

# **Health Consultation**

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**LANDMARK APARTMENTS**

**DERRY, ROCKINGHAM COUNTY, NEW HAMPSHIRE**

**MAY 3, 2007**

**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

LANDMARK APARTMENTS

DERRY, ROCKINGHAM COUNTY, NEW HAMPSHIRE

Prepared By:

New Hampshire Department of Environmental Services  
Environmental Health Program  
Under Cooperative Agreement with the  
Agency for Toxic Substances and Disease Registry

## **SUMMARY AND STATEMENT OF ISSUES**

In October 2006, the New Hampshire Department of Environmental Services (DES), Waste Management Division was contacted by residents of Landmark Apartments (Landmark) located in Derry, Rockingham County, New Hampshire. Residents were concerned that vapors from a nearby former dry cleaning establishment, Shamrock Cleaners (Site), may be migrating into their apartment units. Sanborn, Head and Associates, Inc. (SHA) was subsequently contracted by DES to conduct indoor air sampling and analysis from the basement, first floor, and second floor of Landmark on February 15-16, 2007. An outdoor ambient air sample was also collected by SHA for background comparison purposes (1).

The DES Environmental Health Program (EHP) used the air samples collected by SHA to complete this health consultation. The purpose of the health consultation is to determine if inhalation of indoor air at Landmark presents a human health risk. After thorough analysis of all air data collected, EHP has concluded that adverse health effects are not expected to result from inhalation exposure to indoor air at Landmark (2).

### **PURPOSE**

The Agency for Toxic Substances and Disease Registry (ATSDR) is a non-regulatory federal agency mandated by Congress to assess the public health impact of exposure to hazardous substances released to the environment. To fulfill its mandate, ATSDR enters formal partnerships with state agencies throughout the nation to carry out site-related evaluations on environmental exposures and public health. For 18 years, ATSDR and EHP have maintained a cooperative agreement to conduct these activities in the state. EHP is a non-regulatory program within DES. It functions independently of DES regulatory programs to assess the human health implications of hazardous chemical releases, and to make recommendations to protect the public health.

The purpose of this health consultation is to determine if inhalation to indoor air at Landmark presents a human health risk. It presents an evaluation of environmental data provided to EHP from air samples collected at Landmark on February 15-16, 2007.

### **BACKGROUND**

The former Shamrock Cleaners (Site) was a dry-cleaning establishment that operated from approximately 1950 until 2001. From about 1984 through 2001, tetrachloroethylene (also known as perchloroethylene, perc or PCE) was used in dry-cleaning operations at the Site. Prior to 1984 "Stoddard Solvent" based cleaners were used for dry-cleaning. In August 2005 the former Shamrock Cleaners building (Lot No. 3017) and an unoccupied apartment building (Lot 3018) were demolished (1).

DES's contractor, SHA, conducted a series of investigations to determine the extent of contamination at the Site. These investigations identified contaminants in the groundwater, especially PCE, at levels that could impact the soil above the groundwater.

One method routinely used to determine the extent of soil contamination (from a groundwater source in this case) is soil gas testing. This is commonly known as a soil gas survey. Soil gas samples were collected at Landmark due to the elevated concentration of PCE in groundwater in the vicinity of the Site.

All soils contain gaps between the particles which are filled with either liquids (usually water) or gases. Soil gas is a term used to describe the gas that fills these voids. Chlorinated volatile organic contaminants in groundwater tend to separate from liquid (groundwater) into a soil gas phase. Soil gas contaminants can then migrate through the soil and possibly enter confined building spaces (basements) through crawl spaces, plumbing holes, other floor holes (e.g., sumps) and foundation cracks. This could result in indoor air contamination.

The SHA soil-gas survey identified PCE ranging from 17,000  $\mu\text{g}/\text{m}^3$  to 110,000  $\mu\text{g}/\text{m}^3$  at the Site. Soil gas concentrations near the northwest corner of Landmark (Lot No. 3016), approximately 35 feet southeast outside the Site boundary, ranged from non-detect to 26  $\mu\text{g}/\text{m}^3$  (1, 3). Due to the elevated soil-gas concentrations historically detected at the Site, it was decided that SHA should conduct indoor air quality sampling and analysis from the basement, first floor, and second floor of Landmark. An outdoor ambient air sample was simultaneously collected northwest of Landmark (toward the Site) by SHA for comparison purposes (1). EHP reviewed the SHA report and evaluated the potential for adverse health effects to occur from indoor air exposures to site-related compounds including PCE and its breakdown components. For purposes of evaluating this exposure, EHP assumed that residents are exposed to air inside the building for 16 hours per day, 350 days per year, for a 9-year duration.

