

## Manganese (Mn)

Manganese has a guideline of  $\leq 0.05$  mg/L for aesthetic purposes. Similar to iron, levels above the guideline can cause brownish or blackish staining of plumbing fixtures and laundry, as well as causing a bitter taste in drinking water. Treatment methods which remove iron will also remove manganese.

## Sodium (Na)

The major source of sodium in Nova Scotia are the underground salt deposits. Sodium poses no health risks to most individuals. However, persons on sodium-restricted diets should be aware of maximum recommended levels. An aesthetic guideline of  $\leq 200$  mg/L has been established to avoid unpleasant tastes that can occur with higher levels of sodium. Some water softeners can add sodium to drinking water. Where water is softened by sodium ion exchange, it is recommended that a separate, unsoftened supply be kept for culinary and drinking purposes. Excessive levels can be removed through distillation and reverse osmosis.



*Water Softener  
Used to Treat Hard  
Water by Removing  
High Levels of  
Calcium and  
Magnesium*



*Reverse Osmosis System Used to Remove High  
Levels of Arsenic*

## Indicators of Hard Water

- difficult to form soap suds
- dingy look to laundry, clothes lose their brightness
- laundry may feel harsh and scratchy
- dishes and glasses may be spotted when dry
- leaves a film on glass showers, shower doors and walls, sinks and faucets
- hair may feel sticky and look dull
- water flow may be reduced by deposits in pipes

## Sulfate (SO<sub>4</sub>)

High levels of sulfate can result in a bitter taste in water. An aesthetic guideline of  $\leq 500$  mg/L has been set. A laxative effect can occur when large quantities of sulfate are ingested. Removal methods include reverse osmosis, anion exchange and distillation.

## Zinc (Zn)

Concentrations above  $\leq 5$  mg/L can produce an undesirable taste in water and cause a greasy film on boiling water. Treatment options include reverse osmosis, distillation and in some cases ion exchange.

**Outbreaks of waterborne illnesses can be avoided by proper well construction and maintenance, regular monitoring of water quality, and quick action to investigate water that has tested positive for disease causing organisms.**

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# Well Water Concerns in Nova Scotia related to **WATER QUALITY** factsheet

The drinking water in Nova Scotia is generally of good quality and safe to drink. Continuous monitoring helps to maintain the high quality of our water systems. Municipalities treat water to eliminate any potential disease causing organisms. Private well owners must follow regulations when constructing a well and make sure the well is properly maintained. Many well users in Nova Scotia do not require any treatment to their water prior to use. Unfortunately, even with preventative measures in place, water problems in Nova Scotia can occur.

Water quality problems can be a result of natural problems or can be man-made. Man-made problems include nitrates and bacteria from defective septic systems and the overuse of chemical fertilizers and manure. Naturally occurring problems may result from excessive concentrations of iron, manganese, sulphate, chloride, arsenic, uranium, calcium and magnesium.

Many of these problems only pose aesthetic problems. Excessive amounts of iron, for example, poses no health risk but can cause an undesirable taste in drinking water and stain laundry. Others, such as bacteria, can pose potential health risks. The risk level and quantity of microorganisms or chemicals that will result in illness vary depending on the individual and the type of microorganism or chemical.

Most of these water quality problems can be reduced by physical or chemical means. The solution depends on the type of problem, alternatives that are available and cost. A variety of treatment options are available for most water quality problems.

## Nitrates

Nitrate (NO<sub>3</sub>) is a form of nitrogen that can be converted into nitrite in the body. Nitrate most often enters water supplies through sewage disposal systems, runoff from barnyards or fertilized fields and from industrial wastes.

## Health Concerns

Nitrate found in water in concentrations greater than the maximum acceptable concentration of 10 mg/L as nitrogen (N) can become a health concern. At levels less than 10 mg/L, nitrates may be an indicator of or associated with other problems such as bacteria and pesticides, depending on factors such as location, land use, and well construction. The main health concern with high nitrate levels in drinking water is methemoglobinemia, also known as **blue-baby syndrome**, in infants. This serious illness in infants, mainly six months and under, is due to the conversion of nitrate to nitrite by the body, which can interfere with the oxygen-carrying capacity of the infant's blood. Symptoms include shortness of breath and blueness of the skin, with severe cases resulting in death. There has never been a reported case of blue-baby syndrome in Nova Scotia. Although the guideline for nitrate is based on effects in infants, it is considered wise to minimize exposure of the entire population to nitrate, thus the guideline is intended to apply to both children and adults.

## Treatment

Removal of nitrate can be done using reverse osmosis and distillation methods. Boiling water will **not** remove nitrate and will concentrate it.



## Microorganisms

The microorganisms that tend to be mentioned most often when discussing water quality include total coliforms, fecal coliforms and *Escherichia coli* (*E. coli*). These are all standards used to test water quality. The presence of these bacteria indicate the potential for other harmful or disease-causing microorganisms to be present. The public is often confused about the differences between these organisms relative to health risks. Most sources of disease causing organisms originate from the introduction of fecal matter into a water supply and produce common symptoms. These symptoms often include diarrhea or bloody diarrhea, abdominal cramps, fever, and nausea.

