



All About Your *Well*



The New Brunswick Environmental Industry Association is a non-profit trade association dedicated to promoting the growth of environmental business in New Brunswick.

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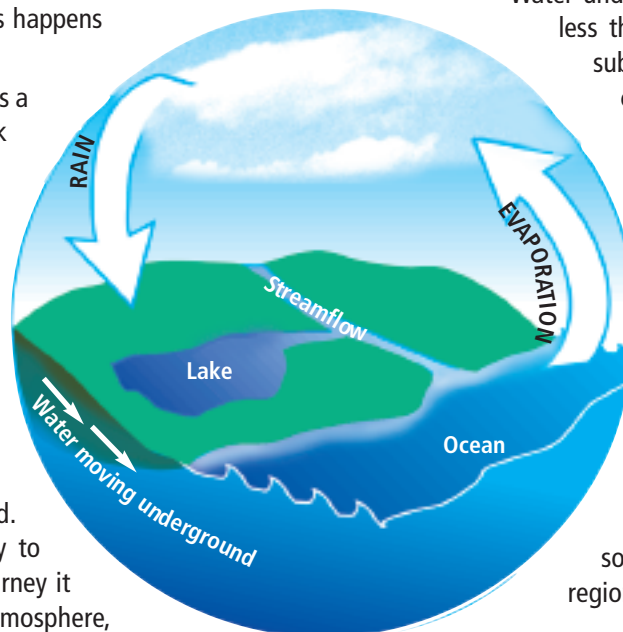
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New  Nouveau
Brunswick
Your Environmental Trust Fund at Work

What is the Water Cycle?

Water, life sustaining and found almost everywhere, is recycled continuously between the clouds, land and oceans. Earth's water circulatory system, known as the hydrologic cycle, is a process that moves water from one location to another using energy from the sun. This happens all over the world.

The recycling of water is a process that started back when the Earth was formed. Water, in the form of rain or snow, falls to the ground and begins to follow many different pathways. It can evaporate immediately into the atmosphere, run off into streams and lakes or seep into the ground. Some of it finds its way to the ocean. During its journey it evaporates into the atmosphere, forms clouds and eventually falls back



down to begin a different journey through the cycle.

The seepage of water into the ground is an important part of the hydrologic cycle. Out of sight and underground, the water moves through small spaces that exist in sediments and rocks.

Water under the ground often moves less than a metre in a year, the subsurface trip to the ocean can take a long time.

At a certain depth below the ground surface, all the spaces in the sediment and rock become filled with water. Aquifers, large underground reservoirs of water, are sometimes formed. Aquifers, because they can store and transfer water, are important sources of freshwater in many regions of the world.

Drinking Water Supplies from Groundwater



Do you know where your last glass of water came from? Water that contains low concentrations of dissolved salts and very few impurities is referred to as "fresh" water, different from the saltwater we find in oceans. Fresh water represents less than three per cent of the water on Earth.

Most people are familiar with fresh surface waters found in streams and lakes, but many

are less familiar with underground freshwater. Water found under the ground surface, is and will continue to be, an important source of drinking water throughout the world. In New Brunswick, over 60 per cent of the population receives its drinking water from a groundwater source.

There are about
100,000
private water
wells in
New Brunswick.

We are all concerned with the quality of our drinking water. The sediment and/or rock overlying aquifers often provide protection against surface contamination. This protection, combined with the filtration capabilities of aquifers, makes groundwater supplies very appealing.

Every day, people in New Brunswick rely on groundwater for their drinking water through either a municipal or individual well water supply. Currently, there are about 100,000 private water wells in the province and approximately 2,500 new wells are drilled each year. A number of people in New Brunswick also rely on shallow groundwater sources accessed through well points, dug wells and springs for their water supplies.

Hiring a Qualified Well Contractor



What Are You Paying For?

- Experience & knowledge
- Drilling
- Well casing
- In some cases, a well screen
- Drive shoe
- Well seal & air vent pipe
- Vermin proof well cap
- Well voucher; water safety test

References:

Department of Environment and Local Government New Brunswick. Undated. *Before You Drill Your Water Well, Points to Remember*. Environment New Brunswick Water Resources Branch. 11p.

Ontario Ministry of the Environment. 1989. *Ground Water Supplies in Ontario*. 98p.

