



GUIDANCE FOR USING NON-POTABLE AMBIENT WATER FOR DOMESTIC PURPOSES IN BRITISH COLUMBIA

June 2016

1. OBJECTIVE

Provide provincial guidance to officials responsible for issuing permits under the *Drinking Water Protection Act* to water supply systems using non-potable water from ambient sources for domestic purposes.

2. REGULATORY FRAMEWORK

All water supply systems, whether providing potable or non-potable water, are subject to the [Drinking Water Protection Act](#) as long as they supply water for domestic purposes (see section 4.2). Section 6 of the act requires water supply systems to supply potable drinking water that is safe to drink and fit for domestic purposes.¹ An exemption to the potability requirement exists under section 3.1(b) of the [Drinking Water Protection Regulation](#). This section states that a water supply system is exempt from section 6 of the *Drinking Water Protection Act* if:

- (i) the system does not provide water for human consumption or food preparation purposes,*
- (ii) the system is not connected to a water supply system that provides water for human consumption or food preparation purposes, and*
- (iii) the water supplier ensures that the location of non-potable water discharge and non-potable water piping are identified by markings that are permanent, distinct and easily recognized.*

A water supply system must meet the criteria outlined in section 3.1(b) of the *Drinking Water Protection Regulation* to be exempted from section 6 of the *Drinking Water Protection Act*. A water supply system exempted from section 6 of the *Drinking Water Protection Act* must still comply with all other sections of the act, including sections 7 and 8 pertaining to the need for construction and operating permits.²

¹ "Potable water" is defined under section 1 of the *Drinking Water Protection Act* as water provided by a domestic water system that (a) meets the standards prescribed by regulation, and (b) is safe to drink and fit for domestic purposes without further treatment. See section 4.2 of this document and the definitions for *water supply system* and *domestic water system* under section 1 of the *Drinking Water Protection Act*.

² Section 6(3)(c) of the *Drinking Water Protection Regulation* states that a person does not require a construction permit for a small system, provided that an issuing official waives the requirement for a construction permit. A water supplier for a small water system should contact the local health authority to discuss the system, after which the issuing official will decide if the requirement for a construction permit can be waived.

3. PURPOSE AND SCOPE

This document provides guidance to drinking water officers on interpreting section 3.1(b) of the Drinking Water Protection Regulation (see section 4.1 of this guideline). This guidance acknowledges that non-potable water has more inherent risk than potable water for domestic use and therefore should only be considered for use in limited situations.

This guidance acknowledges that there are some circumstances in which the water supply's remote location and the nature of the water use (e.g., limited contact over a limited period of time) create a situation whereby the cost and logistics of treating and monitoring water to meet potability standards may outweigh the public health benefit – as long as the water supplier uses appropriate risk management practices and users follow general health and safety practices. For such circumstances, the guidance recommends basic risk management strategies that water suppliers should use to reduce risk amongst water users (see section 4.2 of this guideline).

This document does not address the use of non-potable water where it falls outside the jurisdiction of *Drinking Water Protection Act* or Drinking Water Protection Regulation (e.g., agricultural use), nor does it imply compliance with legislation, policy or guidance related to such uses.

Many agencies, laws, policies and guidance regulate the use of non-potable water in British Columbia. To ensure full compliance, suppliers of non-potable water must ensure they consult with other relevant agencies and legislation. These include, but are not limited to:

- Ministry of Environment
- Ministry of Agriculture
- Public Health Act and regulations
- BC Building Code (e.g., Book II (Plumbing Systems), Division B, Section 2.7: Non-potable Water Systems)³
- BC Fire Code
- CSA Standards (e.g., CSA Standard B128.01-06/B128.2-06: Design and Installation of Non-potable Water Systems⁴)
- Local government bylaws
- WorkSafeBC

4. GUIDANCE

4.1 What is ambient non-potable water for domestic purposes?

4.1.1 What is non-potable water from an ambient source?

Ambient water, for the purposes of this document, is untreated or minimally treated water from a source as it exists in nature. This includes:

- Fresh water from a surface water source (e.g., lakes, rivers, streams and springs).
- Ground water

³ Appendix A of this document contains this section of the *BC Building Code*. This section of the *BC Building Code* includes provisions for labeling pipes and providing signage for non-potable outlets. Appendix B of this document contains an excerpt (sentence A-2.7.3.2.(1)) from Appendix A – Division B, of Book II (Plumbing Systems) of the *BC Building Code* that provides more details pertaining to clause 2.7.3.2.(1)(a), Division B, of Book II of the code.

