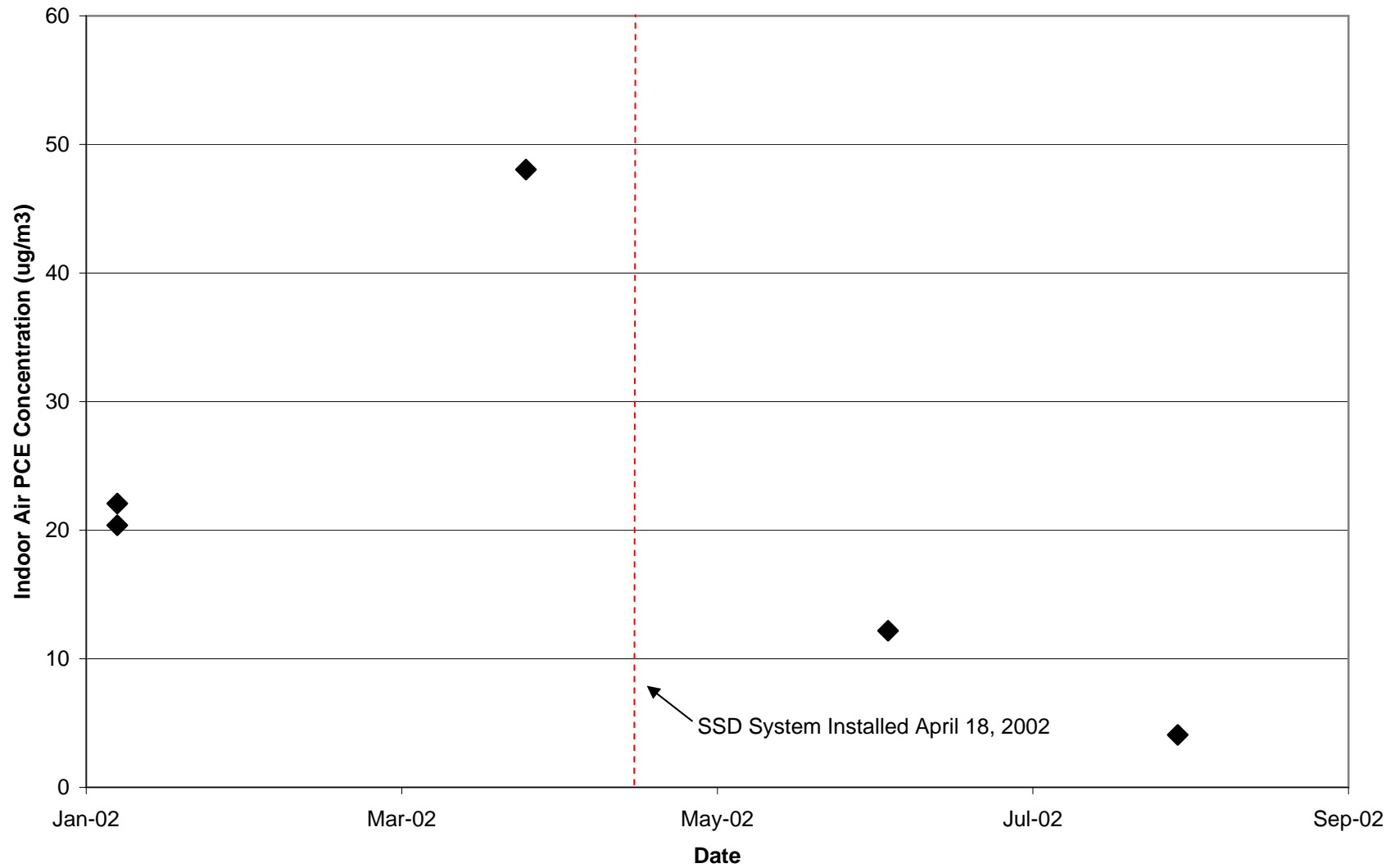
**x = 616461, y = 475243**  
**Indoor Air PCE Basement**



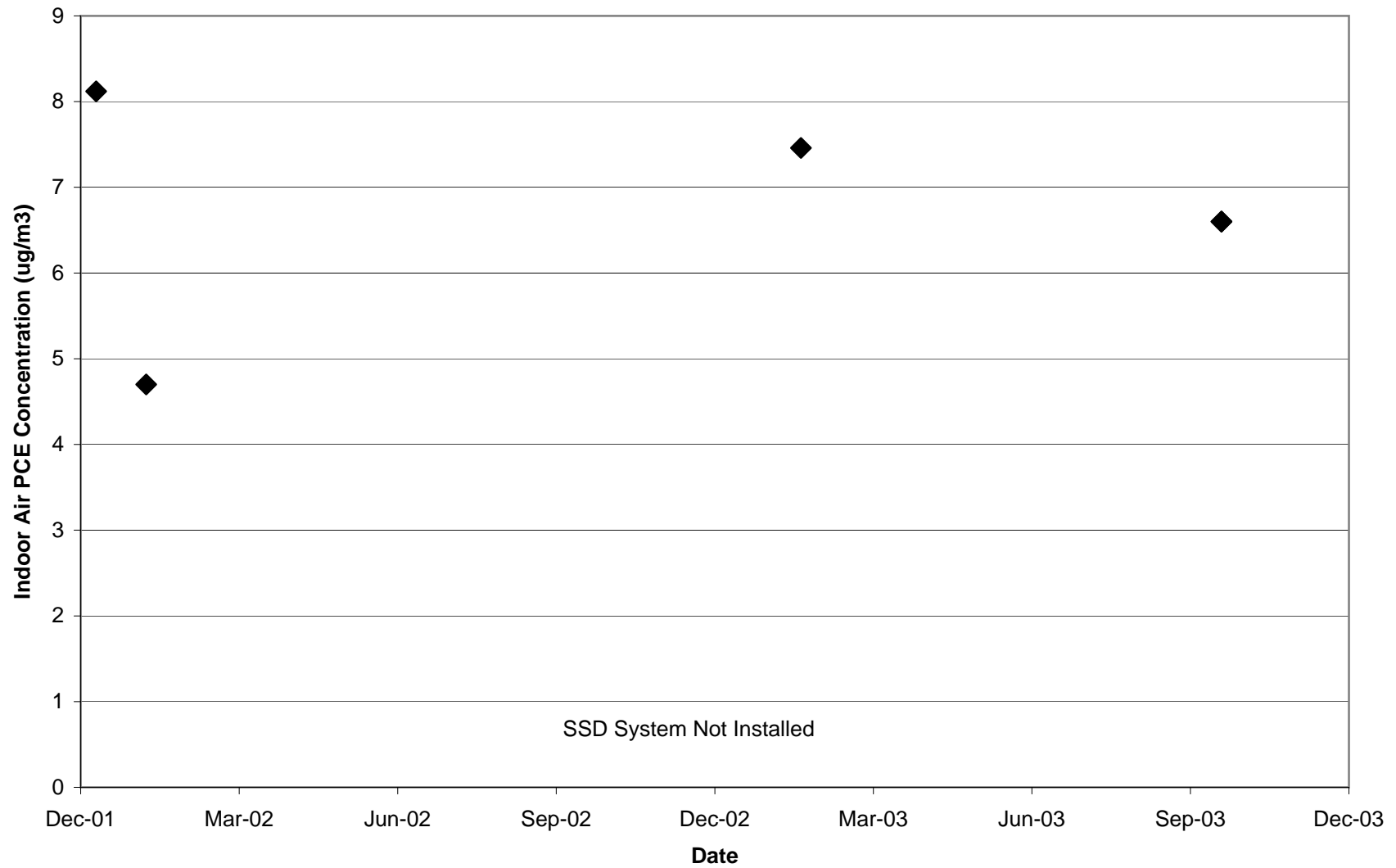
**x = 619147, y = 474305**  
**Indoor Air PCE Basement**



