Letter Health Consultation

675 Elmwood Avenue

Providence County

Final Release
9/2/26

Department of Health
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Providence, RI 02908-5097
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September 2, 2026

Michael Cote

Principal Environmental Scientist

Rhode Island Department of Environmental Management

235 Promenade Street, Providence, RI, 02908

Re: Stratford House, 675 Elmwood Avenue, Providence

Dear Mr. Cote,

On April 30, 2026, the Rhode Island Department of Environmental Management (RIDEM) requested support from the Rhode Island Department of Health (RIDOH) in assessing health concerns about volatile organic compounds (VOCs) detected in indoor air at 675 Elmwood Ave in Providence at a property known as the Stratford House. The property previously housed a dry-cleaning business. This report addresses concerns related to residential exposure to VOCs discovered at the Stratford House apartment building. The primary VOCs of concern were trichloroethylene (TCE) and tetrachloroethylene, also called perchloroethylene (PCE).

RIDOH evaluated health concerns using ATSDR's public health assessment (PHA) process, as summarized in Attachment A, and detailed in the Explanation of ATSDR's PHA Process. The data provided to RIDOH is limited by several factors (see the next paragraph for more details). Based on this limited dataset, RIDOH concludes that exposure to TCE and PCE in indoor air is unlikely to pose an immediate/acute health risk but could pose a risk to public health in the future. TCE and PCE were detected at concentrations less than RIDOH health-based comparison values in (occupied) Apartments #213 and #101. The RIDOH health-based comparison values for TCE and PCE are 0.21 and 2.0 µg/m^3, respectively. More sampling data is recommended to confirm that TCE and PCE levels in other apartments are below comparison values. RIDEM and GZA Geoenvironmental, Inc., the environmental engineering contractor for the building owner, moved quickly to install remedial measures. Air-purifying units have been provided to building occupants on the first floor. The temporary sub-slab vapor mitigation system with vapor treatment was installed and could help reduce the concentrations of TCE and PCE entering the building. The performance of the sub-slab ventilation system also needs to be confirmed by further air sampling data.

Air sampling is particularly susceptible to temporal changes. Data from Stratford House provide information about the current site conditions but are limited by several factors. These include the sampling locations, number of samples, and the timing of sample collection. Limitations in sampling prevent RIDOH from fully understanding historic risk at the site, but current controls should prevent exposure to concerning levels of TCE and PCE if they are operated

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appropriately. Outdoor air samples were not collected, so it is unclear how outdoor conditions differ from indoor. RIDOH also made health-protective assumptions about how people are exposed to contamination at Stratford House. These assumptions likely overestimate the health risks from the contamination onsite.

This letter health consultation serves as a written record and scientific basis for the health-based decisions made during RIDOH's response to RIDEM's request for assistance. As the site progresses through the remediation process, RIDOH recommends that:

- The eventual active sub slab vapor mitigation system should be maintained appropriately and operated continuously at Stratford House. It is recommended that the permanent active vapor mitigation system is equipped with remote telemetry to ensure minimal system downtime in the event of a loss of power. GZA and the building owner should develop a monitoring plan, in coordination with RIDEM, to ensure continued effectiveness of these interventions. Air purifying units on the first floor should continue to operate until the sub slab mitigation system has demonstrated adequate control based on monitoring response.
- RIDEM, the building owner, and GZA continue to keep RIDOH informed of progress at Stratford House.
- In coordination with RIDEM, a more thorough assessment of the sub-slab soil vapor, indoor air, and ambient air should be conducted. Sampling should include more locations and on all floors of the building - common areas, apartment units, mechanical and maintenance rooms, etc. Locations should be resampled regularly to monitor the efficacy of mitigation efforts. Each sampling event should include ambient air, indoor air, and sub-slab soil gas and should occur within the same day (to the extent possible).
- Additional indoor and outdoor sampling data be shared with RIDOH.
- Building occupants should limit the use of VOCs as much as possible and increase ventilation in apartments to bring in more outdoor air where possible.
- The HVAC system in the building should be upgraded to ensure intakes are bringing in fresh outdoor air, filtration of air is adequate, and air pressure within the building is slightly positive to support sub-slab depressurization.
- Any questions from the community about the health implications of VOC exposure be directed to the Environmental Health Risk Assessment Program (EHRAP). Contact 401-222-7746 or zachary.shepard@health.ri.gov to connect with EHRAP.

