Ministry of Health

Small Drinking Water Systems under the *Health Protection and Promotion Act*

Treatment Options

Working Together to Safeguard our Health

This fact sheet provides basic information. It must not take the place of medical advice, diagnosis or treatment. Talk to a health care professional about any health concerns you have, and before you make any changes to your diet, lifestyle, or treatment.

Small drinking water systems in Ontario

The Ministry of Health has oversight of small drinking water systems in Ontario. This fact sheet is to help you become familiar with Ontario's small drinking water system legislation, Ontario Regulation 319/08 (Small Drinking Water Systems) made under the *Health Protection and Promotion Act*. Under this law, you are required to provide users with safe drinking water at all times.

What are the treatment requirements for my small drinking water system?

For each small drinking water system, a public health inspector will conduct a site-specific risk assessment and issue a directive outlining the operational requirements that are necessary for owners and operators to follow to provide safe drinking water to users at all times.

An important consideration in determining these operational requirements is the type of source water you use and the design of your small drinking water system.

To know if you require a treatment device for your small drinking water system, you should begin with regular testing of your drinking water for Escherichia coli (E. coli) and total coliforms. Testing must be carried out by an Ontario laboratory that is licensed by the Ministry of the Environment, Conservation and Parks or an out-of-province laboratory that has been approved by the Ministry of the Environment, Conservation and Parks.

Contact your local public health unit to discuss your specific circumstances and schedule a site-specific risk assessment.

Do you know the quality of your source water?

In Ontario, most small drinking water system operators obtain their water from two main sources: groundwater or surface water.

The type and quality of source water used and the design of your small drinking water system usually determines the treatment required:

Secure Groundwater

Treatment may not be required for water that is obtained from a secure, well-constructed and maintained groundwater source, such as a drilled well.

Non-secure groundwater

Treatment is required if the source water supplying your small drinking water system is a non-secure groundwater source and is used for drinking. If the construction or design of your well allows contamination by surface water, then you may be required to provide filtration and disinfection to the well.

Surface water

Treatment must be provided if the source water supplying your small drinking water system is from a surface water source and is used for drinking. For surface water, you will be required to provide mechanical or chemical assisted filtration and

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primary disinfection. If your small drinking water system has a distribution system, you may be required to provide secondary disinfection.

To help you make the right choices about the treatment requirements that are appropriate for your small drinking water system, contact the local public health unit and speak to a public health inspector. Following the site-specific risk assessment, the inspector will issue you a directive which will set out any treatment requirements for operating your small drinking water system.

Choose a treatment device that is best for your drinking water system

There are two types of drinking water treatment devices available: disinfecting devices that are used to inactivate or remove harmful microorganisms and water conditioning devices that are used for the control or removal of chemical, taste and odour problems.

Before you choose a device, it is important to have your water tested and speak with a water treatment specialist. Look for a device that has been certified by an accredited certification body. They provide standards that have been designed to safeguard drinking water by helping to ensure the material safety and performance of products that come into contact with drinking water.

The following table is a guide for choosing the most appropriate treatment device. It is based on the premise that it is practical and efficient to treat some water quality problems before others. For example, you must control turbidity, acidity, hardness or iron before water conditioners such as activated carbon filters, reverse osmosis units, or distillers can operate efficiently.

Contaminant	**Possible removal technologies**
Turbidity (suspended material, dirt)	Filtration
Fecal coliform (coliforms, E. coli)	Disinfection

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Contaminant	Possible removal technologies
Viruses (Enteroviruses)	Filtration and disinfection
Parasites (Cryptosporidium oocysts, Giardia cysts)	Filtration and disinfection
Chemicals (Arsenic, Fluoride, Lead, Nitrate and Nitrite, Sodium, Uranium)	Contact a water treatment specialist to determine which device would be most suitable for your system: Submicron Filtration, Anion Ion Exchange, Activated Alumina, Reverse Osmosis, Micro-filtration

Filtration

This process uses a filter to remove particulates and reduce the number of parasites from the source water. Filtration is required for all surface water systems and for non-secure groundwater systems that are vulnerable to surface water contamination.

Filtration is the simplest method for removing suspended particles and turbidity from a drinking water supply to allow for successful disinfection. Filtration methods include slow and rapid sand filtration, diatomaceous earth filtration, direct filtration, membrane filtration, and cartridge filtration.

Disinfection

This process reduces or eliminates the number of harmful micro-organisms in water. Disinfection is required for all surface water systems and for non-secure groundwater systems that are vulnerable to surface water contamination.

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Disinfection can be achieved by means of chemical or physical disinfectants such as chlorine, chlorine dioxide, ozone, and ultraviolet (UV) light. The most common disinfectants used to treat water for small systems are chlorine and UV light.

There are two types of treatment systems commonly used to treat your small drinking water system supply: point-of-entry or point-of-use.

Point-of-entry

This device is installed where the water enters the home or building. All water used within the home or building will be treated, including water used for bathing and laundry. Point-of-entry systems tend to be larger and more expensive than alternative systems.

Point-of-use

This device is installed at the tap where the water is being used for drinking or cooking. Only water used from this tap is treated. Water from all other taps will be untreated and should not be used for drinking purposes.

Disinfection and water conditioning devices for treating your small drinking water system

Specific examples of treatment systems are outlined below:

Ultraviolet (UV) Light

Ultraviolet treatment is the disinfection process of passing water by a special light source – UV radiation. The special light is immersed in the water in a protective transparent sleeve and emits UV waves that can destroy harmful micro-organisms. This type of treatment is highly favoured since it does not require the addition of chemicals and therefore leaves no disinfection by-products. UV devices are required to have an alarm or automatic shut-off to alert when there is a failure.