⁴ This CSA standard is recommended in sentence 2.7.4.1.(1) of Book II, Division B of Building Code.

Ambient water, for the purposes of this document, does not include marine water (i.e., seawater), wastewater (e.g., industrial and domestic water), recycled water,⁵ brackish water and rain water (see below for details). Appendix C of this document contains resources that provide information about some of these other sources of non-potable water.

Non-potable water, for the purposes of this document, includes all water from an ambient source that does not meet the definition for potability as per the *Drinking Water Protection Act*. Non-potable water has more inherent risk than potable water for domestic purposes because it does not have the measures in place to control all potential disease-causing pathogens and/or chemical contaminants to the extent needed to be considered potable. The level of risk associated with these potential hazards is dependent on the source of the water, the end use of the water (i.e., exposure potential) and the water quality at the point of use.

What about rain water?

Rain water collected from cityscapes and other areas with impervious structures (e.g., traditional roof tops and roads) can be heavily contaminated by hydrocarbons and heavy metals from vehicle exhaust, brakes and leaked fluids. It is also likely to contain nutrients, pesticides and bacteria from urban and agricultural land uses, and animal contact (e.g., bird droppings). Captured storm water, as this is generally called, is considered a form of recycled water and may require extensive treatment to be made suitable for all domestic purposes.

The risks associated with captured storm water can be minimized if the rain water is collected from suitably designed and well maintained capture areas (e.g., a roof top dedicated for harvesting rain water) and stored in appropriately protected vessels. This water is similar to ambient water (as defined by this guideline) if the rain water collection system is shown to reduce contact with contaminants through generally accepted best management practices and is approved by the health authority as part of the water supply system.

There are, however, some distinct differences between rain water and ambient water (e.g., engineered collection and storage environments, contaminants and pathogens of concern, and volumes collected) that put this water source outside the scope of this guidance. The information in this guideline can be used to inform decisions on dedicated rain water harvesting, but water suppliers and drinking water officers will need more information to adequately identify and manage the unique risks. See Appendix C of this guideline for resources from other jurisdictions.

4.1.2 What domestic purposes are unsuitable for non-potable water use?

The term *domestic purpose* is defined under section 1 of the *Drinking Water Protection Act* to mean the use of water for:

- a) *human consumption, food preparation or sanitation,*
- b) *household purposes not covered by paragraph (a), or*
- c) *other prescribed purposes.*

Consuming (ingesting) non-potable water is a high-risk activity and should be avoided. Section 3.1(b)(i) of the *Drinking Water Protection Regulation* stipulates that a water supply system **is only exempt** from the potability requirement if the system **does not provide** water for human consumption or food preparation. Potable water is required for human consumption and food preparation, such as, but not limited to:

- Drinking water, using it to mix beverages or any other means of purposeful ingestion.
- Oral hygiene (e.g., brushing teeth).
- Dishwashing, unless sanitized in another fashion.

⁵ Recycled water is water generated from sewage, grey water or storm water systems and treated to a standard that is appropriate for its intended use (Australia, 2006).

- Washing fruits and vegetables.
- Cooking.
- Washing hands to handle food or beverages that will not be subsequently heated.
- Making ice cubes.

Domestic purposes are not necessarily exclusive to domestic properties. For example, a kitchen or bathroom on a commercial or industrial property would be subject to the potability requirements of the *Drinking Water Protection Act*.

4.1.3 Are there outlets and fixtures that cannot use non-potable water?

The BC Building Code requires every dwelling unit⁶ to be supplied with potable water (Division B, article 9.31.3.1 of Book I (General) of the BC Building Code). Further to this, the BC Building Code (Book II (Plumbing Systems), Division B, article 2.7.3.2) stipulates that:

An outlet from a non-potable water system shall not be located where it can discharge into

a) a sink or lavatory,⁷

b) a fixture into which an outlet from a potable water system is discharged, or

c) a fixture that is used for the preparation, handling or dispensing of food, drink or products that are intended for human consumption.

