

# Health Consultation

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PEPPERMINT TREE NURSERY SCHOOL

RARITAN ARSENAL  
AREA OF CONCERN 2  
EDISON, MIDDLESEX COUNTY, NEW JERSEY

EPA FACILITY ID: NJD986589190

FEBRUARY 1, 2005

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Public Health Service  
Agency for Toxic Substances and Disease Registry  
Division of Health Assessment and Consultation  
Atlanta, Georgia 30333

## **Health Consultation: A Note of Explanation**

An ATSDR health consultation is a verbal or written response from ATSDR 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 which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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# **HEALTH CONSULTATION**

**PEPPERMINT TREE NURSERY SCHOOL**

**RARITAN ARSENAL  
AREA OF CONCERN 2  
EDISON, MIDDLESEX COUNTY, NEW JERSEY**

**EPA FACILITY ID: NJD986589190**

**Prepared by:**

**New Jersey Department of Health and Senior Services  
Division of Public Health Protection and Emergency  
Preparedness**

**Under a Cooperative Agreement with the  
U.S. Department of Health and Human Services  
Agency for Toxic Substances and Disease Registry**



## Summary

At the request of the New Jersey Department of Environmental Protection, the New Jersey Department of Health and Senior Services, in cooperation with the Agency for Toxic Substances and Disease Registry, prepared a Health Consultation for the Peppermint Tree Nursery School, Edison, Middlesex County, New Jersey. The purpose of this Health Consultation was to evaluate the public health implications to children and school employees associated with indoor air exposure to tetrachloroethylene levels detected in the school.

The Peppermint Tree Nursery School is one of six tenants located in Building 165 Fieldcrest Avenue, within Raritan Center, Edison, New Jersey. Until March 2004, the building was owned by Winsor Street Associates, LP, of Duxbury, Massachusetts and is situated on a portion of the former Raritan Arsenal site.

The former Raritan Arsenal facility is a 3,200 acre site that was operated by the United States Army from 1917 through 1963. Major site activities included receipt, storage, shipment and/or decommissioning of ordnance, arms, and machinery. During this period, waste materials including ordnance and chemical agents (mustard gas, red nitric acid, and miscellaneous chemicals) reportedly were buried at the site; explosive materials were destroyed by surface burning or burning in chamber pits. The United States Army and the United States Environmental Protection Agency concluded that the site's groundwater, surface water, and soil were contaminated with volatile organic chemicals, metals, pesticides, and other contaminants.

In May 2003, Winsor Street Associates conducted an investigation to address concerns expressed by the NJDEP regarding the potential of chlorinated volatile organic vapor intrusion into the building from contaminated groundwater and soil. The results of the May 2003 indoor air sampling of Building 165 indicated the presence of tetrachloroethylene ranging from 3.9 to 91 micrograms of tetrachloroethylene per cubic meter of air ( $\mu\text{g}/\text{m}^3$ ). Tetrachloroethylene was detected in the Peppermint Tree Nursery School at a concentration of  $62 \mu\text{g}/\text{m}^3$ . Tetrachloroethylene levels obtained during the May 2003 sampling event were associated with a lifetime excess cancer risk between  $10^{-5}$  and  $10^{-4}$  which is considered a low increased cancer risk. Moreover, since the tetrachloroethylene levels were below the Minimal Risk Level, they are not expected to cause non-cancer adverse health effects to children and adult employees of the nursery school. However, these conclusions are based on only one sampling event and therefore, it is important to note that past tetrachloroethylene levels may have been higher or lower than levels detected during this sampling event. Due to the tetrachloroethylene levels detected during the May 2003 sampling event, public health actions were taken to reduce the exposure to PCE in the indoor air. Subsequent to the installation of a sub-slab ventilation system at Building 165, quarterly air monitoring was implemented and no tetrachloroethylene was detected inside the building. As such, there is currently **No Public Health Hazard** associated with tetrachloroethylene at the nursery school. This conclusion is contingent upon the sub-slab ventilation system being maintained and working properly.



## **Statement of Issues**

The Peppermint Tree Nursery School is located in the Raritan Center business complex, Building 165, Edison, Middlesex County, New Jersey. The Raritan Center was constructed on the former Raritan Arsenal site where ordnance, arms, and machinery were stored, shipped, and/or decommissioned. In May 2003, elevated indoor air levels of tetrachloroethylene, also known as perchloroethylene, or PCE, were detected in the nursery school. PCE, a probable human carcinogen, is a solvent used primarily for metal degreasing and dry cleaning.