**x = 616205, y = 474520**  
**Indoor Air PCE Basement**

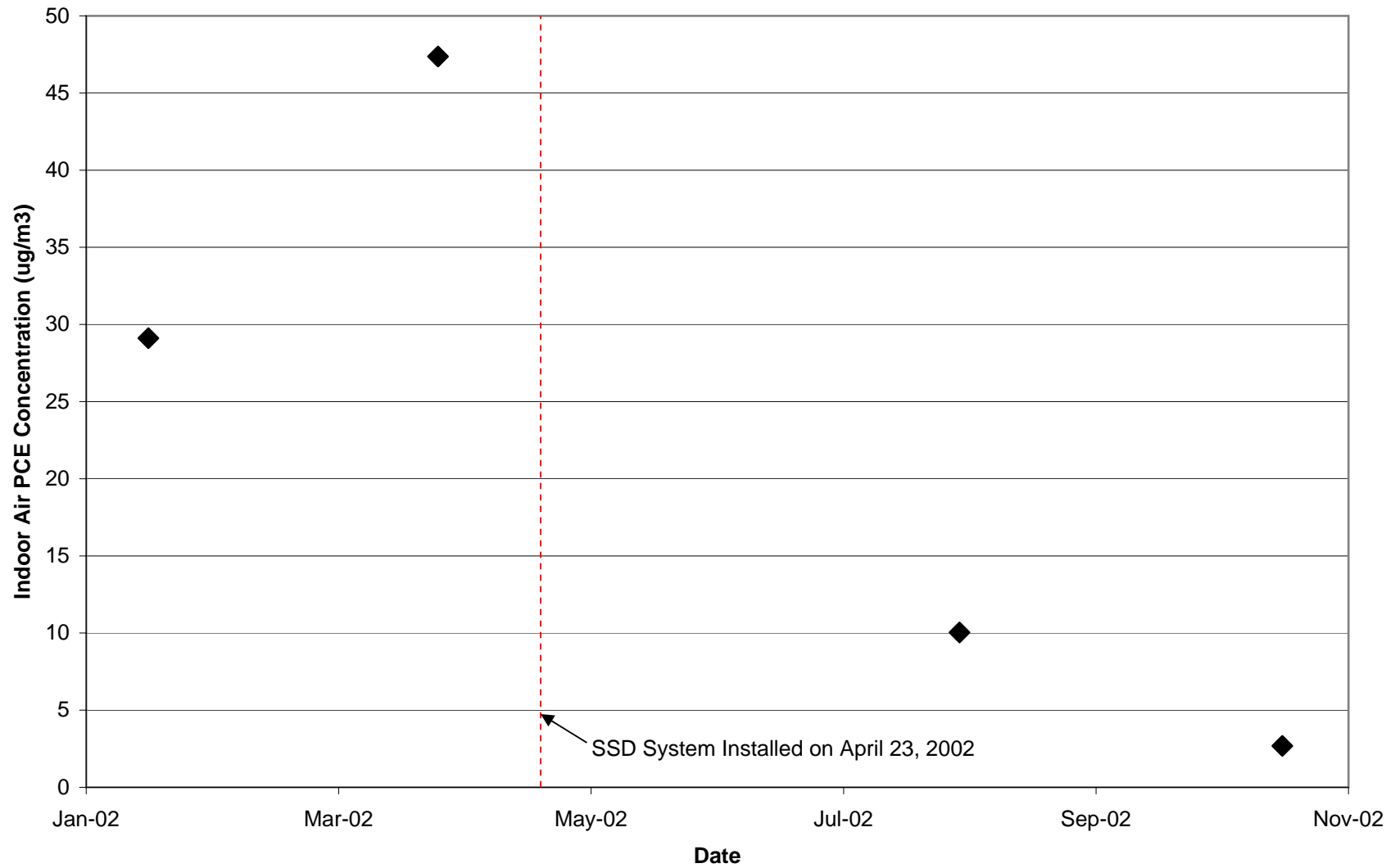


x = 615406, y = 474761  
Indoor Air PCE Basement

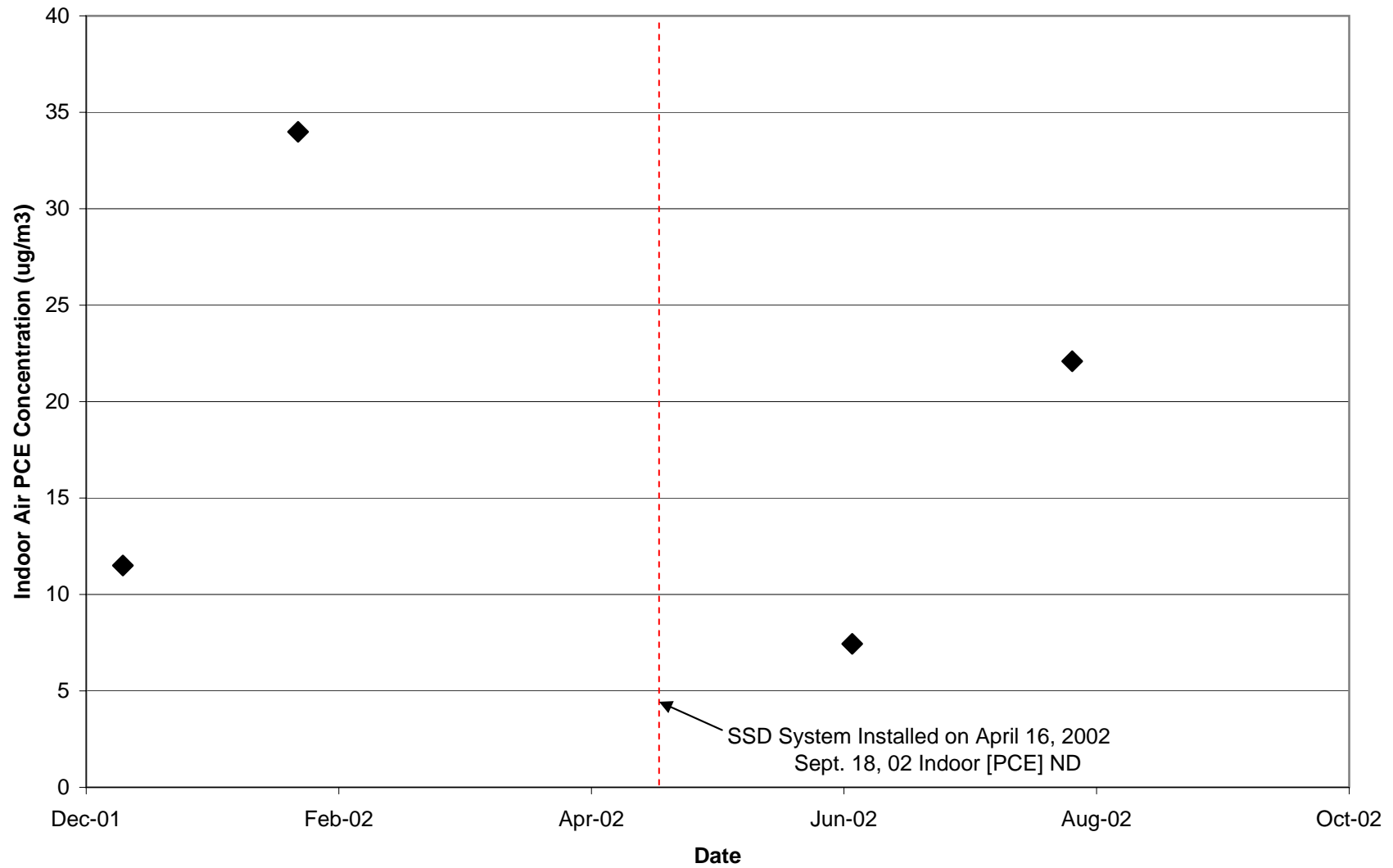




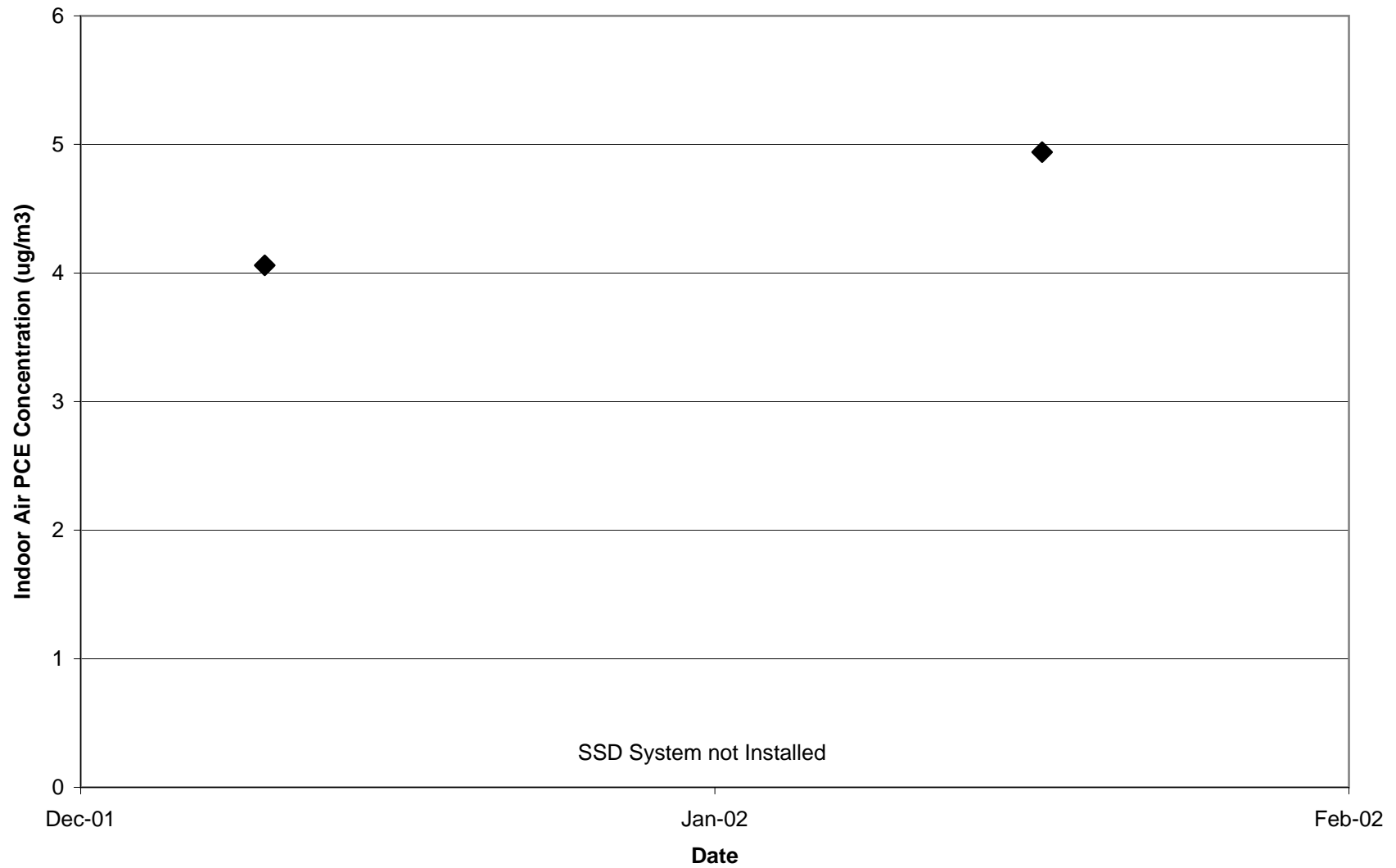
