

June 2011

Safe Water GUIDE for Private Well Owners

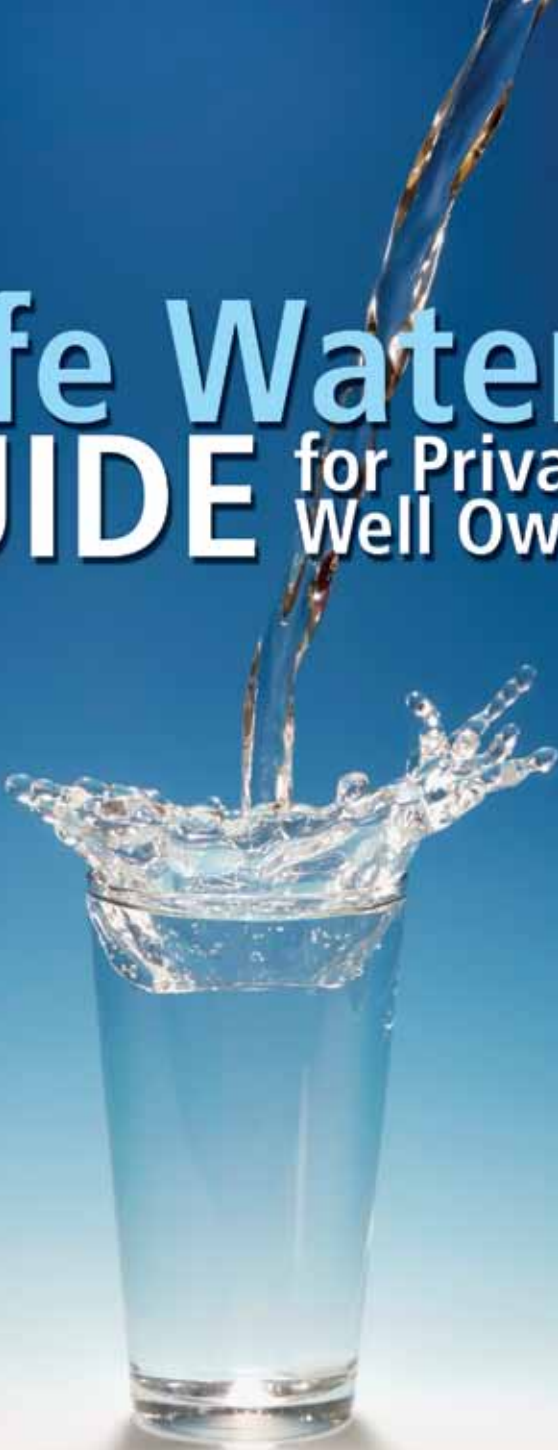


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Introduction

Many Haldimand and Norfolk County residents get their drinking water from private wells.

The water in wells comes from an underground water source called groundwater. Groundwater is water beneath the surface within soil pore spaces and in the cracks of rock formations. While surface water is concentrated in streams and lakes, groundwater is almost everywhere.

If you own a well and get your drinking water from a groundwater source, you are responsible for testing the water, maintaining the well and taking steps to prevent contamination of your drinking water.

This booklet was prepared to help private well owners maintain the safety of their drinking water.

Adapted with permission from the Halton Region Health Department.



Common Types of Wells:

- **Large-diameter wells (dug or bored wells)** have a large diameter casing of 60-120 cm (24-48 in.). Dug wells can reach nine metres deep, while bored wells can reach 30m deep. Shallow dug wells may be prone to surface water contamination.
- **Drilled wells** have a small diameter casing of 10-20 cm (4-8 in.). These wells can reach depths of 185 m, but are commonly 15-60 m deep. Properly installed deep drilled wells may be less prone to contamination. In some cases, however, deep water sources may have poor natural water quality (e.g. high sodium content).

In the past, drilled wells were constructed at the bottom of a **pit** encased by a large diameter casing. Well pits were designed to protect the water lines from freezing. However, debris and surface water can accumulate in the well pit and possibly enter the well leading to contamination of the water. Provincial regulation now prohibits the construction of well pits. **If you have a well pit, consider upgrading your well and removing the pit.**



Photo courtesy of Simon Smith Drilling Ltd.



Photo courtesy of Simon Smith Drilling Ltd.



