FACTS ON DRINKING WATER

General Chemistry and Metals

Water for drinking, cooking, and other domestic uses should be of good quality. It should be free from organisms that may cause disease and free from chemical substances and radioactive matter that may pose a health risk. The water should be aesthetically appealing, which means that it should have no objectionable taste, smell, or colour.

Homeowners are responsible for monitoring their well water quality. Harmful bacteria or chemicals can be present in drinking water that tastes, smells, and looks acceptable. Water quality may be affected by both natural and man-made sources. Some of the potential concerns about groundwater quality in New Brunswick include weathering and erosion of minerals and metals from certain geological formations, saltwater intrusion, de-icing road salt, sewage disposal systems, animal wastes, petroleum products, industrial effluent, landfills, and pesticides.

To ensure a well water supply is safe, it must be tested. The bacterial quality should be checked every six months. The chemical quality should be checked every two years. Frequent testing will check the integrity of your well let you know if corrective measures are required warn you if another activity is affecting the quality of your well water.

Testing should be done earlier if changes in taste, smell, or colour are noted. Testing should also be done when the probability of contamination is greatest – after heavy rains, spring floods, extended drought, or lengthy periods of non-use.

A detailed bacterial and chemical water quality analysis allows for the following:

- an assessment of possible contaminants, such as bacteria and ammonia from sewage, chlorides from saltwater intrusion, nitrate from agricultural practices, and arsenic or uranium from naturally occurring minerals
- an assessment of potential aesthetic problems, such as hardness or staining
- a comparison to previous results

The only way you can be sure your water supply is safe is to have it tested.

Testing

Regularly test your well water for bacteria and a standard suite of chemical and physical parameters. Use an SCC or CALA accredited water testing laboratory. Find a list of accredited laboratories at www.cala.ca , www.scc.ca or see the Yellow Pages under "laboratories."

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

For more information on water testing services, please see Department of Environment's water testing services at www.gnb.ca/environment . Cost of analysis will vary depending on the accredited laboratory and the number of parameters being tested.

What should I test for?

The technical term for the things you can test for is parameters. Many labs offer water quality analysis packages that are usually more cost effective than analysis of individual parameters. These packages provide more information, allowing for better interpretation of water quality results and assessment of water treatment requirements.

Included in this fact sheet is a summary table of general chemistry parameters. These are the most frequently tested parameters offered by most labs. Some parameters included in the water quality analysis package have guideline limits and some do not. However, you should test for all of them for the following reasons:

- Their presence may interfere with the removal of health-related parameters.

- They may affect the type of treatment you select for your water supply or the treatment system's effectiveness.
- They may be indicators of overall water quality.

If you suspect that your water may be contaminated from local human activity, such as farming, septic systems, waste disposal, or underground petroleum storage tanks, then in addition to regular testing, you should test for the presence of volatile organic compounds (VOCs), pesticides, or other trace organic chemicals.

Special Tests

Some parameters must be specifically requested. You can request special tests for hydrogen sulphide, iron bacteria, sulphur bacteria, radon, and radium if you suspect any of these may be present in your well water.

Guidelines for Canadian Drinking Water Quality

You will need to understand two technical terms to be able to interpret the results:

- Maximum Acceptable Concentration (MAC) is a level that has been established for certain substances that are known or suspected to cause adverse health effects.
- Aesthetic Objective (AO) is established for parameters that may impair the taste, smell, or colour of water or which may interfere with the supply of good quality water.

Detection Limit

The detection limit is the lowest concentration of a chemical that can be reliably measured. It may be referred to on a lab report as DL, RDL (reporting detection limit), or RL (reporting limit).

The detection limit depends on the equipment used for analysis and the method of analysis. It can also be affected by the concentration of other parameters present in the water. For example, if the concentration of calcium is very high, it can elevate the detection limit of another parameter. To compare the concentration of a parameter to the Canadian Drinking Water Quality Guideline (if one exists), **the detection limit must be less than the guideline**.

Some labs do not report the detection limit. However, you can still determine the detection limit used for each parameter from the lab report. For example, if the detection limit of a parameter is 2 mg/L and the level of the parameter is below the detection limit, the result will be listed as "< 2" (less than 2 mg/L). If the detection limit is greater than the guideline, you should consult the laboratory where the analysis was done. The laboratory will inform you of the options available for reporting the parameter of concern with a lower detection limit.

