Letter Health Consultation

Westwyk Neighborhood Vapor Intrusion Investigation

CHEMFAB SITE
DOYLESTOWN, BUCKS COUNTY,
PENNSYLVANIA

July 24, 2019

Prepared by:

pennsylvania
DEPARTMENT OF HEALTH

Bureau of Epidemiology, Division of Environmental Health Epidemiology
Room 933 | Health and Welfare Building 625 Forster Street | Harrisburg, PA
17120-0701

Health Consultation: A Note of Explanation

The Pennsylvania Department of Health (PADOH) prepared this Letter Health Consultation (LHC) for the Westwyk neighborhood residences near the Chemfab site, located in Doylestown, Bucks County, Pennsylvania. This publication was made possible by grant number CDC-RFA-TS17-170103CONT19 from the Agency for Toxic Substances Disease Registry (ATSDR). PADOH evaluated data of known quality using approved methods, policies, and procedures existing at the date of publication. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of ATSDR, or the Department of Health and Human Services.

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To: Community Advisory Group, Doylestown, Bucks County, Pennsylvania

From: Sasidevi Arunachalam, Epidemiology Program Specialist, Health Assessment Program, Division of Environmental Health Epidemiology, Bureau of Epidemiology, Pennsylvania Department of Health

Subject: Westwyk neighborhood vapor intrusion investigation near the Chemfab site

Date: July 24, 2019

The community advisory group in Doylestown, Pennsylvania requested the Pennsylvania Department of Health (PADOH) to evaluate the indoor air data collected from the Westwyk neighborhood ("Westwyk"). Westwyk is located downgradient from the Chemfab site ("site"), where contaminated groundwater plume exists mostly with volatile organic compounds (VOCs). To determine the potential migration and exposure to VOCs from the groundwater plume through vapor intrusion pathway, the U.S. Environmental Protection Agency (EPA) Region 3 monitored indoor air in Westwyk from December 2017 to March 2018. Based on the evaluation of air monitoring data, it is unlikely that vapor intrusion was occurring in Westwyk. The measured concentration of VOCs was higher in the indoor air than the sub-slab soil gas. The VOCs detected in the indoor air of homes sampled in this investigation are not expected to cause harm and the detected levels are similar to background indoor air concentrations in the United States. Hence, PADOH concludes that Westwyk residents are not exposed to site-related contaminants through vapor intrusion and the levels of detection do not pose any additional harm to people's health when compared to the general U.S population.

The remainder of this letter health consultation presents detailed information in support of PADOH's data analysis and conclusion.

Background

Westwyk is located approximately 2000 feet southwest of the contaminated site (Figure 1). The site is located on North Broad Street in Bucks County, Doylestown, PA. An electroplating and metal processing facility operated on-site from 1965–1994. The facility stored and disposed of waste chemicals on the property, which contaminated the groundwater underlying the site. As part of a remedial action in 1994, EPA removed 117 drums of chemicals and 8,400 gallons of liquid waste. In 1999, the site underwent renovations and on-site soil was covered with pavement and concrete. The site has been used as commercial business office locations and as a warehouse storage facility since 1999 [EPA 2007]. In 2009, as an early remedial action plan, EPA conducted a vapor intrusion investigation inside the commercial office buildings to determine the extent of contamination at the site. Vapor intrusion occurs when contaminants from any subsurface source such as soil or groundwater volatilize and enter a structure through its foundation and collect in indoor air, causing a potential health concern [EPA 2012]. Many factors, including fluctuations in outdoor barometric pressure (over time), soil moisture (from precipitation) or building pressure (from heating, ventilation or air conditioning operation) can affect whether vapor intrusion occurs or not. Several sampling events over a period of varying conditions may be needed to fully evaluate the potential for vapors to enter a building.
In 2010, EPA detected trichloroethylene in the indoor air at the site that was determined to be associated with on-site vapor intrusion from contaminations beneath the structures. In April

2010, based on groundwater plume migration from the site, EPA conducted a vapor intrusion investigation near the site at nine residential homes and one elementary school. VOCs were not detected in the indoor air samples collected from the elementary school. Five residential properties had detections of VOCs in sub-slab air samples but not in the indoor air samples [EPA 2017]. In December 2017 and March 2018, EPA extended the offsite vapor intrusion investigation and monitored indoor air from 21 residential homes in Westwyk which is located downgradient to the site. Prior to the monitoring, EPA received consent from the Westwyk residents and requested them to remove all the potential sources of VOCs (such as cigarette smoking, nail polish, and plug-in air fresheners, etc.) to reduce their potential interference [EPA, 2017a]. However, not all sources of indoor air contamination can be removed, such as carpeting and building materials. Indoor air and sub-slab soil gas samples were collected from 21 homes. All air samples were collected in certified-clean 6-liter summa canisters equipped with 24-hour regulators. All residences in Westwyk are connected to the public water supply.