Price, M. 1985. *Introducing Groundwater*. George Allen and Unwin, Boston. 195p.

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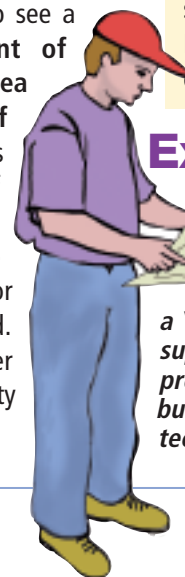
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www.gnb.ca/elg-egl/0373/0001/0009-e.html

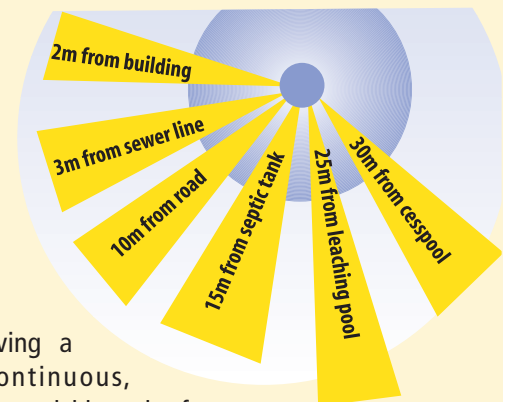
The New Brunswick Water Well Regulation, under the *Clean Water Act*, states that licensed well contractors must construct all water wells. Well contractors are required to follow minimum standards, well water disinfection practices and minimum distances from potential contaminant sources outlined by the regulations.

The contractor must submit a water well driller's report (well log) to the homeowner and the New Brunswick Department of Environment and Local Government office. The well location, depth, length of the well casing installed, sediment and rock encountered and estimated water quantity are some of the items listed in the report. The number on the well identification tag, located on the above-ground portion of the well casing, should match the number on the well driller's report.

In choosing a well contractor, ask to see a **well driller's licence, the amount of experience they have in your local area or neighbourhood, and the type of work they have done.** Neighbours with wells are often a good source of information. They may recommend a reputable well contractor or provide information about any problems or difficulties they may have had. Remember, however, the well driller cannot guarantee the quantity or quality of water before drilling a well.



Choosing a Proper Well Site



Having a continuous, dependable and safe

water supply is important to all of us. Planning for a properly located well site can save many problems in the future. Before a well is drilled, several simple questions should be asked such as:

- How much water is needed now?
- How much water will be needed in the future?
- Are there sources of potential contaminants near the well site?

The New Brunswick Department of Environment and Local Government establishes regulations regarding groundwater exploitation under the *Clean Water Act*. The goal of the *Act* is to ensure the management and protection of drinking water sources.

Regulations under the *Act* set minimum distances from potential contamination sources, above and below ground. As a general rule, a well should be located uphill and as far away as possible, from potential pollutant sources such as septic tanks, home heating oil tanks, roads, sewer pipes, surface water sources and other off-site contaminant sources. Following these regulations will help to reduce the risk of poor water quality or contaminants entering a well.

Exploring for Groundwater

Methods used to find groundwater have changed over the years. In the past "water witchers" walked back and forth across an area of land using a Y-shaped stick, called a dowsing rod, that supposedly twitched downward when water was present below. Today this activity persists locally, but has largely been replaced by more modern techniques.

Tapping into Your Water Supply

Wells can be drilled in a variety of ways depending on the material and characteristics of the aquifer. Rotary drilling is the most common method used to drill drinking water wells, although some well contractors are still equipped with cable tool drilling machinery.

As drilling proceeds, well casing is inserted into the hole that will function as your well. The well casing is essentially a hollow pipe, usually made from metal. Casing is required to prevent surface water from entering the well and protect the hole from collapsing. Well contractors must extend the casing above the ground surface. For additional protection, the well contractor can add grout between the casing and the walls of the hole. The well should also be fitted with a proper cap. These procedures ensure that water and other materials from the surface don't find their way down into the aquifer.