Through a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), the New Jersey Department of Health and Senior Services (NJDHSS) reviewed environmental data available for the site and conducted an analysis of past, current, and future human exposures. Public health implications associated with indoor air exposures to PCE were evaluated for children and school employees.

## **Background**

The Peppermint Tree Nursery School is one of six tenants located in Building 165 of the Raritan Center (a.k.a. 165 Fieldcrest Avenue). Other tenants within the building include a microbiology laboratory, an automated guidance system business, a manufacturer and repairer of military antennae, a newspaper distribution center, and a wholesale computer warehouse. Until March 2004, the building was owned by Winsor Street Associates, LP, of Duxbury, Massachusetts and is situated on a portion of the former Raritan Arsenal site (see Figure 1). The building is currently owned by Federal Business Centers, Edison, New Jersey.

The former Raritan Arsenal site consisted of approximately 3,200 acres and was operated by the United States Army from 1917 through 1963. Major site activities included receipt, storage, shipment and/or decommissioning of ordnance, arms, and machinery. During this period, waste materials including ordnance and chemical agents (mustard gas, red nitric acid, and miscellaneous chemicals) reportedly were buried at the site; explosive materials were destroyed by surface burning or burning in chamber pits (USEPA 1995).

In 1963, the Raritan Arsenal site was decommissioned, and decontamination operations were conducted under the direction of the Letterkenny Army Depot and the Army Material Command Safety Office. The United States Army and the United States Environmental Protection Agency (USEPA) concluded that the site's groundwater, surface water, and soil were contaminated with volatile organic chemicals (VOCs), metals, pesticides, and other contaminants. Seventeen areas of concern (AOC) were identified and designated as unrestricted use, surface use only, or nonuse. The General Service Administration assumed responsibility for the site in 1964 and subsequently sold approximately 2,900 acres to private parties including the Raritan Center (2,000 acres), Middlesex County College, and Thomas Edison Park. Building 165

(where the Peppermint Tree Nursery School is located) is situated within AOC 2, an area of groundwater contamination emanating from Area 18C on the former Raritan Arsenal (see Figure 1).

Limited remedial activities implemented at a portion of AOC 2 included the removal of underground storage tanks, buried drums, and the excavation of contaminated soil. Approximately 2,450 cubic yards (cu yds) of soil were removed in 1999 and an additional 3,000 cu yds were removed in 2002. Results of post-remedial soil sampling indicated soil concentrations up to 600 parts per million (ppm) of PCE and 2,500 ppm of trichloroethylene (TCE). Maximum groundwater contaminant concentrations included 405 parts per billion (ppb) of PCE and 9,820 ppb TCE (NJDEP 2003).

In a July 2002 report to the NJDEP and on behalf of the United States Army, the United States Army Corps of Engineers (USACE) proposed natural attenuation of the AOC 2 contaminant groundwater plume in conjunction with quarterly monitoring. In a March 12, 2003 letter of response, the NJDEP expressed concern regarding the “extremely high concentrations of total VOCs (up to 13 milligrams of VOCs per liter of water)” from monitoring well MW-114 (AOC 2). Figure 1 shows this monitoring well which is located approximately 500 feet north of building 165. NJDEP also indicated a potential concern for indoor air contamination of buildings located within the immediate vicinity of this well. The NJDEP required that the proposed natural attenuation remedy include an evaluation for potential vapor intrusion risks to any receptors (building occupants) (NJDEP 2003). Immediately upon learning of this concern in May 2003, the property owner, Winsor Street Associates, retained Environmental Waste Management Associates (EWMA) of Parsippany to perform indoor air sampling of the six businesses occupying Building 165, including the Peppermint Tree Nursery School.

### **Indoor Air Sampling**

In May 2003, EWMA conducted an indoor air investigation of Building 165 on behalf of Winsor Street Associates. The purpose of the investigation was to determine if potential chlorinated volatile organic vapors from contaminated groundwater and soil (AOC 2) was affecting the indoor air quality of Building 165. The target VOCs of concern were vinyl chloride (VC), TCE and PCE based on historical soil and groundwater data collected near the building. One indoor air sample was collected from each of the six tenant spaces at Building 165; one ambient air sample was also collected adjacent to the rear emergency exit for the Peppermint Tree Nursery School. The results of the May indoor air sampling indicated the presence of PCE ranging from 3.9 micrograms of PCE per cubic meter of air ( $\mu\text{g}/\text{m}^3$ ) to  $91 \mu\text{g}/\text{m}^3$ . PCE was detected in the Peppermint Tree Nursery School at a concentration of  $62 \mu\text{g}/\text{m}^3$ . VC and TCE were not detected in any indoor air samples (see Table 1).

