

# ENVIRONMENTAL Fact Sheet



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## MtBE in Drinking Water

### What is MtBE?

MtBE is the abbreviation for the compound **methyl tertiary butyl ether**. MtBE is manufactured and thus its presence in water indicates that human-caused contamination exists in the recharge area of the well. MtBE degrades very slowly and is highly soluble in water. These characteristics cause it to travel farther, spread faster, and last longer in groundwater than many other contaminants. As a result, MtBE is the most common contaminant in groundwater that is not naturally occurring. MtBE has very low taste and odor thresholds. However, it is important to test drinking water to determine whether MtBE is present.

### Where is MtBE used?

MtBE was used to increase the octane rating of gasoline beginning in 1979 as lead was being phased out. The percentage of MtBE added to gasoline increased in 1995 as a result of amendments to the federal Clean Air Act which required the reformulation of some gasoline to increase the oxygen content. MtBE is an ether and contains 18% oxygen. New Hampshire ultimately banned the use of MtBE in all gasoline beginning on January 1, 2007. However, the groundwater contamination caused by its use persists today.

### What are the health effects?

The U.S. EPA has not set a health-based drinking water standard, known as a maximum contaminant level (MCL), for MtBE, but NHDES has adopted a **health-based** drinking water standard for community public water systems for MtBE of 13 micrograms per liter ( $\mu\text{g}/\text{L}$ ) under New Hampshire's Safe Drinking Water Act. Animal studies suggest drinking water with high levels of MtBE may cause stomach irritation, liver and kidney damage, and nervous system effects. An increase in liver and kidney cancer was found in rats and mice breathing high levels of MtBE or orally consuming high concentrations of the chemical. Because of the animal studies on MtBE, NHDES considers it a possible human carcinogen.

A health information summary for MtBE can be obtained by calling NHDES at (603) 271-4664. It can also be viewed or downloaded at <http://des.nh.gov/organization/commissioner/pip/factsheets/ard/index.htm> by scrolling down to "ARD-EHP-2 MtBE."

### Assistance from NHDES

NHDES' MtBE Remediation Bureau is implementing a comprehensive plan to address MtBE contamination in New Hampshire. The plan allocates funds for: 1) the investigation and remediation of MtBE contaminated sites, 2) testing at-risk private drinking water wells within a determined radius of

contamination source sites, 3) providing safe, clean drinking water to impacted citizens, 4) installation and improvement of public water supply infrastructure in areas having significant MtBE contamination and 5) implementation of measures to prevent further MtBE contamination. Please contact the MtBE Remediation Bureau at (603) 271-7174 to learn whether assistance is available to you.

### **How can MtBE be removed from drinking water?**

Unlike many other hydrocarbons, MtBE is difficult to remove from water. There are three treatment methods that are effective in removing MtBE from drinking water: air stripping, adsorption using activated carbon, and oxidation. Effective treatment methods are discussed below.

If the concentration of hydrocarbon contaminants is high, two treatment units (typically using different methods) are often installed. The first process is used to remove the “heavy” contaminant load while the second provides a “polishing” step to assure full removal of the contaminant(s) and to address “breakthrough.” Air stripping is often the first method used while activated carbon is often used as the polishing step.

#### **Air Stripping Treatment: Advantages and Disadvantages**

Air stripping treatment consists of passing large amounts of air through the contaminated water. The efficiency of the device is improved by breaking up the bulk of the water into many small droplets. The goal is to allow the contaminants to evaporate into the air. When air stripping is used, two problems are possible:

- If there are elevated levels of iron or manganese in the water, rusty precipitate staining of fixtures and clothing is likely. Iron/manganese pretreatment maybe necessary.
- Bacterial slime may grow in the air stripper, causing clogging. This will require occasional cleaning or continuous or periodic chlorination.

The advantage of air stripping is that there is no disposal or regeneration of the treatment media necessary.

#### **Activated Carbon Treatment: Advantages and Disadvantages**

Activated carbon has enormous surface area within each carbon particle. One pound of activated carbon has a surface area greater than the area of a football field. Activated carbon is a material that attracts many types of organic contaminants to its surface. Once the removal capacity of the carbon is used up, it may be returned to the manufacturer for rejuvenation (for very large users) or can be disposed of appropriately for smaller-scale situations. A disadvantage is that carbon has a low capacity of attracting MtBE compared to other organic compounds and must be replaced more frequently. Some activated carbons are now produced that specifically target MtBE.

If activated carbon is used, the radon and mineral radioactivity concentrations of the water should be taken into account. Activated carbon concentrates radon, potentially creating a low level radioactive waste and possible source of increased radiation within the home. Activated carbon can also foster the growth of bacteria by concentrating other organic chemicals which can be used as a food source on its surface. A final concern with activated carbon is the possible release of contaminants after they have been initially adsorbed. This action is known as desorption or dumping. This could occur if other water quality characteristics change.

To address breakthrough and desorption, the overall amount of activated carbon could be divided into two treatment tanks and the two devices installed in a “series” configuration, where water flows

through the first unit and then into the second. In such an arrangement any breakthrough from the first unit can be adsorbed by the unused carbon in the second unit. The advantage of activated carbon treatment in pressure tanks compared to other methods is that the water does not need to be repressurized and is less likely to become contaminated by dust and other airborne contaminants.

For information on treatment systems, visit the fact sheets webpage at <http://des.nh.gov/organization/commissioner/pip/factsheets/dwgb/index.htm> and scroll down to WD-DWGB-2-5, entitled “Considerations When Purchasing Water Treatment Equipment.” A treatment system should not be purchased until sufficient water quality testing has been done to identify all of the following:

1. The short term variability of the contaminant(s).
2. Whether the contaminant concentrations are rising or falling over the long term.
3. Other contaminants that are in the general area and how many are predicted to affect the well in the future.

### **Monitoring Program After Installation of a Treatment System**

Periodic laboratory testing should be done of both the raw and finished water to determine treatment effectiveness. The frequency of this monitoring would be determined based on variability and duration of the past sampling record and other site specific conditions. Where activated carbon is used, the carbon will lose its removal capacity and will need to be replaced in time. A monitoring program will be needed to predict the expected longevity of each new carbon recharge.

### **Laboratory Testing**

The state Public Health Laboratory and many commercial laboratories can test for MtBE and other volatile compounds. The state lab's cost is \$120 for each sample. This test provides information for all of the volatile industrial solvents and hydrocarbons regulated under the Safe Drinking Water Act. MtBE can vary in concentration; thus two or more samples should be taken before judging the average MtBE concentration in a well. Subsequent sampling for just MtBE alone will be performed by the state laboratory for \$60. The state laboratory can be contacted at (603) 271-3445 or 3446. A list of other accredited laboratories that handle private well water testing is available from the DWGB (see below).

### **For More Information**

For additional information, please contact the Drinking Water and Groundwater Bureau (DWGB) at (603) 271-2513 or [dwgbinfo@des.nh.gov](mailto:dwgbinfo@des.nh.gov) or the MtBE Remediation Bureau at (603) 271-7174. You can also visit [www.des.nh.gov](http://www.des.nh.gov), click on A-Z List and choose Drinking Water and Groundwater Bureau. All of the bureau's fact sheets are on-line at <http://des.nh.gov/organization/commissioner/pip/factsheets/dwgb/index.htm>.

Note: This fact sheet is accurate as of July 2014. Statutory or regulatory changes or the availability of additional information after this date may render this information inaccurate or incomplete.