

# FACTS



## Volatile Organic Compounds in Drinking Water



Division of Environmental and Occupational Health Services  
Consumer and Environmental Health Services

## FACTS Volatile Organic Compounds in Drinking Water

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## WHAT ARE VOLATILE ORGANIC COMPOUNDS (VOCs)?

**Volatile organic compounds (VOCs)** include (1) chlorinated solvents and (2) fuel components. The most common VOCs that are found in drinking water are:



### Chlorinated Solvents:

carbon tetrachloride  
1,2-dichloroethane  
1,1-dichloroethylene  
cis-1,2-dichloroethylene  
trans-1,2-dichloroethylene  
methylene chloride  
tetrachloroethylene  
1,1,1-trichloroethane  
trichloroethylene  
vinyl chloride

### Fuel Components:

benzene  
methyl tert-butyl ether  
toluene  
xylenes



### Chlorinated solvents

are widely used in industry and in common household products. These chemicals are or have been used as degreasing fluids for many different purposes such as dry-cleaning clothes, de-cafeinating coffee, cleaning metal machinery, and dissolving grease build up in septic tanks. Some chlorinated solvents are found in such household products as spot removers, typing correction fluids, adhesives, automotive cleaners, inks, and wood furniture cleaners. Vinyl chloride is used to make plastic materials, such as vinyl and plastic wrap, and water pipes.

**Fuel components** are chemicals that are found in products such as gasoline, kerosene, and heating oil. For example, methyl tert-butyl ether (MTBE) is added to gasoline as an octane-booster and as an “oxygenator” (or “oxy-fuel”) to reduce carbon monoxide emissions.

Benzene, toluene, and xylenes (or BTX) are or have been used as solvents in the workplace and are components of some household products, such as glues, paints, and cleaners. Benzene is found in cigarette smoke and car exhaust. MTBE is also used as a laboratory chemical and in medicine to remove gallstones.

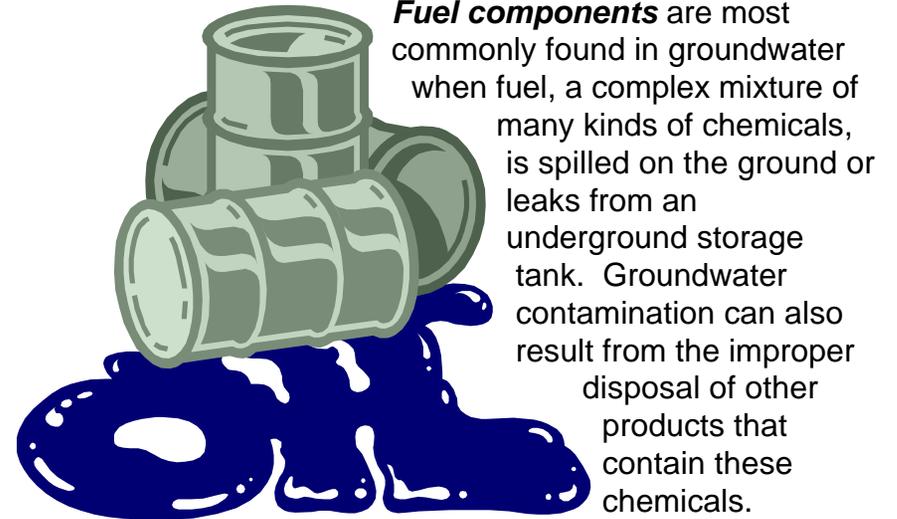


## HOW CAN VOCs GET INTO YOUR DRINKING WATER?

VOCs can move easily through the environment. If improperly discarded onto the ground, these chemicals can travel downward through the soil and eventually end up in the groundwater. VOCs are not usually found in drinking water that comes from a surface water source, such as a lake, reservoir, or stream, because they tend to evaporate from the water into the air.