In other words, plumbing outlets to kitchen and bathroom sinks cannot discharge non-potable water, and non-potable water cannot be discharged to any fixture with a potable water discharge.

Given these stipulations, non-potable water cannot be supplied to a building with kitchens and/or bathrooms unless:

- There is a separate supply of potable water for kitchen and/or bathroom sinks.
- The building is supplied by a small water system making use of point-of-entry and/or point-of-use technology where food preparation or consumption is expected to occur (see section 3.1(a) of the Drinking Water Protection Regulation).
- The water supplier can demonstrate that a sink (except a kitchen sink) has proven acceptable on the basis of past performances.^{8,9}

4.1.4 What domestic purposes are not specifically excluded from non-potable use?

The Drinking Water Protection Regulation does not specifically define the domestic purposes for which non-potable use is acceptable except to state that human consumption and food preparation are not acceptable. Given the definition of *domestic purposes* in the *Drinking Water Protection Act*, the following domestic purposes remain and could be considered suitable for non-potable use:

- Sanitation activities.
- Other household purposes aside from human consumption, food preparation and sanitation.

⁶ A *dwelling unit*, as per section 1.4, Division A, Book I (General) of the *BC Building Code*, is a *suite* operated as a housekeeping unit, used or intended to be used by one or more persons and usually containing cooking, eating, living, sleeping and sanitary facilities.

⁷ A-2.7.3.2.(1) (Appendix A – Division B, of Book II (Plumbing Systems)) of the BC Building Code implies that a lavatory is a bathroom sink. See Appendix B of this document.

⁸ The BC Building Code contains an appendix that allows for some exceptions to the requirement that non-potable water shall not be discharged to a sink or lavatory under circumstances where the use may have proven acceptable on the basis of past performance (e.g., rest stop). Appendix B of this document contains section A-2.7.3.2.(1) (Appendix A – Division B, of Book II (Plumbing Systems)) of the BC Building Code.

⁹ Given that potable water must be used for human consumption and food preparation, there are no circumstances in which non-potable water should supply a kitchen sink. This is because there is a reasonable expectation that water supplying a kitchen sink should be suitable for these purposes.

- Other prescribed purposes.

These domestic purposes are not defined further in the *Drinking Water Protection Act* or Drinking Water Protection Regulation. They could include a multitude of activities ranging in their degree of risk (i.e., likelihood of physical contact, ingestion and/or inhalation) – from toilet flushing (low risk) to showering (high risk).

4.2 What can a water supplier do to manage the risks associated with using non-potable water?

The water supplier is responsible for being proactive and using a multibarrier approach to managing risks in the water supply system. This involves identifying water quality hazards and their associated risks with respect to the intended end use, and using this information to develop strategies for managing risk. Reactive management strategies that rely only on monitoring compliance will not be sufficient to protect the health of people using non-potable water supply systems.

4.2.1 How does a water supplier determine the risks associated with the source water?

Source water quality is dependent on:

- The type of source (i.e., ground water and surface water).
- The type and frequency of activities (i.e., human and animal) occurring in the watershed/capture zone.
- Seasonal water quality variations.

A water supplier should complete a source-to-tap assessment to determine the hazards and risks associated with the source water, operations and delivery of the water that could negatively impact the water quality.¹⁰ The water supplier should perform a source-to-tap assessment on a regular basis (e.g., annually) to ensure conditions and circumstances remain consistent with the original assessment of risk.

4.2.2 How does a water supplier determine the risk associated with the intended domestic purpose(s)?

Since non-potable water has more inherent risk than potable water, its use for any domestic purpose carries some risk to the end users. Some domestic purposes, however, are more risky than others because the nature of the exposure (e.g., showering) carries a greater risk of accidental internal exposure (e.g., ingestion and inhalation).

Non-potable water quality at the point of use needs to be fit for the intended domestic purpose. Some domestic purposes (e.g., showering) may not be appropriate for non-potable water use without more thorough risk assessment and risk management steps (e.g., some treatment). When making risk management decisions, the water supplier should consider how users may be exposed to the non-potable water and the risk of exposure.

