

Drinking Water Source Protection Background Document
The establishment, operation or maintenance of a system that collects, stores,
transmits, treats or disposes of sewage
Subthreat Onsite Sewage System

v.3 March 2011
(Amendments included as Tracked Changes)

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NOTE TO THE READER

This document is one of eighteen background reports now under development by staff at various Conservation Authorities and Conservation Ontario in support of Source Protection Plan development. The final set of reports will cover all nineteen prescribed water quality threat types. Each report looks at the nature of one or more types of drinking water threat, describes the local occurrence (“is” and “would be”) of those threats, assesses existing policies/programs, and introduces related ‘policy concepts’ for source protection planning. ***While every effort has been made to ensure the accuracy of the information in this document, it should not be construed as legal advice or relied on as a substitute for the legislation.***

This version is considered to be a ***working draft*** because it will be going through additional review by MOE and subject experts. SPA/SPRs can use these documents with the understanding that additional refinement will occur. Any questions on these reports can be directed to Nicole Barbato, Source Water Protection Liaison (via nbarbato@conservationontario.ca). Thank you!

1. Definition

This paper provides background information for **prescribed drinking water threat 2C – The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage, subthreat: management of onsite sewage systems.**

The main consideration for reducing or eliminating drinking water threats related to on-site sewage systems is to prevent unacceptable impact on the water resource from chemical and pathogen parameters.

This drinking water threat includes systems that store and/or treat human waste on-site, but does not include sewage treatment plants. These systems come in a variety of forms including earth pit privies, privy vaults, greywater systems, cesspools, leaching bed systems and associated treatment units, and holding tanks. Leaching bed systems with septic tanks or holding tanks are the systems most commonly used.

There are two categories of systems: small and large. Small systems (those with a design flow less than or equal to 10,000 L/day) are subject to approval under the *Ontario Building Code Act* which may be administered by the municipalities, conservation authorities or local health units. Small systems most frequently service individual residences in rural areas or hamlets or small villages that do not have municipal or communal sewage services.

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Large systems (those with a design flow greater than 10,000 L/day) are subject to approval by the Ministry of the Environment (MOE) under the *Ontario Water Resources Act*. Also, any system, no matter its size, which cannot be located within the confines on a single property are subject to approval by the Ministry of the Environment (MOE) under the Ontario Water Resources Act. The requirements are described in more detail below. Schools, campgrounds, larger businesses and communal systems are examples of facilities that may require a large system.

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2. What causes this activity to be a drinking water threat?

The MOE Tables of Drinking Water Threats identify a number of chemicals and pathogens that could make their way from on-site sewage storage and treatment systems into the groundwater and/or surface water under certain conditions (circumstances 831 to 854 and 1955, 1956) (Ontario Ministry of the Environment, 2009). The following chemicals and pathogens could threaten the safety of these sources of drinking water in certain situations.

- Total Coliform
- *E. coli*
- Acetone
- Chloride
- Nitrogen
- Total phosphorus
- Sodium

- dichlorobenzene-1,4 (para)

While the rest of the chemicals listed above are a concern for both surface and groundwater, total phosphorous is only considered for surface water because excessive inputs of total phosphorous in surface water results in eutrophication and can lead to toxic algae blooms.

Appendix A to this report outlines the possible sources of the contaminants of interest in on-site sewage systems. The Drinking Water Threat Contaminants Summary (see Appendix D) includes details on relevant drinking water standards, guidelines or objectives, the health or aesthetic concerns and other useful information for these chemicals and pathogens.

3. Understanding the nature of the drinking water threat

On-site sewage systems, especially leaching bed systems, are prevalent in areas that are not serviced by municipal or communal wastewater treatment systems. They can be found now and or could be in the future in intake protection zones (IPZ), wellhead protection areas (WHPA), highly vulnerable aquifers (HVA), and significant groundwater recharge areas (SGRA).