Review of Residential Vapor Intrusion Sampling

If vapor intrusion is occurring, the measured concentration of a contaminant will lessen as it migrates from a subsurface source to sub-slab soil gas and then to indoor air, provided there are no other indoor sources of that contaminant [EPA, 2015]. For most residences, the levels of contaminants detected in the indoor air were almost the same or greater than the levels detected in sub-slab soil gas, except for chloroform (Table 1). However, chloroform is not a site related contaminant of concern. This indicates that the source is not due to site related vapor intrusion and is likely due to indoor sources such as consumer products, carpeting floor, building materials, etc.

Benzene, 1,3-butadiene, carbon tetrachloride, chloroform, and 1,2-dichloroethane were detected in the indoor air exceeding Agency for Toxic Substances and Disease Registry (ATSDR)'s cancer risk evaluation guide (CREG) values, and like chloroform none of these detected contaminants were site related contaminants of concern. Also, detected indoor levels of these contaminants were similar to or less than U.S. residential indoor air concentrations for these chemicals. Nevertheless, PADOH calculated an estimated lifetime adult cancer risk for contaminants that exceeded the CREG values using the following equation:

$$\text{Estimated cancer risk} = \frac{\text{Indoor air concentration x EPA Inhalation unit risk x 33 Exposure years}}{\text{78 Years.}}$$

Benzene as an indoor air contaminant, can come from attached garages, heating and cooking systems, glues, paints, furniture wax, detergents, smoking cigarette, etc. Benzene levels inside homes are usually higher than outdoor levels [ATSDR 2007]. The National Human Exposure Assessment Survey has reported average benzene concentrations of 7.2 and 3.6 $\mu g/m^3$ in indoor and outdoor air samples respectively [Clayton et al., 1999]. Benzene levels detected in 19 of 21 Westwyk homes exceeded the CREG value. The estimated cancer risk using the maximum indoor benzene level of 1.7 $\mu g/m^3$ was 5.6×10^{-6}, i.e. six additional cases of cancer per one million residents. This risk estimate falls within EPA's acceptable cancer risk range of 1×10^{-6} to 1×10^{-4}. Hence, the detected levels of benzene are not expected to pose any additional harm to people's health when compared to the general U.S population.

1,3-butadiene in indoor air can originate from automobile exhaust and cigarette smoke. In most U.S. homes the 1,3-butadiene concentration in indoor air ranges from 1.0 to 1.2 μg/m^3 [ATSDR, 2012]. 1,3-Butadiene levels detected in 8 of 21 Westwyk homes exceeded the CREG value. The estimated cancer risk using the maximum indoor 1,3-butadiene level of 0.29 μg/m^3 was 3.7 x 10^{-6}, i.e. four additional cases of cancer per one million residents. This risk estimate falls within EPA's acceptable cancer risk range of 1 x 10^{-6} to 1 x 10^{-4}. Hence, the detected levels of 1,3-butadiene are not expected to pose any additional harm to people's health when compared to the general U.S population.

Carbon tetrachloride in indoor air can come from building and cleaning materials. Typical carbon tetrachloride concentrations in homes of several U.S. cities were around 1.0 μg/m^3, with some levels up to 9 μg/m^3 [ATSDR, 2005]. Carbon tetrachloride levels detected in 19 of 21 Westwyk homes exceeded the CREG value. The estimated cancer risk using the maximum indoor air carbon tetrachloride level of 0.82 μg/m^3 was 2.1 x 10^{-6}, i.e. two additional cases of cancer per one million residents. This risk estimate falls within EPA's acceptable cancer risk range of 1 x 10^{-6} to 1 x 10^{-4}. Hence, the detected levels of carbon tetrachloride are not expected to pose any additional harm to people's health when compared to the general U.S population.

Chloroform has been found in the outdoor air in all areas of the U.S. Also, chloroform has been found in nearly all public drinking water supplies; it is formed in small amounts when chlorine is added to water. Typical median indoor air concentration of chloroform in the U.S. ranges from 0.98 to 19 μg/m^3 [ATSDR 1997]. Chloroform levels detected in 18 of 21 Westwyk homes exceeded the CREG value. However, the estimated cancer risk using the maximum indoor chloroform level of 1.6 μg/m^3 was 1.5 x 10^{-5}, i.e. one additional case of cancer per one hundred thousand residents. This risk estimate falls within EPA's acceptable cancer risk range of 1 x 10^{-6} to 1 x 10^{-4}. Hence, the detected levels of chloroform are not expected to pose any additional harm to people's health when compared to the general U.S population.