The UV device works by emitting similar UV radiation to the sun. This radiation alters the genetic material of viruses, bacteria, molds or parasites so that they cannot

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reproduce and are considered inactivated. UV treatment does not alter the water chemically as nothing is added except energy. UV treatment does not remove dirt particles, metals such as lead or iron, or hard minerals such as calcium. Other devices are required to remove particles, metals and minerals.

UV devices are not effective at treating water that is highly contaminated, heavily cloudy or turbid, or high in iron. To increase the effectiveness of the UV device, the water may have to be pretreated. UV lamps should be checked and cleaned periodically or replaced where necessary, in accordance with the manufacturer's instructions.

Chlorinators

Chlorination devices provide disinfection to a system by continuously adding a chlorinated product to all water that is drawn from the system.

Treatment is provided by thoroughly mixing all water in the system with a specific amount (concentration) of chlorine for a sufficient (contact) time period.

The time that is required for disinfection depends on the concentration of the chlorine solution, the quality of the water entering the system, the pH of the water, the temperature and the discharge rate of the pump.

Disinfection of most disease-causing microbes occurs after 20 minutes of contact time if the pH is between 6 and 8 and the free residual chlorine is in the range of 0.2 mg/L to 0.4 mg/L.

Frequent monitoring of the water chemistry is necessary to ensure that adequate disinfection is being continuously provided.

Note: There may be an after-taste produced by the disinfection process. To effectively remove these disinfectant by-products, activated carbon filtration or reverse osmosis devices (discussed below) may be used.

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	Chlorine	UV light
Advantages	• Provides disinfection residual • Provides continuous disinfection and • • Allows for easy monitoring	• Simple to operate • Does not require the addition of chemicals • Requires very little contact time (seconds versus minutes for chemical disinfection)
Disadvantages	• Requires a constant supply of chemicals • Requires a longer contact time (minutes versus seconds for UV light)	• No disinfection residual provided • No continuous protection provided and • If the drinking water system has a distribution system, secondary disinfection will be required

Ozonators

These devices use ozone to inactivate micro-organisms and provide some residual protection.

The device is sealed and requires moderate amounts of electricity to produce ozone. Caution must be used to prevent the leakage of excess ozone from the unit into environment.

Although these devices are easy to install and maintain, they can be expensive.

Other Treatment Devices (including devices used for removal of chemicals, taste, odour)

These include ceramic filters, chlorine or iodine tablets, special cups or straws along with other filters supplemented with a chemical disinfectant. These devices must be used in accordance with the manufacturer's instructions.

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The appearance, taste and smell of drinking water are usually more obvious to the consumer than the bacterial quality. Chemicals such as iron, manganese, sulphide and calcium hardness can cause odour and taste problems.

There are several devices available to remedy these problems; however, these units deal mainly with poor odour and taste problems and do not provide disinfection. If not used correctly, they may even increase existing problems with bacterial contamination in some circumstances.

a) Activated carbon or charcoal filters

These devices are used to remove chlorine, odour and taste caused by organic materials.

The efficiency of the device depends on the quality of the source water used by your small drinking water system, e.g., if the water is dirty or has sediment plugging the filter, you will need to frequently change the cartridge filters.

They are inexpensive and easy to install and require no power to operate. These are not disinfection devices and should only be used on water that is already disinfected and safe to drink.

If you are using these devices for water conditioning, you should know that:

- The bacterial levels in your drinking water may increase because of the dirt and organic material that are trapped in the filters; and
- If you use these devices for the removal of Cryptosporidium oocysts and Giardia cysts, you must use only those filters that will remove particles one micrometre or less in diameter.

b) Reverse Osmosis

This device conditions your small drinking water system supply by forcing water through a filtering membrane to remove most microbiological (bacteria, viruses and protozoa) and chemical (metals and minerals salts) parameters.

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It is easy to install and maintain; however, the water must be pretreated to increase the life of the membrane filters that may clog or rupture if the water is of poor quality.

c) Water Softener

This process is used to remove inorganic contaminants that are inadequately removed by filtration or sedimentation. It is also used to treat hard water and can be used to remove arsenic, chromium, excess fluoride, nitrates, radium and uranium.

Softened water is not recommended for drinking because increased sodium content can pose health risks if exceeding the upper limit of 20 mg/L.

This process may use and discharge significant amounts of salt; however, sodium-free softeners are available.

Backwash from softener should not be discharged into private sewage disposal system (septic tanks).

Where can I find additional information?

Please remember…

This fact sheet is only a summary of your responsibilities as the owner or operator of a small drinking water system and is not a substitute for legal advice.

For a more complete understanding of your legal responsibilities as an owner or operator, refer to Ontario Regulation 319/08 (Small Drinking Water Systems) or any directives issued on your system.

In addition, you should become familiar with the procedure documents produced to help you efficiently operate a small drinking water system:

- Procedure for Disinfection of Drinking Water in Ontario: www.ontario.ca/page/procedure-disinfection-drinking-water-ontario

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- Procedure for Corrective Action for Small Drinking Water Systems that are Not Currently Using Chlorine [Consult your local public health unit for this resource.]

You may also find additional information on the following Ontario ministry websites:

Acts and Regulations: www.e-laws.gov.on.ca/index.html

- Ontario Regulation 319/08: www.ontario.ca/laws/regulation/080319

Ministry of Health: http://www.health.gov.on.ca/en/

- Current list of local public health units: www.health.gov.on.ca/en/common/system/services/phu/locations.aspx

Ministry of the Environment, Conservation and Parks: www.ontario.ca/page/ministry-environment-conservation-parks

- Current list of licensed laboratories: www.ontario.ca/page/list-licensed-laboratories

Ministry of Agriculture, Food and Rural Affairs: www.omafra.gov.on.ca/english/

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