In June 2003, additional indoor air sampling of Building 165 was conducted by the USACE; four soil gas samples from beneath the building and one ambient air sample were also collected. Three indoor air samples were collected from the Peppermint Tree Nursery School. PCE was not detected in any of the indoor air samples or an ambient air

sample collected for Building 165. However, it was noted that the ventilation system had been modified prior to the June sampling event. For the May sampling event, the ventilation system had been placed on an automatic setting. Just prior to the June sampling event, the system was changed to the manual setting. This may have increased the amount of fresh air entering the building. Pursuant to a June 13, 2003 teleconference with Winsor Street Associates, NJDHSS, ATSDR, NJDEP, USACE, EWMA, and the Edison Township Division of Health, all parties concurred that the ventilation system remain on manual since it appeared that changing to that setting may have reduced the PCE levels from the first to the second sampling event.

There are several buildings located on the contaminant plume defined previously as AOC 2 (see Figure 1). The building nearest Building 165 is 151 Fieldcrest Avenue. In June 2003, the USACE collected soil gas and indoor air samples from Building 151. PCE was detected in the indoor air at concentrations ranging from 27 - 81  $\mu\text{g}/\text{m}^3$ . TCE was also detected in this building at concentrations ranging from 4 - 8.6  $\mu\text{g}/\text{m}^3$ . The indoor air results from 151 Fieldcrest Avenue suggest that vapor intrusion associated with AOC 2 is not limited to Building 165.

In order to reduce potential risks to occupants of Building 165, the NJDEP oversaw the installation of a sub-slab ventilation system to interrupt vapors from entering the building. This system has been in operation since September 2003; quarterly air monitoring began in October 2003 in order to monitor the effectiveness of the ventilation system. No PCE or related compounds have been detected in the nursery school or in building 165 since the quarterly air monitoring began.

In November 2003, the USACE submitted a report on its continuing investigation of potential vapor intrusion of other buildings located on AOC 2. Groundwater flow direction at AOC 2 is southeast (see Figure 1), and buildings downgradient may also be affected by the contaminant plume. The NJDEP reviewed the report and requested that a Remedial Action Workplan be submitted by Spring 2004 to address groundwater and soil remediation issues of the former Raritan Arsenal site.

### **Toxicological Characteristics of PCE**

PCE is a manufactured chemical that is widely used for dry cleaning of fabrics and for metal-degreasing. It is a nonflammable liquid at room temperature. It evaporates easily into the air and has a sharp, sweet odor. Most people can smell PCE when it is present in the air at a level of one part per million (1 ppm) or more, although some can smell it at even lower levels. This level (1 ppm) is equivalent to approximately 6,900  $\mu\text{g}/\text{m}^3$  of PCE in air. People are commonly exposed to PCE when they bring clothes home from the dry cleaners.

High concentrations of PCE can cause dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, and unconsciousness. Skin irritation may result from repeated or extended contact with PCE. These symptoms occur almost entirely in work or hobby environments when people have been exposed to high

concentrations. Toxicological outcomes at high levels of exposure have included menstrual problems and spontaneous abortions in women, liver and kidney damage in animals, and behavioral changes in rats due to exposure in utero. It is important to note, however, that not all of the health effects described are expected to occur at the levels detected in the Peppermint Tree Nursery School. The Public Health Implications section of this report discusses this issue further.

In industry, most workers are exposed to PCE levels lower than those causing obvious nervous system effects, although more subtle neurological effects are possible at the lower levels. The health effects of breathing in air or drinking water with low levels of PCE are not known. In addition, the health effects for sensitive populations such as children are also not known and therefore, may be of even more concern.

PCE has been shown to cause liver tumors in mice and kidney tumors in male rats. The United States Department of Health and Human Services (USDHHS) has determined that PCE may reasonably be anticipated to be a human carcinogen.

## **Discussion**

Non-cancer and cancer health effects from exposures to PCE were evaluated for children and adult employees of the Peppermint Tree Nursery School. The school is licensed by the State of New Jersey Division of Youth and Family Services for children six weeks to eight years of age. Although licensed for 150 children, normal attendance is between 90 to 95 children per day.

