Health Consultation

Evaluation of Indoor Air Sampling at Cabo Rojo Ground Water Contamination Site
in Cabo Rojo, Puerto Rico

EPA FACILITY ID: PRN000206319

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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
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Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Prepared By:

Eastern Branch
Division of Community Health Investigations (proposed)
Agency for Toxic Substances and Disease Registry

Summary

Introduction

The Agency for Toxic Substances and Disease Registry's (ATSDR) top priority is to ensure that the people living in or near Cabo Rojo, Puerto Rico have the best information possible to safeguard their health.

Man-made chemicals called chlorinated volatile organic compounds (VOCs) have been detected at low levels in municipal drinking water supply wells in Cabo Rojo. The U.S. Environmental Protection Agency (EPA) is investigating potential sources of the contamination and identified high VOCs in the soil and air beneath some buildings where businesses may have used these chemicals in the past.. In February 2012, ATSDR recommended EPA collect indoor air samples to identify any harmful exposures occurring in nearby schools, residences, and businesses.

The purpose of this Health Consultation (HC) is to evaluate results from EPA's sampling of indoor air, sub-slab soil gas, and ambient (outdoor) air in several locations that are potentially affected by VOCs from contaminated groundwater.

Conclusion

No harmful levels of VOCs were found in indoor air of any of the locations in the recent sampling events. However, sub-slab sampling shows continued high VOC concentrations beneath several buildings.

Next steps

- ATSDR recommends follow-up sampling over time to verify that indoor levels of VOCs do not increase. ATSDR will provide public health input as EPA develops a site-specific sampling strategy.
- Further investigation may be warranted to discover the source or sources of benzene, toluene, ethylbenzene, xylene, and trimethylbenzenes in soil gas beneath one location. These contaminants are not known to be site-related.

Background and Statement of Issues

The Agency for Toxic Substances and Disease Registry (ATSDR) has been working with the U.S. Environmental Protection Agency (EPA) to evaluate whether public health might be affected by an area of groundwater contamination in Cabo Rojo, Puerto Rico known as the Cabo Rojo Ground Water Contamination site. Chlorinated volatile organic compounds (VOCs), man-made chemicals, have been detected at low levels in some public water supply wells serving the city. This site was listed on the National Priorities List (NPL) in March 2011.

In August 2011, ATSDR released a draft public health assessment which concluded that the municipal drinking water was unlikely to cause any harm in people drinking and using this water [1]. However, the Agency recommended further evaluation of the potential for contaminants from the groundwater to enter homes through a process known as vapor intrusion, especially near potential sources of the groundwater contamination where concentrations might be higher.

In January 2012, EPA provided ATSDR with results of soil gas and sub-slab (under building foundations) sampling collected in several potential source areas to assess the potential for vapor intrusion in Cabo Rojo [2]. While not conclusive, the results indicated a potential for harmful concentrations of VOCs, particularly tetrachloroethylene (PCE), in indoor air of certain buildings tested, including a Head Start preschool. In a letter health consultation dated February 24, 2012, ATSDR recommended EPA collect indoor air samples so that VOC concentrations could be evaluated [3][1].

EPA collected indoor air samples, sub-slab samples, and ambient (outdoor) samples at several schools, residences, and businesses potentially affected by vapor intrusion in two phases. Phase 1 sampling occurred the week of February 27, 2012; ATSDR received complete results on March 19, 2012 [4]. EPA collected Phase 2 samples at additional properties the week of March 19, 2012, and provided complete results to ATSDR on April 13, 2012. The focus of this health consultation is on indoor air sample results. Results of sub-slab soil gas and ambient air sampling taken at the same time as the indoor air sampling are discussed only as they apply to the indoor air evaluation.

[1] Note: This health consultation uses a cancer screening value for PCE (3.8 $\mu g/m^3$) based on updated toxicological information finalized by EPA in February 2012. The February 24, 2012 letter health consultation used a value of 0.2 $\mu g/m^3$, based on interim ATSDR guidance to use California EPA PCE information until the EPA update was finalized. This change does not affect ATSDR's prior conclusions or current conclusions regarding PCE potential risk at this site.

Summary of Sampling

In response to ATSDR's February 2012 request for indoor air sampling, EPA conducted further testing in February and March. Samples were collected in 2 phases: Phase 1 testing included schools, businesses, and residences within, immediately adjacent to, or very near the potential sources and was conducted during the week of February 28, 2012. Phase 2 testing included schools, businesses, governmental facilities, and residences located within 100 feet of potential source areas and was conducted the week of March 19, 2012.

Phase 1
EPA investigated all four potential source locations where VOCs were found in sub-slab or soil gas sampling. EPA collected 24-hour indoor, sub-slab, and ambient air samples at each area. Sampling focused on the potential source and schools, businesses, and residences adjacent to and/or near the potential source. Table 1 summarizes the Phase 1 samples.

Table 1. Samples Collected at Potential Sources and Adjoining Properties, Cabo Rojo Ground Water Contamination Site, Phase 1

Potential Source	Location Sampled	# of Indoor Air Samples	# of Sub-Slab Samples*	# of Ambient Samples
Potential Source#1	Potential Source	1	3	1
	Residence	1	0	
Potential Source #2	Potential Source	3	2	5
	Head Start	5	7	
	Adult School	1	1	
Potential Source #3	Potential Source	1	3	3
	Preschool	2	3	
	Residence	1	0	
Potential Source #4[†]	Drug Store	1	2	1
	Vacant Shop	1	3	
	Restaurant	1	0	

*Some residents/occupants did not agree to sub-slab sampling because it would damage flooring.
[†] The building containing Potential Source #4 was demolished several years ago (exact date unknown), and the lot now contains a drug store and a building housing a vacant shop and a restaurant.
NOTE: Samples collected from Potential Source #2 were analyzed for more than 50 VOCs using the standard EPA TO-15 method. Samples from the remaining potential source areas were analyzed for a subset of 8 VOCs related to the Cabo Rojo Ground Water Contamination Site.

Because potential indoor air concerns at the Head Start facility were identified from June 2011 sub-slab sampling, all samples from the area of Potential Source #2 were analyzed for more than 50 VOCs using the EPA TO-15 Method [5]. All other samples from the remaining potential

source areas were analyzed for eight VOCs specific to the Cabo Rojo Site, including PCE, TCE, and six other breakdown products.

Phase 2
In Phase 2, EPA collected 24-hour indoor air, sub-slab, and ambient air samples at schools, businesses, governmental agencies, and residences within 100 feet of the four potential sources tested in Phase 1. No samples associated with Potential Source #4 were collected because there were no properties within 100 feet of the potential source besides those already sampled during Phase 1. Table 2 summarizes the samples collected during Phase 2.