In most cases, a thorough quantitative microbial risk assessment (QMRA) of exposure potential would be impractical, but a water supplier can use the Exposure Potential Categories in the *Guidelines for Canadian Recreational Water Quality* (i.e., primary contact, secondary contact and tertiary contact) for a qualitative description of risk level (see table 1). A water supplier can use this information as well as other information about the system (e.g., demographics of system users, history of the system, and estimated frequency and length of exposures) to complete a qualitative risk assessment to determine: (a) if the situation is appropriate for non-potable use, and (b) the mitigation measures needed to reduce risk.

¹⁰ See Resources for Water System Operators, at <http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/drinking-water-quality/resources-for-water-system-operators> for details about the Drinking Water Source-to-Tap Screening Tool and the Water System Assessment tool.

Table 1: Categories for exposure potential of domestic uses of non-potable water

Exposure Potential Category	Definition	Examples	Hazards (Exposure Pathways)	Example Estimates: Inadvertent Ingestion (Adults) (Compared to drinking water: 2L/day)
Primary Contact (High Risk)	Activities in which the whole body or the face and trunk are frequently immersed or the face is frequently wetted by spray, and where it is likely that some water will be swallowed	<ul style="list-style-type: none"> • Showering • Bathing 	<ul style="list-style-type: none"> • Inadvertent ingestion of pathogens and chemicals • Inhalation of pathogens and chemicals • Absorption of chemicals through skin contact • Contact with pathogens affecting skin 	Showering: <ul style="list-style-type: none"> • 60mL/h¹¹ • Less than 100mL/day¹²
Secondary Contact (Medium to High Risk)	Activities in which there is little or limited skin contact. Greater contact (including swallowing water) is unusual	<ul style="list-style-type: none"> • Hand washing • Laundry • Surface yard irrigation 	<ul style="list-style-type: none"> • Minor inadvertent ingestion of pathogens and chemicals through droplet spread • Absorption of chemicals through skin contact • Contact with pathogens affecting skin 	Laundry use: <ul style="list-style-type: none"> • 0.1mL/use; 100 use/year¹³
Tertiary Contact (Low Risk)	No contact with water is expected aside from incidental spray	<ul style="list-style-type: none"> • Toilet/urinal flushing • Subsurface yard irrigation 	<ul style="list-style-type: none"> • Minor Inadvertent ingestion of pathogens and chemicals through droplet spread and/or aerosols 	Toilet flushing: <ul style="list-style-type: none"> • 0.1mL/flush; 1100 flush/year¹⁴

Some situations are always considered high risk for using non-potable water for primary- or secondary-contact purposes. This is due to the populations served and/or the nature of the use, including medical facilities, care facilities, schools, food service establishments and personal service establishments. Non-potable water should not be provided for primary- and secondary-contact purposes to anyone requiring water for these or any other activities that do not meet the criteria as set out in section 3.1(b) of the Drinking Water Protection Regulation.

¹¹ Streng, D., and Chamberlain, P. (1996). *Multimedia Environmental Pollutant Assessment System (MEPAS®): Exposure Pathway and Human Health Impact Assessment Models*, Version 1.1. Battelle Memorial Institute. Retrieved from <http://mepas.pnnl.gov/mepas/formulations/exposure/vol5expo.pdf>.

¹² Commonwealth of Australia. (2010). *Guidance on use of rainwater tanks*. Retrieved from [http://www.health.gov.au/internet/main/publishing.nsf/Content/OD71DB86E9DA7CF1CA257BF0001CBF2F/\\$File/enhealth-raitank.pdf](http://www.health.gov.au/internet/main/publishing.nsf/Content/OD71DB86E9DA7CF1CA257BF0001CBF2F/$File/enhealth-raitank.pdf).

¹³ Environment Protection and Heritage Council, Natural Resource Management Ministerial Council and Australian Health Ministers' Conference. (2006). *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1)*. Retrieved from http://www.sydneywater.com.au/web/groups/publicwebcontent/documents/document/zgrf/mdq1/~edisp/dd_045701.pdf.

¹⁴ Ibid.