Background

Stratford House is located at 675 Elmwood Ave. in Providence, RI. This location was a dry cleaner from about 1921 to the late 1970s (Urbano, 2026a). Since 1980, Stratford House has been an age-restricted (over 62) and Section 8 (low-come) apartment complex with younger tenants residing in some apartments (Urbano, 2026a). There are 65 residential apartments in the building. There are three floors and two basement areas. Ten leaking underground storage

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tanks on the property were removed or closed in place in August 2006 (Urbano, 2026a). These tanks stored Varnolene (also known as Stoddard solvent), which was a solvent used in dry cleaning (ATSDR, 1995; Urbano, 2026a).

Leaking underground storage tanks of Varnolene created a pool of light, nonaqueous phase liquid (LNAPL) floating on top of the water table under Stratford House (Urbano, 2026a). Remediation of this contamination has been ongoing since its discovery in 2006 (Urbano, 2026a). On April 28, 2026, GZA submitted an Expanded Site Investigation Report that described the installation of new monitoring wells and collection of indoor air samples (Urbano, 2026a). The results of the indoor air sampling submitted in that report triggered RIDEM to alert RIDOH for input on potential health implications.

VOCs are a group of chemicals that are emitted as gases from certain solids or liquids (USEPA, 2026). They come from a variety of sources, including paints, paint strippers, solvents, aerosols, cleaners, moth repellents, and air fresheners (USEPA, 2026). Exposure to VOCs can occur through inhalation, ingestion, or skin contact. Depending on the specific compound, the level of exposure, and the duration of exposure, VOCs have been associated with health effects ranging from eye, nose, and throat irritation and headaches to impacts on the nervous system, liver, kidneys, and an increased risk of certain cancers (ATSDR, 2019b, 2019a; USEPA, 2026). While many VOCs were detected at Stratford House, RIDOH focused on TCE and PCE during its response and preparation of this Letter Health Consultation. This is because TCE and PCE are associated with the LNAPL contamination at Stratford House (Urbano, 2026a), exceeded the RIDOH comparison values, and have strong evidence of negative health impacts (ATSDR, 2019b, 2019a).

Statement of Issue and Purpose

RIDOH was asked to determine if exposure to the chemicals detected in indoor air could impact residents' health and to provide guidance to RIDEM and the building owner. EHRAP provides science-based recommendations to protect public health. EHRAP does not have regulatory authority in this instance and is acting only in an advisory capacity. As such, neither the building owner nor RIDEM are required to pursue recommendations made by RIDOH.

In this document, RIDOH has:

- Provided a detailed discussion of the public health risks posed by TCE and PCE at Stratford House;
- Described the scientific basis for its recommendations; and
- Recommended future actions to protect public health.

Site Description and Timeline

Stratford House (675 Elmwood Ave.) is located in Providence, RI (Figure 1). RIDEM has been involved with groundwater sampling and monitoring since 2000 (Urbano, 2026a). Indoor air quality concerns have been discovered more recently. This report focuses on the more recent

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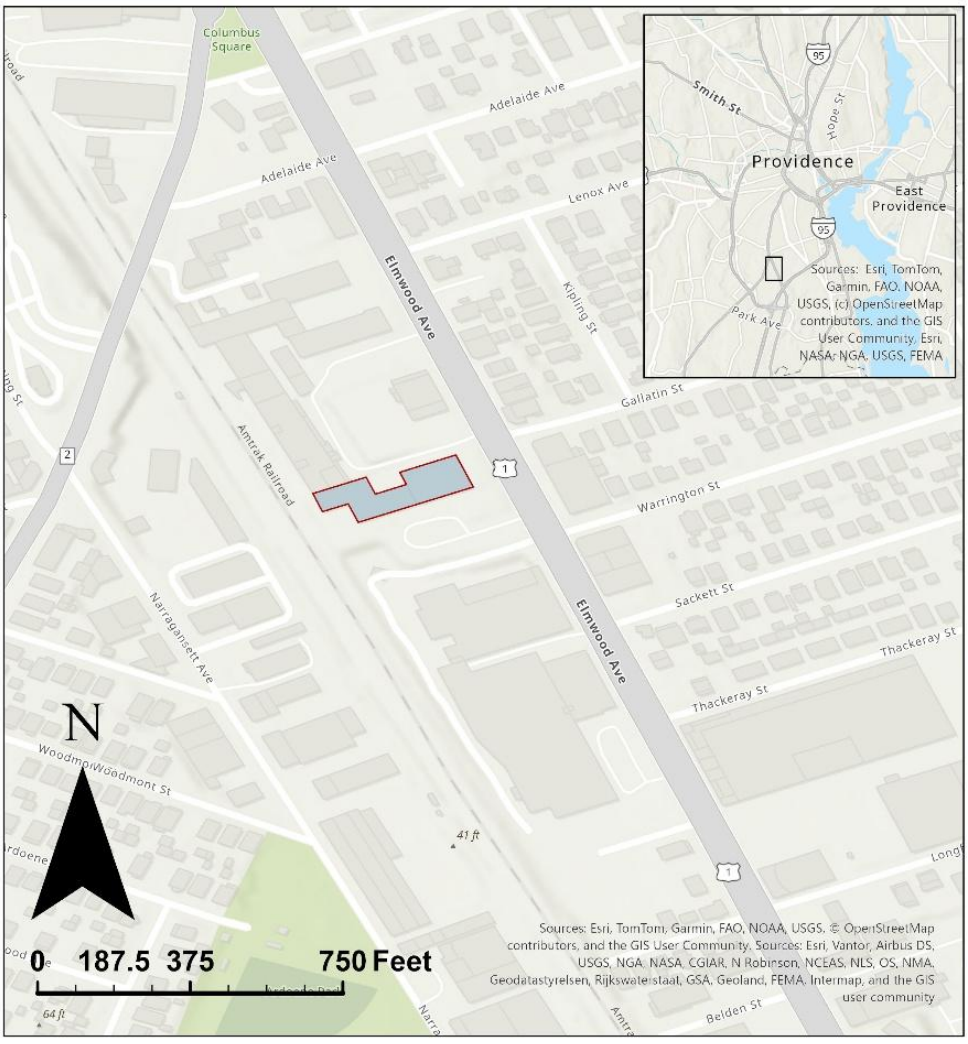
detections of TCE and PCE indoors and the events that transpired after those detections (Table 1).