A septic system or holding tank can be classified as a significant, moderate or low drinking water threat depending on the vulnerable zones, vulnerability score and circumstances related to the system. They can only be a significant threat in IPZ1's with a vulnerability score of 10 and WHPA A's and B's with a vulnerability score of 10.

It should be noted that in some sensitive areas holding tanks can be used where a standard septic systems is not an option. **Appendix B provides detailed information on the local scale of these drinking water threats.**

4. Applicable legislation, policies and programs

a) Provincial

Ontario Building Code (Government of Ontario, 2006)

Small systems (those with a design flow less than or equal to 10,000 L/day) are subject to approval by the municipality under the *Ontario Building Code Act*. Small systems most frequently service rural residences and hamlets or small villages that do not have municipal sewage services.

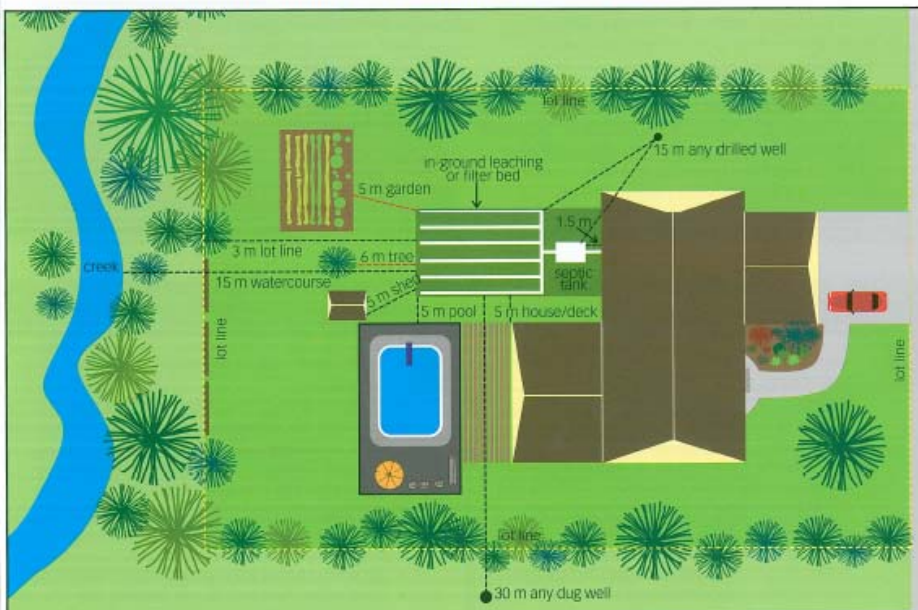
There are five classes of sewage systems under the *Ontario Building Code*:

- Class 1 - Outhouse: chemical or composting toilet, incinerating toilet or vault privy.
- Class 2 - Leaching pit for grey water disposal only
- Class 3 - Cesspool for disposal of outhouse waste

- Class 4 – Septic tank and leaching bed includes a filter bed, conventional leaching bed and chamber systems, tertiary systems (new technologies)
- Class 5 – Holding tanks (minimum 9,000 liters)

Class 4 systems are the most common and include the following components: a septic tank with filter (required as of January 1, 2007), a leaching bed or filter bed, and a mantle. These systems are generally installed on a property by property **basis** conforming to minimum separation distances in the *Ontario Building Code* as displayed on the following figure.

Minimum Separation Distances For Leaching Or Filter Beds



Notes: If a leaching or filter bed is raised the separation distances are increased by a factor directly related to the difference between the finished and existing grade. For instance, if the finished grade is 1.5 m higher than the existing then 1.5 m is multiplied by 2 to equal 3 m. Three metres is then added to all the distances noted above.

Municipalities can impose greater setbacks from waterbodies through their official plans and zoning by-laws.