4.2.3 What strategies can a water supplier use to manage risks for a non-potable water supply system using ambient water?¹⁵

Once a water supplier understands the risks involved with the system's source, operation and end use, he/she should carry out risk mitigation measures to reduce, as much as possible, the end users' exposure to pathogens and chemicals. This will likely involve working with the local drinking water officer and using a whole-system approach relying on a source-to-tap assessment to guide activities. The following is a list of options for potential risk-mitigation measures:

- Monitor source water quality.
- Use some treatment. Non-potable does not necessarily mean untreated: completely untreated water (depending on the source) may be unsafe for some uses, particularly primary contact. Although primary-contact activities have less risk associated with them than human consumption (e.g., estimated ingestion less than 100mL/day versus 2000mL/day respectively), primary-contact activities remain high risk compared to secondary- and tertiary-contact activities, particularly with respect to inhalation risks. Some options for protecting primary-contact users include:
 - Using total chlorine residual of not less than 0.5mg/L or a free chlorine residual of not less than 0.1 mg/L in the water throughout the distribution systems.
 - Operating low-risk ground water systems without a disinfectant residual if the water supplier can demonstrate to the satisfaction of the drinking water officer that 90% of routine bacteriological samples of water from the waterworks have total coliform levels of zero organisms detectable per 100mL.
 - Using ultraviolet technology instead of a residual disinfectant if the water supply system has a short distribution (e.g., less than 3km) and risk is sufficiently managed (e.g., regular flushing and low water age throughout the distribution system).
 - Providing evidence to the satisfaction of the drinking water officer that the source water and water supply system are of low risk (e.g., a source-to-tap assessment demonstrating very little activity upstream of the intake or a QMRA completed by a qualified professional) and proposing other strategies besides disinfection for risk mitigation.
- Use an arithmetic mean of 200 E. coli/100mL (based on a minimum of five samples), maximum of 400 E. coli/100mL and turbidity of 50 NTU as limits for deciding if source water quality is **unsuitable** for primary and secondary contact.¹⁶
- Provide end users with options for reducing their own risk during use (e.g., hand sanitizer at bathroom sinks and information about sponge bathing).
- Communicate risks and mitigation measures to end users in such a manner as to reasonably ensure they are making an informed decision about appropriate use for the water. For example, use appropriate signage at outlets (required by the Drinking Water Protection Regulation and BC Building Code):
 - Written signs (e.g., "Untreated Water," "Do Not Drink" and "For Hand Washing Only").

¹⁵ Any thresholds suggested in section 4.2.3 of this guidance are administrative limits intended to aid the water supplier in reducing risk, but will not eliminate all the risks associated with using non-potable water. Any water supplier operating within suggested thresholds should use other risk management activities to provide a robust system of risk reduction for the users of the water supply system.

¹⁶ These numbers are used in *the Guidelines for Canadian Recreational Water Quality* to determine if water quality is suitable for primary contact. They were not initially intended for indoor use and should be used by drinking water officers and water suppliers for guidance purposes only. Any water exceeding these parameters should not be used for primary- or secondary-contact domestic purposes. Meeting these parameters is not necessarily an indication that the water quality is suitable for the intended domestic purposes. This is because non-potable water will always carry some risk when used for primary- or secondary-contact domestic purposes. A drinking water officer may require more stringent water quality, depending on the circumstance.

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- Pictures for those with limited English or literacy (e.g., a person drinking out of a glass with a red slash through it).
- Use of other languages if water is for locations where another language(s) is prevalent.
- Observe maximum acceptable concentrations for chemicals as indicated by the *Guidelines for Canadian Drinking Water Quality*. This will likely be dependent on long-term exposure potential.
- Limit primary- and secondary-contact uses from ambient sources known for cyanobacteria blooms, schistosomes and organic chemicals as the recommended mitigation measure from the *Guidelines for Canadian Recreational Water Quality* is to wash following exposure.
- Design, fabricate and install the non-potable water supply system in accordance with good engineering practice, such as that described in the ASHRAE Handbooks, ASPE Handbooks and CAN/CSA-B128.1, “Design and Installation of Non-Potable Water Systems.” (As per the BC Building Code, Appendix A.)
- Use best risk management practices for protecting against the deterioration of water quality within the distribution system. For example:
 - cross-connection controls
 - reducing water loss
 - hydraulic integrity
 - labeling pipes (required by the Drinking Water Protection Regulation and BC Building Code)
 - regular flushing and maintenance
 - regular shock chlorination
 - asset management
- Encourage those connected to the water supply system to set the temperature of hot water tanks at 60°C, as indicated in the BC Building Code (Book II (Plumbing Systems), Division B, article 2.6.1.12: Service Water Heaters).
- Ensure that the emergency response and contingency plan addresses issues specific to the use of non-potable water (e.g., what to do if source water quality or point-of-use quality deteriorates). An emergency response and contingency plan is required by section 10 of *Drinking Water Protection Act*.

