Healthy Drinking Waters

for

MASSACHUSETTS

Safe and healthy lives in safe and healthy communities

Man-made Chemicals in Private Drinking Water Wells

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Private well owners are responsible for the quality of their drinking water. The U.S. Environmental Protection Agency (EPA) does not regulate Private wells. Homeowners with private wells are generally not required to test their drinking water, although local Boards of Health or mortgage lenders may require well water testing. While there is also no state requirement to have your well water tested, the Massachusetts Department of Environmental Protection (MassDEP) recommends that all homeowners with private wells do so, and use a state certified testing laboratory. Homeowners can use the public drinking water standards as guidelines to ensure drinking water quality.

Man-made chemicals generally refer to synthetic organic chemicals (SOCs) like pesticides, herbicides, insecticides, and volatile organic chemicals (VOCs) like gasoline and solvents. Currently, Maximum Contaminant Levels (MCLs) have been established for over 50 man-made chemicals. The EPA updates this list frequently as new contaminants are evaluated for health risks and detected in drinking water. EPA lists these chemicals and the drinking water standard for each on their website at http://www.epa.gov/safewater.

Summary

In some areas, man-made chemicals in the water supply can be a concern. A water test is the only way to detect a chemical and determine if it is below the acceptable MCL set by the EPA for public drinking water supplies. Proper storage, use, and disposal of chemicals, and proper well location and construction are the keys to avoiding groundwater contamination. *Preventing water contamination caused by these chemicals is much easier than cleaning it up afterwards.*

If a private well is contaminated, the choices are to use an alternate water supply or treat the water. An alternate supply may be bottled water for drinking or a new well in a different location or aquifer. Connecting to a public water supply may be a feasible option in some areas. Water treatment options will depend upon the contaminant and the level present. First you will need to arrange for a water test.

In some areas of the state, industrial solvents, manufacturing chemicals, ammunition wastes, pesticides and fumigants have been

NEW ENGLAND Regional Water Program

UMassAmherst Outreach UMass Extension

EPA United States Environmental Protection Agency New England

detected in groundwater. In many cases the sources of the contamination could be identified, clean-ups are underway, and alternative water supplies are being used.

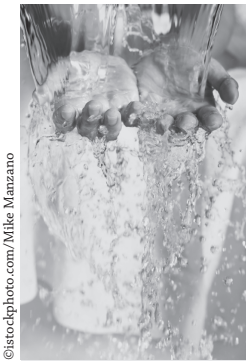
Potential Health Effects

Health hazards from man-made chemicals vary depending on the chemical, the exposure, and the individual. For a complete list of Maximum Contaminant Levels (MCLs) and potential health effects, see the EPA website at: http://www.epa.gov/safewater.

Health effects that may result from drinking contaminated water are classified as either acute or chronic. Acute effects occur immediately or within days after exposure. Chronic effects occur as a result of long-term ingestion of small amounts of a chemical.

Generally, the concentrations of man-made chemicals in groundwater supplies are low and chronic effects are the greatest concern for these chemicals. Most MCLs are based on a lifetime consumption of contaminated water and are established to protect the public from chronic effects. For some of the contaminants, the human body can tolerate chemical doses that exceed the MCL for short periods of time. Consult a physician regarding concerns about the health effects of specific contaminants in your drinking water.

Some contaminants may pose hazards other than drinking water safety. For instance, volatile organic compounds tend to evaporate rapidly at normal room temperatures and pressures. When dissolved in water, they move from the water into the surrounding air. This can especially occur when the water is shaken or aerated, as it is in a washing machine, dishwasher or shower. Some of these compounds may create problems when inhaled or may even be flammable at high concentrations.



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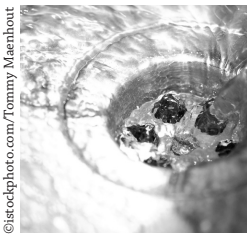

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Indications of Man-made Chemicals

Many man-made chemicals are odorless, colorless, and tasteless and are undetectable in water without testing. As a private well owner, consider testing if a chemical has been spilled near your well or if there is another reason to suspect contamination, such as known contamination in nearby private wells. Unfortunately, there is not a single test for all these chemicals and individual tests can be expensive, ranging from $50 to more than $200 each depending on the test.