Figure 1. Site Location Map



Stratford House (675 Elmwood Ave.) is highlighted in light blue and outlined in red.

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Table 1. Timeline of sampling events and RIDOH, RIDEM, and GZA actions.

Date	Event
March 24, 2026	GZA installed vapor pins onsite to measure concentrations of VOCs in the space underneath the building.
April 15, 2026	Initial sampling occurred in the Maintenance Storage Room, Mechanical Room, Hallway, Apartment #104, and Apartment #320.
April 28, 2026	GZA submitted initial sampling results to RIDEM.
April 30, 2026	RIDOH is notified of initial sampling results and provided RIDEM with recommendations to protect public health. RIDEM responded to GZA with required clean-up actions.
May 1, 2026	RIDOH and GZA coordinate response.
May 4, 2026	First draft of GZA's tenant notification letter is provided to RIDOH and RIDEM.
May 5, 2026	RIDOH provided initial comments on GZA's letter and the TCE/PCE factsheet for distribution to tenants.
May 6, 2026	GZA started operating the pilot sub slab vapor treatment system.
May 8, 2026	GZA provided notification letter to building tenants.
May 13, 2026	Installation of air-purifying units on the first floor began.
May 18, 2026	Follow-up sampling occurred in Apartments 313 and 320.
May 28, 2026	Sampling occurred in Apartment 213.
June 24, 2026	Sampling occurred in Apartment 101.
July 20, 2026	GZA provided notifications of analytical results to RIDOH and RIDEM for review. These notifications were for samples collected in Apartments 101, 213, and 313.
August 19, 2026	Building owner provided indoor air test results to the tenants at Apartments 101, 213, and 313.

Community Description and Concerns

Stratford House is located in Census Tract 2, Providence County, RI. The majority (81%) of residents in this census tract are Hispanic (Walker & Herman, 2026). Median household income is $48,456 annually, which is below the statewide average of $86,372 (Walker & Herman, 2026). Stratford House includes age-restricted (over age 62) and Section 8 (low-income) housing units.

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Sampling Data

Indoor air samples have been collected at Stratford House several times (see Table 1 for details). Each indoor air sample was taken using an individual 6-liter Summa Canister collecting air over 24 hours (Urbano, 2026a). All air samples were analyzed with method TO-15 and some with aromatic petroleum hydrocarbon ranges by Phoenix Environmental Laboratory (Urbano, 2026a).

Scientific Evaluations

Exposure Pathway Analysis

An exposure pathway analysis determines if there is a link between an environmental release and the point where a population might encounter environmental contaminants (ATSDR, 2005). There are five essential components to any exposure pathway (ATSDR, 2005). RIDOH evaluates these components with respect to each contaminated site (Table 2).

Table 2: Exposure pathways and RIDOH evaluation for Stratford House.