## DISCUSSION

### A. Exposure Pathways

Human exposure to environmental contamination occurs only when there is a completed pathway. A *completed* pathway exists when the following five critical elements are present: 1) a source of contamination or release (subsurface soil & groundwater); 2) environmental fate and transport (contaminated soil/groundwater to indoor air); 3) a point or area of exposure (Landmark); 4) a route of human exposure (inhalation); and 5) a receptor population (residents of Landmark). These five elements determine the extent of past, present, or future site-related exposures. In a *potential* exposure pathway, one or more of the critical elements may not be present, but information is insufficient to eliminate or exclude it. For example, an exposure could have occurred in the past, could be occurring currently, or could occur in the future. An exposure pathway is *eliminated* if one or more of the critical elements are missing. Eliminated exposure pathways may also be referred to as incomplete (2).

Table 1 presents the onsite pathway for Landmark (Indoor air in Landmark apartment residences). This pathway is analyzed and discussed in the remaining sections of this health consultation. Public water is provided to this complex. Groundwater contamination

at this Site does not impact the quality of water supplied to residents. The drinking water, like all water supplied from public water sources, is safe for drinking, bathing, and to cook with.

**Table 1. Potential Onsite Pathway of Landmark Apartments (Lot No. 3016 located in Derry, New Hampshire.**

Source	Environmental Transport And Media	Exposure Point	Exposure Route	Exposed Population	Time Frame	Status
Contaminated Soil & Groundwater (Site)	Subsurface soil & Groundwater to <b>Indoor Air</b> through foundation	Indoor Air Onsite	Inhalation	Landmark Residents	Past	Potential
					Present	Potential
					Future	Potential

Contaminants are migrating from the Site through subsurface soil and groundwater via a groundwater contaminant plume. Vapors emanating from the plume may penetrate the Landmark building foundation and mix with indoor air. Residents could be exposed by breathing contaminated indoor air.

**B. Environmental Contamination Data**

An integral element of every health consultation is a review of Site-related environmental contamination. In the preceding section, one pathway for possible human exposure was identified (indoor air). This section examines indoor air contaminants that may pose a hazard for Landmark residents. Environmental sampling preparation, procedures, and results provided in the report prepared by SHA dated March 16, 2007 are summarized below for this potential pathway (1).

On February 14, 2007 SHA conducted a pre-sampling inspection, product inventory and physical layout/condition assessment of each sampling location. These steps are conducted to identify potential sources of volatile organic compounds (VOCs), and to minimize the contribution of VOCs from common indoor sources or activities. SHA returned on February 15, 2007 and began collecting indoor air samples over a 24-hour period from the basement, first floor, and second floor of Landmark. Samples were collected using pre-evacuated 6-liter Summa canisters fitted with metering valves. The Summa canisters were subsequently gathered by SHA on February 16, 2007 and sent to Air Toxics Limited of Folsom, California for chlorinated volatile organic compounds (CVOCs) analyses using EPA Method TO-15 with Selected Ion Monitoring (SIM). Table 2 lists the concentrations of CVOCs that were detected in one or more of the indoor air sampling locations (1).

**Table 2: Concentrations (ppbv) of CVOC contaminants detected in Landmark Apartments (Lot No. 3016) located in Derry, New Hampshire on February 15-16, 2006 (1).**

Contaminant	1 <sup>st</sup> Floor Apt. (ppbv)	Basement Storage Unit (ppbv)	2 <sup>nd</sup> Floor Apt. (ppbv)	Outside Ambient Air (ppbv)
Chloromethane	0.85 J	0.47 J	0.38 J	0.41 J
1,2-Dichloroethane	0.038	ND (0.029)	ND (0.031)	ND (0.029)
Trichloroethylene (TCE)	0.033	0.046	ND (0.031)	ND (0.029)

“ppbv” is parts-per-million volume

“ND” indicates contaminant was not detected - corresponding number in parenthesis indicates the method detection limit

“J” indicates the contaminant concentration was detected below the standard laboratory reporting limit and the laboratory reported the concentration as estimated.

### C. Environmental Data Evaluation & Contaminants of Concern

After exposure pathways are designated and environmental data are summarized, site-related indoor air contaminants are evaluated. EHP uses a conservative, protective approach to determine whether contaminant levels constitute a potential health hazard. Health-based comparison values (CVs) are used to identify pollutants unlikely to present a health concern. If a concentration is below the CV, the compound is eliminated from further analysis. The remaining contaminants are subjected to a thorough scientific literature review to determine whether or not their levels present a public health hazard (2).

