



# PRIVATE WELL WATER IN CONNECTICUT

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## *Iron and Manganese in Private Well Water*

Private well owners are responsible for the quality of their private well water. Homeowners with private wells are generally not required to test their water. However, the State of Connecticut Department of Public Health (CT DPH) recommends testing for iron and manganese, along with other basic indicator tests, at least once per year to ensure that your water is safe.

Testing for iron and manganese is required for all newly constructed wells, in accordance with Regulations of Connecticut State Agencies (RCSA) Section 19-13-B101(d). Testing is also often conducted during real estate transactions.

The United States Environmental Protection Agency (EPA) establishes Secondary Maximum Contaminant Levels (SMCLs) for contaminants based on aesthetic concerns, such as taste, color, and odor. SMCLs are not considered to present a risk to human health.

- The SMCL for iron is **0.3 milligrams per liter (mg/L)** or parts per million (ppm)
- The SMCL for manganese is **0.05 mg/L** or ppm

The Connecticut Department of Public Health (CT DPH) establishes health based Action Levels for private wells that are protective of public health. These Action Levels are based on risk to those who use private well water for drinking, bathing, washing, or cooking.

- The CT DPH Action Level for manganese is **0.3 mg/L** or ppm in private well water

### **Introduction**

Iron and manganese are naturally occurring minerals in rocks, soil and groundwater. Iron and manganese in private well water may also be present due to underground pollution sources such as mining and industrial waste. Their presence may cause staining of plumbing fixtures and laundry, discolor the water, or, produce an offensive taste or appearance. Treatment methods for these elements depend on the form in which they occur in the untreated water. Therefore, accurate water testing is important when considering appropriate treatment options.

### **Potential Health Effects of Iron and Manganese in Private Well Water**

Ingesting iron from drinking water is not directly associated with adverse health effects. Iron is essential for good health, and helps transport oxygen in the blood.



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Manganese is necessary for good health; it aids digestion, increases bone strength and strengthens immune system function. However, too little or too much manganese may be harmful. Exposure to too much manganese may be associated with toxicity to the nervous system.

Infant formulas contain manganese, and if prepared with water that also contains manganese, the infant may get a higher amount than the rest of the family. In addition, infants appear to absorb more manganese than older people but excrete less. This adds up to a greater potential for exposure in the very young. Since manganese's effects on the developing nervous system have not been adequately studied, it is especially important for pregnant women and young children to have drinking water that is below the manganese Action Level of 0.3 mg/L.

### **Forms of Iron and Manganese in Private Well Water**

While water tests generally report the overall level of iron and manganese, they don't usually indicate which form they are in. Knowing this can help in selecting an appropriate treatment option. Iron and manganese are typically found in water, either in a dissolved or particulate state. When water is drawn from the tap and iron and manganese are in a dissolved state, it will appear clear at first, then develop a red or blackish tint as it is exposed to air. When your water is drawn from the tap and appears as rust or blackish colored, or has red or black particles settling out of it, the iron or manganese is in a particulate (oxidized) form.

Additionally, iron and manganese bacteria may feed on iron and manganese in water and appear in the form of a red-brown or black-brown slime, which may be detected in toilet tanks. Refer to *Iron and Manganese Bacteria in Private Well Water*, on the [Publications and Fact Sheets](#) page for more information.

### **Indicators and Potential Effects of Iron and Manganese in Private Well Water**

Iron and manganese in drinking water can impart a metallic taste, can cause the water to be discolored, and can stain plumbing fixtures and laundry.

- Iron and manganese can affect the color and flavor of your water. They may react with tannins in coffee and tea to produce a sludge, which affects taste and appearance.
- Iron may cause reddish-brown staining of laundry, porcelain, dishes, etc. Manganese may cause brownish-black staining. Soaps and detergents won't remove these stains, and chlorine bleach or alkaline builders may make it worse.
- Iron and manganese deposits may build up in plumbing lines, pressure tanks, water heaters, water softeners and other water treatment equipment. This may reduce the effectiveness of these components and may reduce water pressure in your home.
- Iron or manganese in your water might also allow iron and manganese bacteria to grow. These bacteria are not considered health threatening, but can cause a red-brown or black-brown slime, which may be detected in toilet tanks or plumbing.