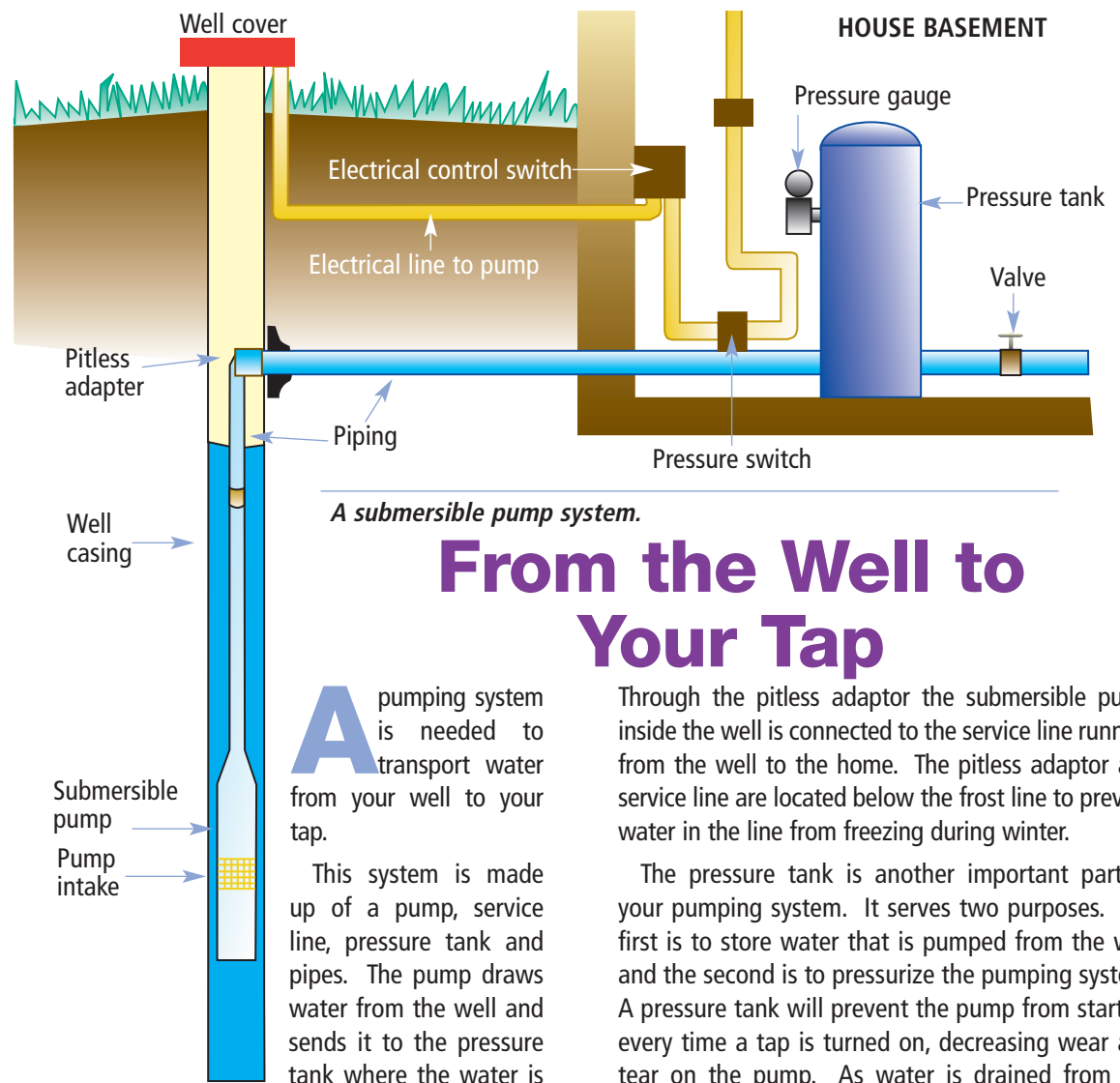
Wells should be chlorinated annually for proper maintenance.

After the well has been installed, a well contractor can use several methods to remove sediment and rock from the well that may cause the water to be cloudy or murky. The final step of well construction is chlorination. Adding chlorine will destroy harmful bacteria that may have entered the well during construction. Wells should be chlorinated annually for proper maintenance, which is best done in the spring or fall. You can learn more about chlorinating your well by viewing the website: <http://www.gnb.ca/0009/0006-e.pdf>

A different type of pumping system needs to be set up for each household depending on how much water is being consumed. To avoid any problems you should consult an experienced pump installer or well contractor before setting up your pumping system.

