Health Consultation

MAY OIL COMPANY

PULASKI, GILES COUNTY, TENNESSEE

TDEC – DUST SITE 6-280074

MAY 7, 2008

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Foreword

This document summarizes an environmental public health investigation performed by Environmental Epidemiology of the State of Tennessee Department of Health. Our work is conducted under a Cooperative Agreement with the federal Agency for Toxic Substances and Disease Registry. In order for the Health Department to answer an environmental public health question, several actions are performed:

Evaluate Exposure: Tennessee health assessors begin by reviewing available information about environmental conditions at a site. We interpret environmental data, review site reports, and talk with environmental officials. Usually, we do not collect our own environmental sampling data. We rely on information provided by the Tennessee Department of Environment and Conservation, U.S. Environmental Protection Agency, and other government agencies, businesses, or the general public. We work to understand how much contamination may be present, where it is located on a site, and how people might be exposed to it. We look for evidence that people may have been exposed to, are being exposed to, or in the future could be exposed to harmful substances.

Evaluate Health Effects: If people could be exposed to contamination, then health assessors take steps to determine if it could be harmful to human health. We base our health conclusions on exposure pathways, risk assessment, toxicology, cleanup actions, and the scientific literature. Make Recommendations: Based on our conclusions, we will recommend that any potential health hazard posed by a site be reduced or eliminated. These actions will prevent possible harmful health effects. The role of Environmental Epidemiology in dealing with hazardous waste sites is to be an advisor. Often, our recommendations will be actions items for other agencies. However, if there is an urgent public health hazard, the Tennessee Department of Health can issue a public health advisory warning people of the danger, and will work with other agencies to resolve the problem.

If you have questions or comments about this report, we encourage you to contact us.

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Or call us at: 615-741-7247 or toll-free 1-800-404-3006 during normal business hours

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Introduction

Cindy Greene with the Tennessee Department of Environment and Conservation (TDEC), Division of Underground Storage Tanks (DUST) contacted the Tennessee Department of Health (TDH), Environmental Epidemiology Program (EEP) about vapors in the basement of the First Missionary Baptist Church. These vapors are believed to have originated from contaminated soil below the church. This soil was contaminated when diesel fuel leaked from an underground storage tank (UST) at the nearby May Oil Company. EEP was supplied indoor air sampling data to review and was asked to provide recommendations as to whether or not the air inside the church is safe to breathe. The purpose of this health consultation is to document this review and the associated findings.

Background

May Oil Company (May Oil) is an independent operator that maintains a bulk fuel and dispensing facility located in Giles County at 619 South Fourth Street, Pulaski, TN, 38478. On January 5, 2006, May Oil reported a release of approximately 900 gallons of off-road diesel fuel from an 18,000-gallon underground storage tank. On January 6, 2006, the City of Pulaski requested an emergency response from First Response Inc. (First Response), a Tennessee licensed emergency response contractor. First Response used absorbent pads and booms to minimize the quantity of fuel entering nearby surface waters, including Richland Creek which serves as the City of Pulaski's water supply. They also monitored the spill around the clock for approximately three weeks. It was during this time that free product was observed flowing from beneath the west side of the First Missionary Baptist Church located across the street at 429 West Shoal Street, Pulaski, TN, Zip Code 38478. Additionally, a very limited volume of contaminated soil was discovered on the north side of the church.

May Oil contracted Shaw Environmental, Inc. (Shaw) as their designated Corrective Action Contractor (CAC) on January 16, 2006, and additional cleanup activities progressed from January 19, 2006 to February 15, 2006. The Tennessee licensed contractor SEMS of Nashville, LLC, was contracted by May Oil to remove the leaking 18,000-gallon UST and four other old USTs occupying the same tank pit. Under on-site supervision by TDEC-DUST, these tanks were removed in late May 2006.

