

APPENDICES

LEGISLATION

ACTS

Ontario Water Resources Act	Ontario Ministry of the Environment	<ul style="list-style-type: none"> protects the quality and quantity of Ontario's surface water and groundwater
Environmental Protection Act	Ontario Ministry of the Environment	<ul style="list-style-type: none"> protects Ontario's land, water, and air resources from pollution
Safe Drinking Water Act	Ontario Ministry of the Environment	<ul style="list-style-type: none"> regulations concerning the sampling and testing, treatment, and reporting of water quality results for identified water systems
Technical Standards and Safety Act	Ontario Ministry of Consumer and Business Services, administered by Technical Standards and Safety Authority	<ul style="list-style-type: none"> protects land and water resources from damage by petroleum products
Pesticide Act	Ontario Ministry of the Environment	<ul style="list-style-type: none"> protects land and water resources from damage by improper pesticide use

REGULATIONS AND GUIDELINES

OWRA Regulation 903: Water Wells	Ontario Ministry of the Environment	<ul style="list-style-type: none"> regulations for the construction, maintenance and abandonment of water wells
Canadian Water Quality Guidelines	Canadian Council of Ministers of the Environment/ Environment Canada	<ul style="list-style-type: none"> water quality recommendations for drinking water, livestock watering, irrigation, recreation and aquatic life
Water Management Policies, Guidelines, Provincial Water Quality Objectives	Ontario Ministry of the Environment	<ul style="list-style-type: none"> provides direction for the management of quality and quantity of surface and groundwater
Ontario Drinking Water Standards	Ontario Ministry of the Environment	<ul style="list-style-type: none"> protects public interest by providing drinking water quality standards
Ontario Building Code, Reg. 403–97: Septic Systems	Ontario Ministry of Municipal Affairs and Housing Act	<ul style="list-style-type: none"> code that stipulates minimum separation distances between wells and septic systems

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METRIC – IMPERIAL UNIT CONVERSIONS

LENGTH

1 kilometre (km) = 0.621 mile	1 mile = 1.609 km
1 metre (m) = 3.28 feet	1 foot = 0.305 m
1 centimetre (cm) = 0.393 inch	1 inch = 2.54 cm
1 millimetre (mm) = 0.0393 inch	1 inch = 25.4 mm

VOLUME

1 cubic metre (m ³) = 35.3 cubic feet	1 cubic foot = 0.0283 m ³
1 m ³ = 220 imperial gallons (imp.gal.)	
1 litre (l) = 0.220 imp.gal.	1 imp. gal. = 4.55 L

DISCHARGE RATE

1 m ³ /day = 0.0116 litres per second (L/s)	1 L/s = 86.4 m ³ /d
1 m ³ /d = 0.153 imp. gal. per min. (igpm)	1 igpm = 6.55 m ³ /d
1 L/s = 13.2 igpm	1 igpm = 0.076 L/s
1 L/min = 0.22 imp. gal. per min. (igpm)	1 igpm = 4.55 L/min

PRESSURE

1 kilopascal (kPa) = 0.102 m water	1 m water = 9.8 kPa
1 kPa = 0.145 psi	1 psi = 6.895 kPa

TRANSMISSIVITY

1 m ³ /s = 5.794 x 10 ⁶ imp. gpd/ft	1 imp. gpd/ft = 1.726 x 10 ⁻⁷ m ³ /s
1 m ³ /s = 86,400 m ³ /d	1 m ³ /d = 1.157 x 10 ⁻⁵ m ³ /s

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WATER QUALITY STANDARDS IN ONTARIO AND CANADA

WATER QUALITY STANDARDS – HOW CLEAN IS CLEAN?

In Ontario, the Ontario Ministry of the Environment sets water quality standards for human use based on federal guidelines. The Ontario Drinking Water Standards set tolerance limits on how much of certain substances can be in drinking water.

The Standards list over 100 substances that have had allowable and recommended limits put in place. Copies are available from ministry offices.

Water quality standards for livestock watering and irrigation are set by the federal government and listed in the Canadian Water Quality Guidelines. These are available from Environment Canada.

WATER QUALITY NEEDS ON THE FARM

Your water quality needs depend on what the water is used for.

HUMANS

Human water uses include not only drinking and cooking, but also the handling of farm products like fruit, vegetables and milk. These uses require water that meets the Ontario Drinking Water Standards. When you test your well water, the results can be compared to the Standards, which are divided into health-related and aesthetic standards.