Photo courtesy of Well Wise Resource Centre

Well Construction

Ontario Regulation 903 (Wells) requirements

Proper well construction and maintenance is essential to prevent contaminants from entering the drinking water supply. Ontario Regulation 903 made under the Ontario Water Resources Act, outlines minimum construction standards for all well types. Well construction and repairs to an existing well should always be done by a contractor who is licensed by the Ontario Ministry of Environment (MOE). Well contractors are listed in the Yellow Pages and on the MOE website: <http://209.47.226.245/>

Well cap – must be tight-fitting and equipped with a screened vent to prevent entry of animals, insects, and plant material.

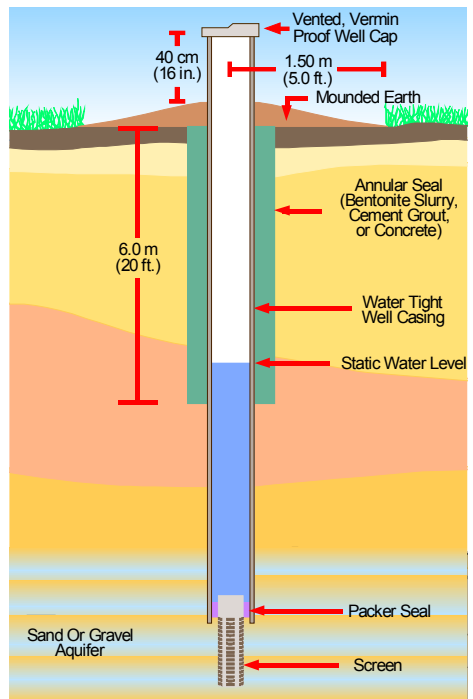
Mounded earth – directs surface water away from the well preventing surface water from entering.

Annular seal – consists of watertight material that fills the gap between the well casing and the surrounding earth.

Well casing – must be watertight to prevent contaminants from entering the well; and extend at least six metres (20 feet) below ground level and 40 cm (16 in) above the ground.

Screen – a perforated cylinder that is attached to the bottom of the drilled well casing; it keeps particles out and water in.

Construction of a drilled well



Best Management Practices - Water Wells



Photo courtesy of Simon Smith Drilling Ltd.

Location, location, location!

Make sure the well is located at a safe distance from any source of contamination such as septic systems, barn yards and roads. A dug well should be located at least 30 metres away from a septic system, and a drilled well should be located at least 15 metres away.

Water well record

A Well Record must be provided to you by the licensed well contractor within two weeks following the construction of a new well. This record must be updated when changes are made to the well, and must also be provided to you when a well is decommissioned. A water well record should contain information on:

- ✓ well location
- ✓ type of soil and bedrock
- ✓ well depth
- ✓ well construction method
- ✓ materials used in construction of the well
- ✓ details on well plugging and sealing
- ✓ pumping test results
- ✓ contractor information/license number

To order a copy of your well record, contact the Ministry of the Environment at 1-888-396-9355.

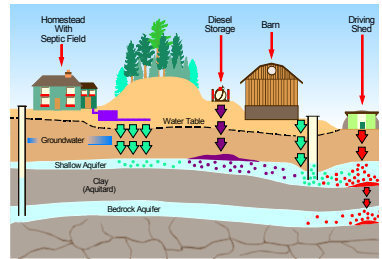
Well Maintenance and Groundwater Protection

It is important to inspect your well at least once a year to check for cracks or other structural concerns. A properly maintained well will help to safeguard your drinking water supply.

Well inspection

Inspection of the outside of your well

- Determine if you have any potential sources of contamination near your well (e.g. manure pile, septic system, pesticides, fertilizers and fuel tanks). Protect your well from access to pets and livestock. Do not store, use or dispose of garbage, manure, petroleum, salt, pesticides or any other potential contaminants near the well. Move storage of these items away from the well.
- Create a three metre radius grass buffer around your well. No other plants, bushes or trees should be allowed to grow within this area.
- Do not treat the area around the well with pesticides or fertilizer.
- The earth around your well should be mounded to direct surface water away and prevent pooling around your well.
- Well casing should extend at least 40 cm (16 inches) above the mounded earth.
- Well casing should not move when pushed. If it does, the annular seal may have shrunk, collapsed or cracked.
- Address septic system malfunctions immediately. Signs of septic malfunction may include backed up or slow drains, spongy spots on or near the leaching bed, sewage on the ground or near the bed, odour in the basement or outside and poor water quality.