**x = 615327, y = 474782**  
**Indoor Air PCE Basement**



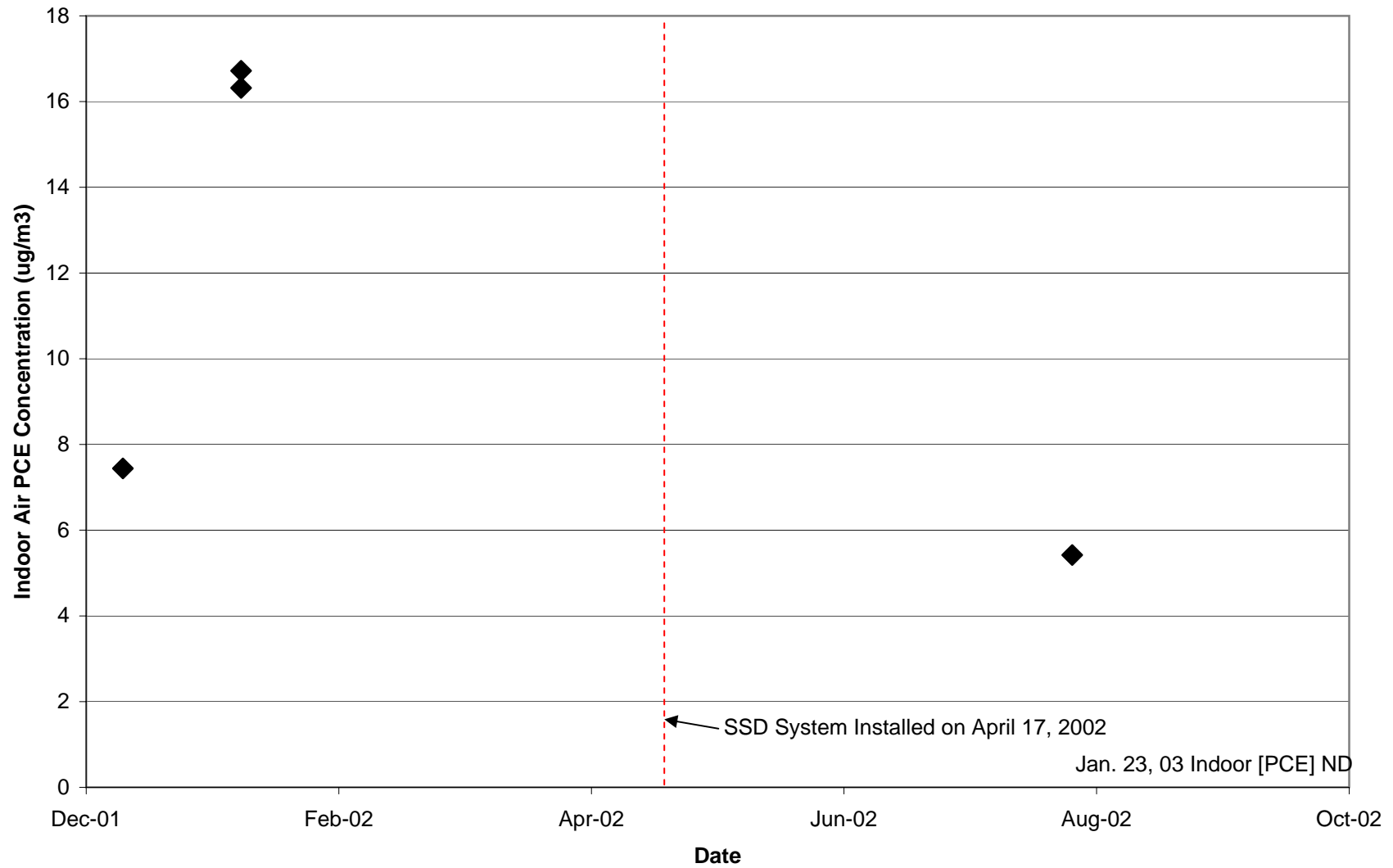
**x = 615267, y = 474797**  
**Indoor Air PCE Basement**



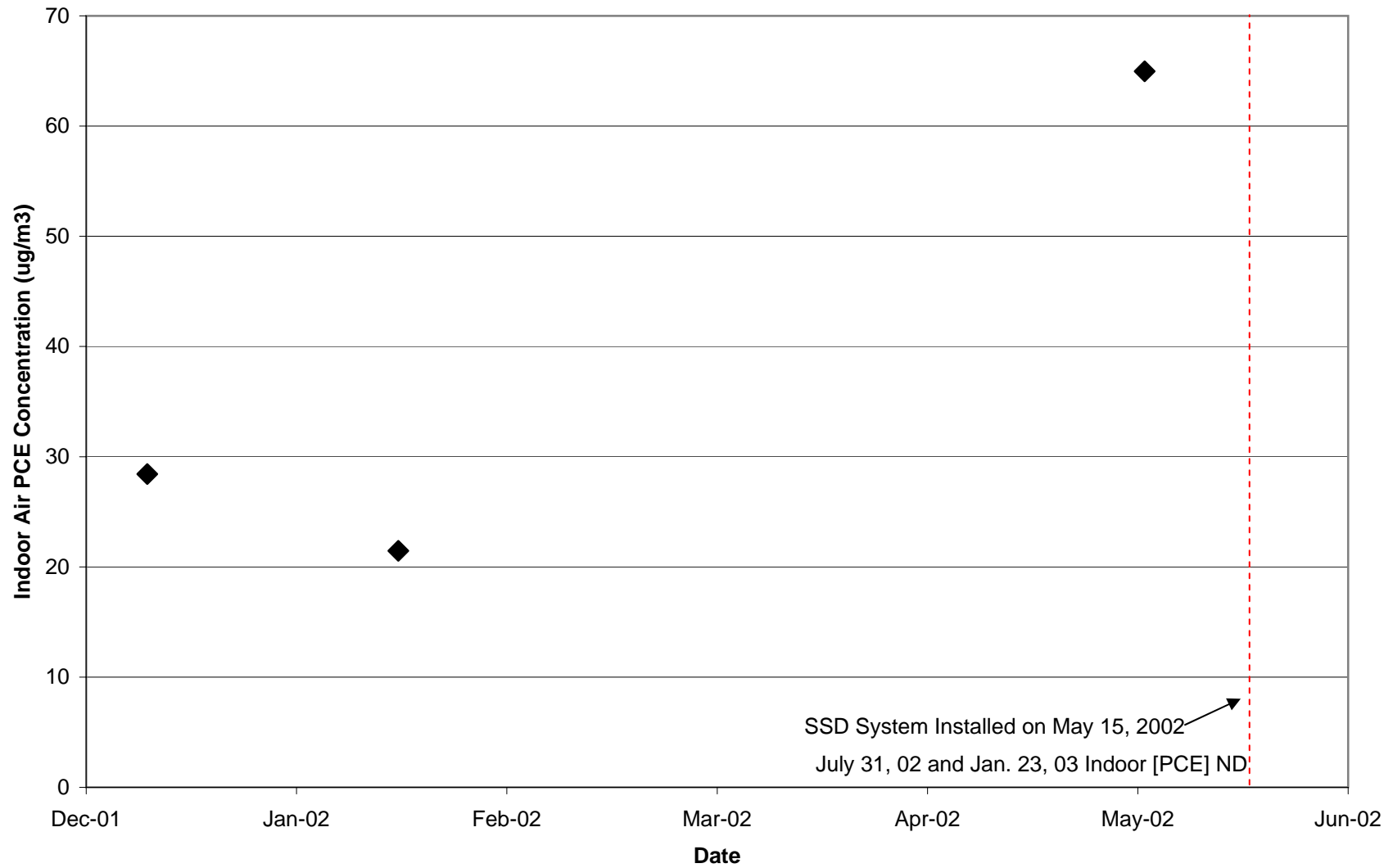
**x = 615041, y = 474696**  
**Indoor Air PCE Basement**