References:

Department of Environment and Local Government. Undated. *Facts on Water*.
Environment New Brunswick. Undated. *Before You Drill Your Water*



From the Well to Your Tap

A pumping system is needed to transport water from your well to your tap.

This system is made up of a pump, service line, pressure tank and pipes. The pump draws water from the well and sends it to the pressure tank where the water is stored until needed.

There are many different pumps that can be used. Some of the more common ones include the jet pump, piston pump and submersible pump. The jet pump uses downward pressure to force water up into the pipes and then to the pressure tank. The piston pump uses an upward and downward motion to draw water up into the pipes. The submersible pump uses a circular motion to draw water up from the well. An advantage of the submersible pump is that it is placed inside the well with a pitless adaptor.

Through the pitless adaptor the submersible pump inside the well is connected to the service line running from the well to the home. The pitless adaptor and service line are located below the frost line to prevent water in the line from freezing during winter.

The pressure tank is another important part of your pumping system. It serves two purposes. The first is to store water that is pumped from the well and the second is to pressurize the pumping system. A pressure tank will prevent the pump from starting every time a tap is turned on, decreasing wear and tear on the pump. As water is drained from the pressure tank the pressure inside the tank begins to drop. When the pressure drops enough the pump will turn on and refill the pressure tank.

Your pumping system may require a setup specific to your household needs. For example, if water demand is high at certain times of the day, the water level in the well could drop significantly. If this happens, the pump could draw air and damage the system. To avoid these problems you should consult a trained pump installer or well contractor before setting up your pumping system.

Web Site:

www.gnb.ca/elg-egl/0373/0001/0009-e.html

Water Testing for New or Modified Wells

Since thousands of New Brunswick families depend on groundwater to supply them with fresh drinking water, the New Brunswick Department of Environment and Local Government has taken steps to prevent drinking water problems and help protect groundwater resources. The Potable Water Regulation under the *Clean Water Act* legally requires owners of new, deepened or repaired wells to test the quality of their water.

The well contractor is required to give the well owner a signed and dated well water-testing voucher. The voucher covers the cost of basic water quality analysis. As stated in the Regulation, the well water must be tested within a period of 12 months after the voucher is issued. It is recommended that the test is completed prior to consuming the water.

Testing involves a check for presence of both microorganisms and inorganic substances in the water. Total coliforms and fecal coliforms are often found in water containing decaying natural organic matter and sewage. Microorganism testing, examines water for the presence of those substances. Inorganic testing examines a number of chemical components related to the geological materials that water comes into contact with the water supply. Test results are compared with the *Guidelines for Canadian Drinking Water Quality* and New Brunswick Health Advisory Levels.

References:

Department of Environment and Local Government. Undated. Facts on Water. Environment New Brunswick. Undated. *Before You Drill Your Water Well, Points to Remember*. Environment New Brunswick Water Resources Branch. 11p.

To check your water quality, you are required to pick up a sampling kit from a local office of the provincial departments of Health and Wellness or Environment and Local Government. The kit includes sample bottles and instructions on how to properly collect a well water sample. After collection, the sample should be submitted to the provincial government laboratory for testing and analysis. If your test results indicate the presence of bacteria you will be contacted by the Department of Health and Wellness. Staff of that agency can provide assistance on appropriate corrective action.

Water test results are sent to the homeowner, the Department of Health and Wellness and a copy is kept on file at the Department of Environment and Local Government. Results of your water analysis are kept confidential. The Department of Health and Wellness will notify the homeowner of any identified health related problems with the tested well water. Instructions for corrective action may be included with the test results if problems are detected.

If you want to resample your well, contact your local office of the provincial department of Health and Wellness or Environment and Local

Government. These offices can also be contacted if you are planning to build a new home and need information regarding wells.

New Brunswick Regulation 93-203 under the *Clean Water Act* (O.C. 93-979) filed December 21, 1993.

Web Site: www.gnb.ca/elg-egl/0373/0001/0009-e.html



Homeowners are required by law to test the water quality of their new, deepened or repaired well.



What to do if your Well is no Longer Needed

We tend to be concerned about the safety of our wells while they are operating, but should we not also be concerned about them after they are abandoned and no longer in use?

Proper closure of an abandoned well will ensure the well will not be used inappropriately for things such as chemical and waste disposal. A well that is not properly closed down provides a direct connection between the ground surface and the aquifer. This increases the chances of surface contaminants reaching the groundwater resource and drinking water supplies.

