STATE OF TENNESSEE
DEPARTMENT OF HEALTH
ENVIRONMENTAL EPIDEMIOLOGY PROGRAM
1ST FLOOR CORDELL HULL BUILDING
425 5TH AVENUE NORTH
NASHVILLE, TN 37243

April 15, 2011

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Drycleaner Environmental Response Program
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Dear Mr. Rowan:

The Tennessee Department of Health's (TDH) Environmental Epidemiology Program (EEP) has reviewed the July 7, 2010 indoor air sampling results provided for the My Valet Cleaners Site located at 6717 East Shelby Drive, Memphis, Shelby County, Tennessee, DCERP Facility No.: D-79-180. The facility's U.S. Environmental Protection Agency (EPA) facility identification number is TND982158966. This Letter Health Consultation is an update to an earlier letter health consultation published on December 10, 2009.

The cleaner is one of several tenants occupying the northern-end suite of one of three buildings comprising a strip mall shopping center. A drycleaner has been located in this suite since at least 1987. Reportedly, tetrachloroethylene has been used as the drycleaning solvent since the cleaner began operating. The Tennessee Department of Environment and Conservation's (TDECs) Drycleaner Environmental Response Program (DCERP) wanted to determine if the indoor air of business suites adjacent to the cleaner were impacted by drycleaner solvent and related chemicals. Because the cleaner is still operating, indoor air in the cleaner suite was not tested.

Various investigations have been conducted at the cleaner. These investigations sampled soil-gas and advanced boreholes from which soil samples were collected. EnSafe Inc. (EnSafe) of Memphis, Tennessee, an approved contractor, performed the investigations (2006a, 2006b, 2007). The source of the drycleaner solvent appears to be leaks or spills from the drycleaning machine during the early years of the cleaner's operation. During an October 2005 site inspection by EnSafe, what appeared to be overspray of "muck" (lint, hair and other residue mixed with tetrachloroethylene or PCE) or waste solvent was visible at the base of the wall directly behind the drycleaning machine and adjoining the waste solvent storage area. Also, an approximate 1 foot diameter area of the floor, from beneath the waste solvent containment pan, appeared to be etched. The extent of the etching beneath the solvent containment pan is

unknown. The cleaner began operation in 1987. The current owners, however, are unaware of any releases of drycleaner solvent since their ownership began in 1993 (EnSafe 2006).

Because the concentrations of drycleaner-related chemicals, such as PCE and trichloroethylene (TCE) in subsurface soil exceeded 100 parts per million (ppm), DCERP decided to sample indoor air in the two adjacent business suites. As a matter of practice, DCERP evaluates the vapor intrusion pathway for drycleaner-related compounds early in its investigations.

PCE is a clear, colorless liquid said to produce a sharp, sweet smell. It evaporates very readily at room temperature. PCE is a synthetic chemical and is often used as a starting point for the manufacture of other chemicals (ATSDR 1997). This site purchased and used PCE as a solvent to dry clean clothes. PCE is readily absorbed following inhalation and oral exposure as well as direct exposure to the skin. For this site, we are concerned with the inhalation of PCE from vapor intrusion into indoor air. Pulmonary absorption of PCE is dependent on the ventilation rate, on the duration of exposure, and at lower concentrations, on the proportion of PCE in the inspired air.

TCE is a clear, colorless liquid said to produce a sharp, sweet odor and a sweet, burning taste. It is nonflammable and evaporates easily at room temperature. If TCE is released to surface water or surface soil, it will mostly evaporate into the air and disperse. Breathing small amounts of TCE may cause a variety of short-term health effects including headaches, lung irritation, dizziness, poor coordination, and difficulty concentrating. Breathing it for long periods may cause nerve, kidney, and liver damage.

Indoor air (vapor intrusion) sampling was performed on April 9, 2009, in a barbeque restaurant adjacent to the cleaners (Figure 1). Also on this date, indoor air sampling was performed in a tax preparation service suite next door to the restaurant (Figure 1). Sampling was performed by EnSafe, using Summa canisters that had flow controllers calibrated to collect a sample over a minimum eight-hour time period (EnSafe 2009). Results of the April 2009 indoor air sampling are in Table 1.

Measured PCE levels were 97 parts per billion (ppb) in the restaurant and 39 ppb in the tax preparation suite during the initial indoor air sampling, as described in the December 10, 2009 letter health consultation. Based on the recommendations of TDH EEP and DCERP, an additional indoor air sampling event was conducted on July 7, 2010. Results for this second indoor air sampling event are also in Table 1. As part of the July 2010 sampling, the restaurant and tax preparation suite were resampled. Additionally, the indoor air in a suite adjacent to the tax preparation suite, housing a pizza delivery service, was sampled (Figure 1).