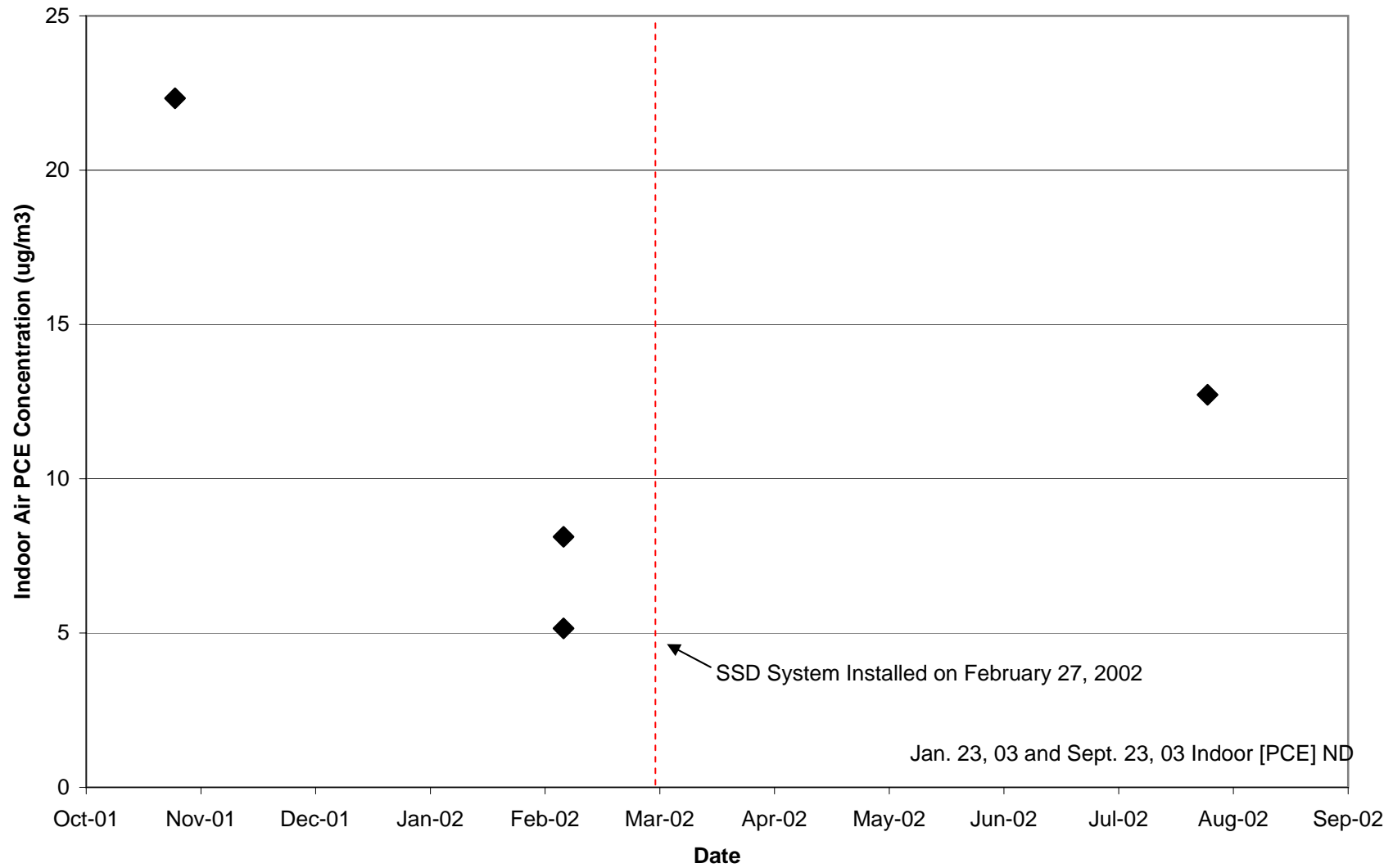
**x = 615152, y = 474835**  
**Indoor Air PCE Basement**



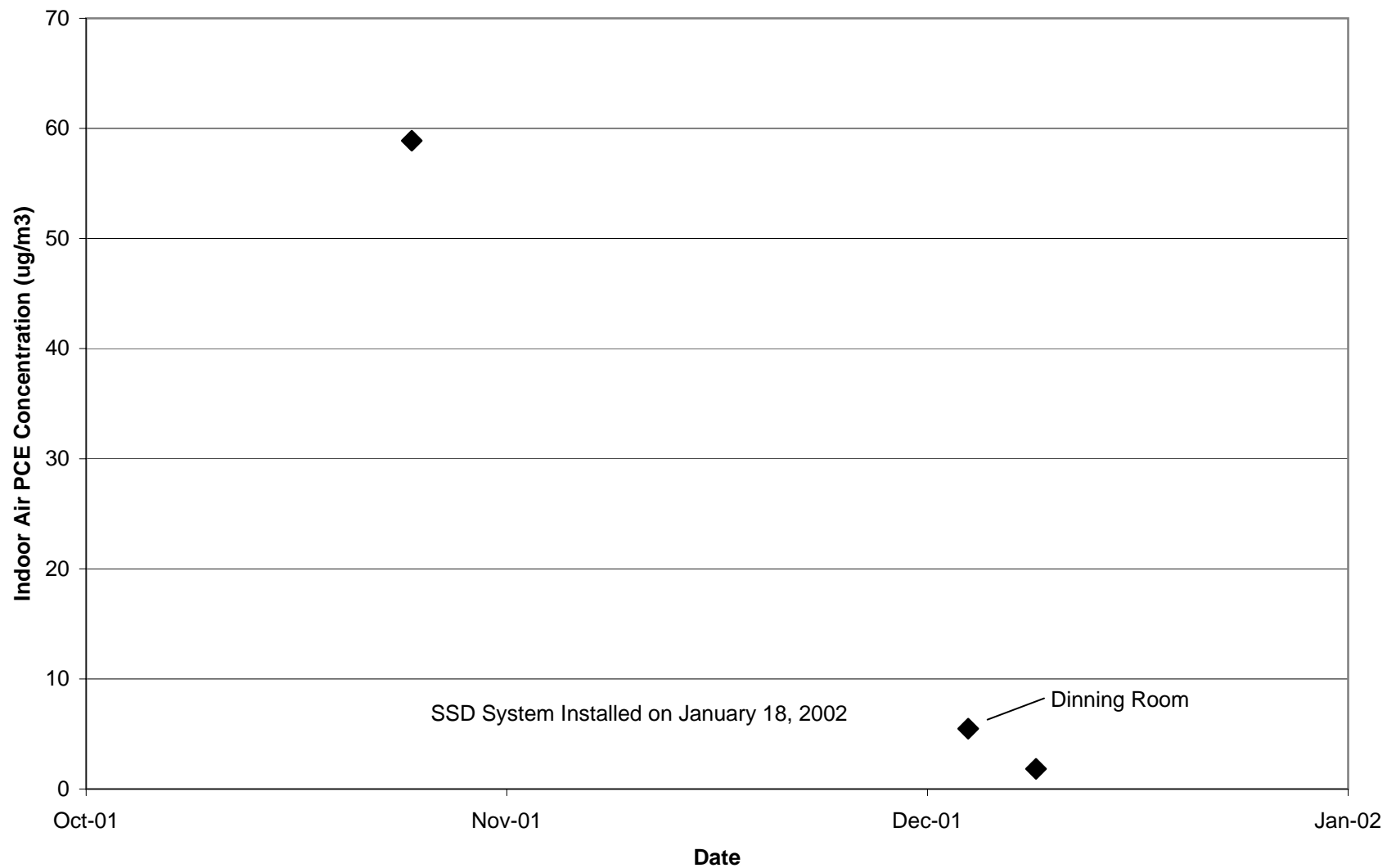
**x = 615087, y = 474854**  
**Indoor Air PCE Basement**