Procedure D-5-4: Technical Guideline for Individual On-Site Sewage Systems: Water Quality Impact Risk Assessments (Ontario Ministry of the Environment, 1996)

The MOE “Procedure D-5-4: Technical Guideline for Individual On-Site Sewage Systems: Water Quality Impact Risk Assessments” provides technical guidance for hydrogeologists to locate septic systems in rural subdivisions with five or more units. It includes a groundwater impact assessment to address the ability of the development lands to treat septic effluent to acceptable limits. Such an assessment should be considered in conjunction with the Technical

Guideline for Private Wells: Water Supply Assessment. Approval under the Ontario Building Code is required for each system that would be installed in the subdivision.

Review of Advanced Treatment Units or New Technologies

Advanced treatment units (ATU) are generally implemented in situations where the size of the lot does not permit the installation of a conventional septic tank and associated leaching bed or when enhanced effluent quality is sought. The main difference between these systems and the conventional ones are that more treatment happens as a result of the introduction of aeration and/or a filter media. Common brands include EcoFlow and Waterloo Biofilter. ATUs must be approved through the Building Materials Evaluation Committee which is under the Ministry of Municipal Affairs and Housing before they can be permitted under the Ontario Building Code. Effluent targets for these systems to be classed as tertiary units are BOD5 15 mg/L, CBOD5 10 mg/L, suspended solids 10 mg/L (from Table 8.6.2.2.A Code and Guide for Sewage Systems – 1997 Ontario Building Code).

Ontario Water Resources Act (Government of Ontario, 1990)

The review and approval of applications for **large systems** (those with a design flow greater than 10,000 L/day) rests with the MOE under the *Ontario Water Resources Act* (OWRA).

The MOE “Guide for Applying for Approval of Municipal and Private Water and Sewage Works” (2000) is used for a number of sewage-related facilities including large on-site sewage systems that require approval under the OWRA. The most important environmental aspect to consider as part of the approval process is the impact of the sewage works on the receiving waterbody or aquifer (groundwater).

The following information is generally needed in support of an application for a large on-site sewage system:

- Expected rate of contaminants discharge to the groundwater.
- Background levels of contaminants in the groundwater.
- Estimated allowable amount of degradation based on the current and potential future uses of the groundwater in accordance with “Guideline B-7: Incorporation of the Reasonable Use Concept into MOEE Groundwater Management Activities”.
- Proposed measures to be taken to reduce or prevent groundwater contamination.
- Proposed monitoring program to assess the effectiveness of the proposed groundwater aquifer contamination control measures.

Guideline B-7 states that there are four situations where a sewage disposal system would be unsuitable:

- where no appreciable attenuation can be provided (e.g. very short time of travel to surface water),
- natural attenuation capacity is weak (e.g. fractured rocks),

- the subsurface is suited for better use (e.g. an esker that could be used as a source water supply), and
- the consequences of failure are unacceptable (e.g. affect the only water supply for a community).

Provincial Policy Statement, 2005

The Provincial Policy Statement (PPS) is issued under Section 3 of the *Planning Act*, and provides direction on matters of provincial interest related to land use planning and development. Decisions affecting planning matters must be consistent with the PPS.

The PPS indicates that municipal sewage services are the preferred form of servicing for new development. Where private communal or individual on-site sewage services (e.g. septic systems) are to be used for new development, lot creation is only to be permitted if there is confirmation of sufficient reserve sewage system capacity within municipal sewage services or private communal sewage services. This capacity relates to the ability to store and treat hauled sewage.