Health-related standards are set for bacteria and for substances such as metals, pesticides and different forms of nitrogen. Some examples are:

► lead	0.01 mg/L	► malathion	0.19 mg/L
► mercury	0.001 mg/L	► nitrate	10 mg/L (as N)
► 2,4-D	0.1 mg/L	► Total Coliform	5 colonies/100mL
		► <i>E. coli</i>	0 colonies/100mL

If test results show a contaminant exceeding the health-related standards, stop drinking the water and have it retested immediately. If the results remain elevated, steps must be taken to eliminate the contaminant

source, upgrade the condition of the well, treat the water supply, or properly plug and seal the well.

Aesthetic standards are set for substances such as iron, hardness, sulfate, colour and taste. These substances are not harmful to your health but can be objectionable if present at high levels. Several of these substances are discussed under the section on water treatment.

Aesthetic limits, such as high levels of iron or hardness, may be exceeded without causing health concerns. Some aesthetic limits, such as sediment or colour, may indicate problems with the well construction.

LIVESTOCK

The quality of water needed for livestock watering depends on the species, age, and physical condition of the animal. Most livestock have a higher tolerance to bacteria and nitrate than humans, but only if they are accustomed to it. Water for livestock should not have an objectionable taste or smell.

Many of the limited substances listed in the Canadian Water Quality Guidelines are for metals and pesticides. These can be toxic to the animal itself and can be transferred to humans through meat, milk and eggs.

The limits placed on substances for livestock can be higher than those for humans. For example:

► lead	0.1 mg/L
► mercury	0.003 mg/L
► atrazine	0.06 mg/L

Some guidelines are the same as for humans. For example:

► 2,4-D	0.1 mg/L
► glyphosate	0.28 mg/L

And some guidelines for livestock have no corresponding limits for humans. For example:

► calcium	1000 mg/L
► MCPA (methyl chloro-phenoxy acetic acid) (amines, esters and salts)	0.025 mg/L

The standard for nitrate-N in drinking water has been set at 10 mg/L because nitrate-N in drinking water above that level may cause infantile methaemoglobinaemia (the “blue baby” syndrome). In such cases, the nitrate ion is changed to nitrite by intestinal bacteria. The nitrite ion reacts with iron in the haemoglobin and reduces its ability to transfer oxygen. The tissue then becomes oxygen-starved. The effects are seen in infants.

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CROPS

The quality of water needed for irrigation and fruit and vegetable washing depends on the type of crop as well as soils, climate and method. The Canadian Water Quality Guidelines for pesticides gives different limits for (a) hay and cereals, (b) legumes and (c) other crops such as lettuce, tomatoes and sunflowers.

Again, most of the substances are metals and pesticides. One exception is bacteria, which is set at:

- *E. coli* 100/100 mL
- Total Coliform 1000/100 mL.

For pesticide mixing, the water must be clean with no sediment. Foam markers, because they are like soap, require soft water to work best.

ONTARIO WELL CONSTRUCTION REGULATIONS

The Ontario Ministry of the Environment regulations set minimum construction standards for all types of wells. The regulations cover:

- who is qualified to construct wells and install pumps
- where a well can be located
- what materials can be used
- how the well is to be constructed
- when a well must be properly abandoned.

Water well contractors are required to maintain a minimum performance standard and their employees are required to be licensed well technicians. They must abide by the water well regulations, which include minimum construction standards. Well technicians must have at least two years of experience. There are four classes of well technician.

Regulations and legislation are revised continuously. Contact the appropriate ministry or agency to confirm current requirements and standards.

WHO IS QUALIFIED TO CONSTRUCT WATER WELLS AND INSTALL PUMPS?

Anyone in the business of constructing wells must have a well contractor's license. The Ontario Ministry of the Environment licenses water well contractors and well technicians for drilling, boring, digging and pump installation.

A well contractor license pertains to anyone engaged in a well construction business (including well drilling and pump installation). The license

means that the holder is required to know the regulations, employ licensed well technicians, and hold comprehensive liability insurance. You may wish to ask for evidence of this. You may also wish to check the reliability of the contractor by asking previous customers.

Anyone can construct a water well for his or her own use, but the well must meet ministry regulations, including minimum construction standards.

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WATER WELL RECORDS

Within two weeks of completing a new well, the person who constructed the well must give the owner a copy of the Water Well Record.

The person constructing the well must also send a copy to the Ontario Ministry of the Environment.

To obtain a copy of your Water Well Record, contact the Environmental Monitoring and Reporting Branch of the ministry. Call 1-888-396-9355.

WELL OWNER RIGHTS AND RESPONSIBILITIES

The provincial regulations protect water wells from interference by large users who move into an area. If a new larger user creates problems for a domestic or livestock water supply, the supply must be restored.