You should contact your regional office of the Department of Environment and Local Government to obtain guidelines on how to properly seal your well. The exact process will vary depending on the type of well that is being closed. However, the general process is the same and should be done by a licensed well contractor:

- Material in the well, such as pumps and debris, are removed.
- The well is filled with a bentonite mixture, starting from the bottom, until the hole is filled.
- The casing may be removed as the well is being filled in if possible. Otherwise it may be cut below the ground surface.

A well properly decommissioned will help prevent contamination of potable groundwater supplies.

Water Quality

After your well has been constructed, you must use your prepaid well water-testing voucher to have the quality of your drinking water tested. The quality of drinking water is determined by chemical and bacteriological testing. Simply smelling or looking at the water cannot detect many water quality problems. Therefore, it is important to have your water tested regularly by an accredited or certified laboratory to ensure it is safe to drink.



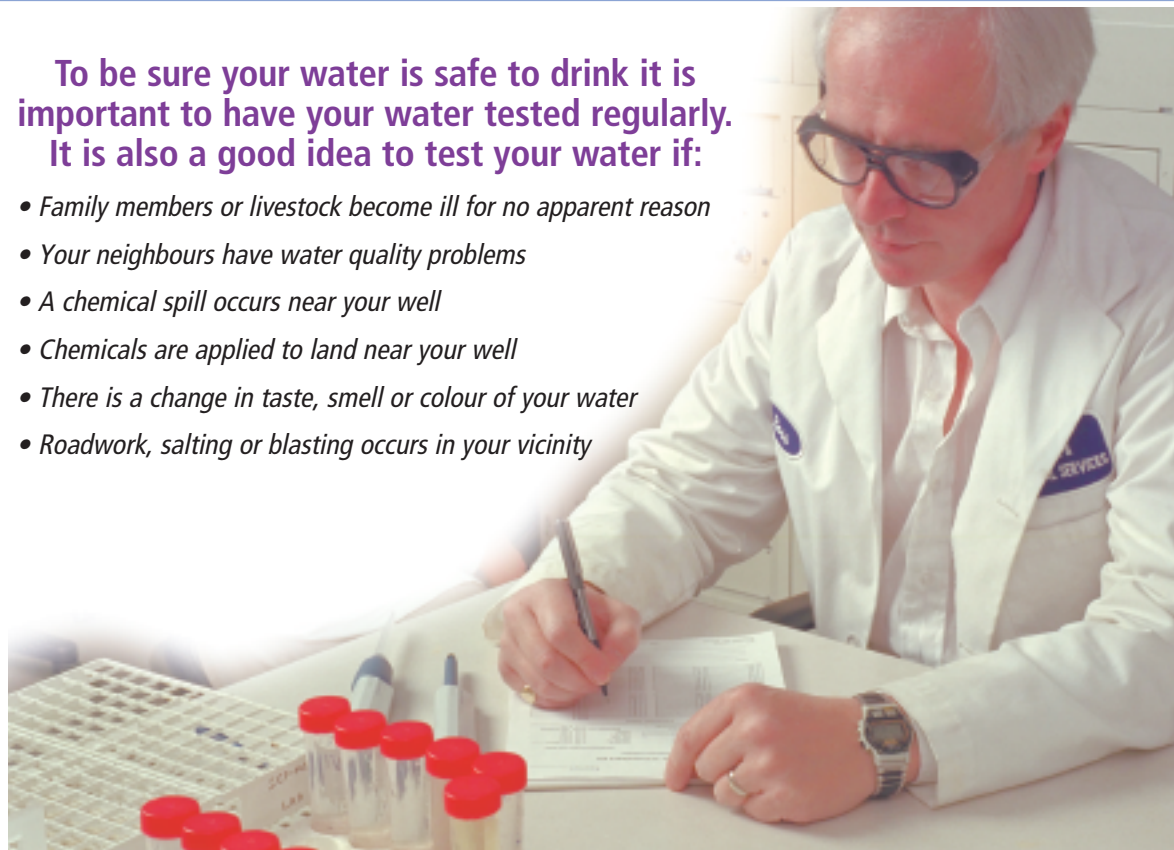
Chemical testing of drinking water includes measuring the pH, hardness and the levels of nitrate, chloride, sulfate and various metals. Certain elements such as manganese and iron, if present in drinking water, may cause aesthetic problems such as colour and/or odour. The presence of other chemicals or elements such as arsenic, uranium or lead in water may pose certain health risks if not treated properly.