Best Management Practices - Water Wells

- Do not flush oils, detergents, paints, solvents or other chemicals down the toilet or sink. Remember, waste poured into your septic system can pollute your water supply and the supply of others who may share the same source. Always dispose of household hazardous waste at a Hazardous Waste Depot. Please visit your municipality's website for more information at either **www.norfolkcounty.ca** or **www.haldimandcounty.ca**.

Inspection of well interior

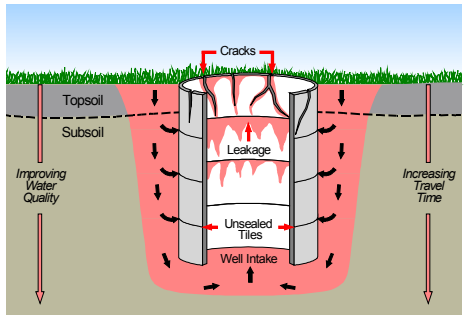
It is recommended that you hire a licensed well contractor to inspect the interior of your well. This advice should be taken into consideration especially where a well pit is involved as only individuals with confined space training and proper equipment should enter into a well pit.

- Inspect the well cap for proper construction.
- If your well is located in a well pit, there should not be any visible water or debris inside the pit. Consider upgrading your well and removing the well pit.
- Stains below joints on the inside of your well casing indicate seepage of water through the joints or cracks. There should not be any debris floating on the surface of the well water.
- If you have a treatment device, it should be maintained in good working order and operated according to the manufacturer's instructions.

Upgraded dug well



Photo courtesy of Simon Smith Drilling Ltd.



Best Management Practices - Water Wells

Well upgrades

Contact a Ministry of Environment (MOE) licensed well contractor to upgrade, repair or construct a new well on your property. Contact information for well contractors can be found in the yellow pages or on the MOE website.

Poorly constructed and maintained wells



Photos courtesy of Simon Smith Drilling Ltd.

Well decommissioning

Neglected wells, or wells that are not in use, can allow surface water and contaminants to reach the groundwater source and contaminate it. Also, children and animals may become injured from falling into an abandoned well.

Wells that are not being used or maintained for future use must be properly sealed and plugged by a well contractor according to requirements outlined in O. Regulation 903 (Wells).

Well Water Contaminants

Bacteria

Wells get water from groundwater supplies that are replenished by surface water. Under ideal conditions, water is filtered to remove bacteria and other organisms, including disease causing agents, as it moves through the soil and rock particles. Cracked well casings and missing or damaged well caps allow contaminants such as insects and surface water containing bacteria and other contaminants to bypass the filtration step offered by the soil and travel more directly into the groundwater supply.

The well water sample that you submit to the Public Health Lab is only tested for *Escherichia coli* (*E. coli*) and total coliforms. These two groups of bacteria are known as indicator bacteria. Below are additional details on these indicator organisms.

Total coliform are a group of bacteria that are present in animal waste and sewage, but are also found in soil and on vegetation. Water samples are tested for these bacteria as their presence in well water indicate that surface water is entering your well. They indicate that other contaminants that could cause illness may also be entering your well. Three water samples taken one to three weeks apart with a result of five or less total coliforms and zero *E. coli* is considered to be a stable water supply that can be used for drinking.

***Escherichia coli* (*E. coli*)** bacteria are found only in the digestive systems of people and warm-blooded animals. These are also indicator organisms and while some *E. coli* bacteria are not harmful to humans, the presence of *E. coli* in your well water sample indicates that sewage contamination from a nearby animal or human source has occurred. This is an early warning signal that potentially more harmful organisms such as *E. coli* 0157:H7 or protozoa could be present and steps need to be taken to protect your drinking water supply.