Reserve capacity for private communal and individual on-site sewage services is considered sufficient if the hauled sewage from the development can be treated or disposed of at sites approved under the *Environmental Protection Act* or the *Ontario Water Resources Act*. Septage treatment capacity can be confirmed in a number of ways including the implementation of a municipal septage plan, and determining that there is an MOE approved facility with capacity to receive and treat septage that is accessible within the area of new development. The capacity could be provided by a municipal sewage treatment plant in the municipality, or through written agreement with another municipality or an approved private sector facility.

b) Regional

A Report of the Great Lakes Science Advisory Board to the International Joint Commission: Groundwater in the Great Lakes Basin (February 2010)

The following recommendations were made in this IJC report that may be applicable to on-site sewage systems:

- Tracking of and communication with homeowners: Increase homeowner awareness through dissemination of information regarding the effects of septic failure (e.g., groundwater contamination) and regulatory expectations. Ideally, septic systems should be inspected as a condition for the transfer of a deed as implemented in Door County, Wisconsin, and Ingham County, Michigan.
- Permitting alternative technologies to be better integrated into the process.
- Requirement for and tracking of maintenance contracts: For example, in British Columbia, the installer only has to provide warranty on the system based on a maintenance contract. It is the onus of the owner to keep up maintenance or risk losing the warranty.

- Funding and support from local governments and homeowners: Regulatory codes should be backed by appropriate department budgets (Gorman and Halvorsen, 2006). The provincial and federal governments should help homeowners pay to fix faulty septic systems that contribute to poor water quality (Hill, 2006). For example, Ontario has a system for front-loading development costs for new developments to include cost of new sewage plants and infrastructure. Homeowners can be granted as much as \$7,500 to upgrade septic systems (Conboy, personal communication, Syracuse Consultation).

c) Municipal

Land Use Planning

Municipalities can impose greater setbacks from waterbodies through their official plans and zoning by-laws than what is required in the Ontario Building Code. A majority of the municipalities require a minimum 30 m setback from waterbodies for development (including septic systems). The intent of the water setback is to provide a buffer of undisturbed soil and vegetation along the shoreline, which will help to filter runoff, prevent soil erosion, and provide wildlife habitat.

In some cases there are also situations where even greater water setbacks are required to protect sensitive lake trout populations in what are called at-capacity lake trout lakes.

Lake trout are found in lakes that have specific concentrations of oxygen and water temperatures that the fish require to complete their life cycles. Nutrient loading (associated with phosphorus) in these lakes decreases the amount of oxygen available and increases the water temperature (through associated activities), resulting in poor water quality. This puts the fish population at risk. It also impacts human water usage.

An at-capacity lake trout lake cannot handle any more nutrient loading. In fact, measures must be taken to reduce further nutrient loading and to improve water quality. The MOE recommends that new lot creation be restricted within 300 m of a lake trout lake, and that development on lots of record be permitted under strict conditions. These recommendations are implemented through municipal official plans and zoning by-laws, in accordance with the Provincial Policy Statement, 2005.

Septic System Re-inspection Programs

Septic system re-inspection programs are used to locate faulty and failed septic systems in areas where septic systems could be a significant threat, and to require their repair or replacement in order to improve effluent, and reduce impact on groundwater and surface water quality.

The Ministry of Municipal Affairs and Housing has amending the *Ontario Building Code Act* (January 2011) required septic system re-inspection programs in vulnerable areas (e.g. WHPAs and IPZs) and voluntary programs elsewhere. The Ministry of Municipal Affairs and Housing has

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prepared guidance material on inspection programs [and additional details are available in the Source Protection Planning Bulletin – Threats related to on-site sewage \(septic\) systems.](#)

5. Gaps in existing legislation, policies and programs

- Few areas in Ontario have programs in place to ensure on-going maintenance and proper function of septic systems.
- The *Ontario Building Code* does not have requirements for bacteria, nitrate and phosphorous control ([other parameters are used as indicators](#)). It is focused on oxygen demand and suspended solids. Nitrate and phosphorus both have implications for enriching our surface water bodies, causing eutrophication. Eutrophic waters have more algae blooms which could produce toxins, interfere with drinking water treatment processes, and can cause taste and odour issues. Nitrate is a direct drinking water concern as well.
- Procedure D-5-4 does not account for pathogens. [Nitrogen is used as an indicator for the transportation of pathogens.](#) Situations that are good for the dilution of nitrogen in groundwater (which is accounted for) are problematic for the transportation of bacteriological contaminants.