To determine the extent of contamination, Shaw conducted initial site characterization (ISC) activities between July 17 and July 26, 2006. These activities included direct-push soil investigation, installation of five shallow aquifer monitoring wells, installation of one double-cased deep well, field volatile organic soil gas screening, geophysical soil sampling, top of casing surveys, field mapping, water use/potable well survey, and soil and groundwater analytical sampling. A follow-up field event was conducted on August 14, 2006 to obtain groundwater samples from a monitoring well that was dry at the time of the initial sampling event. A second follow-up field event was conducted on September 19, 2006 to collect surface water and sediment samples from Richland and Shoal Creeks. A soil sample was also collected from the west side of the First Baptist Missionary Church.

The results of the groundwater and soil analytical sampling revealed the presence of residual petroleum constituents, but the levels detected were considered to be of minimal risk to the natural and human-inhabited environment. Furthermore, it was found that the groundwater and soil concentrations were below the risk-based cleanup levels (RBCLs). This is also true of the surface water and soil concentrations in Shoal and Richland Creeks.

Given that a very limited volume of contaminated soil was discovered at the north side of the First Missionary Baptist Church, Shaw recommended that source removal (soil excavation) be conducted in this area. However, source removal of the area revealed the presence of contaminated soil below the church. Because some of the chemicals in petroleum products, such as diesel fuel, readily evaporate into the air, there is potential for the resulting vapors to move through the soil and enter the lower level of the church. This is referred to as vapor intrusion. Therefore, Shaw recommended that air monitoring be conducted inside the church to verify actual conditions which may demonstrate a possible exposure risk to petroleum-related volatile organic compounds (VOCs).

Discussion

Indoor Air Sampling

Shaw conducted indoor air monitoring at the First Missionary Baptist Church on February 28, 2007 after conducting an initial sweep to ensure no chemicals were present that could compromise the air quality investigation. The air monitoring was done using Summa canisters placed at 13 different locations inside the church (Table 1). Summa canisters are airtight, stainless steel containers that have been evacuated to a high vacuum thereby giving them a negative pressure relative to the surrounding atmosphere. As a result, air can be drawn into the canister without the need for pumps or other powered equipment (ALDOT 2008a). The amount of time each canister was allowed to rest ranged from 2 hours to 3 hours and 45 minutes. Three air samples were taken on the upper level in the sanctuary and ten air samples were taken on the lower level in the fellowship hall. Most of the locations had a noticeable crack or gap that would serve as a conduit for vapors.

Table 2 lists the VOC air data for each sample where a VOC constituent was identified. It also lists the Agency for Toxic Substances and Disease Registry (ATSDR) health screening Cancer Risk Evaluation Guides (CREGs) for cancerous health effects and the Environmental Media Evaluation Guides (EMEGs) for non-cancerous health effects. Benzene and methylene chloride are the only VOCs with a CREG. Additionally, there are no EMEGs for cyclohexane, ethanol, heptane, methyl ethyl ketone, 2-propanol, 1,2,4-trimethylbenzene, or 1,3,5-trimethylbenzene because there are no reliable or sufficient data to identify the target organ(s) of effect or the most sensitive health effect(s) for a specific duration for a given route of exposure to these substances. Methyl ethyl ketone does, however, have an Environmental Protection Agency (EPA) inhalation reference concentration (RfC) (ATSDR 2008). An RfC is an estimate of a continuous inhalation exposure concentration to people that is likely to be without risk of harmful effects during a lifetime (ADEC 2008a).

Evaluation of Analytical Data

The contaminant concentrations were compared to their respective CREG and EMEG comparison values. CREGs and EMEGs are screening levels commonly used during environmental public health investigations. Screening levels are chemical concentrations based on toxicology below which no adverse health effects are predicted to occur. When a screening level is exceeded, it does not indicate that people would be expected to develop adverse health effects. Instead, it simply means that the potential risk of exposure requires further investigation.

CREGs are estimated contaminant concentrations based on a probability of one excess cancer in a million persons exposed to a chemical over a lifetime. EMEGs are an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse noncancer health effects over a specified duration of exposure. They apply to acute (14 days or less), intermediate (15 – 365 days), and chronic (365 days or more) exposures (ATSDR 2008a).