Table 1 - Examples of Bacterial and Protozoan Contaminants of Drinking Water and Related Symptoms

| Contaminants (Organism) | Source of Organism | Symptoms |
|------------------------------|--|---|
| <i>E. Coli</i> 0157:H7 | Human/Animal Waste | Stomach cramps, diarrhea (possibly bloody), fever (infrequent), nausea and vomiting |
| Salmonella Bacteria | Livestock, poultry, cats, dogs and other animals | Sudden onset of cramps, diarrhea, nausea, fever, chills, headache and vomiting |
| Cryptosporidiosis (Protozoa) | Human/Animal Waste | Abdominal cramps, fatigue, nausea, vomiting and low grade fever |
| Giardia (Protozoa) | Human/Animal Waste | Diarrhea, loose stool, stomach cramps, bloating, severe gas, weight loss, fatigue and dehydration |

Chemical Contaminants

Nitrates

Nitrates are naturally present in the environment and well water. However, some human activities such as overuse of fertilizers, improper storage of manure and poorly-functioning septic systems can contaminate the environment and your well water. Nitrates are colourless, odourless, and tasteless in water.

- Nitrate concentration should not be more than 10 mg/L as indicated by the Ontario Drinking Water Quality Standards.
- Only testing can determine the nitrate concentration in your drinking water.
- Well water should be tested for nitrates at least once a year, especially in households with an infant (see info box below).
- High levels of nitrates in well water can be caused by groundwater contamination from manure, fertilizer, or sewage.
- If your water has nitrate concentration above 10mg/L, use an alternate water supply or treat the water to remove nitrates. Nitrate levels above 10 mg/L is a concern for infants under six months old. There are also some concerns about possible adverse health outcomes for adults related to drinking water containing nitrates.
- Boiling the water will increase the nitrate concentration.
- Distillation and reverse osmosis water treatment devices can remove nitrates from water (sample and test water after treatment to verify treatment was successful in removing or reducing nitrates).

Nitrates and your baby

Nitrate levels above 10 mg/L from your well water supply could lead to a condition known as blue baby syndrome in infants under six months of age. Nitrates reduce the ability of the blood to carry oxygen and this lack of oxygen to the body causes the skin to appear blue in colour. If you prepare formula or baby food for an infant under six months of age, ensure the well water is tested for nitrates.

Sodium

Sodium is abundant in nature and is found in most soils and groundwater sources. Man-made sources such as road salts, sewage and industrial waste can also contribute to increasing sodium levels in groundwater. The domestic use of water softening chemicals can also dramatically increase the sodium level in your drinking water. Sodium is not toxic, however, even if you are not on a sodium-restricted diet (see note below), it is recommended that a separate, un-softened water supply be used for drinking and cooking purposes.

- The majority of sodium consumed comes from food not water.
- Boiling the water will increase the sodium concentration.
- Reverse osmosis and distillation devices can reduce sodium concentration.
- Locate new wells away from all man-made sources of sodium that may contaminate your well water over time.

Note

For persons on a sodium-restricted diet due to health conditions including hypertension or congestive heart disease, the intake of sodium from drinking water could become significant. The Haldimand-Norfolk Health Unit recommends that if you suffer from any of the above health conditions, and the sodium concentration in your well water exceeds 20 mg/L, you should consult with your family physician about your daily sodium intake.

Herbicides and pesticides

Herbicides and pesticides applied on farmland and around the home may contaminate wells if used improperly or excessively. These products must be used according to applicable regulations and manufacturer's instructions.

Well Water Testing

Why you should test your well water for bacteria

Water quality can change over time. Testing your well water for bacteria at least three times every year will keep you informed about the safety of your family's drinking water. It is recommended that sampling be carried out in the spring, summer and fall – especially following a heavy rainfall.

Private well owners are responsible for sampling and submitting their well water for testing. The Public Health Laboratory will test well water samples from private residences free of charge for bacteria (total coliform and *E. coli*).

Test your well water three times annually and when:

- Major plumbing or well repair was carried out
- Flooding has occurred
- A change in the well water quality (odour, taste or colour) is detected
- The well water has not been used for several weeks
- Regular well users experience unexplained illness that may be water related

How to test your well water for bacteria:

- Pick up an approved water sample bottle from any Haldimand-Norfolk Health Unit office (locations on page 24)
- Remove the strainer screen from your household tap and disinfect the end of the spout using an alcohol swab or dilute bleach solution (1 part bleach to 9 parts water).
- Run the cold water through the tap for three to four minutes to remove standing water from your plumbing system.
- Fill the bottle up to the indicator line with water directly from the tap without rinsing the bottle or bottle cap. Avoid setting down the lid or touching the bottle lip, inside the lid, or inside of the bottle.
- Complete all the required information on the submission slip.