In the previous Letter Health Consultation prepared by TDH EEP, it was recommended that the heating, ventilation, and air conditioning (HVAC) system of the cleaners and various leased spaces be inspected and the air flow increased for the restaurant leased space. Maintenance of the HVAC system was an issue in the cleaner's suite. It was reported that the HVAC system was not functioning properly (Nancy Boisvert, personal communication December 1, 2009). It should be noted that the HVAC system of the cleaner was repaired prior to the July 2010 sampling (EnSafe 2010).

This Letter Health Consultation will evaluate the July 2010 indoor air concentrations of the chemical PCE used in drycleaning. It will also evaluate the indoor air concentrations of TCE, one of break down chemicals of PCE.

Barbeque Restaurant Suite

The barbeque restaurant is located immediately adjacent to the My Valet Cleaners leased space. Indoor air was sampled on April 9, 2009, and again on July 7, 2010, during normal business hours. There were detections of the drycleaner chemical PCE and one of the chemicals that breaks down from PCE, TCE, in the indoor air samples collected. All other PCE breakdown chemicals were not measured above analytical detection limits. The July 2010 PCE measurement was three times lower than the April 2009 PCE concentration. The July 2010 TCE concentration was also three times lower than the April 2009 concentration. It is not known if the source of all of the PCE in indoor air in the restaurant is from subsurface soil and/or groundwater contamination or the chemicals migrating in the indoor air throughout the building from suite to suite.

In April 2009 the measured PCE concentration in indoor air was 97 parts per billion (ppb). In July 2010, PCE was measured at 32 ppb. The July 2010 PCE concentration was compared to the ATSDR non-cancer health effects environmental media evaluation guide (EMEG) for a chronic exposure for PCE (ATSDR 2011). The non-cancer EMEG is 40 parts per billion (ppb). The measured PCE concentration in the restaurant is below the EMEG. Studies of PCE toxicity suggest effects to liver and kidneys with effects showing up with human lowest observed adverse-effects levels (LOAELs) at approximately 20 parts per million (ppm) (ATSDR 1997). This is approximately 625 times higher than levels measured in the restaurant. The PCE level measured was less than the LOAEL. Therefore, there should not be any non-cancer health effects to those breathing the indoor air of the restaurant.

The main exposed population of the restaurant would be the restaurant owner, manager, or any employees who would spend longer periods of time, over several years, in the restaurant. The PCE concentration of 32 ppb in the restaurant was above the 1 in 10,000 excess cancer risk screening value of 6 ppb (EPA 2010). Thus, the PCE concentration in indoor air exceeds the excess cancer risk considered acceptable by EPA (EPA 1991). An exposure risk was calculated using the inhalation unit risk for PCE (IUR) of 5.9×10^{-6} micrograms per cubic meter $[\mu g/m^3]^{-1}$ multiplied by the PCE concentration of 32 ppb (217 $\mu g/m^3$). This calculated, theoretical risk was then modified using a more representative exposure time frame. The estimated risk was modified for a restaurant worker working a typical 8-hour per day, 6 day per week, 50 weeks per year, for 10 years time frame. The calculated exposure risk was 4.2×10^{-5} or approximately 4 excess cancers in 100,000 people. EEP believes this site-specific calculated cancer risk is closer to the actual risk, and it is within the 10^{-6} to 10^{-4} excess cancer risk considered acceptable by EPA. While there is some increased risk associated with breathing air in the restaurant containing these levels of PCE, there should not be any adverse cancer health effects to workers or customers breathing the indoor air of the barbeque restaurant.

TCE was also detected in the restaurant's indoor air in July 2010 at a concentration of 5 ppb. For TCE exposure, this concentration was below the EPA provisional reference dose of 7.4 ppb for non-cancer health effects (EPA 2001). The TCE concentration was within the 10^{-6} to 10^{-4} excess

cancer range of 0.22 to 22 ppb considered acceptable by EPA (1991, 2010). Therefore, with these low levels of TCE, no significant increased risk of cancer would be expected from breathing air in the restaurant.