**Chlorinated solvents** found in groundwater have sometimes been traced to sources such as home septic tanks, municipal landfills, hazardous waste dumps, and industrial facilities.

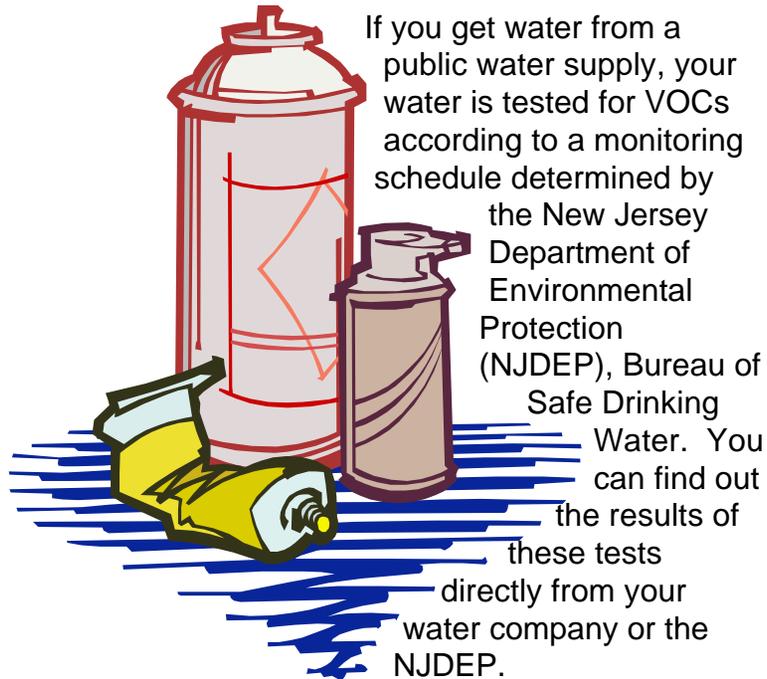


**Fuel components** are most commonly found in groundwater when fuel, a complex mixture of many kinds of chemicals, is spilled on the ground or leaks from an underground storage tank. Groundwater contamination can also result from the improper disposal of other products that contain these chemicals.

VOCs can easily evaporate into indoor air when you use your water for any purpose, such as drinking, cooking, showering, and washing dishes, especially if the water is heated. There are many other sources of chlorinated solvents in indoor air, including a variety of common household products and freshly dry-cleaned clothing. Other sources of fuel components in indoor air include cigarette smoke, gasoline or heating oils stored indoors or in an attached garage, and some hobby or art supplies.



## HOW CAN YOU FIND OUT IF VOCs ARE IN YOUR DRINKING WATER?



If you get water from a public water supply, your water is tested for VOCs according to a monitoring schedule determined by the New Jersey Department of Environmental Protection (NJDEP), Bureau of Safe Drinking Water. You can find out the results of these tests directly from your water company or the NJDEP.

If you have a private well, you can get your water tested by a commercial laboratory listed in the telephone directory. Be sure that the laboratory is certified by NJDEP to test for VOCs in drinking water.

**Contact your local health department for assistance in choosing which type of water tests to conduct.**

## WHAT EFFECTS CAN VOCs HAVE ON YOUR HEALTH?

**To help you understand the possible harmful health effects that a chemical can have on your body, it is important to know how the body handles that chemical.**

**Chlorinated solvents** are easily absorbed through the digestive tract (if swallowed) and the lungs (if breathed in). Once absorbed, they move throughout the body in the blood. For a short time, they can collect in the liver, kidneys, brain, or fatty tissues. In the liver, chlorinated solvents change into other substances and eventually pass out of the body. In general, most of these substances are eliminated from the body in a matter of days after the exposure has ended.