Units

Laboratories may report the concentration of parameters in milligrams per litre (mg/L) or micrograms per litre (µg/L or ug/L). There is a BIG difference: **1 mg/L is equal to 1000 µg/L**.

When looking at the results from a lab and comparing them to previous results, or to the results from a different lab, or to the *Guidelines for Canadian Drinking Water Quality*, make sure the units are the same.

1 mg/L = 1000 micrograms per litre (µg/L)
1 mg/L = 1 part per million (ppm)
1 µg/L = 1 part per billion (ppb)

Interpreting water quality results

Compare the results of your water quality analysis to the Guidelines for Canadian Drinking Water Quality. Some labs will identify the parameters that exceed the guidelines for you.

If your water exceeds a MAC, take action to eliminate the problem or install treatment.

If your water exceeds an AO, you may choose to treat your water for two reasons:

- to prevent staining, scaling, or corrosion of plumbing fixtures and appliances
- to make it more pleasing to consume

Treatment

New Brunswick recommends purchasing a treatment system that has been certified to meet the current NSF standards. 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.

Once installed, test your treated 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, please contact a private water treatment company.

Health Concerns

Health effects from parameters that have a Maximum Acceptable Concentration (MAC) are outlined in the table below. If you have concerns about elevated levels of any parameter, including those with no Canadian Drinking Water Quality Guideline, discuss your concerns with your doctor.

Guidelines for Drinking Water Quality are of two different types:

Maximum Acceptable Concentrations (MAC) are based upon potential adverse health effects (listed in this factsheet if applicable) but water test results that exceed these levels do not necessarily indicate any immediate health problem. This is because whenever possible MACs are developed to be low enough that years of exposure at this level would still only increase the health risk slightly.

However, corrective actions should be taken if water test results exceed the MAC in order to remove any potential for increased health risk.

Aesthetic Objectives (AO) are not based upon health effects, but water test results that exceed these levels may indicate that the water could have objectionable taste, odour, appearance or other factors.

Corrective actions are recommended if water test results exceed the AO but may not be necessary.

Health-based and aesthetic guidelines for chemical and physical drinking water parameters

Parameter	MAC (mg/L)	AO (mg/L)	Comment
Alkalinity (as $CaCO_3$)	N/A	N/A	Alkalinity is a measure of the buffering capacity of the water – its ability to resist sudden changes in pH. pH and alkalinity are factors in determining whether water is corrosive, scale-forming, or neutral. If water is corrosive, metals such as lead or cadmium may leach into the water and cause adverse health effects.
Aluminum (Al)	N/A	N/A	Aluminum is a naturally occurring abundant metal. The *Guidelines for Canadian Drinking Water Quality* have set an operational guideline of 0.1 or 0.2 mg/L for treatment systems that use aluminum-based coagulants (for example, municipal drinking water supplies). No guideline applies to other systems (for example, private wells).
Ammonia (as Nitrogen)	N/A	N/A	The presence of ammonia (NH_3) may indicate improperly treated sewage or fertilizer or it may occur naturally. Ammonia can be converted to nitrate or nitrite. If the nitrate, nitrite, or the bacterial level is elevated, investigate the source.