Tax Service Suite

The tax service occupies a suite in the shopping center adjacent to the barbeque restaurant. The tax service is the second suite from the My Valet Cleaner suite. PCE and TCE were measured in the indoor air. No other PCE solvent breakdown products were measured in the indoor air. The PCE measurement in the indoor air in July 2010 decreased slightly to 34 ppb, compared to the April 2009 measurement of 39 ppb. The PCE concentrations are below the non-cancer health screening value, hence non-cancer health effects are not expected from breathing the indoor air of the tax service.

The tax service indoor air PCE measurement was greater than the 6 ppb concentration excess cancer effects of 1 in 10,000 (10^{-4}) for PCE listed in the regional screening levels table suggested for use by EPA (2010). An exposure risk was calculated using the inhalation unit risk for PCE (IUR) of $5.9x10^{-6}$ $(\mu g/m^3)^{-1}$ multiplied by the PCE concentration of 34 ppb (231 micrograms per square meter [$\mu g/m^3$]). This calculated, theoretical risk was then modified using a more representative time frame. The estimated risk was modified for a worker working in the tax service suite, during typical normal working hours and length of employment. EEP considered workers working 6 days each week for 50 weeks, over a 10-year time period. The calculated health risk was $4.5x10^{-5}$ or about 5 excess cancers in 100,000 people. This risk was similar to the site-specific risk calculated for the barbeque restaurant. This site-specific unit risk is within the range of risk considered acceptable by EPA (1991). Thus, the potential for adverse cancer health effects from breathing indoor air in the tax service leased space would be very low.

TCE was also detected in the tax service suite in July 2010 at a concentration of 1.6 ppb. For TCE exposure, this concentration was below the EPA provisional reference dose of 7.4 ppb for non-cancer health effects. The TCE concentration was also within the 10^{-6} to 10^{-4} excess cancer range of 0.22 to 22 ppb for TCE considered acceptable by EPA (1991). Therefore, neither an elevated non-cancer nor cancer risk is expected in the tax preparation suite due to breathing indoor air having the low concentrations of TCE.

Pizza Delivery Suite

The pizza delivery service occupies a suite in the shopping center adjacent to the tax service suite. The tax service is the third suite from the My Valet Cleaner. The pizza delivery suite was not tested in April 2009. The July 2010 indoor air testing results showed only a measurement of PCE, at a concentration of 1.3 ppb. All other PCE chemical breakdown products were below detection levels. The PCE measurement was well below the ATSDR chronic exposure non-cancer effects EMEG comparison value of 40 ppb (ATSDR 2011). There should not be any non-cancer health effects from breathing the indoor air of the pizza delivery suite.

The indoor air PCE measurement in the pizza delivery suite was also below the 6 ppb excess cancer effects concentration of 1 in 10,000 (10^{-4}) excess cancers for PCE considered acceptable by EPA (EPA 2010). Given the measured indoor air concentration of PCE of 1.3 ppb (9 $\mu g/m^3$)

the inhalation unit risk for PCE of $5.9x10^{-6}$ $(\mu g/m^3)^{-1}$, and using a typical 8 hour work day, 6 days per week, over 50 weeks, over a 5 year time period, the calculated theoretical risk is $1.1x10^{-6}$, or approximately 1 additional excess cancer per 1,000,000 people. Therefore, the potential for adverse cancer health effects from breathing indoor air in the pizza delivery space is very low.

Chemical Mixture

In the July 2010 indoor air sampling, PCE and TCE were identified in both the barbeque restaurant and the tax preparation suites. In the previous April 2009 indoor air sampling event both PCE and TCE were present in only the restaurant. There are possible additive health effects from these chemicals to an exposed population (ATSDR 2004). There is no evidence to indicate that greater-than-additive interactions among TCE or PCE health effects might occur. This includes interactions for the most common liver and kidney or nervous system effects observed from PCE or TCE exposure.

Adding together the risks of PCE and TCE, the total excess cancer risk was still about 4 in 100,000 for both the restaurant and tax preparation suites. It is unlikely that the presence of both PCE and TCE in indoor air would create any increased health effects to those who breathe the indoor air by working in or being a customer of the restaurant or tax preparation suites.

Limitations

There are some limitations to TDH EEP's evaluation of the indoor air data collected. There were no outdoor or ambient air samples collected as part of either the April 2009 or the July 2010 indoor air investigations. A background air sample could be used for comparison purposes to identify if any of the drycleaner solvent or breakdown product chemicals were present in outside air near the location of these business suites.