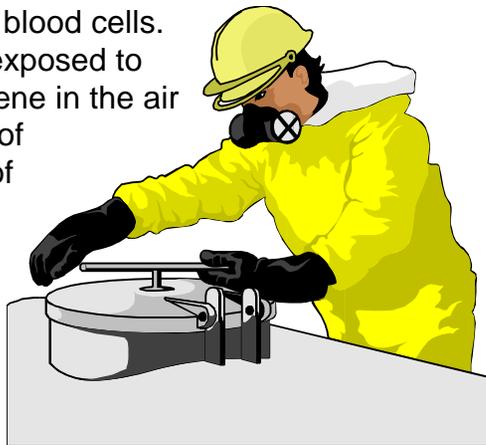


High amounts of chlorinated solvents were found to cause dizziness, reduce the ability to concentrate and remember, damage the nervous system, and produce an irregular heartbeat in people who are exposed in the workplace and in laboratory animals.

Some chlorinated solvents (trichloroethylene, tetrachloroethylene, methylene chloride, carbon tetrachloride, vinyl chloride, and 1, 2-dichloroethane) at high doses have caused cancer in laboratory animals. Vinyl chloride has also caused liver cancer in people who use this chemical at work.

**Fuel components** are easily absorbed through the lungs (if breathed in) and the digestive tract (if swallowed). These chemicals are then carried rapidly throughout the body by the blood, mostly to the brain and nervous system. Fuel components can also build up temporarily in the fatty tissues, bone marrow, liver and kidneys. The liver changes these chemicals to other substances (for example, benzene is changed to phenol) so that they can be excreted through the urine.

Fuel components can cause drowsiness, dizziness, and headaches at high doses. Long-term exposure to high levels of toluene or xylenes may lead to liver and kidney damage. Benzene is the most toxic of the fuel components and can seriously affect the blood cells. Industrial workers exposed to high levels of benzene in the air were at higher risk of developing a type of anemia and of having a low white blood cell count than other unexposed workers.



**Since many of these chemicals have not yet been adequately tested at low levels of exposure, the harmful health effects of VOCs in drinking water and in the air are not well understood. Exposure to VOCs in contaminated drinking water has typically been far below the amounts to which workers and laboratory animals were exposed.**

Leukemia, a form of cancer of the white blood cells, was more likely to occur in industrial workers as compared to other workers. There is also limited evidence that benzene can injure the fetus or cause miscarriage.

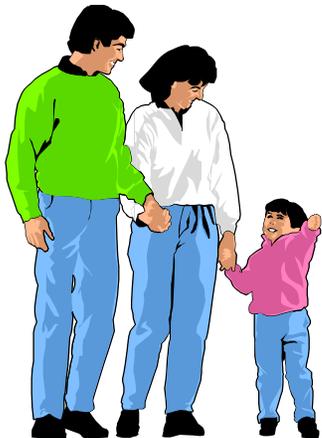


Some people exposed to high levels of MTBE in the air have reported nose and throat irritation. Kidney and liver damage occurred in laboratory animals exposed to high levels of MTBE. Exposure of animals to very high levels of MTBE has caused tumors in several organs of the body.

**DO VOCs AFFECT PEOPLE AT LEVELS FOUND IN DRINKING WATER?**

The likelihood that harmful health effects will occur from exposure to low levels of VOCs in drinking water is very small, although health scientists have much to learn about this question.

A New Jersey Department of Health and Senior Services (NJDHSS) study, and two studies in Massachusetts, suggested that the geographic pattern of tetrachloroethylene (PCE) and trichloroethylene (TCE) in drinking water was related to increases in the occurrence of certain types of leukemia and lymphoma. Other studies in New Jersey and California have also related these chemicals in drinking water with an increase in the occurrence of certain birth defects (congenital heart malformations and neural tube defects) and low birth weight. However, these studies cannot be considered final evidence of health risks related to drinking water at this time.