Table 2. Samples Collected at Properties Within 100 Feet of Potential Sources, Cabo Rojo Ground Water Contamination Site, Phase 2

Potential Source	# and Type of Properties Sampled	# of Indoor Air Samples	# of Sub-Slab Samples*	# of Ambient Samples
Potential Source#1	10 Residences	12	10	1
	4 Businesses	4	4	0
Potential Source #2	6 Residences	8	6	1
	1 School	8	7	1
	5 Government Facilities	6	6	1
Potential Source #3	4 Residences	5	4	1
	2 Schools	16	14	2
Potential Source #4	None†	0	0	0

*Some residents/ occupants did not agree to sub-slab sampling because it would damage flooring.
† No additional properties other than those already sampled in Phase 1 were located within 100 feet of potential source.

Summary of Phase 1 Indoor Air Sampling Results

Table 3 summarizes the results of the indoor air sampling, along with health-based comparison values (CVs) used for screening. CVs are contaminant concentrations in air that are not expected to result in any adverse health effects for continuous exposure over different periods of time. Separate CVs exist for noncancer and cancer effects.

If a measured concentration is higher than a CV, it does not mean that adverse health effects will occur. Rather, it indicates the need to further evaluate the potential for adverse health effects. Of the 11 locations with indoor air samples collected, six had one or more detections above a cancer-based CV; only one location had a detection above a non-cancer CV..

The following discussion focuses on evaluation of the indoor air sample results. Results of sub-slab soil gas and ambient air sampling taken at the same time as the indoor air sampling are discussed only as they apply to the indoor air evaluation; table summaries of sub-slab and ambient air results are included in Appendix A for reference.

Evaluation of Indoor Air Exposures at Phase 1 Locations

ATSDR screened the indoor air results to determine which contaminants exceeded CVs; see Tables 3a and 3b for summaries. For contaminants exceeding noncancer CVs, ATSDR compared potential exposures with findings of relevant toxicological studies to determine the likelihood for adverse noncancer health effects. For contaminants exceeding cancer CVs, ATSDR estimated the theoretical increased risk of cancer. This is calculated by multiplying the concentration of a contaminant by its corresponding inhalation unit risk [6]. Because the inhalation unit risk is based on continuous exposure for a lifetime (70 years), this product may be scaled by the fraction of time a person is assumed to be exposed to the contaminant. For this evaluation, we considered three exposure scenarios:

- Schools: ATSDR assumed teachers would be exposed to the highest concentration of each contaminant detected for 50 hours per week, for 30 years. Students at the school were assumed to be exposed to the highest concentration of each contaminant detected for 50 hours per week, for no more than four years. (Typical enrollees for preschools are 3-5 year-olds.)
- Residences: ATSDR assumed residents would be exposed to the highest concentration of each contaminant detected for 24 hours a day, for an assumed lifetime of 70 years. (i.e., no scaling factor was applied to the concentration × inhalation unit risk product.)
- Businesses: ATSDR assumed workers would be exposed to the highest concentration of each contaminant detected for 50 hours per week, for 30 years. (This category was also applied to businesses that may not be currently operating.)

ATSDR compared the estimated theoretical increased cancer risk with EPA's acceptable risk range for Superfund of 1 in 1,000,000 to 1 in 10,000. More detailed numerical results from ATSDR cancer estimates are included in Appendix A. The following discussion describes ATSDR's findings from this evaluation for each potential source and nearby properties:

Potential Source #1 – Phase 1 Evaluation

Potential Source #1 is a former business; people reside in a building very close to it. Indoor air samples were collected both in the potential source and the residence. Sub-slab samples were collected in the potential source unit only. An ambient air sample was collected outside of the potential source. The following text evaluates the results from sampling around Potential Source #1:

Indoor Air in Potential Source Unit
PCE was the only VOC detected above CVs in indoor air, and it exceeded only the cancer CV. Assuming a worker's exposure to this concentration of PCE for 50 hours per week for 30 years, the theoretical increased risk of cancer would be 1.6×10^{-7}, or less than 1 in 1,000,000. That is, out of a million workers exposed under this scenario, less than one additional case of cancer would be expected due to the exposure. This is below EPA's acceptable risk range for Superfund of 1 in 1,000,000 to 1 in 10,000.

Indoor Air in Residence Near Potential Source #1
A residence adjacent to Potential Source #1 had 1,2-dichloroethane and PCE detected in indoor air above cancer CVs. Assuming a lifetime of exposure to the detected concentrations, the theoretical increased risk of cancer would be 6.6×10^{-5}, or less than 1 in 10,000. That is, out of 10,000 people exposed under this scenario, less than one additional case of cancer would be expected due to the exposure. This is within EPA's acceptable risk range for Superfund of 1 in 1,000,000 to 1 in 10,000.

Ambient Air and Sub-Slab Soil Gas at Potential Source #1
One ambient air sample collected from outside the potential source unit detected PCE at a similar concentration as in the indoor air of both the potential source unit and the residence. Sub-slab soil gas sampling performed at the potential source unit at the same time as the indoor sampling detected PCE concentrations in the sub-slab soil gas ranging from 104,000 to 692,000 $\mu g/m^3$, indicating highly elevated PCE concentrations in the soil gas beneath the potential source building.

To summarize, current indoor air exposures at locations near Potential Source #1 are not likely to result in harm to the occupants. However, elevated sub-slab results indicate that ongoing indoor air monitoring is needed. This monitoring will ensure that changing seasons or building/foundation conditions do not increase the likelihood of vapor intrusion at the potential source and adjoining properties.

Potential Source #2 – Phase 1 Evaluation
Potential Source #2 is an operating business. A Head Start preschool and an adult school are adjacent to the business in the same building. Indoor air and sub-slab soil gas samples were collected in each facility. Ambient air samples were collected in several areas around the building. The following text evaluates the results from sampling around Potential Source #2:

Indoor Air in Potential Source Unit
Within the potential source unit, benzene, carbon tetrachloride, chloroform, methylene chloride and PCE in indoor air exceeded their respective cancer CVs. Recent toxicological information indicates that chloroform is unlikely to be carcinogenic at the concentrations

measured in this sampling[2] [6]. Assuming a worker's exposure to the highest concentration of each of the other carcinogenic contaminants for 50 hours per week for 30 years, the theoretical increased risk of cancer would be 1.1×10^{-5}, or less than 1 in 10,000. That is, out of 10,000 workers exposed under this scenario, less than one additional case of cancer would be expected due to the exposure. This is within EPA's acceptable risk range for Superfund of 1 in 1,000,000 to 1 in 10,000. Benzene, carbon tetrachloride, chloroform, and methylene chloride are not known to be associated with the groundwater contamination for the Site.