To determine if health hazards may exist for any occupants of the church, we have used the CREGs and chronic EMEGs for inhalation as this would be the most conservative assumption about chemical exposure. If an EMEG for the chronic exposure was not listed, the intermediate exposure EMEG was used. If there was no EMEG, the EPA RfC was used.

Chemicals of Concern

There were 17 VOCs detected inside the church. Some, but not all, of these chemicals are related to diesel fuel. There were two chemicals found to exceed their respective CREG value in any of the air samples; benzene and methylene chloride. Of these two, benzene is the only constituent of diesel fuel. None of the chemicals were detected at levels exceeding their respective EMEG. Because the concentrations of benzene and methylene chloride exceeded their respective CREG, we will consider them to be chemicals of concern. Of the chemicals with no comparison values, ethanol was the only one found consistently. Other chemicals were found sporadically at low concentrations. These chemicals are not considered chemicals of concern.

Exposure to Chemicals of Concern

The term chemical of concern (COC) is often applied when the concentration of a screening level, such as a CREG or an EMEG, is exceeded. Chemicals of concern require further investigation. With the identification of a chemical of concern, the exposure scenario, including exposure potential, dose, duration, and frequency, needs to be thoughtfully considered.

People have to come into contact with VOC contaminated air and there must be a *completed exposure pathway* for adverse health effects to occur. A completed exposure pathway consists of five main parts including:

1. a source of VOCs in the environment;
2. a means for the VOCs to migrate from its source;
3. a place where people come into contact with the VOCs;

4. a pathway (route) by which people come into contact with the VOCs such as breathing; and,
5. people who could potentially be exposed (receptor population).

Pathways are also characterized based on whether the exposure occurred in the past, is occurring in the present, or may occur in the future.

Potentially Exposed Populations

Potentially exposed populations include church members and anyone who attends events held at the church.

Toxicological Evaluation

When examining chemical exposure through inhalation, it is necessary to take into account the amount of the chemical that is already in the environment. This is often referred to as the background level. Ambient air in urban areas generally has higher levels of contaminants or pollutants due to many factors, including the concentration of industry, the number of commercial facilities that utilize chemicals (e.g., drycleaners), and the volume of vehicular (i.e., automobiles, tractor trailer trucks, rail yards, etc.) traffic.

Benzene

Benzene in the environment comes from both human activities and natural processes. Benzene is found in air, water, and soil. It is a constituent of gasoline and diesel fuel. As such, it is released with motor vehicle exhaust and evaporation from fuel stations. Another important source of benzene in the air is from industrial discharges and the burning of coal and oil. Benzene is also found in tobacco smoke. Background concentrations of benzene in air range from 2.8 to 20 parts per billion (ppb) (ATSDR 2007b). The Department of Health and Human Services (DHHS) has determined that benzene is a known carcinogen (can cause cancer). Both the International Agency for Cancer Research (IARC) and the EPA has determined that benzene is carcinogenic to humans (ATSDR 2008a).

Methylene Chloride

Methylene chloride is a colorless liquid that has a mild sweet odor. It does not occur naturally in the environment. It can be found in certain aerosol and pesticide products, some spray paints, automotive cleaners, and other household products. It is also widely used as an industrial solvent and a paint stripper. Most of the methylene chloride released into the environment is a result of its use as an end product by various industries and the use of aerosol products and paint removers in the home. It is primarily released into the air because it evaporates easily. Background concentrations of methylene chloride are usually less than 0.1 ppb, but it has been found in some urban air and at some hazardous waste sites at an average concentration of 11 ppb (ATSDR 2000b). Methylene chloride is reasonably anticipated to be a carcinogen by the DHHS. The IARC classifies it as possibly carcinogenic to humans due to limited evidence in humans and less than sufficient evidence in animals. The EPA has classified methylene chloride as a probable

human carcinogen due to inadequate evidence for carcinogenicity in humans but sufficient evidence in animal studies (ATSDR 2008a).