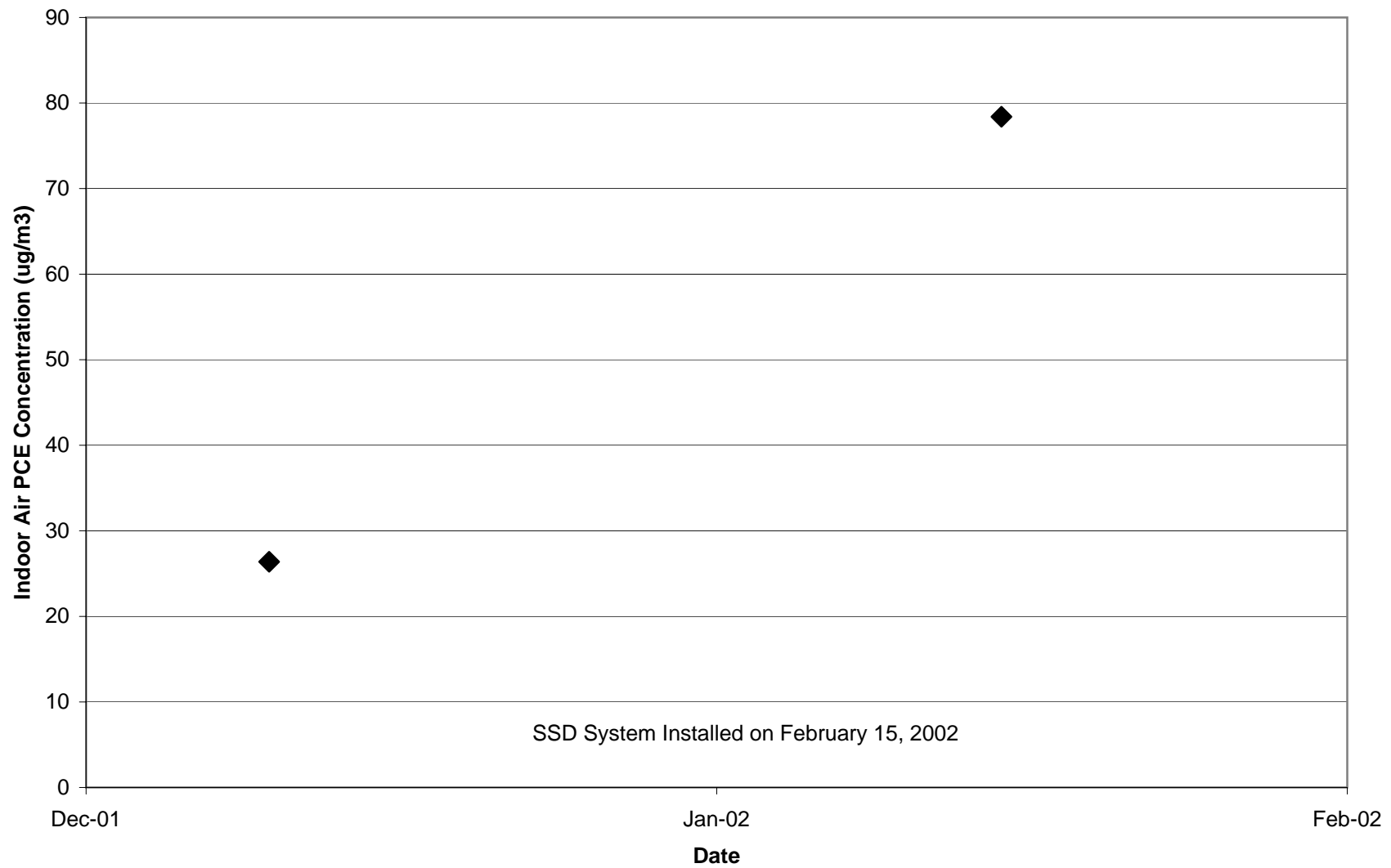
**x = 614839, y = 474772**  
**Indoor Air PCE Basement**