1,2-Dichloroethane in indoor air can come from household products such as cleaning agents, pesticides, and wallpaper and carpet glue. Also, it has been reported that high emissions (290 μg/m^3) of 1,2-dichloroethane can come from holiday decoration items such as molded plastic ornaments [Doucette et al., 2010]. The maximum concentration of 1,2-dichloroethane reported in non-smoking households was 0.54 μg/m^3, while in households where at least one family member smoked, the maximum concentration was 9.72 μg/m^3 [ATSDR, 2001]. 1,2-Dichloroethane detected in 17 of 21 Westwyk homes exceeded the CREG value. The estimated cancer risk using the maximum indoor 1,2-dichloroethane concentration of 9.5 μg/m^3 was 1.0 x 10^{-4}, i.e. one additional case of cancer per ten thousand residents. This risk estimate falls within EPA's acceptable cancer risk range of 1 x 10^{-6} to 1 x 10^{-4}. Hence, the detected levels of 1,2-dichloroethane are not expected to pose any additional harm to people's health when compared to the general U.S population.

Conclusions and Recommendations

PADOH concludes that residents living in Westwyk are not exposed to site-related contaminants through vapor intrusion and the levels of detection do not pose any additional harm to people's health when compared to the general U.S population. However, to protect current and future health of individuals, PADOH/ATSDR will continue to provide health education to the community members to reduce or eliminate chemical exposure from various potential indoor/outdoor sources.

Public Health Action Plan

PADOH will ensure that the community advisory group in Doylestown is aware of the findings of this consultation. PADOH will review and evaluate any future environmental data for this site as requested and share the findings with the community.

Please contact me with any questions you may have regarding this letter health consultation.

Sincerely,

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Table 1: Summary of Contaminants Detected in the Indoor Air and Sub-surface in Westwyk near Chem Fab site (December 2017–March 2018) in microgram per cubic meter (µg/m^3)

Residential Locations		Benzene (CREG* = 0.130)	1,3-Butadiene (CREG* = 0.033)	Carbon tetrachloride (CREG* = 0.170)	Chloroform (CREG* = 0.043)	1,2-Dichloroethane (CREG* = 0.038)
R1	IA	0.700	0.110	0.630	0.200	0.360
	SS	0.480	0.110	0.440	0.200	ND
R2	IA	0.960	0.110	0.630	0.240	0.120 J
	SS	0.260	ND	0.440	2.500	ND
R3	IA	1.400	0.220	0.630	0.340	0.730
	SS	0.770	ND	0.690	0.150 J	0.160
R4	IA	1.100	0.180	0.690	0.290	1.100
	SS	0.860	ND	0.630	0.150 J	ND
R5	IA	1.100	ND	0.630	0.240	**9.500**
	SS	0.960	0.130	0.570	0.340	0.490
R6	IA	1.300	0.270	0.630	0.440	0.200
	SS	0.420	0.066 J	0.440	1.400	ND
R7	IA	1.700	0.270	0.630	1.200	0.160
	SS	0.480	ND	0.690	34.000	ND
R8	IA	1.600	**0.290**	0.630	0.240	0.160
	SS	0.730	ND	0.690	0.240	ND
R9	IA	0.670	ND	0.690	0.200	0.120 J
	SS	0.510	0.066 J	0.570	0.150 J	ND
R10	IA	1.200	0.270	0.630	0.340	0.320
	SS	2.400	0.350	0.570	0.150 J	ND
R11	IA	NA	NA	NA	NA	NA
	SS	0.770	ND	0.570	0.340	0.650
R12	IA	0.510	ND	0.630	0.200	0.160
	SS	0.640	ND	0.570	0.150 J	0.120 J
R13	IA	1.500	ND	0.6300	0.340	0.160
	SS	2.000	ND	0.570	0.150 J	ND
R14	IA	1.400	ND	0.690	1.400	0.280
	SS	1.600	ND	0.690	10.000	0.120 J
R15	IA	0.640	ND	**0.820**	0.340	0.160
	SS	0.830	ND	0.750	2.400	ND
R16	IA	**1.700**	ND	0.690	0.880	1.100
	SS	1.600	ND	0.570	8.500	ND
R17	IA	0.700	ND	0.730	0.150 J	0.520
	SS	1.100	ND	0.6800	0.3400	0.350
R18	IA	1.600	ND	0.690	0.170 J	0.280
	SS	0.580	ND	0.570	0.160 J	ND
R19	IA	0.860	ND	0.750	0.240	0.120 J
	SS	1.500	ND	0.570	0.240	ND
R20	IA	0.860	ND	0.690	0.340	0.850
	SS	1.000	ND	0.680	ND	ND
R21	IA	ND	ND	0.190 J	**1.600**	0.240
	SS	0.450	ND	0.570	ND	0.320

R=Residence; IA=indoor air; SS=sub-surface; CREG=Cancer risk evaluation guide (*CREG for indoor and ambient air only. No direct human exposure to sub-surface contamination); J=the analyte was positively identified, and the numerical value is the approximate concentration shown; ND=not detected; NA=not available; Maximum indoor levels are in bold.