Comparison Values

From the February 28, 2007 air-sampling event, benzene was detected at all 13 air sample locations at concentrations greater than its CREG of 0.03 ppb but less than its chronic EMEG of 3 ppb. Methylene chloride was detected at only one air sample location inside the church and this single detection of 2.40 exceeded its CREG of 0.90 ppb but was less than its chronic EMEG of 300 ppb. The detection was at the floor of the stairwell on the lower level of the church (Table 2). However, all of the benzene and methylene chloride concentration levels are within known background concentrations and are well below screening values for non-carcinogenic effects assuming a chronic exposure. Therefore, based on the concentrations found during this sampling event, no adverse health effects are expected to occur.

Children's Health Considerations

In communities faced with environmental contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than are adults from certain kinds of exposure to hazardous substances (ATSDR 1997a, 1998). Children play outdoors and sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than are adults; this means they breathe dust, soil, and vapors close to the ground. A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Finally, children are dependent on adults for access to housing, for access to medical care, and for risk identification. Thus adults need as much information as possible to make informed decisions regarding their children's health.

Children who were inside the church could have been exposed to benzene and methylene chloride via the inhalation pathway. While children's lungs may be smaller than adults, they breathe a greater relative volume of air compared to adults. Benzene is a known human carcinogen and evidence suggests that methylene chloride may be a human carcinogen. Since concentrations found at this site are within background levels, no adverse health effects are expected to occur.

Conclusions

All contaminant concentrations detected in air at this site are similar to typical background levels; therefore, no apparent public health hazard exists for children or adults who may be exposed to VOC-contaminated air inside the First Missionary Baptist Church.

Recommendations

No further public health action is needed at this time.

Public Health Action Plan

1. TDH EEP is available to review additional data.

2. TDH EEP will provide copies of this health consultation to environmental regulatory agencies, church members, and concerned local residents.

References

[ADEC] Alaska Department of Environmental Conservation, Division of Air Quality. 2008a. Air Non-Point and Mobile Sources. Available online: http://www.dec.state.ak.us/air/anpms/as/toxics/noncarc/noncarchome.htm. Last accessed: March 25, 2008.

[ALDOT] Alabama Department of Transportation, ALDOT Coliseum Plume. 2008a. Description of Technology Utilized. Available online: http://www.dot.state.al.us/docs/Coliseum%20Plume/Technical%20Information. Last accessed: February 11, 2008.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2008a. Air comparison values. Atlanta: US Department of Health and Human Services.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2008. Air Comparison Values in ppb (for VOC Compounds Only). Atlanta: US Department of Health and Human Services.

[ATSDR] Agency for Toxic Substances and Disease Registry. 1997a. Healthy children – toxic environments. Report of the Child Heath Workgroup presented to the Board of Scientific Counselors. Atlanta: US Department of Health and Human Services.

[ATSDR] Agency for Toxic Substances and Disease Registry. 1998. Promoting children's health - progress report of the Child Heath Workgroup, Board of Scientific Counselors. Atlanta: US Department of Health and Human Services.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2007b. Toxicological profile for Benzene. Atlanta: US Department of Health and Human Services.

[ATSDR] Agency for Toxic Substances and Disease Registry. 1995. Toxicological profile for Fuel Oils. Atlanta: US Department of Health and Human Services.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2000b. Toxicological profile for Methylene Chloride. Atlanta: US Department of Health and Human Services.

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Tables

Table 1. Indoor Air Monitoring Locations, Pulaski, TN, 2007. Most locations had a noticeable gap or crack that could be easily monitored.

Sample	Sample Location
AS-1	Pantry Off Kitchen
AS-2	Along West Wall Foundation
AS-3	South Wall Corner
AS-4	At Back Door
AS-5	Hole in Wall of Men's Restroom
AS-6	Base of Cola Machine
AS-7	Storage Close on East Wall
AS-8	West Wall in Storage
AS-9	Storage
AS-10	Stairwell Floor
AS-11	Corner Facing Altar *
AS-12	Minister's Study Along Baseboard *
AS-13	Women's Restroom Beneath Toilet *

* These three locations are at the upper level of the church in the Sanctuary. All other locations are at the lower level of the church in the Fellowship Hall.