Pathway Step	Pathway Step Definition	RIDOH Evaluation at Stratford House
Contaminant source	Where did the contaminants come from?	VOCs, like TCE and PCE, are from the leaking underground storage tanks that were used when the site was a dry cleaner (Urbano, 2026a).
Environmental fate and transport	How contaminants released to the environment move through and across different media, as well as how they degrade or transform in the environment.	VOCs can enter buildings through a process called vapor intrusion (ITRC, 2026; Ma et al., 2020; NJDEP, 2021; Wisconsin DNR, 2026). They evaporate from groundwater or soil and travel through pores in soil (ITRC, 2026; Ma et al., 2020; NJDEP, 2021; Wisconsin DNR, 2026). VOCs enter buildings through cracks in the foundation or around piping for plumbing or electrical (ITRC, 2026; Ma et al., 2020; NJDEP, 2021; Wisconsin DNR, 2026).
Exposure point	The environmental medium (air, water, soil, or food) and location of exposure.	Indoor air in the Stratford House apartment complex.
Exposure route	The path by which contaminants enter the body (dermal, inhalation, ingestion).	Inhalation.
Potentially exposed population	The people who potentially have, do, or could come in contact with environmental contaminants.	People living at Stratford House.

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Based on the analysis in Table 2, we determined that there is a complete exposure pathway. This means that people living in Stratford House may be exposed via inhalation to VOCs from the contaminated plume under the building. It does not guarantee that a person will experience negative health impacts because of this exposure.

Screening Analysis

Air samples were analyzed for a total of 78 VOCs (not every VOC was measured in every air sample). In a Screening Analysis, RIDOH determines the most important VOCs for health risk analysis. Of those 78 VOCs, most (82%) were not detected or not reported. Compounds that were not detected in Stratford House were eliminated from consideration as the most important VOCs at this site.

RIDOH screened the concentrations of detected VOCs against health-based comparison values (CVs) that are protective against negative health effects. VOCs without health-based CVs do not have the scientific basis to provide the quantitative values necessary for health risk calculations. Any VOCs that were detected at concentrations less than their CV do not represent a significant health concern. Any VOCs that did not have health-based CVs or were present at concentrations less than their CVs were eliminated from consideration as the most important VOCs at this site.

Nine VOCs were detected at concentrations exceeding their CVs: 1,3 butadiene, benzene, naphthalene, acrylonitrile, carbon tetrachloride, chloroform, 1,2-dichloroethane, TCE, and PCE. Documents provided by GZA also identify acetone, methylene chloride, and 1,2 dichloroethane as exceeding the Massachusetts Department of Environmental Protection's residential thresholds. VOCs, including those detected at concentrations above their CVs, are commonly found in indoor air and can come from a number of sources. For example, acetone is commonly found in household products such as nail polish remover, benzene is formed during combustion such as from smoking or traffic (ATSDR, 2007), and methylene chloride is found in products like hairspray, furniture polish, and paint strippers (Urbano, 2026b). The focus of this report is on the health implications of exposure via inhalation to VOCs that can be attributed to the LNAPL contamination below Stratford House. TCE and PCE have been associated with the contamination at Stratford House (Urbano, 2026a). These VOCs (TCE and PCE) were detected at several locations within Stratford House at concentrations above their CVs (Table 3). TCE and PCE were identified as the primary contaminants of concern, based on their association with the contamination under Stratford House and their presence at concentrations above their CVs.

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Table 3: Concentrations of TCE and PCE detected in Stratford House.

Sampling Location	Date	Occupied?*	TCE (µg/m^3)	PCE (µg/m^3)
Maintenance Storage Room	April 15, 2026	No	14$^+$	11.1$^+$
Mechanical Room	April 15, 2026	No	5.03$^+$	739$^+$
Hallway near SSSV-4**	April 15, 2026	No	2.79$^+$	111$^+$
Apartment #104	April 15, 2026	No	ND	1.34
Apartment #320	April 15, 2026	No	0.86$^+$	5.31$^+$
Apartment #313	May 18, 2026	Yes	ND	0.76
Apartment #320	May 18, 2026	No	0.45$^+$	1.97
Apartment #213	May 28, 2026	Yes	ND	ND
Apartment #101	June 24, 2026	Yes	ND	0.73

*Occupied at the time of sampling.
**SSSV-4 is a port installed to sample sub slab vapors for VOCs.
Detections exceeding the RIDOH comparison values for TCE (0.21 µg/m^3) or PCE (2.0 µg/m^3) indicated by $^+$.
ND – Nondetect. Compounds were present at concentrations less than could be measured.

The chronic CV for TCE is 0.21 µg/m^3 (ATSDR, 2019b; National Center for Environmental Assessment, 2011). Continuous exposure to concentrations of TCE above 0.21 µg/m^3 for many years can increase risk for kidney cancer (ATSDR, 2019b; National Center for Environmental Assessment, 2011). In this case, continuous exposure means breathing in TCE 24 hours per day, 365 days per year (ATSDR, 2021). Samples collected in the Maintenance Storage Room, Mechanical Room, Hallway near SSSV-4, and Apartment 320 (4/15/26 and 5/18/26 collection dates) exceeded this CV (Table 3).