Some elements occur naturally. Natural processes such as minerals leaching from sediment and rock can slowly lead to changes in the quality of your drinking water. Water quality can also change quickly, for example, if affected by human activity.

Bacteriological testing includes total coliform and *E.coli* tests. The presence of bacteria indicates a possible health risk that needs to be followed up. Although aquifers generally filter groundwater, many types of bacteria can still find their way into your well. Bacterial contamination can result from improper septic tank operation or leaching of animal wastes into the groundwater.

To be sure your water is safe to drink it is important to have your water tested regularly. It is also a good idea to test your water if:

- Family members or livestock become ill for no apparent reason
- Your neighbours have water quality problems
- A chemical spill occurs near your well
- Chemicals are applied to land near your well
- There is a change in taste, smell or colour of your water
- Roadwork, salting or blasting occurs in your vicinity



Water Quality Problems

Parameter	Associated aesthetic problems if parameter is not within acceptable guidelines
Low pH or high pH	<ul style="list-style-type: none"> • corrosion
Hardness	<ul style="list-style-type: none"> • staining or scaling of pipes, bathtubs, and kettles
Iron and Manganese	<ul style="list-style-type: none"> • staining of pipes and laundry • discolouration of water • water with strange taste and smell
Hydrogen Sulphide	<ul style="list-style-type: none"> • water with strange taste and smell (rotten eggs)
Parameter	Associated health problems if parameter is found above acceptable levels
Total coliforms and <i>E.coli</i> tests	<ul style="list-style-type: none"> • gastrointestinal problems or diarrhea • may cause life-threatening illness especially in infants, the elderly and immunosuppressed people
Nitrate/Nitrite	<ul style="list-style-type: none"> • may cause life-threatening methaemoglobinaemia whereby tissues become oxygen deprived, especially susceptible are infants under the age of 3 months
Arsenic	<ul style="list-style-type: none"> • long term exposure may lead to cancer risk • acute poisoning may cause abdominal pain or vomiting
Uranium	<ul style="list-style-type: none"> • long term exposure may lead to cancer risk
Lead	<ul style="list-style-type: none"> • accumulation of lead in body may cause problems with central nervous system, mainly problematic for young children/infants and pregnant women

Maintaining and Testing Your Well

Proper care of your well is a good way to protect the quality of your drinking water and reduce future repair costs.

Well maintenance begins with proper record keeping. Your records should include details about the well's construction (well log), results of water quality tests and information about maintenance work.

Periodically, check your well to make sure the well cap is in place and the above ground well casing is not cracked or corroded. Also, inspect the area surrounding the well to make sure surface water is draining away from the well and not pooling.

Water quality may vary throughout the year depending on the season. To be sure your water is safe to drink, you should have your water tested for bacteria twice a year (spring and fall) and for inorganics at least every two years. If you suspect a water quality problem, however, you should have your water tested as soon as possible.

To check your water quality, you will need to pick up a sampling kit from a local office of the provincial



Keep chemicals and waste away from your well to prevent contamination.

departments of Health and Wellness or Environment and Local Government. The kit includes sample bottles and instructions on how to properly collect a well water sample. After collection, the sample can be submitted to the provincial government laboratory or an accredited private industry laboratory for testing and analysis. If you receive results from an accredited private laboratory that indicate the presence of bacteria you should immediately contact your local Department of Health and Wellness office for assistance on appropriate corrective action.

Keep chemicals and waste away from your well to prevent contamination. Also, keep your septic system in good condition in order to

avoid water quality problems.

It is important to note any changes in the amount of water that can be pumped from your well. A decrease in the well's output over time can indicate your well is either clogged due to bacterial or mineral build-up, or your pump is not working properly.

A well contractor can remove the build-up of minerals and bacteria by injecting strong acids into your well or by physically agitating and removing the build-up from the well. If there is a problem with the pump or pumping system, a licensed well contractor or qualified pump installer should be consulted.



Check your well to make sure the well cap is in place and the above ground well casing is not cracked or corroded.