**x = 614772, y = 474797**  
**Indoor Air PCE Basement**

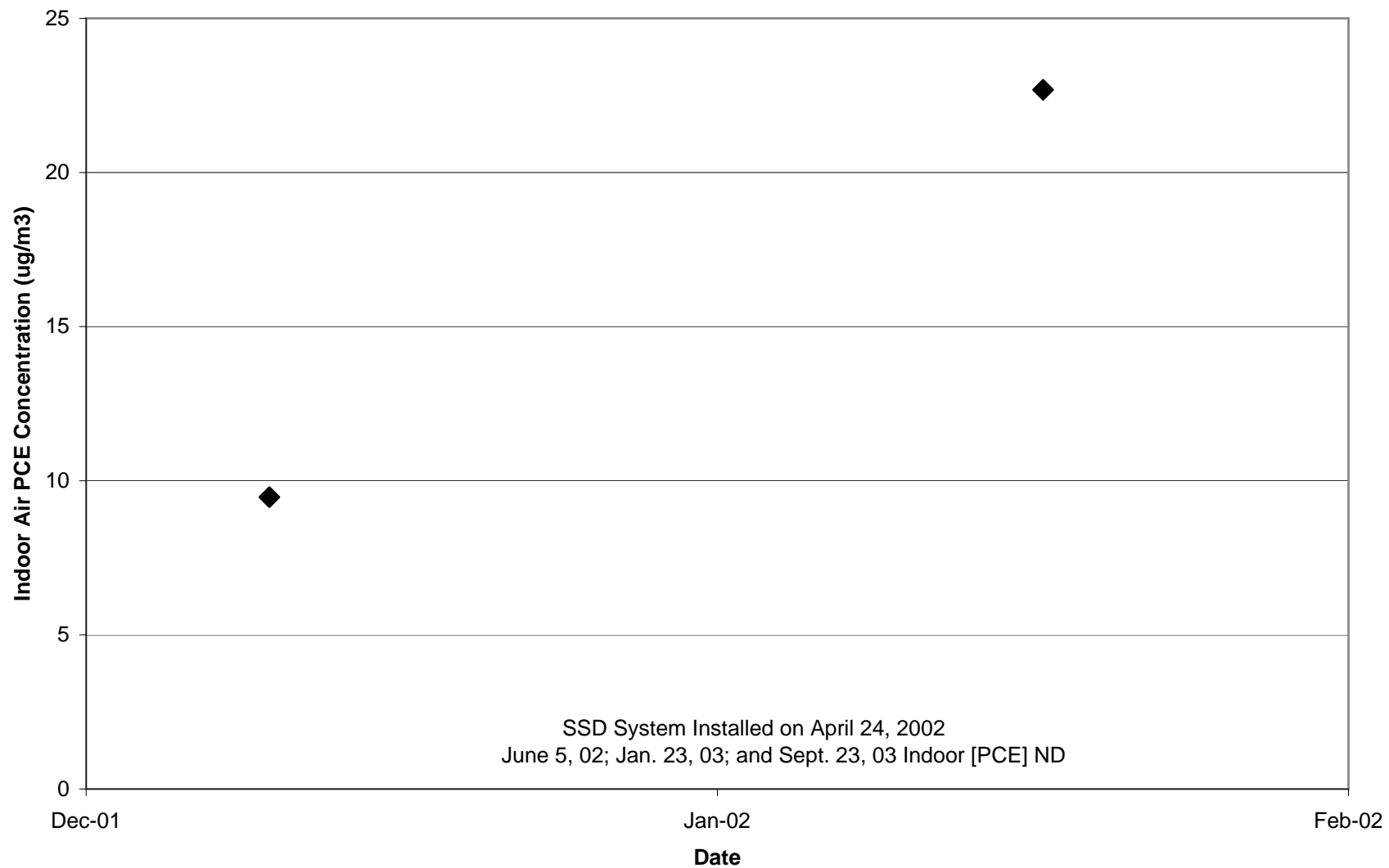


**x = 614924, y = 474915**  
**Indoor Air PCE Basement**

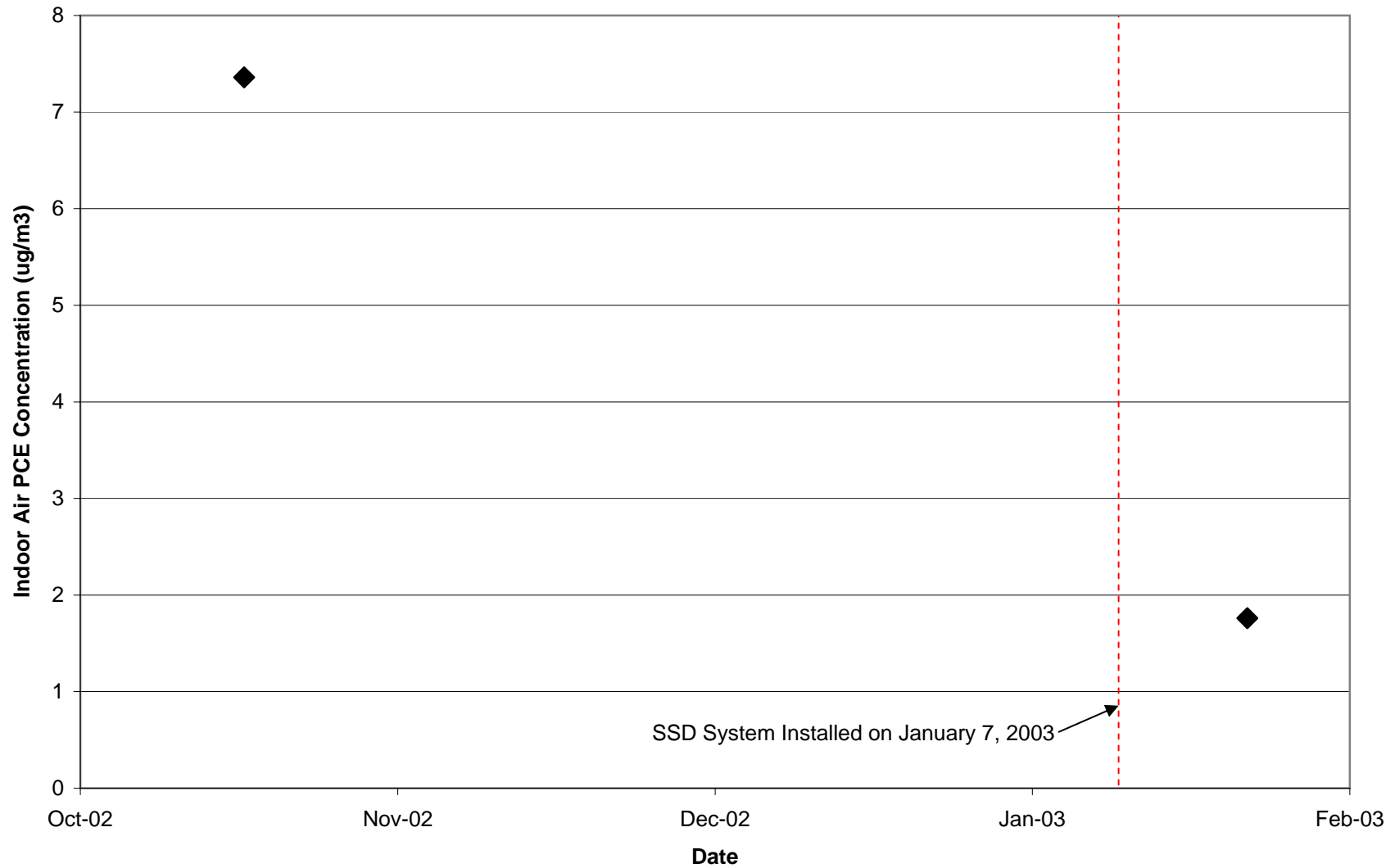




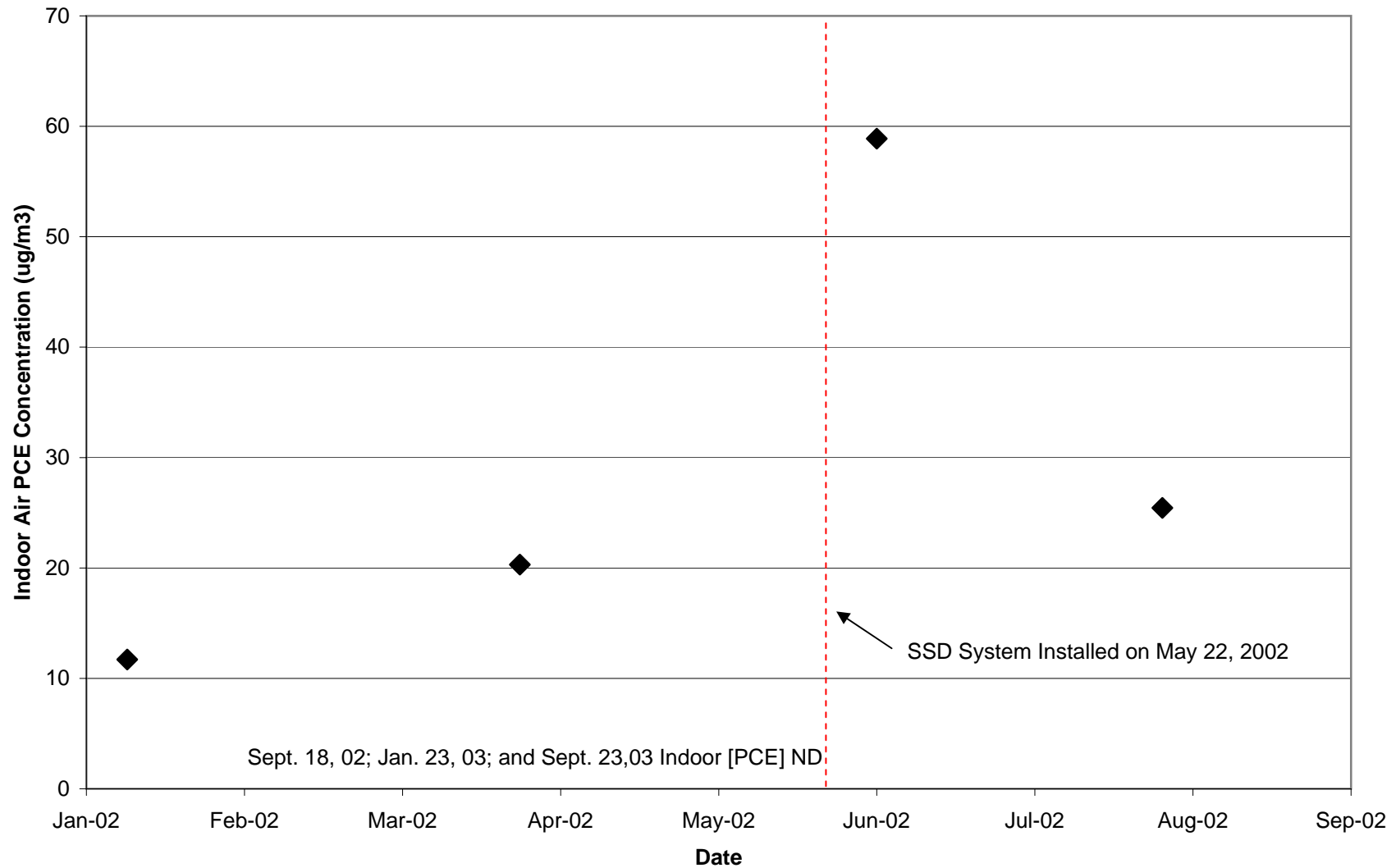
**x = 616789, y = 474743**  
**Indoor Air PCE Basement**