RIDOH's chronic CV for PCE is 2.0 µg/m^3 (Baird et al., 2014; Minnesota Department of Health, 2014), which is slightly more conservative than ATSDR's value of 3.8 µg/m^3 (ATSDR, 2019a). Continuous exposure to concentrations of TCE above 2.0 µg/m^3 can increase risk for leukemia (Baird et al., 2014; Minnesota Department of Health, 2014). Samples collected in the Maintenance Storage Room, Mechanical Room, Hallway near SSSV-4, and Apartment #320 (4/15/26 collection date) exceeded this CV (Table 3). Also, the air sample collected in Apartment #320 on 5/18/26 was very close to the RIDOH CV (Table 3, 1.97 µg/m^3).

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RIDOH has other CVs for shorter-term exposure to TCE and PCE. Intermediate CVs are concentrations that increase risk for negative health effects after exposure for more than 14 days (24 hour per day exposure). The intermediate CV for TCE is 2.1 µg/m^3 and is based on cardiac deformations in fetal development and decreased thymus weight (ATSDR, 2019b). The intermediate CV for PCE is 41 µg/m^3 and is based on changes in blue/yellow color vision (ATSDR, 2019a). No apartments sampled exceeded these CVs, which is why EHRAP focused its analysis and recommendations on the chronic CVs.

TCE and PCE proceed past the screening analysis to the In-Depth Toxicological Effects Analysis because they:

- Have well-studied health risks (ATSDR, 2019a, 2019b);
- Are associated with the contamination identified under Stratford House (Urbano, 2026a); and
- Exceeded their CVs in some locations (Urbano, 2026a).

Exposure Point Concentrations (EPCs) and Exposure Calculations

An exposure point concentration (EPC) is an estimated concentration of a contaminant where people might interact with it (ATSDR, 2005). At Stratford House, an EPC is the concentration of TCE or PCE detected in a room. The room or apartment where people encounter a contaminant is called an exposure unit (ATSDR, 2005). In an exposure unit, RIDOH assumes that people move freely and have complete access to the entire space (ATSDR, 2020). At Stratford House, there was usually only one indoor air sample taken in each apartment. When more than one sample was taken in an apartment, the follow-up sample was taken after the intervention had taken place. Each measurement (summarized in Table 3) of TCE and PCE represents a unique EPC because they were taken from different exposure units and exposure scenarios (ATSDR, 2023).

In-Depth Toxicological Effects Analysis

Through its screening analysis, RIDOH identified TCE and PCE as the primary contaminants of concern. The available information on TCE toxicity shows that the primary target is the central nervous system (ATSDR, 2019b). Other potential targets include the kidney, liver, immune system, male reproductive system, and developing fetus (ATSDR, 2019b). The US Department of Health & Human Services (DHHS), International Agency for Research on Cancer (IARC), and Environmental Protection Agency consider TCE a human carcinogen (ATSDR, 2019b). There is strong evidence relating TCE exposure and kidney cancer in humans (ATSDR, 2019b). There is some evidence supporting the relationship between TCE exposure and other cancer types (liver and testicular) in humans (ATSDR, 2019b). In rats and mice, there is some evidence for testicular cancer, leukemia, lymphoma, and lung cancer (ATSDR, 2019b).

Similar to TCE, the primary target for PCE toxicity is the nervous system (ATSDR, 2019a). Nervous system depression, loss of consciousness, neurobehavioral effects, vision changes, and death are possible at high levels of PCE exposure (ATSDR, 2019a). Peer-reviewed literature indicates that kidneys, liver, reproductive systems, and fetal development can be impacted in

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animals exposed to PCE (ATSDR, 2019a). Animals metabolize PCE differently than humans, so it is unclear whether these health impacts can be expected in exposed people (ATSDR, 2019a).

Increased incidences of tumors in the kidney, liver, and lymphoid tissues have been reported in mice and rats exposed to PCE (ATSDR, 2019a). Human data suggest that there may be a relationship between PCE exposure and non-Hodgkin lymphoma, multiple myeloma, and bladder cancer in humans (ATSDR, 2019a). DHHS has classified PCE as "reasonably anticipated to cause cancer in humans" (ATSDR, 2019a). IARC classified PCE as "probably carcinogenic to humans" (bladder cancer) (ATSDR, 2019a). EPA considers PCE "likely to be carcinogenic by all routes of exposure," supporting bladder cancer, multiple myeloma, and non-Hodgkin lymphoma as potential health endpoints (ATSDR, 2019a).

RIDOH used screening analysis to determine that TCE and PCE were related to environmental contamination and were potentially present at levels of concern. The next step in the process was an in-depth analysis on the potential health risks posed by VOCs identified in the screening analysis. In this step, health risks are estimated by making worst-case assumptions about how people are exposed. Health risks are calculated using ATSDR's process (ATSDR, 2022).