Parameter	MAC (mg/L)	AO (mg/L)	Comment
Anion Sum	N/A	N/A	The anion sum is the sum of the negative ions (anions) present in water. It is used to calculate the ion balance. Major contributions to the anion sum are usually alkalinity, chloride, and sulphate. The anion sum is not an indicator of water quality. It is a check of the analytical accuracy of the data.
Antimony (Sb)	0.006	N/A	Antimony is naturally occurring, but the most common source of antimony in drinking water is the corrosion of antimony-containing plumbing materials. Exposure to very high levels of antimony (above 30 mg/L) in drinking water can cause nausea, vomiting, and diarrhea.
Arsenic (As)	0.010	N/A	Arsenic is a naturally occurring element present in soil and rock. Some areas of New Brunswick have a greater potential for elevated arsenic levels in drinking water, depending on the type of minerals in the soil or bedrock. Exposure to high levels of arsenic in drinking water can cause nausea, diarrhea, and muscle pain. Over the long term, exposure to low levels of arsenic can cause certain types of cancer.
Barium (Ba)	1	N/A	Barium is a common element in the earth's crust. Exposure to high levels of barium in drinking water can cause gastrointestinal discomfort, muscular weakness, high blood pressure, or cardiovascular disease.
Beryllium (Be)	N/A	N/A	Beryllium is a metal found naturally in rocks, and in some precious stones such as emeralds and aquamarine. It is also found in certain industrial and municipal effluent. It is very rare for beryllium to be present in water above detectable levels.
Bicarbonate and carbonate (as CaCO3)	N/A	N/A	Bicarbonate and carbonate, as CaCO3, are derived from carbonate rocks, carbon dioxide (CO2) in the atmosphere, and the weathering of feldspars and other minerals. Both are major contributors to alkalinity. Bicarbonate and carbonate may combine with calcium and magnesium when water is heated, forming a scale on pipes and plumbing materials.

Parameter	MAC (mg/L)	AO (mg/L)	Comment
Bismuth (Bi)	N/A	N/A	Bismuth is a metal found as crystals in nickel, cobalt, silver, and tin ores. It is usually recovered as a byproduct of lead and copper smelting. In New Brunswick, It is very rare for bismuth to be present in water above detectable levels.
Boron (B)	5	N/A	Boron is a naturally occurring element found in rock and soil. Some boron found in groundwater is naturally occurring. It may also be present in groundwater due to industrial effluent, leaching of fertilizer, sewage, or leaching of landfill materials. Exposure to very high concentrations of boron in drinking water can cause reproductive malfunction in men and developmental abnormalities.
Cadmium (Cd)	0.005	N/A	Cadmium is found in very low concentrations in most rocks, as well as in coal and petroleum. It can be present in groundwater through erosion and weathering of certain minerals and rock types. There are many synthetic sources of cadmium in drinking water, the most common being the corrosion of galvanized pipe. Exposure to high levels of cadmium in drinking water can cause gastrointestinal discomforts and kidney damage.
Calcium (Ca)	N/A	N/A	Calcium is present in all natural waters. It is a major contributor to drinking water hardness. Excessively hard water can affect the function and lifetime of plumbing systems and appliances.
Cation Sum	N/A	N/A	The cation sum is the sum of positive ions (cations) present in water. It is used to calculate the ion balance. Major contributors to the cation sum are usually calcium, magnesium, and sodium. The cation sum is not an indicator of water quality. It is a check of the analytical accuracy of the data.
Chloride (Cl^-)	N/A	<=250	Chloride is found naturally in groundwater. It can cause water to have a salty taste. Chloride may also be an indicator of saltwater intrusion or sewage contamination. Chloride is often the first sign of deteriorating groundwater quality.

Parameter	MAC (mg/L)	AO (mg/L)	Comment
Chromium (Cr)	0.05	N/A	Chromium is a metal found naturally in rocks, soils, and plants. It is an essential element required in small amounts by all living organisms. Chromium compounds from natural sources are usually found in groundwater in trace amounts only. The most common man-made sources of chromium in groundwater are the burning of fossil fuels, as well as mining and industrial effluent. Chromium can be present as chromium 3 or chromium 6 in water. Chromium 3 is non-toxic, but exposure to high levels of chromium 6 in drinking water can cause kidney and liver damage.
Cobalt (Co)	N/A	N/A	Cobalt is an element that is relatively rare in groundwater. It may be released into the environment through the emissions of coal burning industries. Cobalt is not considered a health risk, because it is generally not often freely available in the environment.
Coloura	N/A	<=15 TCU	Colour in drinking water may be aesthetically unappealing and is a possible indication of contamination.
Conductivity	N/A	N/A	Conductivity is a measure of the ability of water to carry an electrical current. It increases as the amount of dissolved minerals (ions) increases and can signal the presence of other contaminants in water. Conductivity is one of several parameters used to indicate overall water quality.
Copper (Cu)	N/A	<=1.0	Copper is naturally occurring, but the most common source of copper in drinking water is the corrosion of copper-containing plumbing materials. It is an essential element required in small amounts by all living organisms. Very high concentrations of copper can cause nausea and other gastrointestinal discomforts.
Dissolved Organic Carbon (DOC)	N/A	N/A	Dissolved Organic Carbon (DOC) is used to measure dissolved compounds found in water derived from plant and animal (organic) materials. DOC is one of several parameters used to indicate overall water quality.

