

# Health Consultation

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INDOOR AIR CONCERNS AT REEDSBURG FIRE STATION

CITY OF REEDSBURG, SAUK COUNTY, WISCONSIN

MARCH 31, 2009

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

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HEALTH CONSULTATION

INDOOR AIR CONCERNS AT REEDSBURG FIRE STATION  
CITY OF REEDSBURG, SAUK COUNTY, WISCONSIN

Prepared By:

Division of Public Health,  
Wisconsin Department of Health Services  
Under a Cooperative Agreement with the  
Agency for Toxic Substances and Disease Registry

## Summary

The Wisconsin Division of Public Health (DPH) was requested to evaluate the human health implications of indoor air impacts at the Reedsburg Fire Station. Volatile organic compounds (VOCs) in indoor air of the fire station's basement poses a public health hazard for people who regularly spend long amounts of time in the basement, but is a no apparent public hazard for brief amounts of time in the basement. Whenever people work in the basement, the air should be ventilated and replaced with fresh air. Sealing the sump crocks and actively venting the crock head space will likely be effective at decreasing VOCs levels in basement air, but follow-up indoor air testing is needed. Given the current nearby soil and groundwater contamination, buildings adjacent to the fire station should be assessed for vapor intrusion, and DPH offers technical assistance for such an investigation.

## Background

DPH was contacted on February 13, 2009, by Ms. Jayne Englebert of MSA Professional Services and requested to evaluate indoor air sampling data from inside of the Reedsburg Fire Station, at 131 South Park Street, City of Reedsburg, Sauk County.

Ms. Englebert informed DPH that indoor air quality inside of the fire station's basement has been a concern because of a strong, petroleum or solvent-like odor. She described the odor having a weathered gasoline character, that several others have reported experiencing headaches when in the basement for extended periods, and that at times she personally found the odors to be "overwhelming." DNR reported that during a 2008 visit to the property last year they also noticed petroleum odors in the basement, but did not find these odors to be bothersome over a 10 to 15 minute exposure. Ms. Englebert said fire department volunteers do not spend any time in the basement, and typically keep the door shut and frame sealed with duct tape to keep vapors and odors from spreading to the upstairs. She reported that the fire department has screened indoor air of the basement with a multi-gas meter (oxygen, carbon monoxide, and explosivity) and have never found potentially unsafe or explosive conditions. Ms. Englebert also said the fire department previously moved the forced-air furnace from the basement to an upstairs location in order to minimize air exchanges between the basement and the first and second floors of the fire station.

Ms. Englebert provided DPH with copies of environmental data for water samples from two unsealed sump crocks and a hole in the floor of the fire station basement. She described the basement floor as lower than the nearby water table and that the pumps in these sump crocks are constantly running to empty infiltrating groundwater into the city's sanitary sewer. It should be noted that during DNR's 2008 visit to the fire station, they observed standing water on the basement floor, which was apparently due to infiltrating groundwater. Water samples from the sump crocks were collected on March 1, 2007, and submitted to CT Laboratory (2007) for analysis of VOCs following method VOC8021. Results reported elevated levels of constituents associated with both gasoline/petroleum and chlorinated solvents or dry cleaning fluids. While no one is drinking this water, four VOCs in sump water were above their respective NR140 Enforcement Standards (Wisc Admin Code, 2004). These VOCs were benzene, *cis*-1,2-

dichloroethylene, tetrachloroethylene (PCE), and trichloroethylene (TCE). This data is summarized below in Table 1.

**Table 1: Volatile Organic Compounds in Sump Water**  
 Reedsburg Fire Station  
 131 S. Park Street, Reedsburg, Sauk County, Wisconsin  
 March 2007

All concentrations in micrograms per liter (µg/L)

Chemical	Sump Water Crock Locations			Wisconsin Groundwater Enforcement Standards
	Floor NE	Sump East	Sump South	
<b>Petroleum VOCs</b>				
Benzene	890*	450*	3.9	5
Ethylbenzene	230	110	1.1	7,000
Naphthalene	32	20	ND	100
Toluene	570	300	ND	1,000
1,2,4-Trimethylbenzene	59	40	ND	480
Total Xylenes	250	177	ND	10,000
<b>Dry Cleaning VOCs</b>				
Chloromethane	ND	2	ND	3
<i>cis</i> -1,2,-Dichloroethylene (DCA)	180*	54	20	70
Tetrachloroethylene (PCE)	ND	1	16*	5
Trichloroethylene (TCE)	17*	7	40*	5