### **Exposure Evaluation**

Exposure pathways were evaluated to determine whether children and adult employees of Peppermint Tree Nursery School could have been (past scenario), are (current scenario), or will be (future scenario) exposed to contaminants. An exposure pathway is a series of steps starting with the release of a contaminant in a media and ending at the interface with the human body. A completed exposure pathway consists of five elements:

- 1) source of contamination;
- 2) environmental media and transport mechanisms;
- 3) point of exposure;
- 4) route of exposure; and
- 5) receptor population.

ATSDR and NJDHSS classify exposure pathways into three groups: 1) “completed pathways”, that is, those in which exposure has occurred, is occurring, or will occur; 2) “potential pathways”, that is, those in which exposure might have occurred, may be occurring, or may yet occur; and 3) “incomplete pathways”, that is, those that can

be eliminated from further analysis because one of the five elements is missing and will never be present, or in which no contaminants of concern can be identified.

### *Completed Pathways*

The primary exposure pathway of concern is the inhalation of PCE emanating from the subsurface (groundwater and soil beneath Building 165) into the indoor air. This constitutes a completed exposure pathway because all five elements listed above are present. The volatile contaminant vapors in the groundwater and soil beneath Building 165 migrate through cracks and small openings in the building's foundation into the indoor air, where they are inhaled by children and adult employees of the nursery school.

Public water is supplied to the school and, therefore, groundwater ingestion (i.e., drinking well water) is not a completed exposure pathway. The ingestion of contaminated soil is unlikely because the areas surrounding the buildings are paved with asphalt.

### **Public Health Implications**

The NJDHSS conducted this Health Consultation using the May 2003 data collected by the EWMA on behalf of Winsor Street Associates. Non-cancer and cancer health effects of PCE were evaluated for children and adult employees based on past exposures to PCE in indoor air; current and future exposures were interrupted by the sub-slab ventilation system.

### *Health Guideline Comparison - Non-Cancer Health Effects*

For non-cancer endpoints, the PCE concentration detected in indoor air was compared to the ATSDR Minimal Risk Level (MRL) of 270  $\mu\text{g}/\text{m}^3$  or 40 parts per billion by volume (ppbv). The MRL is an estimate of the exposure level at which adverse non-cancer health effects are not expected to occur in non-hypersensitive individuals. MRLs are based largely on toxicological studies in animals and on reports documenting human occupational exposures. The ATSDR derives MRLs using quantitative and qualitative information for many potential systemic, neurological, and developmental effects. MRLs are specific for the route and duration of exposure.

The maximum concentration of PCE detected in the indoor air of Building 165 was 91  $\mu\text{g}/\text{m}^3$  (or 13 ppbv). The next highest concentration of PCE was detected in the nursery school at 62  $\mu\text{g}/\text{m}^3$  (or 9.2 ppbv). These levels are below the chronic MRL of 270  $\mu\text{g}/\text{m}^3$  (or 40 ppbv), and therefore non-cancer adverse health effects are not expected to occur. It should be noted that the most sensitive endpoint for non-cancer health effects is a subtle neurological effect (i.e., prolonged reaction time) as observed in an adult population working in dry cleaning establishments (ATSDR 1997). Therefore, the MRL, which is based on this endpoint, may not be sufficiently conservative in all cases, especially in children with developing nervous systems.

However, it is important to note that the derivation of the MRL incorporates safety factors to account for various uncertainties, including sensitive populations such as children. For PCE, the study used to derive the MRL incorporates a safety factor of 100 to account for human variability, such as age, race, and sex, and the use of the Lowest Observed Adverse Effect Level (LOAEL). The LOAEL is the lowest dose used in the study that caused a harmful effect, which was prolonged reaction time in the exposed workers.

*Health Guideline Comparison - Cancer Health Effects*

The site-specific lifetime excess cancer risk (LECR) indicates the potential for cancer risk from exposure to contaminants. LECR estimates are usually expressed in terms of excess cancer cases in an exposed population. For example, ATSDR considers estimated cancer risks of less than one additional cancer case among one million exposed persons as insignificant or “no increased risk” (expressed exponentially as  $10^{-6}$ ). Similarly, one additional cancer case among 100,000 exposed persons would be considered to pose “no apparent increased risk”, or  $10^{-5}$ ; one additional cancer case among 10,000 exposed persons would be considered to pose a “low increased risk”, or  $10^{-4}$ ; one additional cancer case among 1,000 exposed persons would be considered to pose a “moderate increased risk, or  $10^{-3}$ ; and for one additional cancer case among 100 exposed persons would be considered to pose a “high increased risk”, or  $10^{-2}$  (see the following Table).