RIDOH assumes the worst-case scenario when calculating health risks related to VOCs in indoor air. We assume that exposure occurs 24 hours per day, 365 days per year. There are some younger tenants living in Stratford House who would be more impacted by indoor air contamination. Children are more sensitive to the effects of contamination because they are still developing and have smaller bodies. Based on this, RIDOH assumed that the worst-case scenario would be a child living onsite for 21 years (ATSDR, 2021).

Using the assumptions described here, RIDOH can calculate an excess lifetime cancer risk (ELCR) for exposure to TCE and PCE every day for 21 years (Table 4). ELCR was calculated because TCE and PCE concentrations at Stratford House have been shown to exceed CVs developed with kidney cancer and leukemia as the health endpoints. The noncancer-related health risks associated with TCE and PCE exposure occur at higher concentrations than CVs associated with higher cancer risk. Exposure to concentrations less than CVs associated with increased cancer risk means that people are also safe from noncancer health effects over the long term. ELCR describes the risk of cancer in excess of "baseline" risk. Everyone has a baseline risk of developing cancer and ELCR shows the specific increase in risk after exposure to a contaminant.

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Table 4: Cancer risk estimates for a child exposed to TCE and PCE every day for 21 years.

Sampling Location	TCE	PCE
Maintenance Storage Room	2.40E-05	7.80E-07
Mechanical Room	8.50E-06	5.20E-05
Hallway near SSSV-4	7.80E-06	4.70E-06
Apartment #104	NC	9.40E-08
Apartment #320 (Sampled 4/15/26)	1.50E-06	3.70E-07
Apartment #313	NC	5.30E-08
Apartment #320 (Sampled 5/18/26)	7.60E-07	1.40E-07
Apartment #213	NC	NC
Apartment #101	NC	5.10E-08

NC – Not calculated because the contaminant was not detected. See Table 3 for concentrations of TCE and PCE.

Cancer risks for TCE and PCE at the levels detected at Stratford House range from 5.10E-08 (five extra cancer cases per 100,000,000 similarly exposed people) to 5.20E-5 (five extra cancer cases per 100,000 similarly exposed people) (Table 4). The highest cancer risks were in the Maintenance Storage Room, Mechanical Room, and Hallway near SSSV-4. This corresponds to the rooms where TCE and PCE concentrations were the highest (Table 3). The estimates in Table 4 likely overestimate the risk for these rooms because people do not spend 24 hours a day, every day, for 35 years in these rooms.

ELCRs for the apartments are lower, ranging from 5.10E-08 to 1.50E-06. ELCRs are lower here because of lower TCE and PCE concentrations detected in apartments. The apartments at Stratford House have better air flow compared to the storage and mechanical rooms. This reduces the concentration of sub slab vapors in living quarters. RIDOH considers 1.00E-06 (one extra case of cancer per 1 million similarly exposed people) to be the “baseline” risk of cancer. Exposure to TCE and PCE at the concentrations detected in Stratford House apartments 24 hours per day, every day, for 21 years is not likely to increase risk for cancer above baseline levels.

The building owner began taking steps to minimize future health risks once notified of high concentrations of TCE and PCE in indoor air. GZA assisted the building owner by operating a

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temporary venting system in the courtyard of Stratford House beginning on May 6. At Stratford House, this system pulls contaminated air out from recently installed monitoring wells MW-103 and MW-104 located just outside of the building slab and treats it. This reduces the concentration of VOCs in the sub-surface soil gas. Nineteen Airpura F600DLX Air Purifiers were also provided to residents on the first floor on May 13. Apartments on the first floor are at highest risk for intrusion of TCE and PCE from the LNAPL below the building. The sample taken at Apartment #101 shows that the risk posed by TCE and PCE in Apartment #101 is low. Concentrations in Apartment #101 were slightly lower than in Apartment #104, which was sampled before the interventions began (Table 3). This means that the cancer risks could be lower following interventions installed by GZA at the direction of the building owner (Table 4). More sampling data is recommended to confirm that the interventions are functioning appropriately.

Overall, the in-depth toxicological analysis showed that concentrations of TCE and PCE were not at levels of concern in the four apartments at Stratford House with sampling data. Concentrations in the other rooms (Maintenance Storage, Mechanical, and Hallway) were much higher, but people spend less time in these rooms, meaning they are not likely to have an increased risk for cancer. While health risks may be low, the samples in the Maintenance Storage, Mechanical, and Hallway indicate that there is a vapor intrusion site that needs to be addressed.

