

Letter Health Consultation

Review of Soil and Air Samples

RIVER OAKS SUBDIVISION

COLONIAL HEIGHTS, VIRGINIA

**Prepared by
Virginia Department of Health**

September 15, 2016

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Community Health Investigations
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.

You May Contact ATSDR TOLL FREE at
1-800-CDC-INFO

or

Visit our Home Page at: <http://www.atsdr.cdc.gov>

LETTER HEALTH CONSULTATION

Review of Soil and Air Samples

RIVER OAKS SUBDIVISION

COLONIAL HEIGHTS, VIRGINIA

Prepared By:

Virginia Department of Health
Division of Environmental Epidemiology
Under a cooperative agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry



COMMONWEALTH of VIRGINIA

Department of Health

MARISSA J. LEVINE, MD, MPH
STATE HEALTH COMMISSIONER

PO BOX 2448
RICHMOND, VA 23218

TTY 7-1-1 OR
1-800-828-1120

Ms. Christine Wagner
U.S. Environmental Protection Agency
629 E Main Street
Richmond, VA 23219

Dear Ms. Wagner,

Thank you for the opportunity to review soil and air samples collected February 10, 2016 from a residential property at the River Oaks subdivision in Colonial Heights, Virginia for public health implications. The Virginia Department of Health (VDH) also contacted the homeowner in April 2016, as you requested, to discuss health concerns and again to follow-up in July 2016. After reviewing the sampling results, VDH concludes that exposures to the chemicals in the air and soil collected at River Oaks in February 2016 are not expected to harm people's health, because the concentrations of each chemical are below their health-based comparison values. One significant limitation of this evaluation is that air was sampled only once, providing only a snapshot in time and might not represent what the homeowner was exposed to previously or since that time. The concentrations of pesticides found at varying depths in the yard are similar to what was found in a background sample taken for this evaluation. VDH does not have any recommendations for further public health evaluation at this time.

BACKGROUND

The background information provided is taken from the U.S. Environmental Protection Agency's (EPA) request for a health consult dated March 30, 2016.¹ EPA was notified by a concerned resident about potential exposure from an unknown source. The resident reported potential used oil or pesticide discharge from a neighboring property. The resident said that the neighbor uses pesticides and petroleum products to control insects in his swimming pool, and then this contamination is carried to his property when the neighbor's pool is drained and the water flows on to his property. The family that resided on River Oaks Drive consisted of an adult male, adult female, and young male (4 years old). The family relocated because the young male became ill while residing in the house.

¹ Personal communication. Lora Werner (ATSDR Region III). March 30, 2016

EPA Region III conducted sampling on February 10, 2016. Air samples were collected within the home, outside the home on the rear deck, and in a crawlspace located below the first floor. These exterior sampling locations were selected to be consistent with where the resident reported the potential for contamination. The sampling within the home was collected in the dining room area on the first floor directly above the crawlspace and on the second floor in the bedroom of the young male. The crawlspace had a sand/dirt floor that was covered with plastic, the plastic was lifted in the area where the sample was collected. The outdoor sample was collected on the deck attached to the home. The air samples were collected over approximately a 24-hour duration in 6-liter summa canisters. The air samples were analyzed for volatile organic compounds, using EPA Method TO-15. This method is used to detect certain volatile organic compounds and includes those that may be associated with fuel oil, petroleum products, and solvents. The results from the air samples collected are in Table 1 (see Attachment). EPA was unable to identify a source for any potential air contamination.

Additionally, soil samples were collected using a geoprobe around the property and grab soil samples were taken from the floor of the crawlspace area. The samples were analyzed for pesticides and semi-volatile organic compounds. The results of the soil samples and sampling depths are in Table 2 (see Attachment). EPA was unable to identify contamination that would indicate a release to the environment occurred on this property.

VDH called the property owner on April 27, 2016. The property owner explained to the VDH toxicologist that when anyone enters the house, the smell is overwhelming and it makes everyone dizzy. VDH told the property owner that anyone exposed should see their family physician and that VDH was reviewing the sampling results provided by EPA. EPA stated that odors were not present when EPA's sampling activities took place. VDH called the property owner again on July 5, 2016. The owner indicated he would like to take measures to proactively ventilate the crawlspace. The resident noted that as of July 2016, his young child is no longer ill. The property owner also told VDH that the family vacated the residence in spring 2016, while the investigation was ongoing, and they have yet to reoccupy the residence.

DISCUSSION

Contaminants in the environment can only impact human health if individuals are exposed to them and they are present at sufficient concentrations. VDH examined exposure pathways and determined whether the concentration of a contaminant in the environment is of concern. Each of these assessments is reported separately below.

Exposure Pathway

An exposure pathway can be defined by five key elements: a source of contamination (e.g., neighbor); an environmental transport medium (e.g., surface water); a point of exposure (e.g., soil and air); route of exposure (e.g., ingestion and inhalation); and exposed population (e.g., residents and guests). These elements determine to what extent exposures may have occurred, may be occurring, or may occur in the future.