The compounds 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene were detected in the source unit indoor air at a level exceeding EPA's regional screening level for residential air for 1,2,4-trimethylbenzene, based on non-cancer effects. These compounds are not known to be

[2] Chloroform is likely to be carcinogenic only under high-exposure conditions leading to cell death and cell regeneration in susceptible tissues. Exposure to chloroform at the measured concentrations is not high enough to cause these effects.

Table 3a. Summary of Phase 1 Indoor Air Results – Potential Sources #1 and #2

Contaminant	Highest Indoor Air VOC Concentration Detected, in µg/m^3					Health-Based Comparison Values in µg/m^3; NTP Cancer Classification
	Potential Source (PS) #1	Residence Near PS#1	Potential Source (PS) #2	Head Start Near PS #2	Adult School Near PS #2	
Benzene	NA	NA	3	1	2	10 - chronic MRL 0.1 –CREG Known human carcinogen
Carbon Tetrachloride	NA	NA	0.4	0.5	ND	200 - chronic MRL 0.2 – CREG Reasonably anticipated to be a carcinogen
Chloroform	NA	NA	2	16	2	100 - chronic MRL 0.04 – CREG Reasonably anticipated to be a carcinogen
1,2-Dichloroethane	ND	2	ND	ND	1	2000 - chronic MRL 0.04 – CREG Reasonably anticipated to be a carcinogen
cis-1,2-Dichloroethylene	ND	ND	ND	ND	1	None Not classified
Methylene Chloride	NA	NA	600	0.8	1	1000 - chronic MRL 100 – CREG Reasonably anticipated to be a carcinogen
Tetrachloroethylene (PCE)	5	7	48	0.7	ND	270 chronic MRL 3.8 – CREG* Reasonably anticipated to be a carcinogen
Toluene	NA	NA	154	13	814	300 - chronic MRL Not classified
1,2,4-Trimethylbenzene	NA	NA	450	3	102	7.3 – RSL Not classified
1,3,5-Trimethylbenzene	NA	NA	154	1	22	7.3 – RSL for 1,2,4-Trimethylbenzene Not classified

Notes: Results rounded to whole number or one significant figure. Highlights indicate detections above comparison values (CVs).
µg/m^3 = micrograms per cubic meter NTP = National Toxicology Program NA = not analyzed ND = not detected
MRL = minimal risk level CREG = cancer risk evaluation guide RSL = regional screening level
*Note: the CREG for PCE has been updated based on updated toxicological information finalized by EPA in February 2012. The PCE CREG used in ATSDR's February 24, 2012 letter health consultation, 0.2 µg/m^3, was based on interim ATSDR guidance to use California EPA PCE information until the EPA update was finalized. This change does not affect ATSDR's prior conclusions or current conclusions regarding PCE potential risk at this site.

Table 3b. Summary of Phase 1 Indoor Air Results – Potential Sources #3 and #4

Contaminant	Highest Indoor Air VOC Concentration Detected, in µg/m^3						Health-Based Comparison Values in µg/m^3; NTP Cancer Classification
	Potential Source (PS) #3	Preschool Near PS #3	Residence Near PS #3	Drug Store at Former PS #4	Vacant Shop at Former PS #4	Restaurant at Former PS #4	
Benzene	NA	NA	NA	NA	NA	NA	10 - chronic MRL 0.1 –CREG Known human carcinogen
Carbon Tetrachloride	NA	NA	NA	NA	NA	NA	200 - chronic MRL 0.2 – CREG Reasonably anticipated to be a carcinogen
Chloroform	NA	NA	NA	NA	NA	NA	100 - chronic MRL 0.04 – CREG Reasonably anticipated to be a carcinogen
1,2-Dichloroethane	ND	ND	ND	4	ND	ND	2000 - chronic MRL 0.04 – CREG Reasonably anticipated to be a carcinogen
cis-1,2-Dichloroethylene	ND	ND	0.3	ND	ND	ND	None Not classified
Methylene Chloride	NA	NA	NA	NA	NA	NA	1000 - chronic MRL 100 – CREG Reasonably anticipated to be a carcinogen
Tetrachloroethylene (PCE)	3	ND	ND	ND	ND	ND	270 chronic MRL 3.8 – CREG* Reasonably anticipated to be a carcinogen
Toluene	NA	NA	NA	NA	NA	NA	300 - chronic MRL Not classified
1,2,4-Trimethylbenzene	NA	NA	NA	NA	NA	NA	7.3 – RSL Not classified
1,3,5-Trimethylbenzene	NA	NA	NA	NA	NA	NA	7.3 – RSL for 1,2,4-Trimethylbenzene Not classified

Notes:
Results rounded to whole number or one significant figure. Highlights indicate detections above lowest comparison value.
µg/m^3 = micrograms per cubic meter NTP = National Toxicology Program NA = not analyzed ND = not detected
MRL = minimal risk level CREG = cancer risk evaluation guide RSL = regional screening level
*Note: the CREG for PCE has been updated based on updated toxicological information finalized by EPA in February 2012. The PCE CREG used in ATSDR's February 24, 2012 letter health consultation, 0.2 µg/m^3, was based on interim ATSDR guidance to use California EPA PCE information until the EPA update was finalized. This change does not affect ATSDR's prior conclusions or current conclusions regarding PCE potential risk at this site.

associated with the groundwater contamination for the Site. Few studies exist of the toxicology of these individual compounds. Animal inhalation studies showed that a mixture of compounds containing trimethylbenzenes and other aromatic hydrocarbons caused liver effects at concentrations thousands of times higher than the highest concentration measured at this potential source unit [7]. Health effects are unlikely from exposure to these compounds.

Indoor Air in the Head Start facility Adjacent to Potential Source #2
At the Head Start facility, benzene, carbon tetrachloride, and chloroform in indoor air exceeded the respective cancer CVs (no noncancer CVs were exceeded). Recent toxicological information indicates that chloroform is unlikely to be carcinogenic at the concentrations measured in this sampling [6]. Assuming a teacher's exposure to the highest concentration of each of the other carcinogenic contaminants for 50 hours per week for 30 years, the theoretical increased risk of cancer would be 4.8×10^{-5}, or less than 1 in 10,000. That is, out of 10,000 teachers exposed under this scenario, less than one additional case of cancer would be expected due to the exposure. This is within EPA's acceptable risk range for Superfund of 1 in 1,000,000 to 1 in 10,000. Children's risk would be lower because children are only enrolled between the ages of 3 and 5, so their duration of exposure would only be 2-4 years. Benzene, carbon tetrachloride, and chloroform are not known to be associated with the groundwater contamination for the Site. No detections above CVs occurred for PCE, TCE, or DCE (VOCs known to be associated with the Site groundwater contamination) in indoor air.