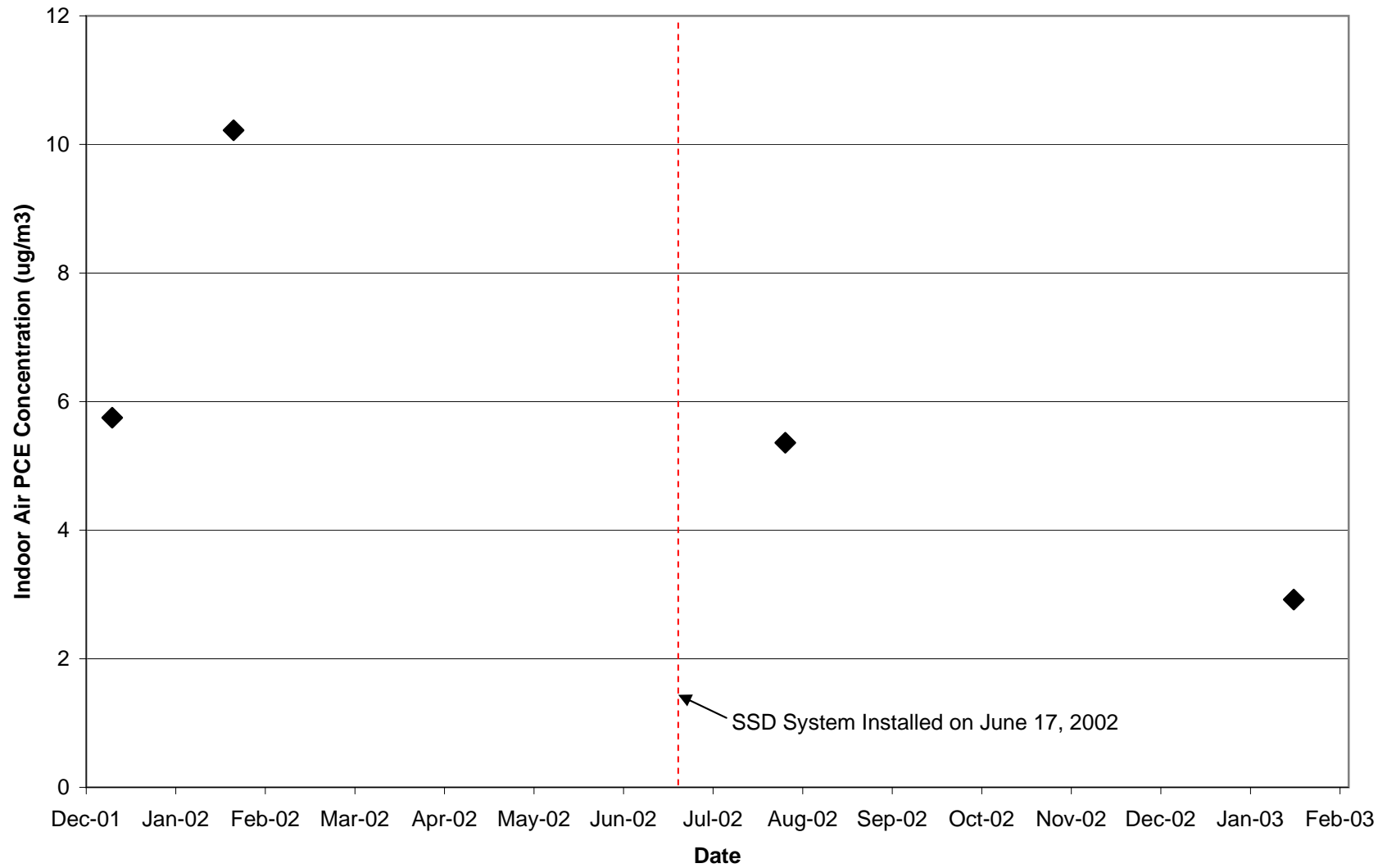
**x = 615751, y = 474978**  
**Indoor Air PCE Basement**



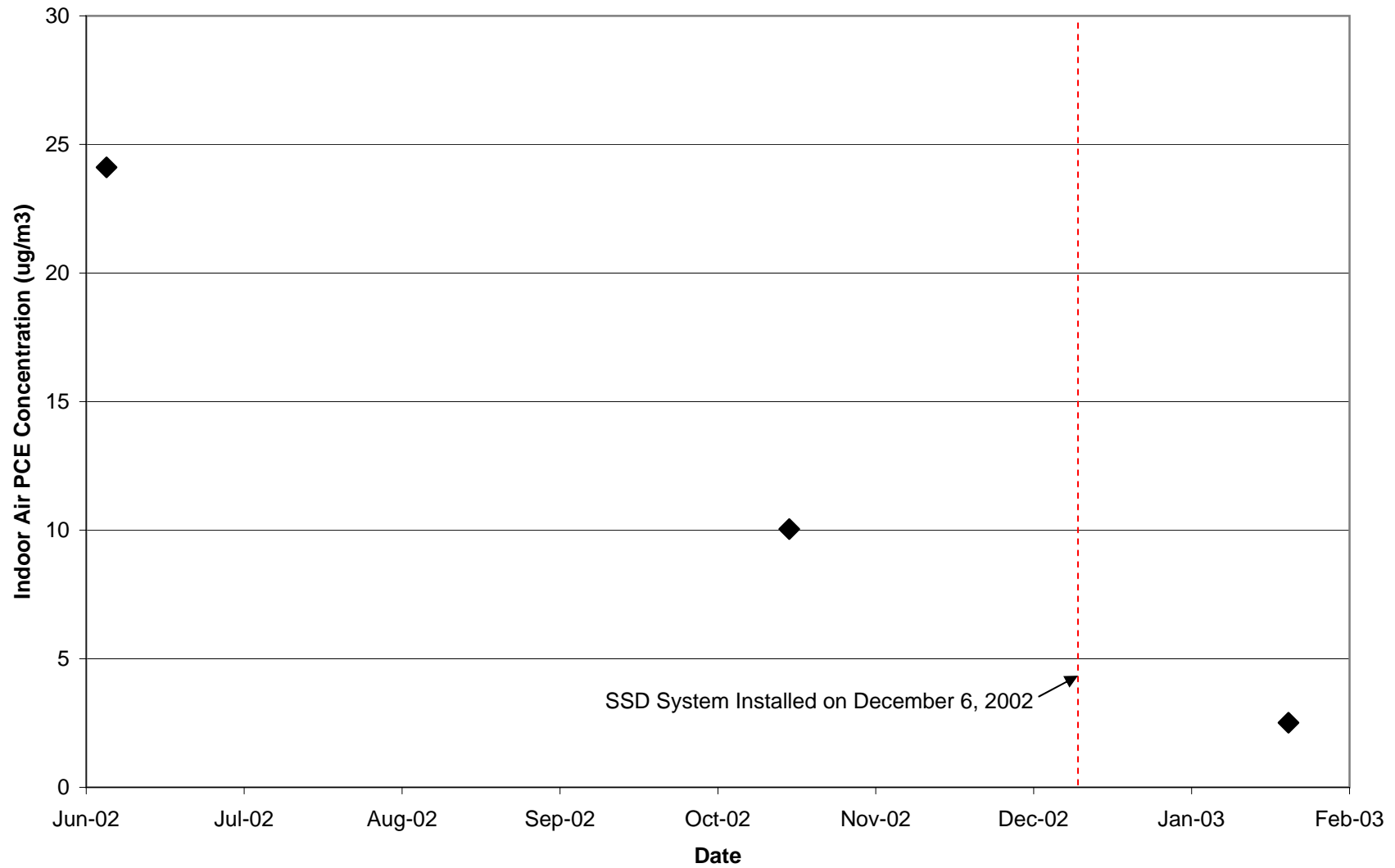
**x = 615810, y = 474858**  
**Indoor Air PCE Basement**