Addressing Community Concerns

After RIDOH was notified of the elevated TCE and PCE concentrations at Stratford House, EHRAP worked with the building owner, GZA, and RIDEM to provide information for building residents. RIDOH reviewed letters from GZA containing health information. Here, we describe the statements in the letters and provide more detailed justification for our conclusions.

The tenant notification letter (provided to tenants on 5/8/26) stated that the health risks to building occupants are minimal. By this point, RIDOH had reviewed the initial set of indoor air quality samples (collected 4/15/26). These samples showed concentrations of TCE and PCE exceeding CVs in rooms that are not accessed frequently or well ventilated (Maintenance Storage Room, Mechanical Room, Hallway near SSSV-4). The apartments that were sampled (Apartment #104 and #320) had much lower concentrations of TCE and PCE (Table 3). Apartment #104 did not exceed CVs for either TCE or PCE (Table 3). Apartment #320 exceeded CVs for TCE and PCE, but this apartment had recently been renovated. Fumes from paint or other construction materials could have contributed to these increased concentrations. RIDOH decided that health risks were minimal given that the better-ventilated areas of Stratford House had lower concentrations of TCE and PCE. The rapid deployment of the air purifiers also helped to limit risk. The temporary ventilation system should continue to be monitored to evaluate sub-slab vacuum response. GZA and the building owner should work with RIDEM to design and implement an appropriate monitoring program and to design and install a permanent sub-slab vapor mitigation system.

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GZA, on behalf of the building owner, also prepared tenant notification letters of analytical results (reviewed by RIDOH on 7/20/26). These letters describe the analytical results of indoor air samples taken in Apartments #313, 213, and 101 (Table 3). TCE was not detected in any sample, and PCE ranged from not detected to 0.76 µg/m^3. These samples were taken after the air purifiers were activated. The results are lower than the CVs for TCE and PCE, indicating that exposure to these levels would not increase the risk for negative health impacts. The concentrations of PCE detected in these apartments are similar to those found in studies of background (uncontaminated) air. Previous studies show that concentrations of PCE in indoor air range from non-detect to 2.2 µg/m^3 (Minnesota Department of Health, 2014; New York State Department of Health, 2026; Office of Solid Waste and Emergency Response, 2011), so the detected concentrations at Stratford House are within the range expected in indoor air. Since there is contamination entering the building through vapor intrusion, further monitoring can help confirm that levels stay within the expected background.

Summary of Limitations and Uncertainties

The sampling conducted by GZA, on behalf of the building owner, provides some understanding of current environmental exposures. That understanding is limited by the sampling location, number of samples, and the timing of sample collection.

- **Sampling Location:** The initial group of indoor air samples (collected on 4/15/16) was not taken from areas that would realistically demonstrate exposure to contamination. These samples were taken in unoccupied rooms and apartments in the building. Later samples showed that concentrations were lower in occupied apartments. This understanding is limited to only apartments that were sampled and occupied.
- **Number of Samples:** A small number of samples were collected at Stratford House. Typically, ATSDR recommends at least eight samples per exposure unit so that a 95% upper confidence limit can be calculated (ATSDR, 2023). Here, RIDOH used each individual measurement as an exposure point concentration. Air samples are particularly susceptible to temporal variations, so this method does not accurately demonstrate risk during a long exposure period.
- **Timing of Sample Collection:** All indoor air samples were collected in 2026, 20 years after the leaking underground storage tanks were removed from the site. Calculations took into account a longer duration of exposure by setting the exposure time to 21 years, but it is unclear how much historic intrusion has occurred. Without historic sampling data, RIDOH cannot accurately calculate the risk to building occupants prior to 3/24/26.

Outdoor air samples were not taken at the same time as the indoor air samples. Tandem indoor/outdoor air samples can help identify the source of indoor air contamination (Adgate et al., 2004; Bureau of Toxic Substance Assessment, New York Department of Health, 2015). In this case, indoor air contamination was linked with the LNAPL plume under Stratford House using

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previous groundwater data. TCE and PCE are pervasive in urban environments and outdoor air samples could be helpful in contextualizing concentrations inside.

To calculate the risk at Stratford House, RIDOH made assumptions about a person's exposure. We assumed that a person is exposed 24 hours per day, every day, for 21 years in our calculations. This means that a person would not leave their apartment (or the Maintenance Storage Room, Mechanical Room, or Hallway) for 21 years. Risk for cancer and noncancer health effects is lower than what was calculated based on these overprotective assumptions (see In-Depth Toxicological Effects Analysis).

ELCRs estimate the level of risk after exposure to a certain chemical. Even if risk exceeds 1E-06 (one extra cancer case per 1 million people similarly exposed), it does not guarantee that a person will get cancer. The development of cancer is a complex process with many potential influencing factors (Cooper, 2000). Exposure to environmental contamination can increase risk, but it does not guarantee a particular health outcome.