Indoor Air in Adult School Near Potential Source #2
At the school for adults, toluene was detected in indoor air at 814 $\mu g/m^3$, above the noncancer CV of 300 $\mu g/m^3$. This chronic minimal risk level is based on a human study showing impaired color vision among workers who were exposed during work hours to 35 ppm of toluene, for at least 6 months [8]. The effect level noted in the study, 35 ppm toluene, converts to 142,000 $\mu g/m^3$ toluene. If the detection of 814 $\mu g/m^3$ is representative of average levels of toluene in this school, it is unlikely that adverse health effects would occur from this exposure. However, ATSDR notes that sub-slab soil gas sampling at this location also detected a high concentration of toluene (131,000 $\mu g/m^3$), along with detections of ethylbenzene, xylenes, and trimethylbenzenes. Benzene, toluene, ethylbenzene, and xylenes ("BTEX" compounds) and trimethylbenzenes are not known to be associated with the Site groundwater contamination.

Also at this school, benzene, chloroform, and 1,2-dichloroethane were detected in indoor air above cancer CVs. Recent toxicological information indicates that chloroform is unlikely to be carcinogenic at the concentrations measured in this sampling [6]. Assuming a teacher's exposure to the highest concentration of each of the other carcinogenic contaminants for 50 hours per week for 30 years, the theoretical increased risk of cancer would be 1.2×10^{-5}, or less than 1 in 10,000. That is, out of 10,000 teachers exposed under this scenario, less than one additional case of cancer would be expected due to the exposure. This is within EPA's acceptable risk range for Superfund of 1 in 1,000,000 to 1 in 10,000. A student's risk would be lower since they will be enrolled for a shorter time.

Ambient Air and Sub-Slab Soil Gas at Potential Source #2
Five ambient air samples collected from around the building housing both schools and the potential source showed concentrations of benzene, carbon tetrachloride, and chloroform similar to those measured in indoor air. Sub-slab soil gas sampling performed in the Head Start facility at the same time as the indoor sampling detected PCE concentrations in the sub-slab soil gas ranging from 748 to 7,340 $\mu g/m^3$, confirming earlier findings. The sub-slab sampling beneath the potential source unit showed PCE concentrations as high as 756,000 $\mu g/m^3$, indicating highly elevated PCE concentrations in the soil gas. Sub-slab sampling beneath the source unit and adjoining properties also detected benzene, chloroform, toluene, and trimethylbenzenes.

To summarize, current indoor air exposures at locations near Potential Source #2 are not likely to result in harm. However, elevated sub-slab results indicate that ongoing monitoring of the indoor air is needed. This monitoring will ensure that changing seasons or building/foundation conditions do not increase the likelihood of vapor intrusion into any of these facilities.

Potential Source #3 – Phase 1 Evaluation
Potential Source #3 is a former business. A residence is adjacent to the potential source in the same building, and a preschool is in a separate building very near the potential source. Indoor air samples were collected in each location (business, residence and preschool). Sub-slab soil gas samples were collected from the potential source and preschool. Ambient air samples were collected in several areas around the preschool building. The following text evaluates the results from sampling around Potential Source #3:

Indoor Air in Potential Source Unit
PCE was the only VOC detected in indoor air, and its concentration did not exceed any CV. Indoor air exposures at this unit are not likely to result in any harm.

Indoor Air in Preschool Near Potential Source #3
At the preschool, there were no detections of any VOCs in indoor air. Indoor air exposures at this preschool are not likely to result in any harm.

Indoor Air in Residence Near Potential Source #3
At a nearby residence there were no detections of any VOCs in indoor air. Indoor air exposures at this residence are not likely to result in any harm.

Ambient Air and Sub-Slab Soil Gas at Potential Source #3
Three ambient air samples collected from around the preschool showed no detections of any VOC. Sub-slab sampling at the potential source unit detected relatively high concentrations of PCE, up to 5,780 $\mu g/m^3$. The sub-slab sampling at the preschool detected low concentrations of PCE in soil gas, which would not be likely to impact indoor air.

To summarize, current indoor air exposures at locations near Potential Source #3 are not likely to result in harm. However, elevated sub-slab results indicate that ongoing monitoring of the indoor air is needed. This monitoring will ensure that changing seasons or building/foundation conditions do not increase the likelihood of vapor intrusion at the potential source and adjoining properties.

Potential Source #4 – Phase 1 Evaluation

Potential Source #4 was a business, but the business closed and the building was demolished several years ago (exact date unknown). Currently, two buildings are present on the property: a drug store and a building containing a vacant shop and a restaurant. Indoor air samples were collected in all 3 units, and sub-slab samples were collected in the drug store and vacant shop. One ambient air sample was collected in between the two buildings. The following text evaluates the results from sampling around former Potential Source #4:

Indoor Air in Drug Store at Former Potential Source Site

The compound 1,2-dichloroethane was the only VOC detected in indoor air at the drug store. Its concentration exceeded only the cancer CV. Assuming a worker's exposure to this concentration of 1,2-dichloroethane for 50 hours per week for 30 years, the theoretical increased risk of cancer would be 1.3×10^{-5}, or less than 1 in 10,000. That is, out of 10,000 workers exposed under this scenario, less than one additional case of cancer would be expected due to the exposure. This is within EPA's acceptable risk range for Superfund of 1 in 1,000,000 to 1 in 10,000.

Indoor Air in Vacant Shop at Former Potential Source Site

No VOCs were detected in indoor air of the vacant shop. Indoor air exposures at this shop are not likely to result in any harm.

Indoor Air in Restaurant at Former Potential Source Site

No VOCs were detected in the restaurant's indoor air.. Indoor air exposures at this restaurant are not likely to result in any harm.

Ambient Air and Sub-Slab Soil Gas at Potential Source #4

One ambient air sample collected in the area of the former Potential Source #4 showed no detections of any VOC. Sub-slab sampling at the drug store detected relatively low concentrations of PCE (49-187 $\mu g/m^3$). The sub-slab sampling at the vacant shop detected even lower concentrations of PCE (1-2 $\mu g/m^3$), which would not be likely to impact indoor air.