Parameter	MAC (mg/L)	AO (mg/L)	Comment
Fluoride (F)	1.5	N/A	Fluoride is naturally occurring. It may be present naturally in dissolved form in groundwater through weathering and erosion of certain rock and soil types. It may also be present in groundwater due to septic and sewage treatment effluent from areas with fluoridated water. Exposure to excess fluoride in drinking water can cause dental fluorosis. Over the long term, it can cause skeletal fluorosis.
Hardness	No numerical guideline but the optimum range of hardness in drinking water is an equivalent calcium carbonate (CaCO3) concentration between 80 and 100 mg/L		Hard water is caused by the presence of minerals such as calcium and magnesium in water. Hard water causes scale formation in pipes, on plumbing fixtures, and in heating systems. Hardness is one of several parameters used to indicate overall water quality.
Ion Balance	N/A	N/A	The ion balance compares the negative ions (anion sum) to the positive ions (cation sum). They should theoretically be equal to each other, within plus or minus 5 percent. Although unusual, if the ions are not balanced, it may indicate that an ion is present in the water that has not been accounted for. The ion balance is not an indicator of water quality. It is a check of the analytical accuracy of the data.
Iron (Fe)	N/A	<=0.3	Iron is a metallic element present in many types of rock. It is commonly found in water. It is an essential element required in small amounts by all living organisms. Iron can collect and block pipes or fixtures and break off as rust flakes or sediment, giving water an unpleasant appearance and taste. Health effects are not expected at levels normally found in drinking water.
Langelier Index	N/A	N/A	The Langelier Index is an approximate indicator of the degree of saturation of calcium carbonate (CaCO3) in water. It is calculated using the pH, alkalinity, calcium concentration, total dissolved solids, and water temperature of a water sample. The Langelier Index was one of many indicators formerly used to assess the stability of water (whether it was corrosive or scale-forming water). It is no longer considered a good indicator of corrosion.

Parameter	MAC (mg/L)	AO (mg/L)	Comment
Lead (Pb)	0.01	N/A	The main source of lead in drinking water is through corrosion of plumbing materials with lead components, such as pipes, solder, faucets, fittings, and older galvanized well liners. Exposure to lead in drinking water can cause damage to the brain and nervous system, behavior problems and learning disabilities, developmental delays, and hearing disorders.
Magnesium (Mg)	N/A	N/A	Magnesium is present in all natural waters. It is an essential element required in small amounts by all living organisms. It is a major contributor to drinking water hardness. Excessively hard water can affect the function and lifetime of plumbing systems and appliances.
Manganese (Mn)	N/A	<=0.05	Manganese is a metallic element present in many types of rock. It is commonly found in water. It is an essential element required in small amounts by all living organisms. Manganese can collect and block pipes or fixtures and break off as black flakes or sediment, giving water an unpleasant appearance and taste. Health effects are not expected at levels normally found in drinking water.
Molybdenum (Mo)	N/A	N/A	Molybdenum is a metal found naturally in small quantities in rocks and soils. It is an essential element required in small amounts by all living organisms. Sources of molybdenum in groundwater include fossil fuel combustion, sewage sludge, certain fertilizers, and mining waste.
Nickel (Ni)	N/A	N/A	Nickel is a metal found naturally in rocks, soils, and plants. In groundwater, nickel can be present through the weathering of rocks and as a result of human activities, such as the burning of fossil fuels, smelting, and the electroplating industry. Although nickel may be toxic in high concentrations, the concentrations in water are not usually high enough to cause health concerns.
Nitrate (NO_3^-)	45 (if measured directly) 10 (if nitrate-nitrogen calculated from total nitrogen concentration)		The presence of nitrate may indicate improperly treated sewage or fertilizer or it may occur naturally. Nitrate contamination is often one of the first signs of deteriorating groundwater quality and could indicate other problems with well water quality. Nitrate-nitrogen levels greater than 10 mg/L can pose a risk to infants up to six months old.