Protecting Your Drinking Water

Did you know it takes as little as one litre of gasoline to contaminate one million litres of groundwater? Gasoline is only one of many chemicals that can contaminate groundwater resources.

Domestic wells can become contaminated from nearby or distant sources. In any case, care must be taken to protect our groundwater supplies. This is especially important since contaminated groundwater can travel in the subsurface from one area to another.

Following are some of the more common sources of harmful chemicals that can make their way into groundwater:

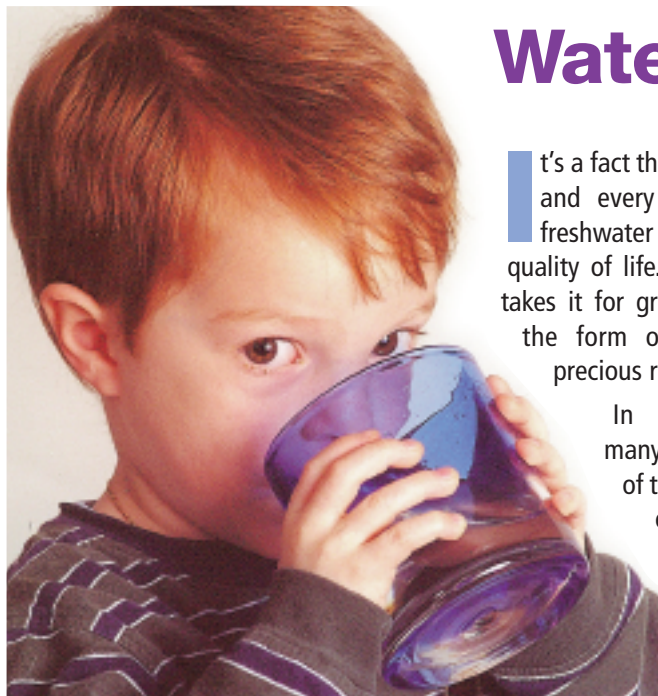
- Pesticides and fertilizers
- Leaking gasoline tanks (from cars and underground storage tanks)
- Home heating oil spills or leaks
- Garbage disposal sites
- Waste from mining activities



Bacteria from manured fields, septic tanks and animal wastes can also find their way into groundwater and impact the quality of water supplies.

Following are some things you can do to prevent bacterial and chemical contamination of your drinking water:

- Avoid the use of pesticides and fertilizers
- Clean up chemical spills right away
- Check for leaking septic tanks
- Keep garbage in a proper storage place
- Minimize the amount of activity around your well
- Ensure surface water doesn't pool in the area around your well



Water Conservation: It is Important!

It's a fact that we need freshwater to survive! Each and every day we depend on freshwater to live and for our quality of life. Yet, almost everyone takes it for granted. Freshwater, in the form of groundwater, is a precious resource.

In North America and many other developed parts of the world, consumption of freshwater has increased to the point where we use it up at a faster rate than nature can replenish it. Unlike coal, oil or gas, freshwater is a renewable resource.

The human body requires four litres of freshwater a day to survive.

However, more water can be taken out of the ground than can be put back in. Population growth, increased living standards, inefficient use and waste threaten our supply of freshwater.

The human body requires four litres of freshwater a day to survive. That is about one wash pail of water a day for every person on Earth. We also use water for domestic purposes such as cooking, bathing and cleaning. On average, we use about 326 litres, or about 82 wash pails of water, per person per day in Canada for indoor uses alone.

It is time to take responsibility for our actions. We must all learn to become more water wise. Water conservation will not only help you minimise water use but can save money as well.

What Can You do to Conserve?

1
Repair leaky or damaged faucets



2
Turn off the faucet when shaving or brushing teeth



3
Place a plastic container filled with water or sand in the toilet tank to reduce the amount of water per flush

4
Install a low-flow showerhead



5
Water the garden in the early morning or evening hours during the summer to reduce water lost to evaporation



6
Only run dishwashers and washing machines when they are full



References

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Web Sites

www.epa.gov/OW/you/chap3.html

<http://www.epa.gov/owm/water-efficiency/index.htm>

<http://www.getwise.org>

NOTE: All About Your Well is not a legal document. For complete information regarding regulatory requirements with respect to well drilling, an office of the NB DELG may be contacted.