

Health Consultation

Technical Document Review
Residential Soil Vapor Vacuum System Installation
Cadet Manufacturing Company Site
Vancouver, Clark County, Washington
EPA Facility ID: WAD009028879

February 27, 2004

Prepared by

**The Washington State Department of Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry**



Foreword

The Washington State Department of Health (DOH) has prepared this health consultation in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is part of the U.S. Department of Health and Human Services and is the principal federal public health agency responsible for health issues related to hazardous waste. This health consultation was prepared in accordance with methodologies and guidelines developed by ATSDR.

The purpose of a health consultation is to identify and prevent harmful human health effects resulting from exposure to hazardous substances in the environment. Health consultations focus on specific health issues so that DOH can respond to requests from concerned residents or agencies for health information on hazardous substances. DOH evaluates sampling data collected from a hazardous waste site, determines whether exposures have occurred or could occur, reports any potential harmful effects, and recommends actions to protect public health. The findings in this report are relevant to conditions at the site during the time of this health consultation, and should not necessarily be relied upon if site conditions or land use changes in the future.

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Glossary

Acute	Occurring over a short time [compare with chronic].
Agency for Toxic Substances and Disease Registry (ATSDR)	The principal federal public health agency involved with hazardous waste issues, responsible for preventing or reducing the harmful effects of exposure to hazardous substances on human health and quality of life. ATSDR is part of the U.S. Department of Health and Human Services.
Chronic	Occurring over a long time (more than 1 year) [compare with acute].
Contaminant	A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects.
Dermal Contact	Contact with (touching) the skin (see route of exposure).
Environmental Protection Agency (EPA)	United States Environmental Protection Agency.
Exposure	Contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term [acute exposure], of intermediate duration, or long-term [chronic exposure].
Groundwater	Water beneath the earth's surface in the spaces between soil particles and between rock surfaces [compare with surface water].
Hazardous substance	Any material that poses a threat to public health and/or the environment. Typical hazardous substances are materials that are toxic, corrosive, ignitable, explosive, or chemically reactive.
Indeterminate public health hazard	The category used in ATSDR's public health assessment documents when a professional judgment about the level of health hazard cannot be made because information critical to such a decision is lacking.
Ingestion	The act of swallowing something through eating, drinking, or mouthing objects. A hazardous substance can enter the body this way [see route of exposure].
Inhalation	The act of breathing. A hazardous substance can enter the body this way [see route of exposure].

Media	Soil, water, air, plants, animals, or any other part of the environment that can contain contaminants.
No apparent public health hazard	A category used in ATSDR's public health assessments for sites where human exposure to contaminated media might be occurring, might have occurred in the past, or might occur in the future, but where the exposure is not expected to cause any harmful health effects.
Plume	A volume of a substance that moves from its source to places farther away from the source. Plumes can be described by the volume of air or water they occupy and the direction they move. For example, a plume can be a column of smoke from a chimney or a substance moving with groundwater.
Route of exposure	The way people come into contact with a hazardous substance. Three routes of exposure are breathing [inhalation], eating or drinking [ingestion], or contact with the skin [dermal contact].
Surface Water	Water on the surface of the earth, such as in lakes, rivers, streams, ponds, and springs [compare with groundwater].

Background and Statement of Issues

The Washington State Department of Health (DOH) has prepared this health consultation report to summarize the results of its technical review of the *Work Plan for Residential Soil Vapor Vacuum System Installation*, dated August 4, 2003.¹ The work plan, which DOH received on September 11, 2003, includes a letter and bid package for the installation of sub-slab soil vapor vacuum systems and/or crawlspace air venting systems at six homes in the Fruit Valley Neighborhood (FVN). DOH was compelled to conduct this review because of the health concerns posed by the chlorinated solvent contaminated groundwater that has migrated from the nearby Cadet Manufacturing Company (Cadet) property to the nearby FVN. The contaminated groundwater is a potential source of indoor air contaminants. DOH prepares health consultations under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR).

The predominant chlorinated solvents found in groundwater below the FVN include trichloroethylene (TCE) and tetrachloroethylene (PCE). Other chlorinated solvents, including 1,1 dichloroethene (1,1-DCE), have also been detected. Chlorinated solvents have also been detected in indoor air at some FVN homes at levels that exceed background levels typically expected in a residential structure suggesting that contaminated groundwater is the source. Three of the six homes proposed for the sub-slab vapor vacuum system installation are homes that DOH recommended that exposures to chlorinated solvents migrating from groundwater to indoor air be eliminated.²

Basements underlay three of the six homes, while two homes are underlain by a crawlspace. One of the homes has a combination basement and two crawlspaces. Sub-slab soil vapor vacuum systems were planned for homes with basements.¹ Although these sub-slab systems were originally designed and used for radon mitigation, they have more recently been used to reduce or eliminate vapors migrating from contaminated environmental media (e.g., groundwater) into indoor air. Air venting systems are proposed for homes with crawlspaces to pull ambient air through the crawlspace to remove potential contaminants.¹