Parameter	MAC (mg/L)	AO (mg/L)	Comment
Nitrite (NO_2^-)	3.2 (if measured directly) 1.0 (if nitrite-nitrogen calculated from total nitrogen concentration		The presence of nitrite may indicate improperly treated sewage or fertilizer, or it may occur naturally. Nitrite contamination may be a sign of deteriorating groundwater quality and could indicate other problems with well water quality. Nitrite-nitrogen levels greater than 1.0 mg/L can pose a risk to infants up to six months old.
Orthophosphate as phosphorous (P)	N/A	N/A	Ortho-phosphate is a chemistry-based term that refers to an inorganic phosphate. The presence of ortho-phosphate in groundwater can indicate contamination from surface water sources. Investigate the source, as the presence of pathogens or other contaminants present in surface water may cause adverse health effects.
pHb	N/A	6.5-8.5	A pH less than 6.5 may contribute to the corrosion of pipes and fittings. A pH less than 6.5 is not a health-risk in itself, but corrosive water can dissolve metals, such as lead, cadmium, zinc, and copper present in pipes. This may lead to increased concentrations of these metals in drinking water, which can cause health concerns. See our fact sheets on lead, cadmium, zinc, copper and corrosive water for more information. A pH greater than 8.5 may contribute to scale build-up in plumbing materials. pH is one of several parameters used to indicate overall water quality.
Phosphorous (P)	N/A	N/A	Phosphorus is an element commonly found in soil, rocks, and plants. It is an essential nutrient for all forms of life. Phosphorus is used in agricultural fertilizers and is also present in detergents, as well as in human and animal wastes. It is much more common in surface water than in groundwater, since it is immobile and is very unlikely to reach groundwater in significant concentrations. A more general concern of phosphorus is its environmental effects. Elevated levels of phosphorus may cause blue-green algal blooms in surface water. The algal blooms can affect human health through contact or consumption.

Parameter	MAC (mg/L)	AO (mg/L)	Comment
Potassium (K)	N/A	N/A	Potassium is naturally occurring, but the most common source of potassium in drinking water are water treatment systems, such as ion exchangers (water softeners) that use potassium chloride. It is an essential element required in small amounts by all living organisms. Adverse health effects from exposure to increased potassium in drinking water are unlikely in healthy people. Potassium may cause health effects in people with certain conditions (for example, people taking certain medications for heart disease, kidney disease, pain, and HIV treatment). If water is softened by potassium ion exchange, you should sue a separate, unsoftened supply of water for cooking and drinking.
Saturation pH	N/A	N/A	Saturation pH is a theoretical pH at which water is stable and will neither form a scale nor corrode. It is calculated using the temperature, total dissolved solids, and the calcium content and alkalinity of water.
Selenium (Se)	0.01	N/A	Selenium is found naturally in small quantities in rocks and soils. It is an essential element required in small amounts by al living organisms. Selenium may be present naturally in dissolved form in groundwater through weathering and erosion of certain rock and soil types. Other sources of selenium in groundwater include contamination from industrial effluent, municipal wastewater, and hazardous waste sites. Exposure to very high levels of selenium (above 9 mg/L) in drinking water can cause fatigue and irritability, as well as damage to hair, fingernails, and liver tissue.
Silica as SiO2	N/A	N/A	Silica is an abundant compound, present in groundwater through erosion of rocks and minerals. Silica is much more common in groundwater than in surface water. Dissolved silica does not have any known health concerns for humans. However, the presence of high amounts of dissolved silica may interfere with water treatment systems designed to remove dissolved iron and manganese. Extremely high dissolved silica concentrations may produce scale in pipes and restrict water flow within piping systems.
Silver (Ag)	N/A	N/A	Silver is a relatively rare metal. The major commercial uses of silver are in photography, electronic components, and in the manufacturing of metal alloys. Silver may be adsorbed by soils, but is very immobile and is unlikely to be present above detection limits in groundwater.