6. Policy Considerations

- REMINDER: The main consideration for reducing or eliminating drinking water threats related to on-site sewage systems is to produce cleaner effluent. It appears that the legislative framework makes great strides toward this objective and that education and continued contact with system owners could also be effective.
- *Clean Water Act* Part IV tools interim risk management plans, risk management plans, prohibition, and restricted land uses cannot be used for sewage systems, which include on-site sewage treatment and storage systems.
- In certain instances the “would be” drinking water threats are unlikely to occur. However, the source protection plan will still need to address those situations through a high-level policy approach (“a catch-all policy”).

Examples of risk management measures and policy ideas

For discussion purposes, this section of the report provides examples of risk management measures and policy ideas that could be applicable to on-site sewage treatment and storage systems. It is not an exhaustive list.

The examples are categorized by the types of policy tools that can be used to meet the source protection plan objectives. A link to MOE’s Risk Management Catalogue is available in Appendix D.

Table 6.1 – Examples of risk management measures and policy ideas for on-site sewage systems

Policy Tool	Example
Education and Outreach	<ul style="list-style-type: none"> Area-wide education and outreach programs targeted at landowners with septic systems and holding tanks about the importance of maintaining their systems, the impact of the systems on drinking water and the natural environment, and reducing their use of phosphorus-containing products.
Incentive Programs	<ul style="list-style-type: none"> Grant program for landowners to upgrade or replace sub-standard or failing on-site wastewater treatment systems.
Land Use Planning	<ul style="list-style-type: none"> Direct municipality(ies) to require that all new development must be on municipal services. Direct municipalities to require a larger minimum lot size for all new development on private servicing.
Prescribed Provincial Instruments	<ul style="list-style-type: none">
Municipal Operations / Infrastructure	<ul style="list-style-type: none"> <u>Support the implement an area-wide septic re-inspection program that targets specific locations, with the option of expansion to the entire area, to ensure on-going maintenance and proper function of systems.</u> Include an on-site wastewater treatment system inspection in annual municipal infrastructure inspections <u>Direct the municipality(ies) to establish a by-law to require hooking up to municipal services, where feasible.</u>

Comment [AD1]: This is not allowed.
~~Deleted: <#>Require advanced treatment units in sensitive source water areas¶~~

Appendix A - Contaminant Sources in On-site Sewage Systems

Acetone - Acetone is the active ingredient in common household products like nail polish remover, paint thinner and household cleaner. It is also used in industrial products and applications such as pesticides, cleaning (e.g. printing), solvents (e.g. rubber manufacturing), and dilution and extraction (e.g. laboratories).

Chloride, Sodium and Total Phosphorus - Water softeners (water used and backwash), laundry detergents, bar soaps, foods and cleaning products may contain chloride, sodium and phosphorus.

Dichlorobenzene-1,4 (para) - 1,4 Dichlorobenzene (para) is used as a disinfectant, pesticide (e.g. mothballs, general agricultural insecticide), a deodorant (e.g. urinal cakes), for resin manufacturing and in the pharmaceutical industry.

Nitrogen and Pathogens - The primary source of nitrogen and pathogens in on-site systems and holding tanks is from human waste. Bacteria, viruses and protozoans are the main categories of pathogens.

Appendix B – Local Information on Drinking Water Threats

1. Local scale of the drinking water threat?

[Insert description and/or map of local threat context with reference to Table A]

- The management of onsite sewage systems is or would be a significant, moderate, or low threat in {insert areas}.
 - o This activity is most likely to occur in {insert area}