Notes: ND – Chemical Not Detected  
 \* – Exceeds Enforcement Standard

DPH and DNR discussed that the chlorinated VOCs in sump crock water of the Reedsburg Fire Station is possibly originating from contamination at an active dry cleaning business that is approximately 300 feet northwest of the fire station. Soils and groundwater at the dry cleaner property are contaminated by chlorinated VOCs. Agencies also considered residual levels of petroleum contamination at a gas station that is immediately north of and shares a property boundary with the fire station. DNR also indicated that groundwater impacts affecting fire station sump water are more likely coming from a different upgradient source, which is a former gas station that is approximately 400 feet northeast of the fire station and is contaminated by high levels of petroleum and petroleum product.

Due to health concerns about breathing indoor air, MSA collected indoor air samples from within the fire station. On January 14, 2009, four integrated indoor air samples were collected over 8 hours into 6-liter Summa<sup>®</sup> canisters. These air samples were collected from inside the basement, the first floor vehicle bay, the first floor chief's office, and the second floor meeting room. The air sample collected in the vehicle bay was drawn over 2 hours because of problems with the sampling regulator. The samples were analyzed for VOCs by EMSL Analytical following EPA Method TO-15. The results found low-levels of a number of VOCs, including those associated with petroleum and dry cleaning solvents (EMSL 2009). The basement sample

also included low-levels of a number of tentatively identified compounds that are associated with petroleum. This data appears below in Table 2.

**Table 2: Volatile Organic Compounds in Indoor Air**  
Reedsburg Fire Department  
131 S. Park Street, Reedsburg, Sauk County, Wisconsin  
January 2009

All concentrations in micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ )

Chemical	Indoor Air Sample Locations				Non-Residential Indoor Air Comparison Value
	Basement	Office First Floor	Vehicle Bay First Floor	Meeting Room Second Floor	
<b>Petroleum VOCs</b>					
Benzene	52.0*	8.4	5.1	4.0	16.0 <sup>a</sup>
Ethylbenzene	14.0*	2.7	3.1	ND	9.7 <sup>b</sup>
Toluene	73.0	17.0	18.0	12.0	5,000.0 <sup>c</sup>
1,2,4-Trimethylbenzene	6.0	3.0	3.9	2.6	31.0 <sup>d</sup>
Total Xylenes	36.9	10.6	13.9	8.7	3,000.0 <sup>e</sup>
<b>Dry Cleaning VOCs</b>					
Chloromethane	1.0	1.1	ND	ND	68.0 <sup>f</sup>
<i>cis</i> -1,2-Dichloroethylene (DCA)	9.2	ND	ND	ND	n/a
Tetrachloroethylene (PCE)	13.0	ND	ND	ND	21.0 <sup>b</sup>
Trichloroethylene (TCE)	17.0	ND	ND	ND	61.0 <sup>b</sup>

Notes: ND – Chemical Not Detected

\* – Exceeds Comparison Value

n/a – Comparison Value not available

a – U.S. EPA Level A Carcinogen, 1-in-100,000 excess lifetime cancer risk

b – California EPA Carcinogen, 1-in-100,000 excess lifetime cancer risk

c – U.S. EPA Reference Concentration – *non-cancer*

d – U.S. EPA Provisional Peer-Reviewed Toxicity Value – *non-cancer*

e – California EPA Reference Concentration – *non-cancer*

f – U.S. EPA Region III Risk Based Concentration, 1-in-100,000 excess lifetime cancer risk

## Discussion

Indoor air at the Reedsburg Fire Department had elevated levels of VOCs that come from the infiltration of contaminated groundwater into sumps in the basement. A single round of air sampling in the basement found that dry cleaning-related VOCs did not exceed their respective non-residential indoor air action levels. However, the levels of benzene and ethylbenzene in the basement air did exceed action levels. While it is reported that fire department staff avoid entering and spending time in the basement, benzene and ethylbenzene levels pose an unacceptable increased cancer risk for people who might regularly spend time there.

Petroleum odors in the basement suggest the presence of a mixture of many other petroleum-related VOCs and semi-VOCs that are not typically reported by method TO-15, such as

naphthalene. Naphthalene was found in water samples from 2 sumps, but cannot be detected in indoor air by method TO-15. People typically start noticing naphthalene in air at a very low concentration that also is higher than the action level. While some people may not notice or be bothered by such petroleum odors, other people report respiratory irritations, burning eyes, headaches, and nausea. For indoor air conditions where the apparent source of strong or irritating odors is associated with the presence of refined petroleum or gasoline, DHS's general health-based assessment follows a qualitative approach and concludes that a human health hazard exists until mitigation or remediation has removed the odor (DHS 2008). In this case, there have been both action level exceedances and reports of irritating odors. Based on both quantitative laboratory analytical data and qualitative odor descriptions, indoor air in the basement of the Reedsburg Fire Station poses a public health hazard for people who might regularly or each day spend long amounts of time in the basement.