The legislation controls large water users with Permits to Take Water. Anyone planning to pump more than 50,000 litres (10,000 gal.) a day must contact the Ontario Ministry of the Environment to obtain a Permit to Take Water. Water-taking for livestock and poultry, domestic gardens,

and domestic use is exempted from this requirement. (See Best Management Practices, *Irrigation Management*, for more information on Permits to Take Water).

All rights come with responsibilities. As the well owner, you are required to maintain your well so as to keep out surface water and other foreign materials.

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WELL INFORMATION AND MONITORING RECORD SHEETS

WELL INFORMATION SHEET

Type of well: *drilled / dug or bored / well point*

Year constructed: _____

Well depth: _____

Casing type: _____

Type of aquifer: *overburden / bedrock* _____

Contractor: _____

Casing depth: _____

Casing diameter: _____

Well Screen

Length: _____

Slot size: _____

Water Levels

Date: _____

Static water level: _____

Pumping water level: _____

Pump Information

Pump type: _____

Capacity: _____

Manufacturer: _____

Pumping rate: _____

Date installed: _____

Depth to intake: _____

LOCATION

North 

measure to closest permanent structure

Well Improvements

DATE

DESCRIPTION

DATE	DESCRIPTION

Well owners may want to copy and affix this well information sheet to their water storage tank for recordkeeping.

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MONITORING RECORD SHEET

INSPECTION REPORT

Date: _____		
	CONDITION	ACTION NEEDED
Distance from potential pollution sources		
Ground condition around well		
Well cap/cover/sanitary seal and vent		
Casing condition – cracks/holes seepage/staining		

WATER LEVEL MONITORING

DATE	PUMPING RATE	STATIC WATER LEVEL	PUMPING WATER LEVEL

below top of casing

WATER QUALITY TEST RESULTS

	SAMPLE #1	SAMPLE #2	SAMPLE #3
DATE TESTED			
TOTAL COLIFORM			
<i>E. COLI</i>			
NITRATE			

APPENDICES

GLOSSARY

annular space – open space between the casing and the side of a well

aquifer – a waterbearing formation that is capable of transmitting water in sufficient quantities to serve as a source of water supply

aquitard – a geological formation that prevents the significant flow of water, e.g., clay layers or tight deposits of shale

baseflow – when groundwater flows to surface water

bedding plane – in sedimentary or stratified rocks, the division planes that separate the individual layers, beds or strata

bentonite – a colloidal clay, largely made up of the mineral sodium montmorillonite, a hydrated aluminum silicate; bentonite commonly has the ability to absorb water and to swell accordingly

capillary zone – area above the water table where groundwater is drawn upward and held in tension in the pore spaces

coliform – a general family of bacteria found in animal wastes, surface soils and vegetation whose presence in well water can indicate organic contamination and possible surface water contamination

continuous chlorination – involves the continuous addition of low levels of chlorine to a water supply

denitrification – the loss of nitrogen in soils by either biological or chemical mechanisms: this is a gaseous loss that isn't related to loss by physical processes such as leaching

discharge – when the water reappears above the ground surface

evaporation – part of the water cycle where water (liquid) from the earth's surface is transformed to vapor and is added to the atmosphere

evapotranspiration – the transformation of water (liquid) from both the earth's surface (evaporation) and from the surfaces of plants (transpiration) to the atmosphere

flowing well – a well that has a static water level above the surface of the adjacent ground, causing the well to flow

formation – bedrock (e.g., granite) or overburden deposits (e.g., sands and gravels) with pores containing water and air

fracture – breaks in rocks or soil due to folding or faulting

grout – material such as bentonite (1 part bentonite mixed with 4 parts clean water) or other materials capable of forming a watertight barrier, used to fill and seal the annular space

hole stabilizer – may be a steel casing, a concrete tile, or an open hole in solid bedrock

indicator bacteria – their presence in drinking-water test results suggest possible health risks related to the well water, and are often an indication of surface water contamination

infiltration – movement of water from the earth's surface into formations

inlet – allows groundwater to enter the well, and may be a slotted well screen in overburden aquifers or an open hole in bedrock

jetting – propulsion of water under high pressure into sandy aquifers to create a hole for a well point