To summarize, current indoor air exposures at locations near former Potential Source #4 are not likely to result in harm. However, ongoing monitoring of the indoor air is recommended to ensure that changing seasons or building/foundation conditions do not increase the likelihood of vapor intrusion at properties associated with this former potential source.

Summary of Phase 2 Indoor Air Sampling Results
Data from the Phase 2 sampling (additional properties within 100 feet of the potential source areas) were evaluated similarly as the Phase 1 results. Tables 4a, 4b, and 4c summarize the Phase 2 indoor air results for each potential source area along with applicable health-based CVs. No additional properties were located within 100 feet of Potential Source #4, so no results are shown.

The following discussion focuses on evaluation of the indoor air sample results. Results of sub-slab soil gas and ambient air sampling taken at the same time as the indoor air sampling are discussed only as they apply to the indoor air evaluation; table summaries of sub-slab and ambient air results are attached in Appendix A for reference.

Evaluation of Indoor Air Exposures at Phase 2 Locations

Data from the Phase 2 sampling were evaluated similarly as the Phase 1 data; the general procedure is described in the section beginning on page 7 of this document. Of all the samples collected during Phase 2, no indoor air contaminant levels exceeded a noncancer CV. Some contaminant concentrations exceeded cancer CVs and were evaluated using the same exposure scenarios described previously. For government facilities, the exposure was assumed to be similar to a business exposure scenario.

Potential Source #1 – Phase 2 Evaluation
Indoor air and sub-slab soil gas samples were collected in 4 businesses and 10 residences within 100 feet of potential source #1.One ambient air sample was collected outside of one of the residences. The following text evaluates the results from Phase 2 sampling around Potential Source #1, summarized in Table 4a:

Indoor Air in Residences Near Potential Source #1
1,2-Dichloroethane was the only substance detected above CVs in indoor air in the residential samples. It was detected at only one residence out of 10 residences sampled. A lifetime of exposure to the detected concentration of this compound would result in a theoretical increased risk of 7.5×10^{-6}, or less than 1 in 100,000. That is, out of 100,000 people exposed under this scenario, less than one additional case of cancer would be expected due to the exposure. This is within EPA's acceptable risk range for Superfund of 1 in 1,000,000 to 1 in 10,000.

Indoor Air in Businesses Near Potential Source #1
1,2-Dichloroethane and PCE were detected above CVs in indoor air at two of the businesses sampled. Assuming a worker's exposure to the highest concentration of each carcinogenic contaminant for 50 hours per week for 30 years, the theoretical increased risk of cancer would be 1.1×10^{-6}, or less than 1 in 100,000. That is, out of 100,000 workers exposed under this scenario, less than one additional case of cancer would be expected due to the exposures. This is within EPA's acceptable risk range for Superfund of 1 in 1,000,000 to 1 in 10,000.

Ambient Air and Sub-Slab Soil Gas from Phase 2 Properties Near Potential Source #1
The ambient air sample detected TCE at 0.3 µg/m^3. The origin of this relatively low detection is not clear, since TCE was not detected in nearby indoor air or sub-slab samples. Sub-slab soil gas sampling performed at the residences and businesses at the same time as the indoor sampling detected low concentrations of PCE and PCE breakdown products in the sub-slab soil gas. PCE concentrations ranged from 0.6 to 12 µg/m^3 in residences and from 3 to 109 µg/m^3 in the businesses.

To summarize, current indoor air exposures at residences and businesses within 100 feet of Potential Source #1 are not likely to result in harm to the occupants.

Table 4a. Summary of Indoor Air Results – Phase 2 Sampling Near Potential Source #1

Contaminant	Highest Indoor Air VOC Concentration Detected, in µg/m^3		Health-Based Comparison Values in µg/m^3; NTP Cancer Classification
	Residences	Businesses	
1,2-Dichloroethane	0.3	0.3	2000 - chronic MRL 0.04 – CREG Reasonably anticipated to be a carcinogen
Tetrachloroethylene (PCE)	ND	0.5	270 chronic MRL 3.8 – CREG* Reasonably anticipated to be a carcinogen

Notes:
Results rounded to whole number or one significant figure.
Highlights indicate detections above comparison values (CVs).
µg/m^3 = micrograms per cubic meter NTP = National Toxicology Program ND = not detected
MRL = minimal risk level CREG = cancer risk evaluation guide
*Note: the CREG for PCE has been updated based on updated toxicological information finalized by EPA in February 2012. The PCE CREG used in ATSDR's February 24, 2012 letter health consultation, 0.2 µg/m^3, was based on interim ATSDR guidance to use California EPA PCE information until the EPA update was finalized. This change does not affect ATSDR's prior conclusions or current conclusions regarding PCE potential risk at this site.

Potential Source #2 – Phase 2 Evaluation

Indoor air and sub-slab soil gas samples were collected in one school, six residences, and five government facilities within 100 feet of potential source #2. Ambient air samples were collected outside of the school, one residence, and one government facility. The following text evaluates the results from Phase 2 sampling around Potential Source #2:

Indoor Air in School Near Potential Source #2

Benzene, chloroform, and 1,2-dichloroethane were the only substances detected above CVs in indoor air in the school samples. Recent toxicological information indicates that chloroform is unlikely to be carcinogenic at the concentrations measured in this sampling [6]. Assuming a teacher's exposure to the highest concentration of each of the other carcinogenic contaminants for 50 hours per week for 30 years, the theoretical increased risk of cancer would be 1.0×10^{-5}, or 1 in 100,000. That is, out of 100,000 teachers exposed under this scenario, one additional case of cancer would be expected due to the exposure. This is within EPA's acceptable risk range for Superfund of 1 in 1,000,000 to 1 in 10,000. Children's risk would be lower because children are only enrolled for 2-4 years. Benzene and chloroform are not known to be associated with the groundwater contamination for the Site.

Indoor Air in Residences Near Potential Source #2

Chloroform and 1,2-dichloroethane were the only substances detected above CVs in indoor air in the residential samples. Recent toxicological information indicates that chloroform is unlikely to be carcinogenic at the concentrations measured in this sampling [6]. Assuming a lifetime of exposure to the highest concentration of each of the other carcinogenic contaminants, the theoretical increased risk of cancer would be 1.7×10^{-5}, or less than 1 in 10,000. That is, out of 10,000 people exposed under this scenario, less than one additional case of cancer would be expected due to the exposure. This is within EPA's acceptable risk range for Superfund of 1 in 1,000,000 to 1 in 10,000.