Parameter	MAC (mg/L)	AO (mg/L)	Comment
Sodium (Na)	N/A	<=200	All groundwater naturally contains some sodium. It is an essential element required in small amounts by all living organisms. High levels of sodium can give water a salty taste. Sodium in drinking water may cause health concerns for those on sodium-restricted diets. If water is softened by sodium ion exchange, you should use a separate, unsoftened supply of water for cooking and drinking.
Strontium (Sr)	N/A	N/A	Strontium is an element abundant in rocks and soil. The presence of strontium in well water is more prevalent in certain rock and soil types.
Sulphate (SO42-)	N/A	<=500	Sulphate minerals in drinking water can increase corrosion of plumbing and water well materials. Sulphate is found naturally in groundwater through the weathering of rocks. At levels above 1000 mg/L, sulphate in drinking water can have a laxative effect. See our fact sheet on sulphate for more information.
Thallium (Tl)	N/A	N/A	Thallium is naturally present in rocks. The most common source of thallium in groundwater is through the leaching of thallium from ore processing operations.
Tin (Sn)	N/A	N/A	Tin is a metal found in many rocks and minerals. It is rare for tin to be naturally present in soils and water. Most tin present in groundwater is due to manufacturing and industrial effluent.
Titanium (Ti)	N/A	N/A	Titanium is an element found naturally in many igneous and sedimentary rocks. Titanium compounds are stable in soil, so only small amounts of titanium end up in water from the weathering of rocks. Titanium may also be present in groundwater due to manufacturing effluent. Titanium is relatively non-toxic. It does not accumulate in the human body.
Total dissolved solids (TDS)	N/A	<=500	Total dissolved solids (TDS) is the calculated dissolved matter found in water comprised of mineral salts and small amounts of other inorganic and organic substances. It is related to the conductivity of water. TDS is one of several parameters used to indicate overall water quality. If the concentration of total dissolved solids is too high, the water is unsuitable for drinking or cooking.

Parameter	MAC (mg/L)	AO (mg/L)	Comment
Turbidity	Varies, based on the source and the technology used to treat water		For surface water and groundwater under the direct influence of surface water, turbidity may indicate the presence of disease-causing organisms, such as bacteria, viruses, and parasites that can cause nausea, cramps, diarrhea, and associated headaches. In secure groundwater sources, turbidity may be present due to the presence of clay, silt, and inorganic matter from natural sources. It is important to know and understand the source of turbidity.
Uranium (U)	0.02	N/A	Uranium is a naturally occurring radioactive element that exists in soil and rock throughout the world. Some areas of new Brunswick have a greater potential for uranium levels in drinking water to exceed the guideline, depending on the type of minerals in the soil or bedrock. Exposure to uranium in drinking water can result in kidney damage.
Vanadium (V)	N/A	N/A	Vanadium is found naturally in small quantities in rocks and soils. The presence of vanadium in well water depends on the rock and soil type in the area. Other human-related sources of vanadium are from emissions from the production of oil, gas, and metal alloys.
Zinc (Zn)	N/A	<=5.0	Zinc is naturally occurring, but the most common source of zinc in drinking water is the corrosion of galvanized plumbing and well materials. Zinc is an essential element and is generally considered to be non-toxic at levels normally found in drinking water. Exposure to very high concentration of zinc may result in nausea and diarrhea.

aTCU = true colour unit.

bNo units.

For more information, please contact the nearest regional Health Protection Branch office:

Bathurst
165 St- Andrew Street
(506) 549-5550

Grand Falls
131 Pleasant Street
(506) 737-4400

Shippagan
239B, boulevard J.D. Gauthier
(506) 336-3061

Campbellton
10 Village Avenue, Unit 15
(506) 789-2549

Miramichi
1780 Water Street
(506) 778-6765

St. Stephen
41 King Street
(506) 466-7615

Caraquet
295, boulevard St-Pierre Ouest
(506) 726-2025

Moncton
81 Albert Street
(506) 856-2814

Sussex
30 Moffett Avenue
(506) 432-2104

Edmundston
121 Church Street
(506) 737-4400

Perth-Andover
35 F Tribe Rd.
(506) 273-4715

Tracadie
3520, rue Principale
(506) 394-3888

Fredericton
300 St Mary's Street
(506) 453-2830

Saint John
55 Union Street
(506) 658-3022

Woodstock
200 King Street
(506) 325-4408

Adapted from Nova Scotia's The Drop on Water fact sheets