DOH began its preliminary review of the work plan for the sub-slab soil vapor vacuum system and crawlspace air venting systems on September 15, 2003, four days after receiving the plan. On that same day, DOH learned that all of the systems had already been installed.³ On September 16, DOH notified the Washington State Department of Ecology (Ecology) about possible problems with these installations that could result in potential health risks (personal communication, Craig Rankine, Washington State Department of Ecology, September 16, 2003). DOH identified these potential problems after reviewing the Environmental Protection Agency (EPA's) radon mitigation standards.⁴ DOH's concerns about the systems were also summarized in a draft health consultation that was sent to Ecology on November 17, 2003.⁵ DOH considers the radon mitigation standards as relevant and appropriate criteria when evaluating the adequacy of the sub-slab soil vapor vacuum system and crawlspace air venting systems designs developed by Cadet since the goal, in both cases, is to prevent migration of potentially harmful levels of subsurface contaminants into indoor air.

Discussion

Installing remediation systems in homes with potentially elevated levels of chlorinated solvents in indoor air associated with subsurface contamination is a good step for reducing potential inhalation exposures to contaminants. Such systems have been installed throughout the country to reduce radon levels in indoor air. As mentioned previously, these systems have more recently been used to reduce or eliminate vapors migrating from contaminated environmental media (e.g., groundwater) into indoor air. EPA developed radon mitigation standards to provide radon mitigation contractors with uniform standards for ensuring quality and effective design, installation, and evaluation of radon mitigation systems in residential buildings three stories or less in height. The standards describe minimum and recommended provisions for installing such systems in homes with basements and crawlspaces, and provide a basis for evaluating the quality of these installations.⁴

Although the sub-slab soil vapor vacuum systems and crawlspace air venting equipment installed by Cadet are similar in design to radon mitigation systems, the radon mitigation standards are not referenced in the Cadet work plan for the residential systems. As mentioned above, these standards appear to be relevant and appropriate requirements to ensure that these systems, when installed, do not pose a potential health threat to residents. In addition, a number of the required elements of the standards are either not addressed in the plan (e.g., backdrafting of furnaces and other combustion appliances) or do not appear to have been considered (e.g., requirement that vent fans in basements where soil depressurization is occurring is unacceptable; warning system to alert residents if the equipment fails).

Ecology reports that it has briefly discussed the EPA radon mitigation standards issue with Cadet after DOH raised the issue on September 16. However, as of February 19, 2004, Ecology has not received a response from Cadet to indicate how these standards were used during the design and installation, and how the standards will be used in the future during subsequent monitoring.

Child Health Considerations

The goal of the Cadet residential soil vapor vacuum systems and crawlspace air venting systems is to reduce chlorinated solvent concentrations in indoor air at six homes in the FVN. These homes are buildings where children could potentially be exposed to chlorinated solvents migrating from contaminated groundwater to indoor air. Children may be uniquely vulnerable to the hazardous effects of environmental contaminants. Children breathe more air per pound of body weight than do adults resulting in higher levels of exposure to contaminants in air. Additionally, the fetus may be highly sensitive to many chemicals, particularly with respect to potential impact on childhood development. For these reasons, DOH has determined that it is very important to consider the effects these sub-slab soil vapor vacuum system and/or crawlspace air venting systems may have on children, as well as other sensitive populations. DOH will continue evaluating these potential exposures as information becomes available.

Conclusions

The goal of the sub-slab soil vapor vacuum systems and crawlspace air venting systems installed by Cadet at six FVN homes located above the plume of chlorinated solvent contaminated groundwater is to reduce chlorinated solvent levels in indoor air. However, there is uncertainty about the effectiveness of these systems, as described above. These systems, therefore, pose an indeterminate public health hazard.

Recommendations

DOH recommends that Ecology expeditiously work with Cadet to assure that the soil vapor vacuum systems and crawlspace air venting systems meet or exceed the EPA radon mitigation standards. If the EPA radon mitigation standards have not been met at these homes, DOH recommends that Ecology ask Cadet to upgrade the systems.

Public Health Action Plan

DOH will continue working with Ecology to review and comment on documents associated with the Cadet site.

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References

1. AMEC Earth & Environmental, Work plan for residential soil vapor vacuum system installation Cadet Manufacturing Company. Portland, Oregon: AMEC Earth & Environmental; 2003, August 4.
2. Washington State Department of Health. Indoor air quality evaluation, Cadet Manufacturing Company site. Olympia, Washington: Washington State Department of Health. 2003 May 6.
3. Washington State Department of Ecology. E-mail from Craig Rankine to Barbara Trejo, Washington State Department of Health, concerning residential soil vapor vacuum system installation. Olympia, WA, September 15, 2003.
4. U.S. Environmental Protection Agency. Radon mitigation standards. U.S. Environmental Protection Agency. 1994 April.
5. Washington State Department of Health. Draft Health Consultation Report, Technical Document Review, Residential Soil Vapor Vacuum System Installation, Cadet Manufacturing Company Site, Vancouver, Washington. Olympia, Washington: Washington State Department of Health. 2003 November 13.

Certification

This Cadet Health Consultation was prepared by the Washington State Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

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

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