Ms. Englebert asked DPH whether it is safe for workers to enter the basement for short periods. DPH concluded that working in the basement for a short amount of time is not likely to result in permanent, adverse health effects, though more sensitive people may experience reversible respiratory and eye irritation. This poses a no apparent public health hazard. However, as a precaution, DPH recommended that whenever people are working in the basement, a temporary system be installed that vents indoor air to the outside and draws fresh outdoor air is drawn to the basement.

Ms. Englebert indicated that consideration was being given to covering the sump crocks with a sealed lid to minimize or halt vapor releases to indoor air from contaminated water. DPH's experience has found that such an action along with active ventilation (with an "intrinsically safe" fan) to outdoor air is often effective at decreasing indoor air impacts from VOC-contaminated sump water. Sump sealing will only be useful if measures are taken to eliminate the potential for groundwater infiltrating into the basement, which was observed in 2008. Once crocks have been sealed, follow-up testing is needed because it is possible there could be an additional preferential pathway for sub-slab vapors to reach to indoor air. DPH suggested that a ventilation stack be placed on each sealed lid and sump crock headspace is actively vented to outdoor air. After this is completed there should be follow-up indoor air sampling to assess the effectiveness of the ventilation system. DPH also suggested that any future indoor air sampling include an outdoor air sample from an upwind location to provide information on background VOC levels in the City of Reedsburg.

DPH recommends that, given the various VOC sources and contamination in this portion of downtown Reedsburg, other nearby buildings should be assessed to determine whether vapor migration and intrusion is a completed pathway. DPH is willing to assist DNR with technical assistance for such an investigation, including indoor air and sub-slab sample collection, laboratory analysis, data interpretation, and community outreach.

## **Child Health Considerations**

DPH recognizes that children can be more sensitive than adults to contaminants in the environment. Children are often at greater risk than adults to certain kinds of exposure from hazardous chemicals in the environment. Children engage in activities, such as playing outdoors

and hand-to-mouth behaviors, that increase their exposure to hazardous substances. Being much smaller than adults and playing on their hands and knees, children breathe air close to the ground that can have more dust, soil particles, and vapors. Children have a lower body weight, but a higher intake rate which results in a greater dose to hazardous substances per unit body weight. Also, children's bodies are developing and have permanent damage if toxic exposures are high enough during critical growth stages. 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. For these reasons, DPH considers children as one of the most sensitive population evaluated in this health consultation, and always takes into account children when evaluating exposures to contaminants.

At the Reedsburg Fire Station, children are not likely entering the basement and have not been exposed to contaminants at levels that would be expected to cause adverse health effects.

## **Conclusions**

Indoor air in the basement of the Reedsburg Fire Station poses a public health hazard for people who regularly work 8 hours per day in the basement.

Indoor air is no apparent public hazard for people who spend short amounts of time in the basement.

## **Recommendations**

Whenever people enter and spend time in the basement of the Reedsburg Fire Station, outdoor air should be vented into the basement to decrease solvent vapors.

Sealing basement sump crocks and venting head space air to outdoors can be effective at decreasing indoor air impacts from contaminated sump water, but follow-up indoor air testing is needed to evaluate the effectiveness of such mitigation actions.

Given the current environmental contamination conditions at several properties in downtown Reedsburg, other buildings adjacent to the Reedsburg Fire Station should be assessed for the potential of vapor migration and intrusion to the indoor air pathway.

## **Public Health Action Plan**

DPH has provided technical assistance and recommendations to DNR and MSA on the human health implications of indoor air at the Reedsburg Fire Station.

DPH will continue to assist DNR, MSA, and Sauk County Health Department in responding to community health concerns and addressing environmental health and vapor intrusion issues in the City of Reedsburg.



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<http://www.dhs.wisconsin.gov/eh/Air/fs/Oilspill.htm>.




## CERTIFICATION

This Health Consultation for the Reedsburg Fire Station was prepared by the Wisconsin Department of Health Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with the approved methodology and procedures existing at the time the Health Consultation was begun. Editorial review was completed by the Cooperative Agreement partner.

  
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The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this Health Consultation and concurs with the findings.

  
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