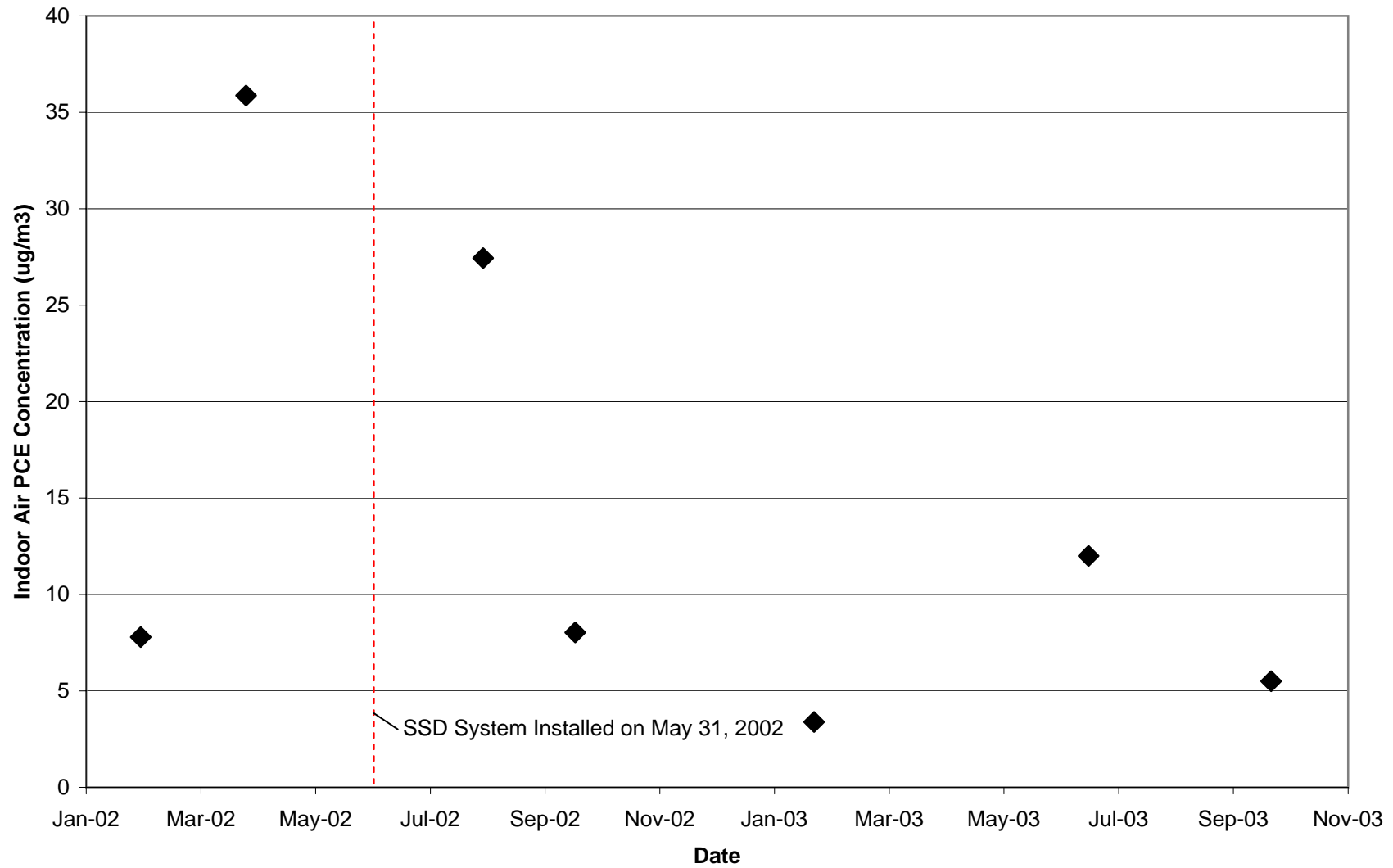
**x = 616583, y = 473931**  
**Indoor Air PCE Basement**



**x = 616290, 474044**  
**Indoor Air PCE Basement**



**x = 614507, 474648**  
**Ave Indoor Air PCE Basement**



### **APPENDIX III**

### **DESCRIPTION OF BUILDING CHARACTERISTICS**

x (State Plane Feet)	y (State Plane Feet)	Sump	SSD System Installed	Building Type	Basement Size	# Floors Below Grade	# Floors Above Grade	Foundation Type	Wall Construction	Floor construction	Heating	Dry Cleaning?	Other
614902	474748	Yes	2/11/2002	Residential		1	2	Cinder block	Cinder block	slab			Paint odor, attached garage, strong gasoline odor garage
618498	474118	No	5/23/2002			1.00	2		Cinder block		Natural gas, electric	Recently, but aired outside	Former sump filled in with concrete, pipes running through walls/ floor, solvents, paints stored in basement
616715	475038		12/5/2002	Residential		1	2	Cinder block		concrete floating?	Natural gas	No	
616461	475243	Yes	5/16/2002								Natural gas	yes	Paint thinners, household cleaning products stored in basement
616485	475406			SFR		1	2	Cinder block		concrete floating?	Natural gas, wood	three days ago	Sump, paint thinner smell in basement
619147	474305	No	11/9/2002				2	Cinder block					
615905	474619					1.00	1	Cinder block		slab	natural gas		Paints, thinners stored basement
615692	474672					1.00	1	Cinder block		slab	natural gas		Paints, thinners stored basement
615538	474730				1000 ft	1 (8 ft ceiling)	1		Cinder block	slab, good condition	natural gas	1xmoth	Paints, thinners stored basement, pipes run through walls
615319	474611				18 by 22				Cinder block, good	slab	natural gas	2xmonth	walls
615256	474645				800 ft2	1.00	1	Cinder block	clinder block	slab	natural gas	no	Paints, thinners stored basement
						1 (1/2 basement, 1/2 crawlspace)	1						
615406	474761	No									natural gas	1 to 2xmonth	
615327	474782	Yes	4/23/2002	SFR	1200 ft2	1		Cinder block		concrete	natural gas	no	Sump, heavy rain during sampling
615184	474663					1.00	1	Cinder block	sheet rock	slab	oil	no	paint, thinners basement
615267	474797	First Floor	4/16/2002		1000 ft2	1 (7 ft ceiling)	1			Tile	natural gas	twice a month	
615041	474696	Yes				1.00	1	Cinder block	Cinder block	slab	natural gas	2-3 weeks before sampling	paint, thinners basement
615152	474835	No	4/17/2002			1.00	1	Cinder block	cinder block	slab	natural gas	2x year	paint, thinners basement
615087	474854	No	5/15/2002			1.00	1	Cinder block	Cinder block	slab	natural gas	no	household cleaning products stored in basement
615032	474869	Yes	1/11/2002			1.00	2					once month	paint, thinners basement
614839	474772	Yes	2/27/2002	SFR	800 ft2	1 full	2	Cinder block	cinder block, good condition	floating, good condition	natural gas		paint, thinners, sump present basement
614772	474797	Yes	1/18/2002	Residential		1	2	Cinder block	Cinder block	floating	natural gas		solvents, gasoline stored basement, sump
614924	474915	No	2/15/2002			1	1	Cinder block	Cinder block	Slab	natural gas	every 2 months	paints, thinners, former sump, now sealed
614696	474817	Yes	1/7/2002			1	2	Cinder block		floating	natural gas	once month	paint, thinners, household cleaning products in basement, sump
616789	474743		4/24/2002		900 ft2	1 (8 ft ceiling)				new poured concrete over old cinder bloc	oil, natural gas?		paints, thinners, solvent, glue, basement, UST beside house
616511	474848			Residential		1.00	1		Cinder block, good condition	slab, good condition	oil, natural gas	no	paints, thinners basement, UST
615751	474978		1/7/2003	SFR		full basement	2	Cinder blocks		Concrete	natural gas	2 to 3 weeks prior to sampling	No sump, heavy rain and wind during sampling on 10/16/02
615403	475114			SFR			2	Concrete block		Concrete	natural gas	3 to 4 weeks prior to sampling	Sump, heavy rain and wind during sampling on 10/16/02
616715	476654	No		SFR		1	1	Cinder blocks		Concrete		3 months ago	No sump
						partial basement, & crawlspace							
615810	474858		5/22/2002			1.00	3		cinder block	slab	natural gas	Infrequently	solvents, paints, thinners stored basement
616583	473931	No	6/17/2002			1.00		Brick		Poured concrete, bare spots	natural gas	2 to 3 weeks	basement
616290	474044		12/6/2002	SFR		1 (full)				Concrete	natural gas	3 weeks ago	no sump
615445	474140			SFR		1	2	brick		concrete and dirt	natural gas	no	no sump, old house
614947	474485			Residential	800 ft2	1 (8 ft ceiling)	1	Cinder block	Cinder block	concrete slab, good condition	natural gas	1 x month	Paints, thinners stored in basement
614602	474804	No				1 (full)	2	Cinder block	Cinder block	concrete slab, cracks			Paints, solvents and household cleaning products stored
620043	473647	No		School				Slab		slab	Electric	no	Gasoline, solvents, paint/thinners stored
								Cinder blocks with cracks					
615301	474889			SFR		1	2			concrete with cracks		1 month ago	

= NJDEP data

SFR = single family residence

= EPA data from March 2003 table

= NJDEP data, home remediated by NJDEP

= NJDEP/EPA data, home remediated by EPA

= EPA Edison data only