<b>LECR</b>	<b>Public Health Designation</b>
$LECR \leq 1 \times 10^{-6}$	No increased risk
$1 \times 10^{-6} < LECR \leq 1 \times 10^{-5}$	No apparent increased risk
$1 \times 10^{-5} < LECR \leq 1 \times 10^{-4}$	Low increased risk
$1 \times 10^{-4} < LECR \leq 1 \times 10^{-3}$	Moderate increased risk
$LECR > 1 \times 10^{-3}$	High increased risk

The USDHHS categorizes contaminants into three “cancer classes” depending on the potential for a specific contaminant to cause cancer in humans and/or animals. These cancer classes are defined as follows:

- 1 = Known human carcinogen
- 2 = Reasonably anticipated to be a carcinogen
- 3 = Not classified

PCE is considered a “Class 2” contaminant according to the USDHHS.

For cancer endpoints, the following equation was used to calculate the past exposure dose:

$$Exposure\ Dose\ (mg/kg/day) = \frac{C \times CR \times ET \times EF \times ED}{BW \times AT} \quad (1)$$

where,

C	=	concentration of the contaminant in air (mg/m <sup>3</sup> )
CR	=	contact (inhalation) rate (m <sup>3</sup> /hour)
ET	=	exposure time (hours/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)

For adults, an exposure duration of 13 years was assumed because the nursery school has been licensed for 13 years. The school is open five days a week for 11.5 hours per day. It is evident that the PCE exposure dose would be highest for a child who attended the school as an infant and continued through eight years of age. As such, the average body weight and recommended inhalation rate as a function of age (USEPA 2002) may be used to calculate the child exposure dose (McKone 1987; McKone and Bogen 1992). Since the mean body weight of girls is typically lower than that of boys, the mean girl body weight was selected as a conservative value.

Equation (1) is now modified as follows:

$$Exposure\ Dose\ (mg/kg/day) = \frac{C \times ET \times EF}{AT} \sum_{i=0}^8 \frac{CR_i \times ED_i}{BW_i} \quad (2)$$

where,

$\sum$	=	summation
i	=	age

The following site-specific assumptions and recommended exposure factors (EPA 2002) were used to calculate the past contaminant dose:

**Assumptions for Calculating Adult and Child Exposure Dose**

Exposed Population	CR (m <sup>3</sup> /hour)	ET (hrs/day)	EF (day/yr)	ED (yrs)	BW (kg)	AT (days)
<b>Child</b>	variable*	11.5	260	8	variable*	25550**
<b>Adult</b>	0.83	11.5	260	13	70	25550

\* The Appendix provides details on average CR and BW

\*\* Equivalent to an average lifetime of 70 years

Using equation (2) and relevant exposure factors (USEPA 2002), the LECRs were calculated by multiplying the exposure dose by the USEPA Region 3 cancer slope factor for PCE, which is  $2.1 \times 10^{-2}$ . The LECRs are presented in the following table:

**Child and Adult LECR Based on the Maximum Concentration of PCE  
Detected in Building 165 and Peppermint Tree Nursery School**

Sampling Location	Exposed Population	PCE ( $\mu\text{g}/\text{m}^3$ )	Exposure Dose ( $\text{mg}/\text{kg}/\text{day}$ )	Cancer Slope Factor ( $\text{mg}/\text{kg}/\text{day}$ ) <sup>-1</sup>	LECR
Building 165	Child	91	0.00189	0.021	$3.98 \times 10^{-5}$
	Adult		0.00164		$3.46 \times 10^{-5}$
Peppermint Tree Nursery School	Child	62	0.00129		$2.70 \times 10^{-5}$
	Adult		0.00112		$2.35 \times 10^{-5}$

Based on the maximum PCE concentration detected in the building (i.e.,  $91 \mu\text{g}/\text{m}^3$ ), the calculated LECR for children and adults was between  $1 \times 10^{-5}$  and  $1 \times 10^{-4}$ , indicating a “low increased risk” for children and adult employee building occupants. Similarly, based on the maximum concentration detected in the nursery school (i.e.,  $62 \mu\text{g}/\text{m}^3$ ) the calculated LECR also indicates a “low increased risk” to the children and adult employees. It is important to note that these calculations are based on only one sampling event and reflect a specific window of time. Additionally, these data do not necessarily represent past PCE concentrations which may have been higher, or lower, than the levels detected during the May 2003 sampling event.