Indoor Air in Government Facilities Near Potential Source #2

Chloroform, 1,2-dichloroethane, and TCE were the only substances detected above CVs in indoor air in the government facility samples. Recent toxicological information indicates that chloroform is unlikely to be carcinogenic at the concentrations measured in this sampling [6]. Assuming a worker's exposure to the highest concentration of each of the other carcinogenic contaminants for 50 hours per week for 30 years, the theoretical increased risk of cancer would be 1.1×10^{-5}, or less than 1 in 10,000. That is, out of 10,000 workers exposed under this scenario, less than one additional case of cancer would be expected due to the exposure. This is within EPA's acceptable risk range for Superfund of 1 in 1,000,000 to 1 in 10,000. Chloroform is not known to be associated with the groundwater contamination for the Site.

Table 4b. Summary of Indoor Air Results – Phase 2 Sampling Near Potential Source #2

Contaminant	Highest Indoor Air VOC Concentration Detected, in µg/m^3			Health-Based Comparison Values in µg/m^3; NTP Cancer Classification
	School	Residences	Government Facilities	
Benzene	7	ND	ND	10 - chronic MRL 0.1 –CREG Known human carcinogen
Chloroform	0.2	8	3	100 - chronic MRL 0.04 – CREG Reasonably anticipated to be a carcinogen
1,2-Dichloroethane	0.1	0.4	0.4	2000 - chronic MRL 0.04 – CREG Reasonably anticipated to be a carcinogen
Ethylbenzene	8	2	1	300 – chronic MRL Not classified
Methylene Chloride	0.7	0.8	0.5	1000 - chronic MRL 100 – CREG Reasonably anticipated to be a carcinogen
Tetrachloroethylene (PCE)	ND	1	ND	270 chronic MRL 3.8 – CREG* Reasonably anticipated to be a carcinogen
Toluene	39	31	10	300 - chronic MRL Not classified
Trichloroethylene (TCE)	ND	ND	0.6	2 – chronic MRL 0.24 – CREG Reasonably anticipated to be a carcinogen
1,2,4-Trimethylbenzene	7	4	3	7.3 – RSL Not classified

Notes:
Results rounded to whole number or one significant figure.
Highlights indicate detections above comparison values (CVs).
µg/m^3 = micrograms per cubic meter NTP = National Toxicology Program ND = not detected
RSL = EPA Regional Screening Level for resident air MRL = minimal risk level
CREG = cancer risk evaluation guide
*Note: the CREG for PCE has been updated based on updated toxicological information finalized by EPA in February 2012. The PCE CREG used in ATSDR's February 24, 2012 letter health consultation, 0.2 µg/m^3, was based on interim ATSDR guidance to use California EPA PCE information until the EPA update was finalized. This change does not affect ATSDR's prior conclusions or current conclusions regarding PCE potential risk at this site.

Ambient Air and Sub-Slab Soil Gas from Phase 2 Properties Near Potential Source #2
Ambient air samples collected from outside selected Phase 2 locations showed detections of a few VOCs at levels similar to those detected indoors. The VOCs detected were 1,2,4-trimethylbenzene, ethylbenzene, methylene chloride, PCE, and toluene. Sub-slab soil gas

sampling performed at the school, residences, and government facilities at the same time as the indoor sampling detected low concentrations of various VOCs in the sub-slab soil gas, mostly similar in concentration to the indoor air and ambient measurements. PCE sub-slab soil gas concentrations were higher than found in indoor air or ambient samples. Sub slab sample, PCE concentrations ranged from 0.5 to 2 µg/m^3 at the school, 2 to 409 µg/m^3 at residences, and 1 to 7 µg/m^3 at government facilities.

To summarize, current indoor air exposures at schools, residences, and government facilities within 100 feet of Potential Source #2 are not likely to result in harm to the occupants.

Table 4c. Summary of Indoor Air Results – Phase 2 Sampling Near Potential Source #3

Contaminant	Highest Indoor Air VOC Concentration Detected, in µg/m^3		Health-Based Comparison Values in µg/m^3; NTP Cancer Classification
	Schools	Residences	
1,1-Dichloroethylene	ND	0.2	80 – intermediate MRL
1,2-Dichloroethane	0.3	0.2	2000 - chronic MRL 0.04 – CREG Reasonably anticipated to be a carcinogen
cis-1,2-Dichloroethylene	0.2	1	63 – RSL for trans-1,2-dichloroethylene Not classified
trans-1,2-Dichloroethylene	ND	1	63 – RSL Not classified
Tetrachloroethylene (PCE)	0.3	2	270 chronic MRL 3.8 – CREG* Reasonably anticipated to be a carcinogen
Trichloroethylene (TCE)	0.2	0.7	2 – chronic MRL 0.24 – CREG Reasonably anticipated to be a carcinogen

Notes:
Results rounded to whole number or one significant figure.
Highlights indicate detections above comparison values (CVs).
µg/m^3 = micrograms per cubic meter NTP = National Toxicology Program ND = not detected
RSL = EPA Regional Screening Level for resident air MRL = minimal risk level
CREG = cancer risk evaluation guide
*Note: the CREG for PCE has been updated based on updated toxicological information finalized by EPA in February 2012. The PCE CREG used in ATSDR's February 24, 2012 letter health consultation, 0.2 µg/m^3, was based on interim ATSDR guidance to use California EPA PCE information until the EPA update was finalized. This change does not affect ATSDR's prior conclusions or current conclusions regarding PCE potential risk at this site.

Potential Source #3 – Phase 2 Evaluation

Indoor air and sub-slab soil gas samples were collected in two schools and four residences within 100 feet of potential source #3.Ambient air samples were collected outside of the school and one of the residences. The following text evaluates the results from Phase 2 sampling around Potential Source #3:

Indoor Air in Schools Near Potential Source #3

1,2-Dichloroethane was the only substance detected above CVs in indoor air in the school samples. However, assuming a teacher's exposure to the highest concentration detected of this contaminant for 50 hours per week for 30 years, the theoretical increased risk of cancer would be 1.2×10^{-6}, or less than 1 in 100,000. That is, out of 100,000 teachers exposed under this scenario, less than one additional case of cancer would be expected due to the exposure. This is within EPA's acceptable risk range for Superfund of 1 in 1,000,000 to 1 in 10,000. Children's risk would be lower because children are only enrolled for 2-4 years.

Indoor Air in Residences Near Potential Source #3

1,2-Dichloroethane and TCE were the only substances detected above CVs in indoor air in the residential samples. A lifetime of exposure to the highest detected concentrations of these compounds would result in a theoretical increased risk of cancer of 8.8×10^{-6}, or less than 1 in 100,000. That is, out of 100,000 people exposed under this scenario, less than one additional case of cancer would be expected due to the exposure. This is within EPA's acceptable risk range for Superfund of 1 in 1,000,000 to 1 in 10,000.

