CT Department of Public Health

Bathing and Showering Guidance for Private Wells

The CT Department of Public Health (DPH) sets Action Levels (ALs) for private wells at levels that are protective of public health and are feasible from an analytical and treatment standpoint. When contaminant concentrations in a private well exceed the Action Level, residents should be advised to stop drinking their water or using it for cooking. The current list of Action Levels for private wells can be found here. Even if a resident is not consuming the water, continued bathing/showering (B/S), could result in exposures that present an unacceptable risk. Answering the question "at what concentration does B/S exposure become unacceptable?" requires consideration of the contaminant, its tendency to leave water and become an air concentration, its ability to be absorbed across the skin, the length of the exposure period and the age of the resident.

In July 2013, changes to the state's Potable Water law removed the CT Department of Energy and Environmental Protection's (DEEP's) authority and funding to provide a short-term, alternative water supply to residents with private wells contaminated at levels exceeding CT's Action Levels. In cases where a responsible party has not been identified, or such party does not have the financial wherewithal, it is now the responsibility of the homeowner to arrange for bottled water, whole house or point of use treatment, or connection to municipal water. Because residents are now bearing this responsibility, it is important for them to be aware of B/S exposures and when such exposures could be high enough to present an unacceptable risk.

This guidance provides information on B/S exposures for DPH, DEEP and Local Health Department (LHD) staff to use when communicating with private well owners whose wells are contaminated above Action Levels. Table 1 provides exposure time frames and concentration multipliers above the Action Level for which continued use of the water for B/S could present unacceptable risks. We provide general advice for volatile and non-volatile chemicals and then specific advice for contaminants which DPH has examined more closely and developed contaminant-specific advice. The concentration multipliers are expressed relative to CT's Action Levels because Action Levels are values DPH reviews on a regular basis to confirm their health protectiveness and feasibility. However, the approach used to establish the Action Level multipliers is also valid for Maximum Contaminant Levels (MCLs) set by EPA. If a chemical detected in a private well has an MCL but no AL, this guidance can be used to identify whether continued B/S could result in unacceptable exposures.

Volatile organic chemicals have a high potential for both inhalation exposure and absorption across the skin while bathing and showering. Various models and experiments have

shown that the amount of dermal plus inhalation exposure can equal or surpass the amount of exposure from water ingestion. This makes it important to adhere to the Action Level with regards to long-term exposure with somewhat higher levels acceptable for the shorter period of time (up to 3 months) it can take to install a whole house filtration system. An exception to this is volatile chemicals with high Action Levels (greater than 1,000 µg/L). For these chemicals, we recommend no multiplier because concentrations above the Action Level are gross contamination levels that may have odors and/or acute effects.

Inorganic chemicals generally pose less of a concern because they are not volatile and thus have less inhalation and skin uptake during B/S than organic chemicals. Similarly, non-volatile organic compounds also have much lower non-ingestion exposure concern than do volatile organic chemicals. Non-volatile chemicals are those identified in the USEPA's Preliminary Remediation Goal (PRG) table (http://www.epa.gov/region9/superfund/prg/) as non-volatile based upon low Henry's law constant ($<10^{-5}$ atm-m^3/mole) with additional consideration of molecular weight (>200 g/mole being less likely to be volatile). Therefore, these three categories of chemicals (volatile organics, non-volatile organics and inorganics) are addressed separately in Table 1.

Information in Table 1 is intended to identify situations in which homeowners should be discouraged from relying on bottled water or point-of-use treatment as a long-term solution and instead should install whole house treatment or connect with municipal water. When communicating with private well owners about the B/S recommendations, risk management considerations detailed in Table 2 should also be discussed. Figure 1 provides a simplified version of the B/S concentration multipliers and timeframes from Table 1.

Aside from bathing and showering, another potential source of exposure is ingestion of water from household taps that are not treated. For example, if point-of-use treatment is installed at the kitchen tap (instead of whole house treatment), there may be ingestion exposure in the bathroom or other sinks around the home as residents brush teeth or find it convenient to drink from the closest tap. However, this guidance assumes that this is not a significant source of exposure. To ensure that this is the case, young children should be monitored so that they do not swallow water when brushing teeth or during bathing or showering. This precaution is consistent with the need to monitor tooth brushing in young children to make sure they do not ingest toothpaste because of the fluoride content. Residents should be encouraged to keep a supply of treated or bottled water at taps in the home that do not have point-of-use treatment. This will reduce the possibility of consuming untreated water.