Table 2. Indoor Air Monitoring Analytical Results Inside the First Missionary Baptist Church, Pulaski, TN, 2007.

Volatile Organic Compound (VOC)	Reportable Detection Level (ppb)	Sample Location Inside the First Missionary Baptist Church													Frequency of Detection		ATSDR Comparison Values (ppb) for Inhalation			
		Lower Level										Upper Level					CREG	EMEG		
		AS-1	AS-2	AS-3	AS-4	AS-5	AS-6	AS-7	AS-8	AS-9	AS-10	AS-11	AS-12	AS-13	n	%		Chronic	Intermediate	Acute
Acetone	1.25	6.60	4.90	4.90	4.40	4.40	6.80	8.00	5.20	2.60	9.80	5.30	5.10	8.80	13	86.67		13,000	13,000	26,000
Benzene	0.20	**0.21**	**0.26**	**0.20**	**0.24**	**0.25**	**0.27**	**0.27**	**0.22**	**0.21**	**0.34**	**0.28**	**0.29**	**0.32**	13	86.67	0.03	3	6	9
Chloromethane	0.20	0.42	0.70	0.42	0.42	0.39	0.40	0.40	0.40	0.43	0.74	0.42	0.40	0.41	13	86.67		50	200	500
Cyclohexane	0.31	---	---	---	---	---	---	0.33	---	---	0.37	---	---	---	2	13.33				
1,4-Dichlorobenzene	0.20	---	---	---	---	---	---	---	---	---	---	0.35	0.31	0.30	3	20.00		10	200	2,000
1,2-Dichloropropane	0.20	---	---	---	---	---	---	---	---	---	0.26	---	---	0.68	2	13.33			7	50
Ethanol	0.63	3.80	5.60	7.40	4.20	---	8.70	5.30	4.60	3.70	78.00	7.50	3.20	5.00	12	80.00				
Heptane	0.31	---	---	---	---	---	---	---	0.52	0.40	0.33	---	---	---	3	20.00				
n-Hexane	0.31	---	---	---	---	---	---	0.35	---	---	0.60	---	---	---	2	13.33		600		
Methylene Chloride	0.63	---	---	---	---	---	---	---	---	---	**2.40**	---	---	---	1	6.67	0.90	300	300	600
Methyl Ethyl Ketone	1.25	---	---	---	---	---	---	2.30	1.40	---	1.30	---	---	---	3	20.00			2,000 *	
2-Propanol	1.25	---	---	---	---	---	---	---	---	---	2.00	---	---	---	1	6.67				
Toluene	0.20	0.41	0.60	0.34	0.53	0.50	0.58	0.62	0.56	0.41	0.90	0.56	0.59	0.66	13	86.67		80		1,000
1,2,4-Trimethylbenzene	0.20	0.24	---	---	0.20	---	---	---	---	---	0.27	0.23	0.21	0.23	6	40.00				
1,3,5-Trimethylbenzene	0.20	---	---	---	---	---	---	---	0.61	0.52	---	---	---	---	2	13.33				
m&p-Xylene	0.40	---	---	---	---	---	---	---	---	---	0.41	1.10	---	0.42	3	20.00		50	600	2,000
o-Xylene	0.20	---	---	---	---	---	---	---	0.31	0.29	---	0.47	---	0.20	4	26.67		50	600	2,000

CREG – Cancer Risk Evaluation Guide
EMEG – Environmental Media Evaluation Guides (ATSDR)
* RfC – Inhalation Reference Concentration (EPA)
Results reported in parts per billion (ppb).
Cells shaded in gray indicate unavailable data.
Bold type indicates constituent above ATSDR CREG value.

Certification

This Public Health Consultation: *May Oil Company, Pulaski, Giles County, Tennessee*, was prepared by the Tennessee Department of Health Environmental Epidemiology under a Cooperative Agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It was prepared in accordance with the approved methodology and procedures that existed at the time the health consultation was begun. Editorial review was completed by the Cooperative Agreement Partner.

Technical Project Officer, CAT, CAPEB, DHAC, ATSDR

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

Team Leader, CAT, CAPEB, DHAC, ATSDR