Conclusions

RIDOH has concluded that exposure to VOCs from the LNAPL plume at Stratford House does not present an immediate/acute health hazard. Sampling data shows that TCE and PCE vapors from the LNAPL plume have migrated into the building, so more robust sampling and treatment systems are necessary to ensure the protection of public health. This is because health risks and concentrations of TCE and PCE are low in occupied apartments (of which only two were sampled). RIDOH does not have enough data to demonstrate whether there was risk from previous exposure at the site. Indoor air sampling occurred only recently; therefore, we do not have the data necessary to characterize historic exposure.

Recommendations

As Stratford House progresses through the remediation process, RIDOH recommends that:

- The eventual active sub slab vapor mitigation system should be maintained appropriately and operated continuously at Stratford House. It is recommended that the permanent active vapor mitigation system is equipped with remote telemetry to ensure minimal system downtime in the event of a loss of power. GZA and the building owner should develop a monitoring plan, in coordination with RIDEM, to ensure continued effectiveness of these interventions. Air purifying units on the first floor should continue to be operated until the sub slab mitigation system has demonstrated adequate control based on monitoring response.
- RIDEM, the building owner, and GZA continue to keep RIDOH informed of progress at Stratford House.
- In coordination with RIDEM, a more thorough assessment of the sub-slab soil vapor, indoor air, and ambient air should be conducted. Sampling should include more locations and on all floors of the building - common areas, apartment units, mechanical

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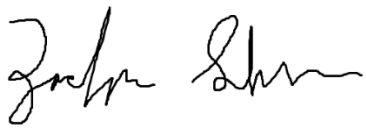
and maintenance rooms, etc. Locations should be resampled regularly to monitor the efficacy of mitigation efforts. Each sampling event should include ambient air, indoor air, and sub-slab soil gas and should occur within the same day (to the extent possible).

- Additional indoor and outdoor sampling data be shared with RIDOH.
- Building occupants should limit the use of VOCs as much as possible and increase ventilation in apartments to bring in more outdoor air where possible.
- The HVAC system in the building should be upgraded to ensure intakes are bringing in fresh outdoor air, filtration of air is adequate, and air pressure within the building is slightly positive to support sub-slab depressurization.
- Any questions from the community about the health implications of VOC exposure be directed to the Environmental Health Risk Assessment Program (EHRAP). Contact 401-222-7746 or zachary.shepard@health.ri.gov to connect with EHRAP.

Please feel free to contact me at zachary.shepard@health.ri.gov or by phone at 401-578-5906, if you have any questions.

Sincerely,



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Attachment A: Brief Summary of ATSDR's Public Health Assessment (PHA) Process

ATSDR follows the PHA process to find out:

- Whether people living near a hazardous waste site are being exposed to toxic substances.
- Whether that exposure is harmful.
- What must be done to stop or reduce exposure.

The PHA process is a step-by-step consistent approach during which ATSDR:

- Establishes communication mechanisms, including engaging communities at the beginning of site activities and involves them throughout the process to respond to their health concerns.
- Collects many different kinds of site information.
- Obtains, compiles, and evaluates the usability and quality of environmental and biological sampling data (and sometimes modeling data) to examine environmental contamination at a site.
- Conducts four main, sequential scientific evaluations:
    - Exposure pathways evaluation to identify past, present, and future site-specific exposure situations, and categorize them as completed, potential, or eliminated.
    - Screening analysis to compare the available sampling data to media-specific environmental screening levels (ATSDR comparison values [CVs] and non-ATSDR screening levels). This identifies potential contaminants of concern that require further evaluation for completed and potential exposure pathways.
    - Exposure Point Concentrations (EPCs) and exposure calculations for contaminants flagged as requiring further evaluation in completed and potential exposure pathways. It involves calculating EPCs, using the estimated EPCs to perform exposure calculations, and determining which site-specific scenarios requires an in-depth toxicological effects analysis.
    - In-depth toxicological effects evaluation, if necessary, based on the three previous scientific evaluations. This step looks more closely at contaminant-specific information in the context of site exposures. This evaluation can also help determine if there is a potential for noncancer or cancer health effects.
- Summarizes findings and next steps, while acknowledging uncertainties and limitations.
- Provides recommendations to site-related entities, partner agencies, and communities to prevent and minimize harmful exposures.

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The sequence of steps can differ based on site-specific factors. For instance, health assessors might define an exposure unit before or after the screening analysis.

For more detail on the PHA process, please visit *Explanation of ATSDR's PHA Process Evaluation*. Readers can also refer to *ATSDR's Public Health Assessment Guidance Manual* for all information related to the step-wise PHA process.