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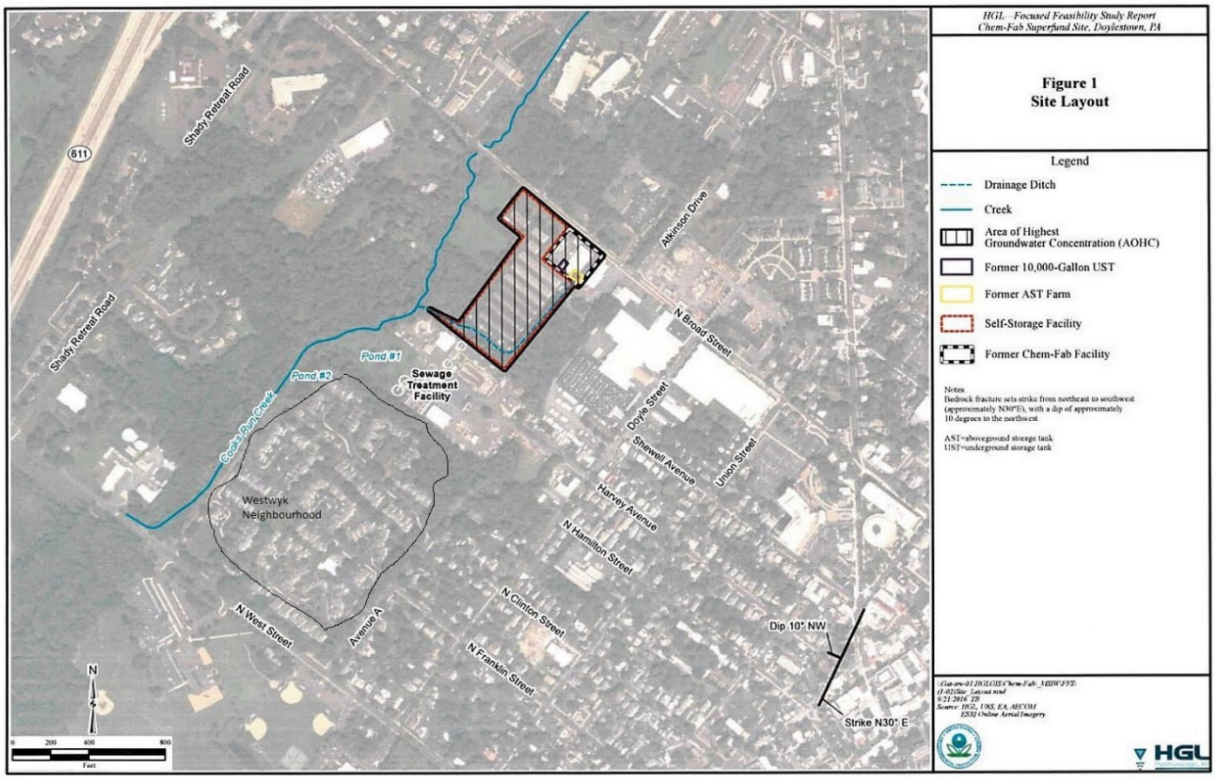
Figure 1


HGL - Focused Feasibility Study Report
Chem-Fab Superfund Site, Doylestown, PA
Figure 1
Site Layout
Legend
Drainage Ditch
Creek
Area of Highest Groundwater Concentration (AOHC)
Former 10,000-Gallon UST
Former AST Farm
Self-Storage Facility
Former Chem-Fab Facility
Notes
Bedrock fracture sets strike from northeast to southwest (approximately N30°E), with a dip of approximately 10 degrees to the northwest.
AST=aboveground storage tank
UST=underground storage tank
Shady Retreat Road
611
Pond #1
Pond #2
Sewage Treatment Facility
Cook's Run Creek
Westwyk Neighbourhood
Atkinson Drive
N Broad Street
Doyle Street
Shewell Avenue
Union Street
Harvey Avenue
N Hamilton Street
N Clinton Street
N West Street
Avenue A
N Franklin Street
Dip 10° NW
Strike N30° E
N
0
200
400
800
Feet
HGL