**While there is no conclusive evidence that small amounts of VOCs will cause the same health effects that occurred in workers and animals exposed to high levels, harmful health effects from exposure to low levels of VOCs in drinking water cannot be ruled out until further research is conducted.**

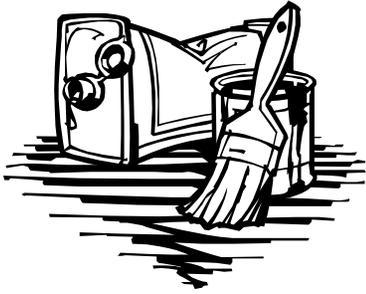
**IS THERE A SAFE LEVEL OF VOCs IN YOUR DRINKING WATER?**



In order to prevent or reduce the chances of health effects from occurring due to drinking water contamination, "Maximum Contaminant Levels" (MCLs) have been established by the NJDEP and the United States Environmental Protection Agency (USEPA) for many VOCs. MCLs are set at levels well below those known to cause health effects in lab animals and workers. In New Jersey, MCLs for many VOCs are more strict than the USEPA levels. MCLs are limits that public water systems are required to meet by law.

**If your drinking water is found to contain VOCs at levels greater than the MCLs, it does not necessarily mean that the water will make you sick. Because of the uncertainty, however, it is important that steps be taken to reduce the levels of these chemicals in your drinking water if they are greater than the MCLs.**

**SHOULD YOU CONTINUE TO USE YOUR DRINKING WATER IF VOCS ARE FOUND?**



If your water public supply is found to contain VOCs at levels above the MCLs, the NJDEP will require your water company to supply water that meets the MCLs within one year or less.

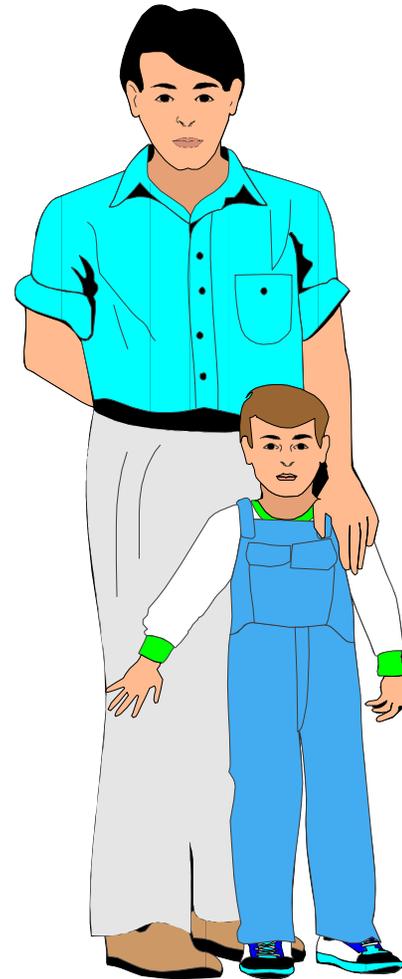
If you have a private well with VOC contamination, you should report your water test results to your local health department. They can investigate the source of the contamination in your well and see if other wells around you are also contaminated.

Your local health department can also provide you with advice based your test results. For example, if VOC levels are very high, they may recommend that you not use the water for any purpose while a permanent solution to the problem is developed. If the levels are slightly elevated, they may recommend that you take some simple steps to reduce your exposure to VOCs (see next page).



If VOCs are found at levels above the MCLs in your public water system or private well, you should follow these

steps to reduce your exposure while a permanent solution is being developed:



***Shower or wash clothes and dishes in cooler water. VOCs are more likely to evaporate into the air you breathe when the water is hot.***

***Use less water. Take shorter showers or baths, and use shorter wash cycles for dishes and clothes.***

***Ventilate bathrooms, washrooms, and kitchens during and after water use.***

**WHAT CAN YOU DO TO REMOVE VOCs FROM YOUR DRINKING WATER?**



Carbon (GAC) system or an Air Stripping system. For more information on treatment devices, contact the NJDEP, Bureau of Wellfield Remediation or the U.S. Environmental Protection Agency, Safe Drinking Water Hotline.