**Children’s Health Considerations**

ATSDR’s Child Health Initiative recognizes that the unique vulnerabilities of infants and children demand special emphasis in communities faced with contamination in their environment. Children are at greater risk than adults from certain kinds of exposures to hazardous substances because they eat and breathe more than adults. They also play outdoors and often bring food into contaminated areas. They are shorter than adults, which means they breathe dust, soil, and heavy vapors closer to the ground. Children are also smaller, resulting in higher doses of chemical exposure per body weight. The developing body systems of children can sustain permanent damage if toxic exposures occur during critical growth stages. Most important, children depend completely on adults for risk identification and management decisions, housing decisions, and access to medical care.

Prior to the installation of the ventilation system, children attending the Peppermint Tree Nursery School were exposed to PCE in the indoor air. Based on the available data, which indicated a PCE concentration in the nursery school of  $62 \mu\text{g}/\text{m}^3$ , it was found that non-cancer health effects are not expected, and that there is a “low increased risk” of developing cancer from past exposures to PCE. As mentioned

previously, the MRL used to evaluate non-cancer health effects was based on adult workers in an occupational setting and not on exposures to children in a residential or child care setting. Although uncertainty factors are incorporated into the MRL to protect sensitive populations such as children, toxicological data specific to child exposures to PCE are not available to evaluate adverse health effects in children.

### **Conclusions**

The detected PCE levels obtained during a May 2003 sampling event were associated with a LECR between  $10^{-5}$  and  $10^{-4}$  which is considered a low increased cancer risk. Moreover, since the PCE levels were below the ATSDR MRL, they are not expected to cause non-cancer adverse health effects to children and adult employees of the nursery school. However, these conclusions are based on only one sampling event and therefore, it is important to note that past PCE levels may have been higher or lower than levels detected during this sampling event. Due to the PCE levels detected during the May 2003 sampling event, public health actions were taken to reduce the exposure to PCE in the indoor air. Subsequent to the installation of a sub-slab ventilation system at Building 165, quarterly air monitoring was conducted and no PCE was detected inside the building. As such, there is currently ***No Public Health Hazard*** associated with PCE at the nursery school. This conclusion is contingent upon the ventilation system being maintained and working properly.

### **Recommendations**

1. The USACE should apply permanent techniques in the remediation of the groundwater plume to prevent future vapor intrusion into the nursery school.
2. The USACE should continue to monitor the level and extent of the groundwater contamination plume and regularly conduct indoor air sampling in potentially affected buildings.
3. The USACE should report indoor air sampling results and updates on cleanup progress to the NJDEP, NJDHSS, and the Edison Township Division of Health.
4. The NJDEP should continue to review data submitted by the USACE to ensure that the cleanup is completed according to the appropriate NJDEP guidelines.

### **Public Health Action Plan**

The Public Health Action Plan (PHAP) for the Peppermint Tree Nursery School describes actions to be taken by the NJDHSS and/or ATSDR in relation to the nursery school subsequent to the completion of this Health Consultation. The purpose of the PHAP is to ensure that this Health Consultation not only identifies public health hazards,

but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Included is a commitment on the part of the NJDHSS and ATSDR to follow up on this plan to ensure that it is implemented.

*Public Health Actions Taken*

Available indoor air data and other relevant information pertaining to the Peppermint Tree Nursery School have been reviewed and evaluated to determine human exposure pathways and public health issues.

The NJDHSS met with the USACE, the current property owner (Federal Business Centers), and Building 165 tenants to discuss the current status of the indoor air monitoring and the sub-slab ventilation system. Educational information pertaining to PCE and its health effects was distributed to the tenants.

*Public Health Actions Planned*

The Health Consultation will be provided to the Peppermint Tree Nursery School. A Citizen's Guide providing a brief summary of the Health Consultation will be developed and distributed to parents of children who currently attend or have attended the nursery school. Copies will also be made available to the Edison Township Division of Health, USACE, Federal Business Centers, NJDEP, and Winsor Street Associates.