Restaurants typically have several products that are used daily as part of their operation and cleaning activities. These products may also contain chemicals that drycleaners use in the course of their operations. It is unknown if the restaurant that was tested used cleaning solutions or solvents containing PCE or TCE. There was no mention of chemicals present in the information presented in any of the reports published by the site's environmental consultant (EnSafe 2006a, 2006b, 2007).

EEP concludes:

EEP concludes that the concentrations of the drycleaner solvent PCE measured in the barbeque restaurant, tax service, and the pizza delivery suites were not expected to harm the health of workers or customers of these suites. This is because the non-cancer risk in all the suites is below conservative health comparison values provided by both ATSDR and EPA and the lifetime excess cancer risk, adjusted for a reasonable work place exposure scenario for workers at these businesses, is very low. Customers of the former cleaner would have a short and very limited exposure to PCE and therefore customers should not experience increased non-cancer or cancer health effects by breathing the indoor air of these suites.

EEP recommends:

It would be prudent to maintain the HVAC system in this situation. The strip mall owner should continue to maintain and service the HVAC system using a maintenance schedule to ensure the proper rate of air flow is maintained in these suites. A properly functioning HVAC/air circulation/air exchange system would coincidentally mitigate the vapor intrusion that appears to be occurring at the site.

Sincerely,

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Environmental Epidemiology Program

References

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Figure 1. Indoor Air Sampling Locations near the My Valet Cleaners, 6717 East Shelby Drive, Memphis, Shelby County, Tennessee. (Source: EnSafe Air Sampling Results Report, September 7, 2010).