## Total Coliforms

This group includes non-pathogenic bacteria that are found naturally in soil, decaying plant material and water, as well as a number of pathogenic and non-pathogenic bacteria that are found in human and animal feces.

## Fecal Coliforms

Fecal coliforms are a subset of the total coliforms. The occurrence of fecal coliforms in water indicates the presence of fecal matter from warm-blooded animals. In turn, the presence of fecal matter indicates the potential for human pathogens to be present.

## *Escherichia coli* (*E. Coli*)

*E. Coli* is naturally found in very high numbers in all fecal matter. Most of the *E. coli* in feces are harmless, but some strains of *E. coli* are pathogenic and potentially fatal.

## Other Harmful or Disease Causing Microorganisms

While *E. coli* is the standard used to identify the presence of disease causing organisms, other pathogenic organisms may include *Salmonella*, *Shigella*, *Campylobacter* and *Yersinia*.

**Depending on the location, nitrates, uranium and arsenic are the most common health related problems that exceed recommended guidelines in Nova Scotia.**

## Health Concerns

With many different types of bacterial contamination, each poses different health risks. *E. Coli*, for example, has hundreds of strains that are harmless and live in the intestines of healthy humans and animals, while some strains can cause severe illness. The specific strain *E.coli* 0157:H7 produces a powerful toxin and can cause severe bloody diarrhea and abdominal cramps, with the worst cases potentially ending in death.

## Treatment

If a test indicates the presence of coliforms, the well should be resampled to ensure that the sample was not contaminated during collection. If the retest is still positive, an investigation is necessary to determine the cause.

During the investigation, and until you receive results that contain no presence of fecal coliforms, you should use bottled or boiled water for drinking purposes or any activity requiring human consumption. Water for household use should be treated by boiling, chlorination, ultra-violet (UV) light or by ozone before it is used. Treatment should be considered a short-term temporary measure, and efforts should be made to locate the source and to remedy the problem.



*Ultraviolet Disinfection System Effective Against E. coli.*

## Naturally Occurring Contaminants

### Arsenic (As)

Arsenic is a naturally occurring element that is widely distributed in the Earth's crust and is present in trace amounts in all living matter. Arsenic is also used commercially and can be introduced through industrial effluents. It is tasteless and odourless, making it difficult to detect in drinking water. There are several areas in Nova Scotia that contain high

arsenic concentrations in the rocks. Arsenic is a cumulative toxin that affects the nervous system and is a known human carcinogen. Health Canada has established a guideline based on health considerations of 0.025 mg/L. Reverse osmosis and distillation can be used to reduce the amount of arsenic in your drinking water supply. Some types of treatment may require monitoring of arsenic concentrations to ensure that the treatment objectives are being met and the guideline is not exceeded. Treatment units must be properly maintained to continue to be effective.

### Uranium (U)

Uranium is a common element that exists naturally in soil and rock throughout the world. It enters drinking water when uranium in minerals is dissolved in water. Water problems associated with high levels of uranium occur in several areas of Nova Scotia, and are most likely to occur in drilled wells. A health guideline of 0.02 mg/L has been set as uranium can affect the kidneys. Treatment options for removing uranium include distillation and reverse osmosis.

### Calcium and Magnesium (Ca and Mg)

Calcium and magnesium dissolve as water flows through certain rocks, such as limestone and gypsum. When excessive amounts of these elements enter drinking water, the water becomes "hard". A good indicator of hard water is when it is difficult for soap to lather. There are no health affects associated with calcium or magnesium, therefore, there are no guidelines set for these parameters. Water softeners are the best way to control water hardness.



*Distillation System Used to Eliminate Minerals, Bacteria and Virtually All Contaminants*

*Oxidation Filtration System Used to Remove Iron, Manganese and Hydrogen Sulfide*



### Chloride (Cl)

Posing no health threat to humans, an aesthetic guideline of  $\leq 250$  mg/L is set. High chloride concentrations are often associated with high sodium levels. Elevated levels of chloride can cause a salty taste in water. Reverse osmosis, distillation and deionization can all remove chloride from water.

### Copper (Cu)

A limit of  $\leq 1$  mg/L is set to ensure that the taste of the water is not affected and to avoid staining laundry and plumbing fixtures a greenish color.

### Hydrogen Sulfide (H<sub>2</sub>S)

The presence of hydrogen sulfide above the maximum acceptable concentration of  $\leq 0.05$  mg/L can result in an unpleasant taste and a "rotten egg" odour. High levels of hydrogen sulfide can be removed by oxidation and filtration.

### Iron(Fe)

Iron has an aesthetic guideline set at  $\leq 0.3$  mg/L. Concentrations of 0.3 mg/L and above can stain laundry and plumbing fixtures and produce a bitter and/or metallic taste. High amounts of iron can also cause a reddish-brown color in water. Water softeners and filters can remove iron.

**Hardness, iron and manganese are the most common aesthetic problems that exceed recommended guidelines in Nova Scotia.**