Note: The Haldimand-Norfolk Health Unit number is 2234.

- Return the water sample and submission form to your nearest Haldimand-Norfolk Health Unit office on any weekday EXCEPT Friday. No returns are accepted on Friday as lab analysis needs to occur within two days of receiving the sample (locations on page 24).
- The water sample will be sent by courier to the Hamilton Public Health Laboratory. The Haldimand-Norfolk Health Unit is not responsible for lost results.
 - ✓ Be sure to drop off your well water sample within 24 hours of collection.
 - ✓ The sample should be refrigerated unless it is dropped off immediately after collection.
 - ✓ Be sure to record and store the Personal Identification Number (PIN) in a safe location in order to retrieve your results. The PIN number is located at the side of the water sample bottle.

How to get your well water sample results:

There are three ways you can get your well water test results:

1. The results will be mailed to you from the lab in seven to 10 working days from the day the sample was submitted.
2. You can call 1-877-723-3426 for your test results after four to five business days from the day the sample was submitted. To call, you will need your PIN number.
3. You can pick-up your result at the Public Health Laboratory, located at 250 Fennell Avenue, Hamilton, 905-385-5379 or 1-866-282-7376.

Testing your well water for other contaminants

Tests are available through private laboratories at the well owner's expense. A list of private laboratories is available through the Ministry of the Environment (MOE) website www.portal.gov.on.ca/drinkingwater/dw_el_prd_042275.pdf or by calling the MOE at 1-800-565-4923.

Table 2 - Interpretation of Your Well Water Sample Results

| Organisms | Lab Results & Ontario Drinking Water Quality Standards Interpretation | | Recommendations |
|---------------------------|---|---|--|
| Total coliform per 100 ml | Five or less | No significant evidence of bacterial contamination. | Three samples, taken one to three weeks apart, are needed to determine the stability of the water supply. |
| <i>E. coli</i> per 100 ml | 0 | | |
| Total coliform per 100 ml | More than five | Significant evidence of bacterial contamination. | <p>May be unsafe to drink. Immediately re-sample your water supply to confirm your results.</p> <p>Inspect your well and have any structural problems fixed by a licensed well contractor if required. If the re-sample water results contain greater than five total coliforms, disinfect your well (see pg.19) and re-sample three to five days after disinfection when the water system is free of chlorine*.</p> <p>If you have a treatment system, check the operational status of the treatment system and repair if required. Consult with a water treatment company.</p> <p>Contact the Health Unit if more information is required.</p> |
| <i>E. coli</i> per 100 ml | 0 | | |
| Total coliform per 100 ml | 0 or more | Significant evidence of bacterial contamination. Animal or human waste contamination. | <p>Unsafe to drink. Do not drink well water unless treated or boiled (see pg. 17 for how to use water safely for other purposes). See above recommendations for corrective actions.</p> |
| <i>E. coli</i> per 100 ml | Greater than zero | | |

Note: * Three consecutive good test results (total coliform – five or less, *E. coli* – zero) taken one to three weeks apart indicate that the chlorine treatment was effective and the water supply is considered to be safe for drinking. Test well water at least **three times a year**.

If any of the consecutive water test results show total coliform greater than five and *E. coli* - greater than zero, you should consult with a licensed well contractor and/or consider installation of a water treatment system.

How to use water safely when your bacterial test results indicate that the water is unsafe to drink:

Boil your water at a rolling boil for at least ONE MINUTE before using it to:

- drink
- gargle, brush teeth or rinse dentures
- rinse contact lenses
- wash fruits, vegetables and other foods
- make ice, juices, puddings, or other mixes
- make baby food or formula

Another option is to use an alternate water supply such as bottled water.

Hand washing:

The water can be used for hand washing if the *E. coli* test result was zero and no one in the household is experiencing gastrointestinal illness. There is no need for additional hand disinfection with bleach solution or alcohol.



Dishwashing by hand:

Use boiled water for washing dishes, or wash them in soap and hot tap water then rinse them in boiled water.