If fuel, pesticide, or other chemical spills occur near the water supply, clean the spill immediately, including soil removal and proper disposal of the contaminated soil. Arrange to test the well right away. Follow-up testing may be needed to monitor the effects of the spill. By the time the chemical is detected in a well, a lot of soil and groundwater may already be contaminated. The affected soil may continue

to pollute groundwater for many years. This is a particular concern in areas where spills or contamination occurred many years ago.

Volatile organic compounds (VOCs) are found in a variety of solvents, pesticides, household cleaning supplies, industrial wastes, and fuels. Many of these products and other man-made chemicals do not reach the groundwater themselves, but their chemical constituents and/or breakdown products may contaminate the water supply.

For instance, petroleum fuels contain a number of potentially toxic compounds including common solvents such as benzene, toluene and xylene, and additives such as ethylene dibromide and organic lead compounds. Therefore, knowing what to test for after a spill can be complicated and may require some knowledge of the chemical mixture and the degradation processes involved. MassDEP can advise you on the appropriate testing.

Sources of Man-made Chemicals in Drinking Water

- The nature and properties of man-made chemicals vary significantly. Chemicals that do not tend to bind to soil particles have a greater risk of moving down through the soil along with water, where they can eventually reach the groundwater. Coarse, sandy soils allow the greatest movement.
- Activities near a well involving the application, mixing and handling, or storage of various chemicals can contaminate the water supply. Examples include: used motor oil that has been improperly dumped on the ground, fuel that was spilled when filling motorized equipment near the well, fuel storage tanks that leak, applying pesticides to your lawn too close to the well, paint thinner that was poured down the drain and ended up in the septic system—the scenarios are endless. Good housekeeping practices such as the proper use, storage, and disposal of household chemicals and fuels, along with proper lawn and garden care, can prevent contamination of your well water supply.
- Improper well location and construction can allow chemicals that are used or spilled to travel quickly and directly to the well water supply. Surface runoff that accumulates around the well, cracks in the well cover or casing, improper sealing around the outside of the well casing, wells that are immediately down-slope of fuel or pesticide storage and handling areas greatly increase the risk of chemical contamination.
- Abandoned wells that are not properly sealed are a direct pathway to the groundwater. Work with a registered well driller to properly seal an old, abandoned well.

Testing for Man-made Chemicals in Private Drinking Water Wells

To determine if certain chemicals are present, arrange to test your drinking water at a state certified laboratory. Because of the expense, however, concerned homeowners will probably want to limit their testing to just the specific chemicals that are most likely to be present. Potential contaminants could include any chemical spilled near the well, chemicals commonly used or stored near the well, or chemicals that previously have been detected in groundwater in your area.

Follow laboratory instructions carefully to avoid contamination and to obtain a good sample. The sample bottle and instruction will usually be test-specific for a given chemical and special sampling and handling procedures will be required. For instance, the samples may need to be collected with no air bubbles in the sample or cooled and/or transported directly to the lab immediately. Do not stop for gas as you transport the samples to the lab as you can

contaminate the sample. Although field test kits are available for detecting some chemical contaminants in water, they are not as accurate as laboratory procedures. The accuracy of the field test kits can be altered by the presence of other chemicals in the water. State certified laboratory testing should be used to obtain the most accurate and reliable results.

Interpreting Test Results

The laboratory will report the chemical concentration as milligrams per liter (mg/L) or as parts per million (ppm), which are equivalent for the chemical concentrations occurring in water (1 mg/L = 1 ppm). Laboratories may express organic chemical concentrations in parts per billion (ppb) or micrograms per liter (μg/L), which also are equivalent. One mg/L = 1,000 μg/L.