Ambient Air and Sub-Slab Soil Gas from Phase 2 Properties Near Potential Source #3

Ambient air samples showed no detections of VOCs. Sub-slab soil gas sampling performed at the schools and residences at the same time as the indoor sampling detected low concentrations of PCE and one or two detections of its breakdown products. PCE concentrations ranged from 1 to 8 $\mu g/m^3$ at the school and from 2 to 20 $\mu g/m^3$ at the residences.

To summarize, current indoor air exposures at schools and residences within 100 feet of Potential Source #3 are not likely to result in harm.

Conclusions and Recommendations

- No harmful levels of VOCs were found in indoor air of any of the locations in the recent sampling events. However, sub-slab sampling shows continued high VOC concentrations beneath several buildings
- We recommend periodic follow-up sampling to verify that indoor levels of VOCs do not increase. ATSDR will provide public health input as EPA develops a site-specific sampling strategy.
- Further investigation may be warranted to discover the source or sources of benzene, toluene, ethylbenzene, xylene, and trimethylbenzenes in soil gas beneath one location. These contaminants are not known to be site-related.

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8. Agency for Toxic Substances and Disease Registry. Toxicological profile for toluene (updated). Atlanta: US Department of Health and Human Services; September 2000.

9. Agency for Toxic Substances and Disease Registry. Toxicological profile for chloroform (updated). Atlanta: US Department of Health and Human Services; September 1997.

Appendix A. Additional Information – Theoretical Cancer Risk Estimate Tables and Ambient and Sub-Slab Sample Summary Tables

Table A1. Details of Cancer Calculations for Potential Sources #1 and #2 – Phase 1 Sampling—Indoor Air

Source Location	Carcinogenic Contaminants Detected Above Cancer CVs											
	Exposure Fraction	Benzene		Carbon Tetrachloride		1,2-Dichloroethane		Methylene Chloride		PCE		Total Theoretical Increased Cancer Risk
		Maximum Detect, in µg/m^3	Inhalation Unit Risk (IUR), per µg/m^3	Maximum Detect, in µg/m^3	IUR, per µg/m^3	Maximum Detect, in µg/m^3	IUR, per µg/m^3	Maximum Detect, in µg/m^3	IUR, per µg/m^3	Maximum Detect, in µg/m^3	IUR, per µg/m^3	
Potential Source #1	0.13	-	-	-		-		-	-	4.85	2.6E-07	1.6E-07
Residence Near PS#1	1.0		-	-	-	2.48	2.6E-05		-	6.77	2.6E-07	6.6E-05
Potential Source #2	0.13	2.93	7.8E-06	0.449	6E-06	-	-	600	1E-08	47.5	2.6E-07	1.1E-05
Head Start Near PS #2	0.13	0.981	7.8E-06	0.519	6E-06		-	-	-	-	-	4.8E-05
Adult School Near PS #2	0.13	2.17	7.8E-06		-	1.04	2.6E-05		-	-	-	1.2E-05

Note: Data presented as reported (without rounding for significant figures) to allow reproduction of cancer risk estimate calculations. Chloroform was not included in calculations because the exposures possible at this site are not high enough for chloroform to be considered carcinogenic [6].
Exposure fraction calculated from hours per week exposed and duration of exposure as follows:
- Residences: 168 hours per 168-hour week times 70 years exposure per 70-year lifetime = 1.0
- Schools and Businesses: 50 hours per 168-hour week times 30 years exposure per 70-year lifetime = 50/168 * 30/70 = 0.13

Total Theoretical Cancer Risk equals sum of each maximum detected value times corresponding Inhalation Unit Risk times exposure fraction.

Table A2. Details of Cancer Calculations for Potential Sources #3 and #4 – Phase 1 Sampling—Indoor Air

Source Location	Carcinogenic Contaminants Detected Above Cancer CVs			
	Exposure Fraction	1,2-Dichloroethane		Total Theoretical Increased Cancer Risk
		Maximum Detect, in µg/m^3	Inhalation Unit Risk (IUR), per µg/m^3	
Potential Source #3	0.13		-	-
Preschool Near PS #3	0.13		-	-
Residence Near PS #3	1.0		-	-
Drug Store at Former PS #4	0.13	3.78	2.6E-05	1.3E-05
Vacant Shop at Former PS #4	0.13		-	-
Restaurant at Former PS #4	0.13		-	-

Note: Data presented as reported (without rounding for significant figures) to allow reproduction of cancer risk estimate calculations.
Exposure fraction calculated from hours per week exposed and duration of exposure as follows:
- Residences: 168 hours per 168-hour week times 70 years exposure per 70-year lifetime = 1.0
- Schools and Businesses: 50 hours per 168-hour week times 30 years exposure per 70-year lifetime = 50/168 * 30/70 = 0.13

Total Theoretical Cancer Risk equals sum of each maximum detected value times corresponding Inhalation Unit Risk times exposure fraction.

Table A3. Details of Cancer Calculations for Potential Sources #1 and #2 – Phase 2 Properties—Indoor Air

Source Location	Carcinogenic Contaminants													Total Theoretical Increased Cancer Risk
	Exposure Fraction	Benzene		1,2-Dichloroethane		Ethylbenzene		Methylene Chloride		PCE		TCE		
		Maximum Detect, in µg/m^3	Inhalation Unit Risk (IUR), per µg/m^3	Maximum Detect, in µg/m^3	IUR, per µg/m^3	Maximum Detect, in µg/m^3	IUR, per µg/m^3	Maximum Detect, in µg/m^3	IUR, per µg/m^3	Maximum Detect, in µg/m^3	IUR, per µg/m^3	Maximum Detect, in µg/m^3	IUR, per µg/m^3	
Residences Near PS #1	1.0		-	0.287	2.6E-05	-	-	-		-			-	7.5E-06
Businesses Near PS #1	0.13-		-	0.34	2.6E-05		-	-	-	0.514	2.6E-07		-	1.1E-06
School Near PS #2	0.13 -	6.65	7.8E-06	0.14	2.6E-05 -	7.65	2.5E-06	- 0.659	1E-08	- -	- -		-	1.0E-05
Residences Near PS #2	1.0		-	0.434	2.6E-05	2.13	2.5E-06	0.825	1E-08	1.19	2.6E-07		-	1.7E-05
Government Facilities Near PS #2	0.13-		-	0.418	2.6E-05	1.1	2.5E-06	0.508	1E-08	-	- - -	0.575	4.1E-06	1.1E-05

Note: Data presented as reported (without rounding for significant figures) to allow reproduction of cancer risk estimate calculations. Chloroform was not included in calculations because the exposures possible at this site are not high enough for chloroform to be considered carcinogenic [6].
Exposure fraction calculated from hours per week exposed and duration of exposure as follows:
- Residences: 168 hours per 168-hour week times 70 years exposure per 70-year lifetime = 1.0
- Schools and Businesses: 50 hours per 168-hour week times 30 years exposure per 70-year lifetime = 50/168 * 30/70 = 0.13

Total Theoretical Cancer Risk equals sum of each maximum detected value times corresponding Inhalation Unit Risk times exposure fraction.