A water supplier should review the system’s risk management plan with the drinking water officer to determine if the strategies will be sufficient to reasonably manage the risk. A drinking water officer may impose terms and conditions to ensure that the water supplier is managing risk on an ongoing basis. Drinking water officers should periodically re-assess water supply systems exempted from section 6 of the *Drinking Water Protection Act* to ensure they are adhering to the risk management strategies and continuing to meet the criteria for the allowance of non-potable water use as outlined in section 3.1(b) of the Drinking Water Protection Regulation.

APPENDIX A: RELEVANT EXCERPTS FROM THE BC BUILDING CODE

1. From Section 2.7 of Book II (Plumbing Systems), Division B, BC Building Code

This outlines requirements for the location, connection and identification of non-potable pipes:

2.7.1. Connection

2.7.1.1. Not Permitted

1) A non-potable water system shall not be connected to a potable water system.

2.7.2. Identification

2.7.2.1. Markings Required

1) The location of non-potable water discharge and non-potable water piping shall be identified by markings that are permanent, distinct and easily recognized.

2.7.3. Location

2.7.3.1. Pipes

1) Non-potable water piping shall not be located

- a) where food is prepared in a food-processing plant,
- b) above food-handling equipment,
- c) above a non-pressurized potable water tank, or
- d) above a cover of a pressurized potable water tank.

2.7.3.2. Outlets

1) An outlet from a non-potable water system shall not be located where it can discharge into

- a) a sink or lavatory,
- b) a fixture into which an outlet from a potable water system is discharged, or
- c) a fixture that is used for the preparation, handling or dispensing of food, drink or products that are intended for human consumption.

(See Appendix A of the BC Building Code.)

2.7.4. Design

2.7.4.1. Non-potable Water System Design

(See Appendix A of the Building Code.)

1) Non-potable water systems shall be designed, fabricated and installed in accordance with good engineering practice, such as that described in the ASHRAE Handbooks, ASPE Handbooks and CAN/CSA-B128.1, "Design and Installation of Non-Potable Water Systems."

2. From Appendix A – Division B of Book II (Plumbing Systems), BC Building Code

This is for explanatory purposes only and does not form part of the requirements:

A-2.7.3.2.(1) Outlets from Non-potable Water Systems

*The location of outlets from non-potable water systems where they can be discharged into a sink or **lavatory (i.e. bathroom sink)**, a fixture into which an outlet from a potable water system is discharged, or a fixture that is used for the preparation, handling or dispensing of food, drink or products that are intended for human consumption, may have proven acceptable on the basis of past performance in some localities such as rest stops, and its acceptance under this Code may be warranted.*

2.7.3.2.(1)(b) would permit non potable water to be used to supply water closets or urinals provided the fixtures are not also connected to potable water.

A-2.7.4.1. Non-potable Water System Design

There is a growing interest in Canada in using available non-potable water supplies in the place of potable ones for selected purposes such as flushing toilets and irrigating lawns and gardens. Article 2.7.4.1. applies to non-potable water systems regardless of the origin of the water. The non-potable water must meet applicable water quality standards as determined by an authority having jurisdiction.

Non-potable water can vary greatly in quality and hazard level. The water from sewage, storm water, clear-water waste or an auxiliary water supply that is not safe for human consumption is included. Grey-water (which commonly refers to a subset of sewage) discharges from the fixture outlet pipes of specific fixtures such as laundry facilities, showers, baths and bathroom sinks. Typically neither the discharge from sanitary units such as toilets, nor the discharge from kitchen sinks, is included within the scope of the term grey-water.