You can also wash dishes in soap and hot tap water and then rinse them in a bleach solution. Mix approximately 30 ml (one ounce) of bleach in 13.5 litres (three gallons) of water at room temperature.

Allow dishes to soak for at least one minute in this solution. Let the dishes air dry.

Hint – Half-fill a normal kitchen sink and add 30 ml (one ounce) of bleach

Dishwashing using a mechanical dishwasher:

Use your dishwasher’s “hot” setting to safely disinfect dishes.

For dishwashers without a “hot” setting, finish the cycle then soak dishes in a bleach solution for one minute. Mix approximately 30 ml (one ounce) of bleach in 13.5 litres (three gallons) of water at room temperature. Allow the dishes to air dry.

Cleaning (countertops, cutting boards, and utensils):

Surfaces that have come in contact with raw meat should first be cleaned with soap and hot water then wiped with a bleach solution.

Mix approximately 60 ml (1/4 cup) of bleach in 4.5 litres (one gallon) of water. This is a stronger solution than the one used for rinsing dishes. Do not reuse or store this solution. Make it fresh daily. Keep it out of reach of children in a tightly closed container.

Bathing:

- Do not swallow any water while bathing or showering.
- Adults, teens and older children can use the water for baths and showers.
- Small children should be given sponge-baths instead of tub baths or showers.

Laundry:

Continue doing laundry the way you usually do.

Water play activities:

- Contaminated water is not safe to use in children’s pools as children tend to drink the water.
- The lawn sprinkler should not be used for play.

Well Disinfection



1. Measure the diameter of the well (the distance across the centre of the well, from one side to the other).
2. Calculate the depth of water in the well by subtracting the distance to the resting water level from the well depth.
3. Using Table 3 on page 20, measure the amount of bleach needed (Table 3 indicates the amount of bleach needed for different well sizes). Use caution when handling chlorine bleach. Follow the directions on the product label.
4. Remove or bypass any carbon filters on the system. The filters will remove the chlorine from the water and as a result, any pipes beyond the filter will not be disinfected. Replace with new filters after disinfection to avoid reintroducing bacteria into the system.
5. Mix the chlorine with water in a bucket. Then, pour the mixture into your well by allowing it to run down the inner wall of the casing. If possible, mix the water in the well by attaching a hose to a tap, and running water from the well through the hose and back into the well.
6. Run the water at every interior and exterior faucet until a chlorine odour is detected. Turn off all faucets.
7. Add more bleach to the well if the chlorine smell is weak or undetected and repeat Step 6.
8. Drain the hot water tank and fill with chlorinated water.
9. Back-flush the water softener and all water filters (except carbon filters).
10. Let the chlorinated water stand in the system for at least 12 hours, preferably overnight.
11. Remove the chlorinated water from the well by turning on an outside tap with hose attached and run the water until the chlorine smell is no longer detected. Ensure the waste water is directed away from the septic system. Run all indoor faucets until the water no longer smells of chlorine.
12. Test the well water three to five days after disinfection, to ensure that the system is free of chlorine. Three consecutive good test results taken one to three weeks apart indicate the treatment was successful and that the water is safe to drink.

Table 3 - Well Disinfection Using Chlorine Bleach

| Volume of Bleach to Add for Every Three Metres (10 Feet) of Water in the Well | | |
|---|--------|-----------------------------------|
| Well Casing Diameter | | Volume of Bleach (5.25% solution) |
| millimetres | inches | millilitres |
| 50 | 2 | 6 |
| 100 | 4 | 30 |
| 150 | 6 | 60 |
| 200 | 8 | 100 |
| 250 | 10 | 200 |
| 300 | 12 | 250 |
| 400 | 16 | 400 |
| 500 | 20 | 650 |
| 600 | 24 | 900 |
| 900 | 36 | 2000 (2 litres) |
| 1200 | 48 | 3600 (3.6 litres) |

Water Treatment Devices

- It is important to continue to monitor the quality of your drinking water through regular testing for bacteria (three times per year) even when a treatment device is being used.
- Always follow the manufacturer’s instructions for proper installation, use and maintenance of your treatment device.