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**Preparers of Report:**

Christa Fontecchio, M.P.H.  
Research Scientist II  
New Jersey Department of Health and Senior Services  
Hazardous Site Health Evaluation Program

Julie R. Petix, M.P.H., C.P.M., H.O.  
Health Assessment Project Manager  
New Jersey Department of Health and Senior Services  
Hazardous Site Health Evaluation Program

Tariq Ahmed, PhD., P.E.  
Research Scientist II  
New Jersey Department of Health and Senior Services  
Hazardous Site Health Evaluation Program

Steven M. Miller, Ph.D.  
Environmental Scientist II  
New Jersey Department of Health and Senior Services  
Hazardous Site Health Evaluation Program

**ATSDR Regional Representatives:**

Arthur Block  
Senior Regional Representative  
Office of Regional Operations, Region II

Leah T. Escobar, R.S.  
Associate Regional Representative  
Office of Regional Operations, Region II

**ATSDR Technical Project Officer:**

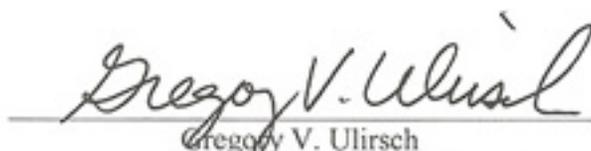
Gregory V. Ulirsch, M.S.  
Technical Project Officer  
Superfund Site Health Assessment Branch  
Division of Health Assessment and Consultation

**Any questions concerning this document should be directed to:**

Julie R. Petix, M.P.H., C.P.M., H.O.  
Health Assessment Project Manager  
New Jersey Department of Health and Senior Services  
Division of Public Health Protection and Emergency Preparedness  
Hazardous Site Health Evaluation Program  
P.O. Box 369  
Trenton, New Jersey 08625-0369

## CERTIFICATION

The Health Consultation for the Peppermint Tree Nursery, Edison, New Jersey, was prepared by the New Jersey Department of Health and Senior Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the public health assessment was initiated.



Gregory V. Ulirsch  
Technical Project Officer, SPAB, DHAC  
Agency for Toxic Substances and Disease Registry (ATSDR)

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this Health Consultation and concurs with its findings.