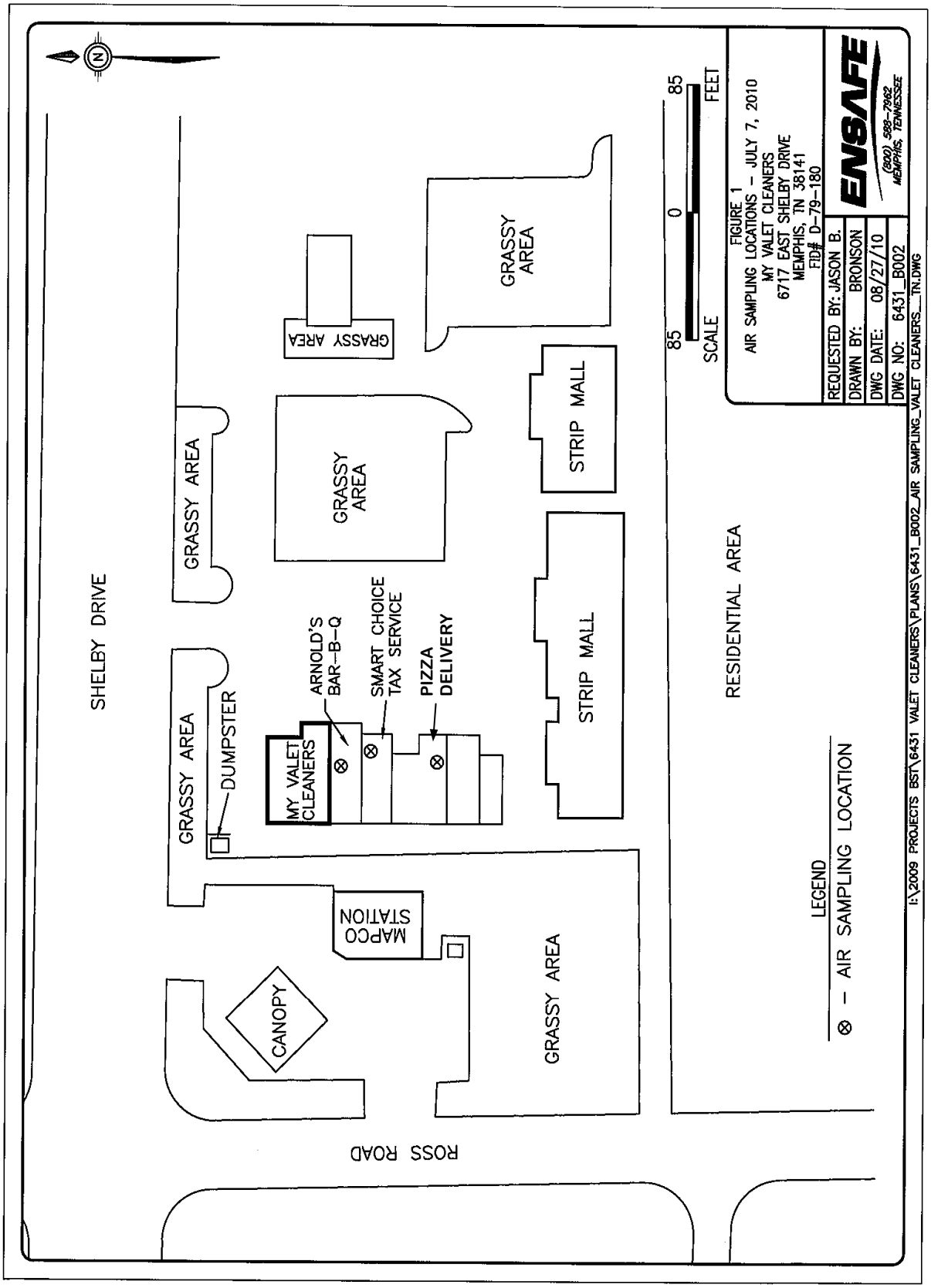

TABLE 1. Indoor air sampling results for leased spaces near the My Valet Cleaners, Memphis, Shelby County, TN. Samples were collected on April 9, 2009, and July 7, 2010 over an approximate 8-hour time period during normal working hours with Summa canisters (EnSafe 2010). Values are reported in parts per billion (ppb). Health screening guidelines based on chronic exposure duration for greater than 365 days (ATSDR 2011), ATSDR cancer risk evaluation guides (CREGs) (2010), and EPA residential inhalation Regional Screening Levels (EPA 2010).

Chemical / Sampling Data and Location	Acronym	Barbeque Restaurant Suite		Tax Service Suite		Pizza Delivery Suite	ATSDR Chronic EMEG (unless noted) (non-cancer risk)	ATSDR CREG (unless noted) (10^{-6} excess cancer risk)
Sampling Date		April 9, 2009	July 7, 2010	April 9, 2009	July 7, 2010	July 7, 2010		
Results reported in:		ppb	ppb	ppb	ppb	ppb	ppb	ppb
Tetrachloroethylene	PCE	**97**	*32*	*39*	*34*	*1.3*	40	0.06[E]
Trichloroethylene	TCE	**8.9**	*5.0*	<0.060	*1.6*	<0.32	7.4[E]	0.22[E]
cis-1,2-dichloroethylene	*cis*-1,2-DCE	<0.19	<0.19	<0.19	<0.19	<0.19	ngv	nc
trans-1,2-dichloroethylene	*trans*-1,2-DCE	<0.20	<0.20	<0.20	<0.20	<0.20	200i	nc
1,1-dichloroethene	1,1-DCE	<0.32	<0.32	<0.32	<0.32	<0.32	20i	0.01
1,1-dichloroethane	1,1-DCA	<0.11	<0.11	<0.11	<0.11	<0.11	ngv	ngv
1,2-dichloroethane	1,2-DCA	<0.13	<0.13	<0.13	<0.13	<0.13	600	0.01
vinyl chloride	VC	<0.093	<0.093	<0.093	<0.093	<0.093	30i	0.04

Notes:

ATSDR EMEG = Agency for Toxic Substances and Disease Registry Minimum Risk Level / Environmental Media Evaluation Guide (ATSDR 2011). Chronic non-cancer exposure comparison values (exposure greater than 365 days) used to determine if chemical concentrations warrant further health-based screening.

ATSDR CREG = Agency for Toxic Substances and Disease Registry Cancer Risk Evaluation Guide (ATSDR 2011). Cancer risk comparison values for cancer risk of 1 excess cancer in 1,000,000 people used to determine if chemical concentrations warrant further health-based screening.

<0.060 = not detected in the air sample (above the analytical detection limit shown for compounds listed)

97 = indoor air concentration is the same or greater than both non-cancer comparison value for the chemical and the 1 in 1,000,000 excess cancer comparison value for the chemical.

8.9 = indoor air concentration is greater than the cancer comparison value for the chemical and in the 1 in 1,000,000 excess cancer comparison value for the chemical.

E = EPA Regional Screening Levels for Residential Indoor Air (EPA 2008)

i = ATSDR comparison intermediate value for 15-365 days exposure; typically higher than a chronic value

nc = not classified as to carcinogenity and no guidance value available

ngv = no guidance value available

Certification

This Public Health Consultation: *My Valet Cleaners Update, Memphis, Shelby County, Tennessee*, was prepared by the Tennessee Department of Health's Environmental Epidemiology Program. It was prepared in accordance with the approved methodology and procedures that existed at the time the health consultation was begun.

Director of EEP, CEDS, TDH