Table A Septic System and Holding Tank Threat Classification Table

Prescribed Threat	Threat Circumstance	Vulnerable Area	Vulnerability Score	Highest Possible Threat Classification (P = Pathogen, C = Chemical)		
				Significant	Moderate	Low
The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.	The system is an earth pit privy, privy vault, greywater system, cesspool, or a leaching bed system and its associated treatment unit.	IPZ WHPAe WHPAf	10	P	C	
			9		P C	
			8.1		P	C
			8		P	C
			7.2			P C
			7			P C
			6.4			P C
			6.3			P C
			6			P C
			5.6			P
	5.4			P		
	5					
	4.9					
	4.8					
	4.5					
	4.2					
	The system requires or uses a holding tank for the retention of hauled sewage at the site where it is produced before its collection by a hauled sewage system.	WHPAa,b,c,d	10	P C		
			8		P C	
			6			P C
			4			
2						

This Table shows only the highest possible ranking of a septic system or holding tank with reference to vulnerability score. To define a specific threat, refer to the threat circumstances as detailed in Threats Tables (MOE 2009).

2. Local approaches to managing these drinking water threats.

a. Land Use Planning

[Insert description of local land use approaches that are being used]

b. Other Local Programs

[Insert discussion on local programs including Stewardship, Education/Outreach, Incentive, etc. implemented by Conservation Authority, Municipality, or other watershed/community groups.]

c. Cross Jurisdiction Considerations

[Insert discussion on policy approaches being considered by neighboring Source Protection Areas/Regions.]

3. Further Research for Specific Vulnerable Areas

- [insert additional background research needed, where applicable]

For example, additional research by staff is required for the following matters:

- Obtain and review certificates of approval for large systems for information about monitoring and maintenance requirements.
- Consider, in consultation with municipalities and others, if there is sufficient monitoring of the contaminants of concern.
- Review specific requirements contained in Official Plans with regard to water setbacks.
- Summarize lot sizing and septic setback requirement in official plans and consider the information.

Appendix C – Reference List

Government of Ontario. 2006. Building Code Act. Ontario Regulations 350/06 – Building Code. www.e-laws.gov.on.ca/html/regs/english/elaws_regs_060350_e.htm

Government of Ontario. 1990. Ontario Water Resources Act. www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90o40_e.htm

International Joint Commission. 2010. A Report of the Great Lakes Science Advisory Board to the International Joint Commission. Groundwater in the Great Lakes Basin. www.ijc.org/php/publications/pdf/ID1637.pdf

Ontario Ministry of the Environment. 1996. Procedure D-5-4: Technical Guideline for Individual On-Site Sewage Systems: Water Quality Impact Risk Assessments. www.ene.gov.on.ca/envision/gp/d5-4.pdf

Ontario Ministry of the Environment. 2000. Guide for Applying for Approval of Municipal and Private Water and Sewage Works. www.ene.gov.on.ca/envision/gp/4063e.htm

Ontario Ministry of the Environment. 2009. Tables of Drinking Water Threats. 2008, as amended in 2009. www.ene.gov.on.ca/publications/cw/7561e03.pdf

Appendix D - Additional Resources

1. Drinking Water Threat Contaminants Summary (DRAFT).
2. The MOE Water Quality Risk Management Measures Catalogue (Version 2, 09/07/2010)
<http://maps.thamesriver.on.ca/swpCAMaps/rmc/disclaimer.aspx>
3. Ministry of the Environment. SPP Bulletins available at:
www.conservationontario.ca/members/members_source_protection_committee/spc_index.html
(username: spcmember; password: spc123)

Available as of December 2010:

- Overview of Source Protection Plan requirements
- Notice of when Source Protection Plan preparation begins
- Existing municipal authorities and land use planning
- Section 57 Prohibition
- Overview of Prescribed Instruments
 - Table 2 – Prescribed Instruments Management of Drinking Water Threats
 - Pesticide permits
 - Renewable energy approval
 - Municipal drinking water licence and drinking water works permits
 - Example of municipal drinking water licence
 - Example of drinking water works permit
 - Nutrient Management Instruments
 - Sample letter of approval – nutrient management strategy
 - Sample nutrient management strategy and plan
 - Sample record of approval – nutrient management strategy
 - Sample multiple year nutrient management strategy and plan