A *completed* exposure pathway exists if all five elements of a pathway are present. A *potential* exposure pathway exists if one or more of the elements may not be present, but information is insufficient to eliminate or exclude the element. An *eliminated* exposure pathway is when one or more of the elements are absent.

VDH eliminated “exposure to contaminants in soil under the house” as a possible completed exposure pathway. There is no report that work was being done which required access to the crawlspace or any reason to believe that anyone would frequent the crawlspace.

Exposure to chemicals in the indoor air is a potential past exposure pathway. Past sampling data would be needed to confirm past exposure.

Exposure to chemicals in soil is a potential exposure pathway. VDH is aware that a four year old lived at the home. Children at this age may be exposed to chemicals in soil from dermal contact and incidental ingestion.

Chemical environmental concentration evaluation

The comparison of environmental data with ATSDR comparison values (CVs) is used by VDH to identify environmental contaminants that require further evaluation. CVs are neither site specific nor intended to be used as environmental clean-up levels. They are based on health guidelines with uncertainty factors applied to ensure that they are adequately protective of public health.

When a contaminant is detected at a concentration less than its respective CVs, exposure is not expected to result in health effects nor is it considered further as part of the public health assessment process. **It should be noted that contaminants detected at concentrations that exceed their respective CVs, do not necessarily represent a health threat.** Instead, the results of the CV screening identify those contaminants that warrant a more detailed, site-specific evaluation to determine whether health effects are possible.

CVs can be based on either carcinogenic or non-carcinogenic effects. Cancer-based CVs are calculated from the U.S. Environmental Protection Agency’s (EPA) oral cancer slope factor (CSF) or inhalation unit risk (IUR). Cancer based CVs are derived for a lifetime exposure. Non-cancer values are calculated from ATSDR’s minimal risk levels (MRLs), EPA’s reference doses (RfDs), or EPA’s reference concentrations (RfCs). MRLs are derived for acute (1-14 days), intermediate (15-364 days), and chronic (365 days and longer) durations for the oral routes of exposure. VDH used comparison values derived for children when available. This was done to be protective of the most sensitive population living at the residence.

When a CV does not exist for a chemical VDH will then use comparison values derived by other federal agencies or states. VDH used the following CVs to evaluate River Oaks air and soil results:

- Environmental media evaluation guides (EMEGs) represent concentrations of substances in water, soil, and air to which humans may be exposed during a specified period of time (acute, intermediate or chronic) without experiencing non-cancerous adverse health effects.
- Cancer risk evaluation guides (CREGs) are media-specific comparison values that are used to identify concentrations of cancer-causing substances that are unlikely to result in a significant increase of cancer rates in an exposed population. ATSDR develops CREGs using EPA's CSF or IUR, a target risk level (10^{-6}), and default exposure assumptions.
- Reference Concentrations (RfCs) are derived by EPA and are an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure of a chemical to the human population through inhalation (including sensitive subpopulations), that is likely to be without risk of deleterious non-cancer effects during a lifetime.
- Regional Screening Levels (RSLs) are risk-based concentrations derived from standardized equations combining exposure information assumptions with EPA toxicity data.
- Recommended Exposure Limits (RELs) are NIOSH time-weighted averages (TWAs) that are protective of worker health. For this evaluation all are 10-hour TWAs.

The only CV exceeded was for tetrachloroethene. Sources of tetrachloroethene in the home include dry cleaning, glues, printing inks, and sealants. The exceedance was in a non-dwelling space of the residence, the crawlspace. It was also detected in the toddler's room duplicate sample, but it was below the CREG. It was not detected anywhere else. Therefore, tetrachloroethene was not evaluated further.

The screening value used for ethanol is for worker exposure and not intended to be protective of children's health. However, the highest concentration measured in indoor air ($133 \mu\text{g}/\text{m}^3$) is fourteen thousand times less than this screening value ($1,900,000/133 \approx 14,000$). There are multiple consumer products in the home that contain ethanol and may contribute to the concentration measured in air. They include medications, mouthwash, hairspray, perfumes, hand sanitizers, alcoholic beverages, and cooking extracts like vanilla. A study of ethanol concentrations in indoor air in Melbourne, Australia reported average indoor air concentrations less than $100 \mu\text{g}/\text{m}^3$ in 27 homes; a maximum concentration exceeded $100 \mu\text{g}/\text{m}^3$ in a home where new construction was taking place.²

² Brown, S.K. 2002. Volatile Organic Pollutants in New and Established Buildings in Melbourne, Australia. *Indoor Air* 12: 55-63.

EPA collected various depth soil samples, as described in Table 2 (see Attachment), including a deep background soil sample. To evaluate residential soil samples for public health exposure purposes, VDH prefers to review results from soil samples taken 0 to 3 inches deep. This depth is more reflective of a resident's exposure. However, these soil sampling results are useful for environmental characterization purposes to determine if a release to the environment has occurred. Per discussions with EPA, the soil sampling results do not show any evidence of a chemical release impacting this residential property.