Karst topography – water moving through fractures in limestone has dissolved the rock, enlarging fractures and creating caverns

overburden – the loose soil, clay, silt, sand, gravel or other unconsolidated material overlying the bedrock, whether transported or formed in place

peak water demand – highest rate of water use each day: well capacities or storage facilities must be able to meet this demand

permeability – the property of porous rock, sediment, or soil for transmitting a fluid: it is a measure of the relative ease of fluid flow under an energy gradient

pitless adapter – device designed to replace the need for well pits and pump-houses – usually a metallic (brass) fitting that is attached to the casing below the frost line to connect the in-well water line to the buried water line leading to point of use

plugging and sealing – corrective actions recommended for the proper abandonment of unused wells, including: the removal of the pump, piping, water, well casing, etc. and the filling of bore hole with proper materials to prevent the downward movement of water – this procedure is normally done by a licensed water well contractor

plume – a trail of dissolved contaminants in groundwater issuing from a contaminant source and spreading out as the trail travels in the direction of groundwater flow

pore – small openings filled with air or water

porosity – the amount of pore space in a formation

pumping water level – the water level in a well being pumped

recharge – replacement of moving aquifer water with water infiltrating from the surface and percolating through unsaturated formations to the water table

recharge area – area of land beneath which there is a measurable downward driving force below the water table: rolling or steep landforms with coarse-textured deposits (e.g., sand plains, end moraines) are particularly important recharge areas because of their high vertical flow rates

saturated – pores filled with water

shock chlorination – involves adding a large amount of chlorine to the water in the well and pumping it through the system: the chlorinated water is left in the system long enough to ensure complete disinfection

solution channel – cavities formed in soluble rocks (such as limestone) by the dissolving action of moving water

specific capacity – result of dividing the pumping rate by the drawdown

spring – discharge area where groundwater moves from a shallow aquifer to the surface or surface waters: wetlands, ponds, lakes, streams and rivers can be wholly, or in part, spring-fed

static water level – the level in a well attained by water at equilibrium in a well when no water is being taken from the well

unsaturated – pores containing air or a mixture of air and water

water cycle – continuous movement of water from the atmosphere to the earth's surface (precipitation), through (infiltration, percolation) formations to aquifers (recharge), back to the earth's surface (discharge, capillary rise, plant uptake) and to the atmosphere (evaporation, transpiration, evapotranspiration)

water table – depth at which all the pores are saturated

well – a hole made in the ground to locate or to obtain groundwater from an aquifer, and includes a spring around or in which works are made or equipment is installed for collation of water and that is or is likely to be used as a source of water for human consumption

well casing – pipe, tubing or other material installed in a well to support its sides

well screen – slotted or perforated cylinder that is attached to the bottom of the solid casing of a drilled well to keep formation particles out and let water in

Agencies and Offices

Ontario Ministry of the Environment
www.ene.gov.on.ca

Regional Offices of MOE

Southwestern Region
733 Exeter Rd., 2nd Floor
London, Ontario N6E 1L3
Toll free number from area code 519: 1-800-265-7672
Fax: 519-873-5020

West Central Region
119 King Street West
12th Floor
Hamilton, Ontario L8P 4Y7
Toll free: 1-800-668-4557
Tel: 905-521-7640
Fax: 905-521-7820

Central Region
5775 Yonge Street, 8th Floor
North York, Ontario M2M 4J1
Toll free: 1-800-810-8048
Fax: 416-325-6345

Eastern Region
133 Dalton Avenue, Box 820
Kingston, Ontario K7L 4X6
Toll free for area codes
613/705/905:
1-800-267-0974
Fax: 613-548-6908

Northern Region
435 James Street South
Suite 331, 3rd Floor
Thunder Bay, Ontario P7E 6S7
Toll free from area codes
705/807: 1-800-875-7772
Fax: 807-475-1754

Water Well Records Ministry of the Environment
Environmental Monitoring and Reporting Branch
125 Resources Road
Toronto, Ontario M9P 3V0
Tel: 1-888-396-9355
Fax: 416-235-5960

Environment Canada
Canadian Water Quality Guidelines; Ecosystems Conservation Directorate; Evaluation and Interpretation Branch; Guidelines Division
Ottawa, Ontario K1A 0H3
Tel: 819-953-0602
Fax: 819-953-0461
http://www.ec.gc.ca

Ontario Ministry of Health and Long-Term Care
Contact your local health unit.

Ontario Ground Water Association
c/o 7522 Aberfeldy Line
R.R. #2
Bothwell, Ontario N0P 1C0
Tel: 519-847-5717
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http://www.ogwa.ca
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Ontario Soil and Crop Improvement Association
1st Floor, 1 Stone Road West
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Fax: 519-826-4224
http://www.ontariosoilcrop.org
or e-mail
oscia@ontariosoilcrop.org

Ontario Ministry of Agriculture and Food
Agricultural Information Contact Centre
1 Stone Road West
Guelph, Ontario N1G 4Y2
Tel: 1-877-424-1300
or e-mail
ag.info@omaf.gov.on.ca

Ontario Farm Environmental Coalition
c/o Ontario Federation of Agriculture
40 Eglinton Avenue East,
5th Floor
Toronto, Ontario M4P 3B1
Tel: 416-485-3333
Fax: 416-485-9027

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