Roberta Erlwein  
Team Leader, CAT, SPAB, DHAC, ATSDR



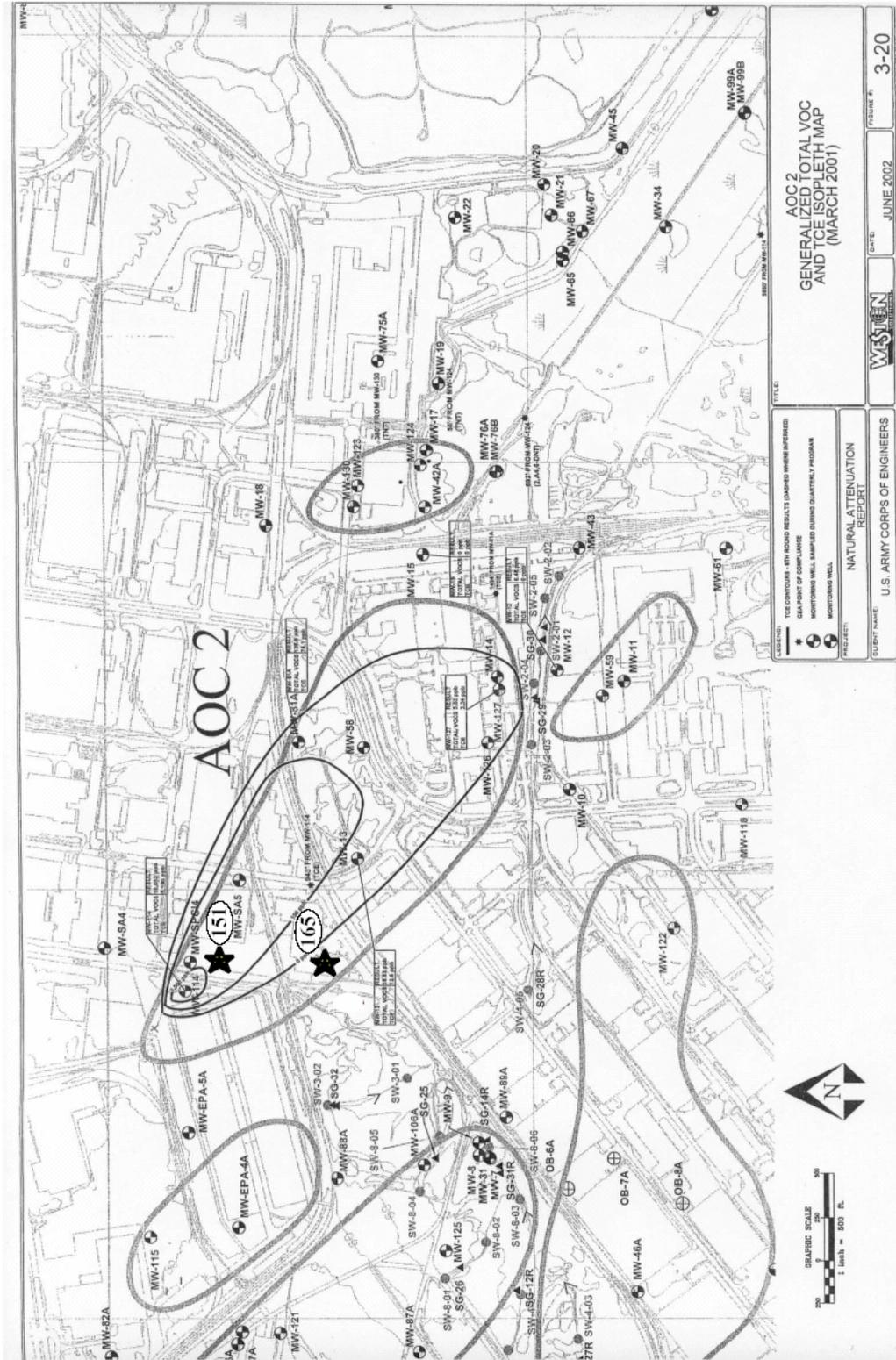


Figure 1: Total VOC and TCE isopleth map for AOC 2 (AOC 2 in Relation to Buildings 165 and 151 Fieldcrest Avenue)

**Table 1: Summary of Indoor Air Sampling Results for 165 Fieldcrest Avenue Edison, NJ  
(Sample Date: May 8, 2003)**

Compound	Business Name					
	<u>Celci</u> s	<b>Macka</b> <b>y</b>	<b>Hom</b> <b>e</b> <b>News</b>	<b>Rockwel</b> <b>l</b>	<b>Ama</b> <b>x</b>	<b>Peppermin</b> <b>t Tree</b>
Vinyl Chloride, ppbv ( $\mu\text{g}/\text{m}^3$ )	ND	ND	ND	ND	ND	ND
Trichloroethene, ppbv ( $\mu\text{g}/\text{m}^3$ )	ND	ND	ND	ND	ND	ND
Tetrachloroethene , ppbv ( $\mu\text{g}/\text{m}^3$ )	0.58 (3.9)	2.3 (15.0)	8.7 (59.0)	4.5 (31.0)	13.0 (91.0)	9.2 (62.0)

ND = Not Detected

ppbv = parts per billion by volume

$\mu\text{g}/\text{m}^3$  = micrograms per cubic meter

## **Appendix**

### Dose Calculation for Cancer Risk

The body weight and the inhalation rate of an individual are function of age. The rate of change of the body weight and the inhalation rate may be accounted for (McKone 1987; McKone and Bogen 1992) by using discrete body weight and inhalation rate in the following equation:

$$Exposure\ Dose\ (mg/kg/day) = \frac{C \times ET \times EF}{AT} \sum_{i=0}^8 \frac{CR_i \times ED_i}{BW_i}$$

where,  $\sum$  = summation  
i = year

The CR (contact or inhalation rate) and BW (body weight) in the above equation were obtained from the EPA's Child-Specific Exposure Factors Handbook (September 2002). The calculation for the evaluation of the expression within the summation sign is shown in the following table:

Age (yr)	Body Weight (BW) (kg)	Inhalation Rate (CR) (m <sup>3</sup> /hr)	$\frac{CR \times ED}{BW}$
0.5	7	0.188	0.013393
1	9.1	0.188	0.010302
2	11	0.283	0.025758
3	12.5	0.346	0.027667
4	14.9	0.346	0.02321
5	17.2	0.346	0.020107
6	19.4	0.417	0.021478
7	21.3	0.417	0.019562
8	25.6	0.417	0.016276
$\sum_{i=0}^8 \frac{CR_i \times ED_i}{BW_i} =$			0.17775

The calculated factor (i.e., 0.17775) was then used to calculate the exposure dose. Sample calculation for maximum concentration of PCE detected in the building (i.e., 0.091mg/m<sup>3</sup>) for children is shown below:

$$\begin{aligned}
 Exposure\ Dose &= \frac{C \times ET \times EF}{AT} \sum_{i=0}^8 \frac{CR_i \times ED_i}{BW_i} \\
 &= \frac{0.091 \times 11.5 \times 260}{25550} \times 0.17775 \\
 &= 0.00189\ mg/kg/day
 \end{aligned}$$