In the long-term, the best way to assure the quality of your water is to be connected to a public water system that is regularly monitored and that meets state standards.

As a short-term solution, there are some drinking water treatment devices that can be installed in your home. To remove VOCs, you may consider installing a Granulated Activated

Your local health department may also provide you with water for drinking and cooking while a long-term solution is developed.



**IS THERE A MEDICAL TEST TO SEE IF YOU HAVE BEEN EXPOSED TO VOCs?**

There are medical tests available at research laboratories that can measure the amounts of specific chemicals in your breath, urine or blood. However, these tests are not able to predict the likelihood that harmful health effects will occur. At best, these tests may tell you if you have been recently exposed to the chemical. For example, benzene can be measured in the blood and breath after recent, relatively high exposure. Phenol measured in the urine may be evidence of benzene exposure but phenol also occurs naturally in the urine from the breakdown of a variety of foods. Unfortunately, measurements of benzene or phenol are

not useful for predicting whether harmful health effects will occur in the future.



**Talk to your physician if you think that you are sick because of drinking water contamination. Be prepared to tell your physician what contaminants are in the water and what specific effects you feel might be related. Your physician can consult with NJDHSS or an occupational and environmental medical clinic.**

**FOR MORE INFORMATION...**



**Local Health Department**

Local telephone directory

Local water issues, private well testing guidance, and health effects of VOCs in drinking water

◆ **New Jersey Department of Health and Senior Services  
Consumer and Environmental Health Services**

PO Box 369

Trenton, NJ 08625-0369

(609) 588-3120

Health effects of VOCs in drinking water

(609) 588-3123

Bottled water regulations

◆ **New Jersey Department of Environmental Protection  
Bureau of Safe Drinking Water**

(609) 292-5550

Federal and State drinking water regulations and public water supply monitoring results

**Bureau of Water Allocation**

(609) 984-6831

Well permitting and regulations

**Office of Environmental Planning**

(609) 633-1179

Groundwater quality planning

**Office of Quality Assurance**

(609) 292-3950

NJ certified laboratories for VOCs in drinking water

**FOR MORE INFORMATION...**



**Bureau of Site Remediation**

(609) 984-5862

Home water treatment devices

◆ **United States Environmental Protection Agency  
Safe Drinking Water Hotline**

(800) 426-4791

Federal drinking water regulations, health effects of VOCs in drinking water, and other water safety issues

◆ **Public Water Company**

Local telephone directory

Public drinking water regulations and monitoring results

◆ **County Office of Rutgers Cooperative Extension**

Local telephone directory

Local land use activities and private well testing guidance

◆ **NSF International**

(313) 769-8010

(800) NSF-6275

Home water treatment device and bottled water information

◆ **Environmental and Occupational Health Clinical Center  
University of Medicine and Dentistry/New Jersey**

(732) 445-0123

Physician referral or consultation on health effects of VOCs

**OTHER AVAILABLE MATERIALS...**



- FACTS: Lead in Drinking Water*
- FACTS: Mercury in Drinking Water*
- FACTS: Microorganisms in Drinking Water*
- FACTS: Nitrate and Nitrite in Drinking Water*
- FACTS: Pesticides in Drinking Water*
- Parasites and New Jersey Drinking Water: Information on Giardia and Cryptosporidium*
- Contacts and Information: Drinking Water Issues*
- Don't Drink Lead (11" x 17" poster)*
- Don't Drink Lead (8½" x 11" flyer)*
- Keep Your Baby Safe From Lead (11" x 17" poster)*
- Keep Your Baby Safe From Lead (8½" x 11" flyer)*

Name \_\_\_\_\_

Address \_\_\_\_\_

Town \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Please send this order form to:

New Jersey Department of Health and Senior Services  
Consumer and Environmental Health Services  
PO Box 369  
Trenton, NJ 08625-0369



Division of Environmental and Occupational Health Services  
Consumer and Environmental Health Services  
PO Box 369  
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