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Corrective Action

It is important to test the water and determine what contaminants are present before choosing a treatment system. Not all units will effectively treat all contaminants. If man-made chemicals are present in your water supply, you have two choices: obtain an alternate water supply or use a treatment system to remove the contaminant or reduce its concentration. Base your treatment decision on the water test results conducted by a state certified laboratory, and after consulting with a physician concerning potential health risks. Depending on the contaminant and its concentration, home treatment may be used for drinking and cooking (point-of-use systems), or whole-house treatment (point-of-entry) may be required to avoid hazards due to skin contact and inhalation. Also, certain home treatment methods may result in maintenance issues such as the disposal of used filter cartridges that may need to be handled as hazardous waste. All of these factors need to be evaluated.

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Drilling a new well in a different location, or a deeper well in a different aquifer may provide a satisfactory alternate water supply. Contact a registered well driller, who will follow proper well construction and siting practices.

Connecting to a public water supply or using bottled water may be alternatives for you to consider, especially when the contaminant is in water used primarily for drinking and cooking.

Three primary methods will remove man-made chemicals from household drinking water: granular activated carbon filters, reverse osmosis, and distillation. Home treatment equipment using these processes is available from several manufacturers. No single type of treatment system will remove all chemicals. Work with the water treatment equipment dealer to obtain equipment performance data for removal of the specific contaminants of concern. In addition, verify that the treatment system you will purchase has been tested by a third

party organization and certified to remove the contaminant(s) of concern. NFS International, a nonprofit organization, tests and verifies that home water treatment systems meet manufacturers' claims. See the **Resources** section at the end of this fact sheet for contact information.

For more information on these treatment options, see fact sheets entitled:
Activated Carbon Treatment for Drinking Water Wells
Reverse Osmosis Treatment for Drinking Water Wells
Distillation Treatment for Drinking Water Wells

Home treatment of certain man-made chemicals in drinking water can be relatively expensive. When choosing a treatment method, consider both the initial cost and the operating costs. Operating costs include the energy needed to operate the system, additional water that may be needed for flushing the system, consumable supplies and filters, repairs, disposal, and general maintenance.

Regardless of the quality of the equipment purchased, it will not operate well unless maintained in accordance with the manufacturer's recommendations. Keep a logbook to record equipment maintenance and repairs. Equipment maintenance may include periodic cleaning and replacement of some components. Also consider any special installation requirements that may add to the equipment cost. For more information, refer to fact sheet *Questions to Ask When Purchasing Water Treatment Equipment*.

Protection of Private Drinking Water Supplies

You can protect your private well by paying careful attention to what you do in and around your home as well as your neighbor's activities near your well. Regular testing and adopting practices to prevent contamination can help ensure that your well supplies you and your family with good quality drinking water. For more information on well protection see the fact sheet *Drinking Water Wells*.

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Resources

UMass Extension

This fact sheet is one in a series on drinking water wells, testing, protection, common contaminants, and home water treatment methods available on-line at the University of Massachusetts website: http://www.umass.edu/nrec/watershed_water_quality/watershed_online_docs.html and Cape Cod Cooperative Extension: 508-375-6699 http://www.capecodextension.org

MA Department of Environmental Protection, Division of Environmental Analysis

Offers assistance, information on testing and state certified laboratories: 617-292-5770 For a listing of MassDEP certified private laboratories in Massachusetts: http://www.mass.gov/dep/service/compliance/wespub02.htm

U.S. Environmental Protection Agency, New England Office

Information and education on where drinking water comes from; drinking water testing and national laws; and how to prevent contamination: http://www.epa.gov/ne/eco/drinkwater

US Environmental Protection Agency

For a complete list of primary and secondary drinking water standards: http://www.epa.gov/safewater

MA Department of Conservation and Recreation, Division of Water Supply Protection

Maintains listing of registered well drillers, information on well location and construction: 617-626-1409 http://www.mass.gov/dcr/waterSupply/welldril/index.htm

NSF International

The NSF International has tested and certified treatment systems since 1965. For information on water treatment systems: 800-NSF-MARK (800-673-6275) http://www.nsf.org/consumer/

Water Quality Association

The Water Quality Association is a not-for-profit international trade association representing the household, commercial, industrial, and small community water treatment industry. For information on water quality contaminants and treatment systems: http://www.wqa.org

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