CVs used in this report represent concentrations of contaminants that current scientific literature concludes are "harmless." CVs are conservative, represent “worst-case” exposure assumptions, and include ample safety factors in consideration of sensitive populations such as children, the elderly, and those with chronic respiratory disease. Therefore, CVs are protective of public health in most exposure situations. If a contaminant level is lower than its CV, it is unlikely that harmful effects will result. If a contaminant exceeds its CV, it is examined in greater detail. Because CVs are based on conservative assumptions, the presence of concentrations greater than a CV does not necessarily indicate that adverse health effects will occur among exposed populations (2).

Table 3 lists the highest measured or “estimated” CVOC concentrations and their associated CVs used in EHP’s assessment. These concentrations represent the maximum level that an individual may be exposed to assuming a continuous 24-hour exposure. As a conservative measure, CVOCs not detected during laboratory analysis were also included at one-half of their analytical detection limit (referred to as “est.” in Table 3). For example, if the analytical device was unable to detect the target compound, EHP assigned a value on-half of the instrument’s lowest measurable quantity. These CVOC concentrations were then compared to relevant DES Residential Indoor Air Screening Levels, as well as more conservative ATSDR and EPA cancer and non-cancer air CVs. Bolded font indicates that the CV was exceeded.

EHP compared the highest recorded or “estimated” contaminant concentration to its CV. The comparison revealed that concentrations of 1,2-Dichloroethane, 1,1,2,2-Tetrachloroethane (estimated), and 1,1,2-Trichloroethane (estimated) exceeded their respective cancer CVs. EHP then conducted a site-specific risk assessment to determine if these concentrations represented a health concern to residents of Landmark. The conservative exposure scenario employed by EHP assumed that young children (<1yr-9yrs) and adult residents of Landmark were present in their homes for 16 hours per day, 350 days per year, over a nine-year duration of exposure (national median average at one residence). The scenario also assumed that the highest recorded or “estimated” contaminant concentrations were present throughout the building.

**Table 3: Highest estimated and actual CVOC concentrations (ppbv) and respective CVs detected in Landmark Apartments (Lot No. 3016) located in Derry, New Hampshire on February 15-16, 2007 (1, 4, 5, 6).**

Contaminant	1 <sup>st</sup> Floor Apartment (ppbv)	Basement Storage Unit (ppbv)	2 <sup>nd</sup> Floor Apartment (ppbv)	Ambient Air (ppbv)	Non-cancer CV (ppbv)	Cancer CV (ppbv)
Chloroethane	0.04 est.	0.037 est.	0.039 est.	0.036 est.	4000 (a)	-
Chloromethane	0.85 J	0.47 J	0.38 J	0.41 J	40 (a)	-
1,1-Dichloroethane	0.016 est.	0.015 est.	0.016 est.	0.015 est.	128 (e)	-
<b>1,2-Dichloroethane</b>	<b>0.038</b>	<b>0.015 est.</b>	<b>0.016 est.</b>	<b>0.015 est.</b>	600 (b)	<b>0.01 (d)</b>
1,1-Dichloroethene	0.008 est.	0.008 est.	0.008 est.	0.007 est.	20 (c)	-
<i>cis</i> 1,2-Dichloroethene	0.016 est.	0.015 est.	0.016 est.	0.015 est.	9.3 (e)	-
<i>trans</i> -1,2-Dichloroethene	0.08 est.	0.08 est.	0.08 est.	0.07 est.	200 (c)	-
Methylene Chloride	0.16 est.	0.15 est.	0.16 est.	0.15 est.	300 (b)	0.9 (d)
<b>1,1,2,2-Tetrachloroethane</b>	<b>0.016 est.</b>	<b>0.015 est.</b>	<b>0.016 est.</b>	<b>0.015 est.</b>	400 (c)	<b>0.003 (d)</b>
Tetrachloroethylene (PCE)	0.016 est.	0.015 est.	0.016 est.	0.015 est.	40 (b)	-
1,1,1-Trichloroethane	0.016 est.	0.015 est.	0.016 est.	0.015 est.	700 (c)	-
<b>1,1,2-Trichloroethane</b>	<b>0.016 est.</b>	<b>0.015 est.</b>	<b>0.016 est.</b>	<b>0.015 est.</b>	0.02 (e)	<b>0.01 (d)</b>
Trichloroethylene (TCE)	0.033	0.046	0.016 est.	0.015 est.	100 (c)	-
Vinyl Chloride	0.008 est.	0.008 est.	0.008 est.	0.007 est.	40 (a)	0.04 (d)

Comparison Value Sources

(a) EPA RfC

(b) ATSDR Chronic MRL/EMEG

(c) ATSDR Intermediate MRL/EMEG

(d) ATSDR CREG

(e) EPA Region 9 PRG

“-“ indicates that no comparison value has been established.

