



# The drop on water Iron and Manganese

Iron (Fe) and manganese (Mn) are metallic elements present in many types of rock. Both are commonly found in water. Both are essential elements required in small amounts by all living organisms.

## Sources

Iron and manganese often occur naturally together. The most common sources of iron and manganese in groundwater are naturally occurring; for example, from weathering of iron and manganese bearing minerals and rocks, such as amphiboles, ferromagnesian micas, iron sulphides, magnetite, oxides, carbonates, and iron clay minerals.

Iron and manganese often occur naturally in deeper wells where the groundwater may have little or no oxygen, and in areas where groundwater flows through soils rich in organic matter.

Man-made sources include well casing, piping, pump parts, storage tanks, and other objects of cast iron or steel that may be in contact with water.

Industrial effluent, acid-mine drainage, sewage, and landfill leachate may also contribute iron and manganese to local groundwater.

## Aesthetic Objective for Drinking Water

Manganese or iron at concentrations above the drinking water guidelines may affect the taste, smell, or colour of well water.

The Canadian drinking water quality guideline for **iron** is an Aesthetic Objective (AO) of less than or equal to **0.3 milligrams per litre (mg/L)**.

The Canadian drinking water quality guideline for **manganese** is an Aesthetic Objective (AO) of less than or equal to **0.05 milligrams per litre (mg/L)**.

## QUICK FACTS

- Iron and Manganese often occur naturally together, through the weathering of rocks and minerals.
- The presence of iron or manganese in drinking water can affect the taste, smell, or colour of the water.
- Iron and manganese can be detected through chemical testing.
- The Canadian drinking water quality guideline for **iron** is an Aesthetic Objective (AO) of less than or equal to **0.3 mg/L**.
- The Canadian drinking water quality guideline for **manganese** is an Aesthetic Objective (AO) of less than or equal to **0.05 mg/L**.
- Health effects are not expected at levels normally found in drinking water.
- To improve the aesthetic quality of drinking water, homeowners may consider water treatment options or use an alternative water source.

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## Health Risks

Health effects are not expected at levels normally found in drinking water.

Water with a high concentration of iron or manganese may cause the staining of plumbing fixtures or laundry. Manganese solids may form deposits within pipes and break off as black particles that give water an unpleasant appearance and taste. Similarly, iron can collect and block pipes or fixtures and produce rust flakes in water. Both substances can increase the growth of unwanted bacteria that form a slimy coating in water pipes. See our fact sheet on iron and sulphur bacteria for more information.

## Testing

Regularly test your well water for a standard suite of chemical parameters, including iron and manganese. Use an accredited water testing laboratory. Find a list of accredited water testing laboratories at [www.gov.ns.ca/nse/water/waterlabs.asp](http://www.gov.ns.ca/nse/water/waterlabs.asp) or see the Yellow Pages under "laboratories."

Get the special sampling bottles and instructions on proper sampling from the laboratory.

The cost of analyzing water samples can range from \$15 for a single parameter to \$230 for a full suite of chemical parameters. The cost can vary depending on the lab and the number of parameters being tested.

## Solutions

If iron is present above 0.3 mg/L or if manganese is present above 0.05 mg/L in the first test, get a second test to confirm the original results.

Iron and Manganese are aesthetic parameters. Aesthetic parameters may impair the taste, smell, or colour of water. Although iron and manganese do not pose a health risk at levels normally found in drinking water, the presence of either can indicate deteriorating groundwater quality and could indicate other problems with well water quality, which may cause adverse health effects.

## REGULAR TESTING

Homeowners are responsible for monitoring the quality of their well water:

- Test for bacterial quality every 6 months.
- Test for chemical quality every 2 years.
- Test more often if you notice changes in physical qualities – taste, smell, or colour.

Regular testing alerts you to problems with your drinking water.



# Manganese

If iron is confirmed to be present above 0.3 mg/L or if manganese is confirmed to be present above 0.05 mg/L in the well water, investigate the source of iron or manganese in drinking water. Consider the following options:

- If the iron or manganese is from surface sources, such as industrial or sewage effluent, it may indicate the presence of pathogens or other contaminants present in surface water, which may cause adverse health effects:
  - Test your well water for other contaminants, including bacteria.
  - Inspect the well construction.
  - Consider drilling a new well with proper site selection and construction to prevent contamination.

When the source of iron or manganese does not pose a health risk, treating your water is optional. You may choose to treat your water to make it more pleasing to consume.

When the source of iron and manganese is from surface sources and other contaminants, including bacteria, are present, consider well construction improvements or water treatment options.

## Treatment

Pitcher-style carbon filtration units can reduce the levels of some forms of iron and manganese, but generally not at levels found in groundwater. Another type of treatment device may be more appropriate.

Effective treatment methods for reducing iron levels in drinking water include

- aeration followed by filtration
- adsorption systems
- greensand filtration
- ion exchange
- oxidizing filters, including birm units
- reverse osmosis

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Buy a treatment system that has been certified to meet the current NSF standards for iron reduction. NSF International is a not-for-profit, non-governmental organization that sets health and safety standards for manufacturers in 80 countries. See its website at [www.nsf.org](http://www.nsf.org).

Although there are currently no treatment units certified specifically for manganese reduction, iron and manganese are often treated at the same time by water treatment which includes oxidation, with chlorine or aeration, followed by filtration. The treatment methods listed above for reducing iron levels are also effective at reducing manganese levels in drinking water.

The effectiveness of each method often depends on the type of iron or manganese present, the pH of the water, and the parameter's relative concentration.

Once installed, re-test your water to ensure the treatment system is working properly. Maintain the system according to the manufacturer's instructions to ensure a continued supply of safe drinking water.

For more information on water treatment, see our publications *Water Treatment Options* and *Maintaining Your Water Treatment*, part of the *Your Well Water* booklet series at [www.gov.ns.ca/nse/water/privatewells.asp](http://www.gov.ns.ca/nse/water/privatewells.asp).

## Considerations

The concentration of iron and manganese in well water can fluctuate seasonally and vary with the depth and location of the well and the geology of an area.

## FOR MORE INFORMATION

### Contact

Nova Scotia Environment at  
1-877-9ENVIRO  
or 1-877-936-8476

[www.gov.ns.ca/nse/water/](http://www.gov.ns.ca/nse/water/)