Table A4. Details of Cancer Calculations for Potential Source #3 – Phase 2 Properties—Indoor Air

Source Location	Carcinogenic Contaminants							
	Exposure Fraction	1,2-Dichloroethane		PCE		TCE		Total Theoretical Increased Cancer Risk
		Maximum Detect, in µg/m^3	Inhalation Unit Risk (IUR), per µg/m^3	Maximum Detect, in µg/m^3	IUR, per µg/m^3	Maximum Detect, in µg/m^3	IUR, per µg/m^3	
Schools Near PS #3	0.13	0.322	2.6E-05	0.293	2.6E-07	0.242	4.1E-06	1.2E-06
Residences Near PS #3	1.0	0.204	2.6E-05	2.06	2.6E-07	0.73	4.1E-06	8.8E-06

Note: Data presented as reported (without rounding for significant figures) to allow reproduction of cancer risk estimate calculations.
Exposure fraction calculated from hours per week exposed and duration of exposure as follows:
- Residences: 168 hours per 168-hour week times 70 years exposure per 70-year lifetime = 1.0
- Schools and Businesses: 50 hours per 168-hour week times 30 years exposure per 70-year lifetime = 50/168 * 30/70 = 0.13

Total Theoretical Cancer Risk equals sum of each maximum detected value times corresponding Inhalation Unit Risk times exposure fraction.

Table A5. Summary of Ambient Air Sampling Results – Phase 1 Sampling

Source Location	Number of Ambient Air Samples Collected	Contaminant*	Range of Detected Concentrations for Contaminants in $\mu g/m^3$	Number of Detections
Potential Source #1	1	PCE	7.99	1
Potential Source #2	5	Benzene	0.788—1.1	5
		Chloroform	0.602—2.4	3
		1,2,4-Trimethylbenzene	0.888—22.4	5
		1,3,5-Trimethylbenzene	0.382—8.77	3
Potential Source #3	3	None Detected	N/A	N/A
Former Potential Source #4	1	None Detected	N/A	N/A
* Only contaminants that exceeded CVs and with detections elevated above detection limit are listed. N/A = Not applicable.				

Table A6. Summary of Sub-Slab Soil Gas Sampling Results – Phase 1 Sampling

Source Location	Number of Sub-Slab Soil Gas Samples Collected	Contaminant*	Range of Detected Concentrations for Contaminants in µg/m^3	Number of Detections
Potential Source (PS) #1	3	PCE	104,000—692,000	3
		TCE	57.1—156	3
Residence Near PS #1	0	N/A	N/A	N/A
Potential Source (PS) #2	2	PCE	561—756,000	2
		TCE	0.654—3370	2
		1,2,4-Trimethylbenzene	0.598—130	2
		1,3,5-Trimethylbenzene	47.7	1
Head Start Near PS #2	7	Benzene	0.223—0.607	5
		Chloroform	0.447—8.69	3
		PCE	748—7340	7
		TCE	0.453—9.41	3
Adult School Near PS #2	1	Chloroform	8.78	1
		Toluene	131,000	1
		1,2,4-Trimethylbenzene	27.8	1
		1,3,5-Trimethylbenzene	8.79	1
Potential Source (PS) #3	3	PCE	332—5,760	3
		TCE	1.58—39.7	3
Preschool Near PS #3	3	PCE	18—26.6	3
Residence Near PS #3	0	N/A	N/A	N/A
Drug Store Near Former PS #4	2	PCE	48.6—187	2
		TCE	1.66	1
Vacant Shop Near PS #4	2	1,1-Dichloroethene	0.334	1
		PCE	1.13—2.29	2
Restaurant Near PS #4	0	N/A	N/A	N/A

* Only contaminants that exceeded CVs and with detections elevated above detection limit are listed.
N/A = Not applicable.

Table A7. Summary of Ambient Air Sampling Results – Phase 2 Sampling

Source Location	Number of Ambient Air Samples Collected	Contaminant*	Range of Detected Concentrations for Contaminants in $\mu g/m^3$	Number of Detections
Ambient Samples Near PS #1	1	TCE	0.359	1
Ambient Samples Near PS #2	4	Ethylbenzene	0.82—1.2	3
		Methylene Chloride	0.46—0.576	4
		PCE	0.46—0.558	2
		Toluene	8.68	1
		1,2,4-Trimethylbenzene	1.23—1.61	2
Ambient Samples Near PS #3	3	None Detected	N/A	N/A
* All contaminants with detections are listed. N/A = Not applicable.				

Table A8. Summary of Sub-Slab Soil Gas Sampling Results – Phase 2 Sampling

Source Location	Number of Sub-Slab Soil Gas Samples Collected	Contaminant*	Range of Detected Concentrations for Contaminants in µg/m^3	Number of Detections
Residences Near PS #1	12	1,2-Dichloroethane	1.13	1
		cis-1,2-Dichloroethylene	2.07	1
		trans-1,2-Dichloroethylene	1.46	1
		PCE	0.823—11.9	10
		TCE	0.457—2.68	2
Businesses Near PS #1	4	PCE	3.31—109	3
School Near PS #2	8	Chloroform	0.707	1
Residences Near PS #2	8	Benzene	4.68—5.99	3
		Chloroform	0.58—23.5	5
		PCE	1.7—409	6
		TCE	0.56	1
		1,2,4-Trimethylbenzene	1.64—16.1	5
		Vinyl Chloride	0.186	1
Government Facilities Near PS #2	6	Benzene	2.82—3.01	2
		Chloroform	0.635—15	3
		PCE	1.25—7.25	5
		TCE	0.467—0.497	2
Schools Near PS #3	14	cis-1,2-Dichloroethylene	0.531	1
		PCE	0.663—8.38	10
		TCE	1.76	1
Residences Near PS #3	4	PCE	0.665—20.4	4
		TCE	2.22	1

* Only contaminants that exceeded CVs and with detections elevated above detection limit are listed.
N/A = Not applicable.