### **Sources of Iron and Manganese in Private Well Water**

Iron and manganese are naturally occurring elements in soils, rocks and minerals. They often occur naturally in deeper wells where the groundwater has little or no oxygen, and where soils are rich in organic matter. Iron and manganese often occur together, but manganese is more typically found at lower concentrations than iron. As water percolates through soil and rock, it can dissolve minerals containing iron and manganese and hold them in solution. Corrosion and deterioration of old iron pipes may also be a source of iron in water. Iron and manganese in groundwater may also be present from or be exacerbated by man made activity from pollution sources such as industrial, mining, sewage and landfill leachate.

## **Testing for Iron and Manganese in Private Well Water**

To determine if iron and manganese are present, arrange to test your private well water at a state approved laboratory certified to test drinking water. Home test kits may not provide accurate results. Follow the laboratory's instructions carefully to avoid contamination and to obtain a good sample. The amount of iron and manganese in water is important to help you determine the type of treatment system you need to remedy the problem. You may also want to consider testing your well water for iron and manganese bacteria. This type of bacteria is not a coliform so it will not be detected by the standard coliform test.

## **Plumbing Corrosion and Iron Pipes**

Corroding iron pipes and equipment may cause reddish-brown particles in the water. When water has rust colored particles at first, that settle out as the water stands, and a low pH this may indicate iron corrosion from piping or equipment.

## **Corrective Action – Treatment Options for Iron and Manganese**

Several methods are available for reducing iron and manganese from water. The best option depends on several factors, including the concentration and form of iron or manganese in your water, other water quality characteristics, and the volume of water you need to treat.

The five most common methods for treating water with iron and manganese are: (1) oxidizing filters; (2) ion exchange; (3) aeration followed by filtration; (4) chemical oxidation followed by filtration; (5) phosphate compounds. Phosphate compounds require chemical injection which must be closely monitored in order to prevent overfeed and proper maintenance.

The pH of your water may impact the effectiveness of the treatment option you choose. So, it may be necessary to treat your water's pH to more effectively address iron or manganese. For example, many treatment techniques are effective in water within a narrow pH range of 7.0.

Table 1 summarizes the treatment options of iron and manganese in private well water.

**Table 1 Iron and Manganese in Private Well Water: Treatment Options**

<b>Indication</b>	<b>Cause</b>	<b>Treatment</b> <i>Fe: Iron Mn: Manganese</i>
When water is clear at first, but then develops a red or blackish tint when exposed to air	<b>Dissolved</b> iron or manganese	Oxidizing filter: such as Mn greensand (< 15mg/l combined Fe & Mn) Ion Exchange (< 5mg/L combined Fe & Mn) Aeration (< 25mg/l combined Fe & Mn) Chemical oxidation with chlorine or potassium permanganate; followed by filtration (> 10mg/l combined Fe & Mn) Phosphate compounds (< 3mg/L Fe)
When water is rust or blackish colored at first, or red or black particles settle out of the water	<b>Particulate</b> (oxidized) iron or manganese	Particle filter (if quantity of oxidized material is high, use larger filter than inline e.g. sand filter)

When water has rust colored particles at first; particles settle out	Iron particles <b>from iron corrosion</b> of pipes & equipment	Raise pH with neutralizing filter, then filter for removal
Red-brown or black slime appears in toilet tanks or from clogs in faucets	Iron and manganese <b>bacteria</b>	Inactivate bacteria by shock treatment with chlorine, then filter. May require continuous attention.
Reddish or black color that remains longer than 24 hours	<b>Colloidal</b> iron or manganese	Chemical oxidation with chlorine or potassium permanganate followed by filtration

Table adapted from "Iron and Manganese in Household Water," Water Treatment Notes, Fact Sheet 6, Cornell Cooperative Extension (1989)

Note: mg/l = milligrams per liter, < = less than, > = greater than

**For More Information & Resources:**

For a full list of private well related publications and fact sheets, regarding contaminants and treatment technologies: [CT DPH Private Well Program, Publications and Fact Sheets](#)

For general questions regarding testing, corrective action, treatment, etc. please contact: CT DPH, [Private Well Program](#), **860-509-8041**

For questions regarding health based concerns please contact: CT DPH, [Environmental & Occupational Health Assessment Program](#), **(860) 509-7740**