Note that water containing concentrations greater than the Action Level should never be used for drinking or cooking. However, brushing teeth with water above the Action Level should present very minimal exposure risks as long as the water is not swallowed regularly.

We also encourage LHD and DEEP staff to continue their practice of contacting us when they learn of private wells with contaminant concentrations exceeding Action Levels and when a contaminant for which there is no Action Level is found in a private well. Points of contact for Action Level questions and assistance are listed below.

Health-related Questions:
DPH Environmental & Occupational Health Assessment Program: 860-509-7740
cheryl.fields@ct.gov margaret.harvey@ct.gov sharee.rusnak@ct.gov

Treatment-Related Questions:
DPH Private Well Program: 860-509-8401
DPH.PrivateWellProgram@ct.gov

Table 1. Bathing and Showering Guidance for Private Wells

Chemical[1]	Concen-tration	Bathing/Showering (B/S) Advice	Rationale
General Advice			
Volatile Organic	>10x AL	Avoid immediately	Even short term B/S exposures could pose elevated cancer risks.
	1 to 10x > AL	Treatment[2] or alternative water within 3 months[3]	Long-term exposure will involve substantial risk from dermal and inhalation.
Non-volatile Organic	>30x AL	Avoid immediately	Even short term B/S might lead to substantial dermal exposure.
	3 to 30x > AL	Treatment[2] or alternative water within 3 months[3]	Long-term exposure may involve substantial dermal exposure.
Organic with high AL (>1000 µg/L)	>AL	Avoid immediately	Concentrations > AL are gross contamination levels that may have odors and/or acute effects.
Inorganic	>30x AL	Treatment[2] or alternative water within 3 months[3]	Relatively low inhalation and skin uptake. Small exposures may build up if B/S exposure > 3 months.
Specific Determinations			
Trichloroethylene (TCE)	>5 ppb	Avoid immediately	TCE is a carcinogen and developmental toxicant. Significant exposure can occur from short B/S exposure periods. Exposure to pregnant women/developing fetus is a special concern.
	> 1 to 5 ppb	Treatment[2] or alternative water within 2 weeks	
1,4-Dioxane	>50 ppb	Avoid immediately	Exposures could pose elevated cancer risks.
Arsenic	>500 ppb	Avoid immediately	New Jersey/Wisconsin advisory
	>100 ppb	Treatment[2] or alternative water within 3 months[3]	
Per-and Polyfluoro-alkyl Substances (PFAS): Perfluorohexane sulfonic acid (PFHxS), Perfluorooctane sulfonic acid (PFOS), Perfluorooctanoic acid (PFOA), and Perfluorononanoic acid (PFNA)	n/a	Exposure to PFAS during B/S is not a significant source of exposure because of low inhalation and skin absorption. If point-of-use treatment is being considered, call DPH at 860-509-7740 if you have questions about B/S exposures.	Site specific advice is available from DPH.

[1] Chemicals on the DPH Action Level List:
Volatile Organic Chemicals: benzene, carbon tetrachloride, 1,4-dichlorobenzene, 1,2-dichloroethane, dichloromethane (methylene chloride), 1,1-dichloroethylene 1,2-dichloropropane, 1,1-dichloroethane, EDB (1,2 dibromoethane), isopropanol tetrachloroethylene, toluene, 1,1,1-trichloroethane, 1,2,3-trichloropropane, TPH, MTBE, TBA, vinyl chloride.
Non-volatile organic chemicals:, dieldrin, 2,4-D, endrin, methoxyclor, PCBs, silvex (2,4,5-TP).
Inorganic Chemicals: barium, chromium, manganese, mercury, nitrate, nitrite, selenium.
[2]Whole-house (point-of-entry) treatment.
[3]In most cases, 3 months will be an adequate period of time for a homeowner to install whole house treatment or connect with municipal water (if a public water line is available close to the home).
NOTE: Private well water with a chemical concentration exceeding the Action Level should not be used for drinking or cooking.

Table 2. Bathing and Showering Risk Management Considerations

Chemical	Risk Management Considerations
All Chemicals	Site-specific information such as the absence of young children or pregnant women may in some cases justify modifying the B/S advice in Table 1.
All volatile organics	Shorter showers with cooler water, coarser spray and good bathroom ventilation will reduce exposure during B/S.
Uranium, Arsenic, 1,4-dioxane	Call the DPH Private Well Program for assistance on whole house treatment.

Figure 1: Recommended timeframes for installing whole house treatment or obtaining alternative water source for Bathing/Showering