LIMITATION

One significant limitation of this evaluation is that air was sampled only once, providing only a snapshot in time and may not be representative of what the homeowner was exposed to previously.

CONCLUSION

VDH concludes that the chemicals in the air and soil collected at River Oaks in February 2016 are not expected to harm people's health, because the concentrations of each chemical are below their health-based comparison values in the living space.

RECOMMENDATION

EPA investigations do not indicate a source of environmental contamination impacting this property; therefore, additional samples to identify potential seasonal variation are not warranted at this time. VDH does not have any recommendations for further public health evaluation at this time.

Author

Dwight Flammia, Ph.D.
State Public Health Toxicologist
Virginia Department of Health
Richmond, VA 23219

ATTACHMENTS

Table 1: February 10, 2016 Air Sample Results and Comparison Values

Sample Location	Toddler's Bedroom	Toddler's Bedroom (Duplicate)	Dining Room	Crawlspace	Deck (Ambient Air)	Comparison Value	
						Value	Type
EPA Method T0-15 Target Compounds: Results ($\mu\text{g}/\text{m}^3$)						$\mu\text{g}/\text{m}^3$	
Acetone	6.8	7.3	5.3	2.3	U	31,000	EMEG _C
2-Butanone	U	U	0.7 J	U	U	5,000	RfC
Carbon disulfide	1.6	U	U	U	U	930	EMEG _C
Chloromethane	1.3	1.4	1.6	1.7	1.7	100	EMEG _C
Dichlorofluoromethane	1.9	2.0 J	2	2.2 J	2	4,950,000	REL
Ethanol	131	133	121	0.8 J	1.8	1,900,000	REL
Ethyl Acetate	U	0.7 J	0.8 J	U	U	73	RSL
Tetrachloroethene	U	3.2	U	10.3	U	3.8	CREG
Toluene	14.7	14.1	17.2	1.8	U	300	EMEG _C
Trichlorofluoromethane	1.2 J	1.3 J	1.5 J	1.3 J	1.4 J	5,600,000	REL
Tentatively Identified Compounds - Volatile Organic Compounds: Results (ppbv)						ppb	
Propane	3.6	3.5	3.9	U	U	1,000,000	REL
Unknown	U	U	1.6	U	U		
Butane	1.2	1.2	1.3	U	U	800,000	REL

EMEG_C = ATSDR's environmental media exposure guideline (chronic); CREG = ATSDR's cancer risk evaluation guideline; RfC = EPA's reference concentration; REL = NIOSH recommended exposure limit, RSL = EPA's regional screening level; Boldface = concentration exceeded its comparison value; ppb = parts per billion; $\mu\text{g}/\text{m}^3$ = micrograms per cubic meter. J = estimated concentration; U = not detected at quantitation limit

Table 2: February 10, 2016 Soil Sample Results and Comparison Values

Sample Location and Soil Depth	Crawlspace 0-3"	Crawlspace (Duplicate) 0-3"	SSO1 (Background) 34-40"	SS02 4-12"	SS03 0-12"	SS03 (Duplicate) 0-12"	SS04 6-12"	Comparison Value	
								Value	Type
Volatile and Semi- Volatile Organic Compounds: Results (µg/kg)								µg/kg	
Acetone	10 U	10 U	10 U	11 U	8.7 J	10 J	5.2 J	100,000,000	EMEG _I child
Methylene Chloride	2.5 J	5.0 U	2.3 J	5.3 U	5.7 U	6.8 U	2.2 J	3,000,000	EMEG _C child
Naphthalene	392 U	375 U	397 U	386 U	406 U	405 U	381 U	30,000,000	EMEG _I child
Pesticides Results (mg/kg)								mg/kg	
alpha-Chlordane	0.559	0.642	0.00185 U	0.00193 U	0.00189 U	0.00191 U	0.00162 U	2	CREG
gamma-Chlordane	0.538	0.683	0.00185 U	0.00193 U	0.00189 U	0.00191 U	0.00162 U	2	CREG
4,4'-DDE	0.0106	0.0108	0.00370 U	0.00385 U	0.00379 U	0.00383 U	0.00324 U	2.1	CREG
4,4'-DDT	0.0219	0.00402 U	0.00370 U	0.00385 U	0.00379 U	0.00383 U	0.00324 U	2.1	CREG
Endrin aldehyde	0.00529	0.0067	0.00370 U	0.00385 U	0.00379 U	0.00383 U	0.00324 U	15	EMEG _C child
Heptachlor	0.014	0.0202	0.00185 U	0.00193 U	0.00189 U	0.00191 U	0.00162 U	0.16	CREG

EMEG_I = ATSDR's environmental media exposure guideline (intermediate); EMEG_C = ATSDR's environmental media exposure guideline (chronic); CREG = ATSDR's cancer risk evaluation guideline; µg/kg = microgram per kilogram; mg/kg = milligram per kilogram; J = estimated concentration; U = not detected at quantitation limit