“J” indicates the contaminant concentration was detected below the standard laboratory reporting limit and the laboratory reported the concentration as estimated.



#### **D. Public Health Implications of Exposure**

This section evaluates the public health implications of indoor air contaminants measured at Landmark. Available monitoring data indicate that of the fourteen CVOCs sampled, 1,2-Dichloroethane, 1,1,2,2-Tetrachloroethane, and 1,1,2-Trichloroethane were above their respective cancer CVs. Of these three, only 1,2-Dichloroethane was measured above its analytical detection limit. Following is a review of the scientific literature on the health effects of 1,2-Dichloroethane.

The compound 1,2-Dichloroethane is a clear liquid that is not found naturally in the environment. It evaporates quickly at room temperature, and has a pleasant smell and a sweet taste. 1,2-dichloroethane is used today to make vinyl chloride, which is, in turn, used to manufacture other products including PVC pipes, packaging materials, upholstery, wall coverings, house wares, and automobile parts. Humans can be exposed to low levels of 1,2-dichloroethane in air from products formerly made with 1,2-dichloroethane, such as cleaning agents, pesticides, and adhesives used to glue wallpaper and carpets. ATSDR concludes that such exposure is unlikely to cause harmful health effects. Background levels of 1,2-Dichloroethane is typically between 0.10–1.50 ppb in air near urban areas and 0.01–0.003 ppb near hazardous waste sites. Small amounts of 1,2-dichloroethane have also been found in foods (7).

Human and animal studies indicate that breathing large amounts of 1,2-dichloroethane is associated with nervous system disorders, liver and kidney disease, and lung effects. Longer-term exposure to lower doses has also caused kidney disease in laboratory animals. Exposure to 1,2-dichloroethane has not been associated with cancer in humans, but cannot be completely ruled out due to findings in some animal studies. EPA has determined that 1,2-dichloroethane is a probable human carcinogen (7).

EHP evaluated an exposure scenario for adults and young children (<10yrs) exposed to indoor air CVOC contaminants at Landmark. Exposure to the maximum measured concentration of 1,2-Dichloroethane, as well as estimated levels of 1,1,2,2-Tetrachloroethane and 1,1,2-Trichloroethane, would not result in increased cancer risk among Landmark residents. The cumulative theoretical excess lifetime cancer risk for all recorded and estimated concentrations of carcinogenic CVOCs is also not significant.

Individual CVOC contaminant levels measured in indoor air at Landmark Apartments were all below established non-cancer CVs. As an additional conservative measure, the potential for non-carcinogenic health effects was evaluated by a comparison with the calculated inhalation average daily dose. In all cases, each calculated inhalation average daily dose was below a level of concern for a lifetime of continuous exposure (4). The cumulative potential (all fourteen CVOCs added) for non-cancer health effects also did not indicate that residents would experience adverse health effects from these exposures.

## CONCLUSION

After thorough analysis of all of all air data collected, EHP concludes that adverse health effects are not expected to result from inhalation exposure to indoor air at Landmark. Exposure to indoor air at Landmark therefore poses *no apparent public health hazard*.

## RECOMMENDATIONS

Based on the conclusions of this report, EHP makes the following recommendations:

- EHP staff will evaluate any additional indoor air monitoring data that may become available.

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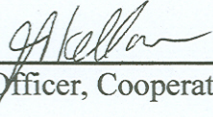
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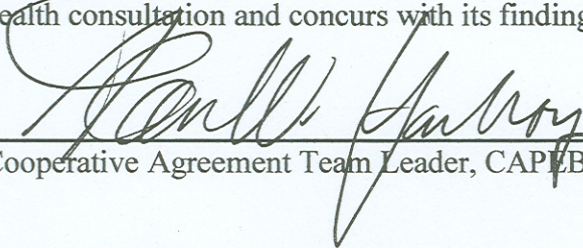
**Certification**

This health consultation on the evaluation of air data for the Landmark Apartments was prepared by the New Hampshire Department of Environmental Services, Environmental Health Program, under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It was prepared in accordance with methods and procedures approved at the time the consultation was initiated. Editorial review was completed by the Cooperative Agreement partner.



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Technical Project Officer, Cooperative Agreement Team, CAPEB, DHAC, ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with its findings.



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