Table 4 - Water Treatment Devices

| Water treatment method | Uses | Limitations |
|------------------------------|---|--|
| Ultraviolet light | kills all micro-organisms used with filtration to remove microbes embedded in dirt particles, including parasites | UV lamp must be kept clean UV lamp must be replaced yearly or as indicated in manufacturer's instruction |
| Distillation | kills all microbes by heat removes heavy metals and nitrates often used in combination with activated carbon filters | can concentrate chemicals with boiling points lower than water in distilled water (like ammonia) needs regular de-scaling and weekly disinfecting with bleach or heat |
| Chlorination | kills bacteria and viruses used with filtration to remove microbes shielded or embedded in dirt particles, including parasites | needs careful handling of chlorine needs testing of chlorine levels needs maintenance of dosing pump |
| Ozonation | kills most micro-organisms but not cryptosporidium removes organic compounds, including pesticides can be used in combination with activated carbon filters | needs filtration to remove microbes embedded in dirt particles, including parasites varies in effectiveness depending on application and manufacturer |
| Activated carbon filtration* | removes traces of organic compounds and chemicals, including pesticides used for removing tastes and odours | not suitable for removing minerals, or larger amounts of chemicals must be replaced regularly can become a dangerous source of bacteria and taste and odour problems |

Table 4 - Water Treatment Devices

| Water Treatment Method | Uses | Limitations |
|------------------------|---|---|
| Reverse osmosis* | removes nitrates, sulphate, hardness, most microbes, dirt particles and small amounts of some pesticides used in combination with activated carbon filters | can result in plugged membranes because of hard water costly because of need to replace membrane needs pre-filtration and softening of hard water |
| Greensand Treatment | removes moderate amounts of iron and manganese | not suitable for removing microbes difficult to operate or maintain |
| Softeners | reduce hardness that produces lime deposits on dish-washed items, and gives a starched effect on laundry | not suitable for removing microbes or most chemicals increase sodium concentration in treated water |

* Should not be used with microbiologically unsafe waters or water of unknown microbiological quality.

Table references:

Table 1: Pathogenic Organisms and Related Symptoms
Ministry of Health and Long Term Care

Table 2: Interpretation of your well water sample results
Ministry of Health and Long Term Care

Table 3: Well Disinfection Using Chlorine Bleach
Ministry of Health and Long Term Care

Table 4: Water Treatment Devices
Ministry of Health and Long Term Care

Well Water Testing Log Sheet

| Date | Result | Action |
|------|--------|--------|
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Haldimand-Norfolk Health Unit Office Locations

The Haldimand-Norfolk Health Unit services both Haldimand County and Norfolk County. We are open Monday through Friday, 8:30 a.m. to 4:30 p.m.

- **Simcoe Office:**
12 Gilbertson Drive, P.O.Box 247, Simcoe ON N3Y 4L1
Ph: 519.426.6170 or 905.318.6623
Fax: 519.426.9974
- **Caledonia Office:**
282 Argyle Street S. Caledonia ON N3W 1K7
Ph: 905.318.5367
Fax: 905.765.8905
- **Dunnville Office:**
117 Forest Street East Dunnville ON N1A 1B9
Ph: 905.774.3333
Fax: 905.774.1538
- **Langton Office:**
22 Albert Street, Langton, ON N0E 1G0
Ph: 519.875.4485
Fax: 519.875.4789

Resources

Haldimand-Norfolk Health Unit

Website: www.hnhu.org

E-mail: info@hnhu.org

Phone: 519.426.6170 or 905.318.6623

Ministry of Health and Long-Term Care: fact sheets

Website: www.health.gov.on.ca

Phone: 1-800-267-8097

Canada Mortgage and Housing Corporation

Water Quantity and Conservation Household Guide to Water Efficiency

Website: www.cmhc-schl.gc.ca

Phone: 1-800-668-2642

Ministry of Municipal Affairs and Housing

A Guide to Operating and Maintaining Your Septic System

Website: www.mah.gov.on.ca/

Phone: 1-416-585-6666

Ontario Ministry of Agriculture, Food and Rural Affairs

Information on pesticide, fuel and fertilizer storage, and aspects of nutrient management

Website: www.omafra.gov.on.ca/

Phone: 1-888-466-2372

Ontario Ministry of the Environment

Well-related publications, links to regional and district MOE offices, Acts and regulations

Website: www.ene.gov.on.ca

Phone: 1-800-565-4923