Good engineering practice would dictate that non-potable water be of appropriate quality for the end use. The Canadian Guidelines for Domestic Reclaimed Water for Use in Toilet and Urinal Flushing, as published by Health Canada, provides appropriate water quality values for those uses.¹⁷

Water quality values and monitoring requirements for reclaimed water are also prescribed by a regulation made under the Environmental Management Act (EMA). Reclaimed water is a subset of non-potable water, produced from larger volume systems accepting domestic or municipal wastewater. Consequently, the monitoring requirements may be more stringent than necessary for smaller applications, but the water quality values may still be taken in isolation and used as a benchmark for non-potable water systems designed to meet Article 2.7.4.1. to which the regulation under the EMA does not apply. The water quality values can include biochemical oxygen demand (BOD5), turbidity (NTU) and fecal coliforms.

Note that the regulation under the EMA permits additional uses for non-potable water under certain conditions. It is not the intent of Section 2.7. to contradict the EMA or its regulations, but rather, to regulate the end use of non-potable water systems where the EMA does not apply.

¹⁷ The *Canadian Guidelines for Domestic Reclaimed Water Use in Toilet and Urinal Flushing* are intended to guide the use of recycled wastewater in toilets and urinals. Wastewater is high-risk source water known to contain large concentrations of disease-causing pathogens and chemicals. There is a high likelihood of its use in dual-distribution systems, meaning there is an increased risk of cross connections. As such, the water quality objective recommended by these guidelines is rigorous in that it is almost on a par with the potable water quality standard in Schedule A of the Drinking Water Protection Regulation. It was determined that this guideline was more stringent than necessary for the use of non-potable water from ambient sources to supply toilets and urinals in British Columbia, given the context for its application.

APPENDIX B: FURTHER RESOURCES

British Columbia

B.C. Ministry of Agriculture. Publications related to water management.

<http://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/agricultural-land-and-environment/water/publications>

B.C. Ministry of Environment. (2013). *Reclaimed Water Guideline*.

<http://www2.gov.bc.ca/assets/gov/environment/waste-management/sewage/reclaimedwater.pdf>

B.C. Ministry of Health. (2014). *Drinking Water Officers' Guide*.

- *Introduction:*
<http://www2.gov.bc.ca/gov/DownloadAsset?assetId=DDFC6F380FB04C298779016AEDC3E3F7&filename=dwog-introduction.pdf>
- *Part A: Legislative Requirements:*
<http://www2.gov.bc.ca/gov/DownloadAsset?assetId=F1B6A8C2B7994316BFFEA025851ED8C5&filename=dwog-part-a.pdf>
- *Part B: Best Practices and Technical Assistance:*
<http://www2.gov.bc.ca/gov/DownloadAsset?assetId=7237F524FF9646C39148CE54F7D4ED33&filename=dwog-part-b.pdf>
- *Appendices:*
<http://www2.gov.bc.ca/gov/DownloadAsset?assetId=D7A511C0CFBD4371B94A5399D1538BEB&filename=dwog-appendices.pdf>

B.C. Ministry of Water, Land and Air Protection (currently Ministry of Environment). (2003). *Stormwater Planning: A Guidebook for British Columbia*.

<http://www.env.gov.bc.ca/epd/epdpa/mpp/stormwater/guidebook/pdfs/stormwater.pdf>

Government of British Columbia. (2012). *British Columbia Codes 2012*.

http://www.bccodes.ca/default.aspx?vid=QPLEGALEZE:bccodes_2012_view

Queen's Printer BC. (N.D.). *BC Laws*. <http://www.bclaws.ca/>

WorkSafeBC. (N.D.). *OHS Regulation and Related Materials*.

http://www2.worksafebc.com/publications/OHSRegulation/Home.asp?_ga=1.245206790.2006508184.1400106590

Canada

Health Canada

Federal-Provincial-Territorial Committee on Drinking Water and the CCME Water Quality Task Group. (2004). *From Source to Tap: Guidance on the Multi-barrier Approach to Safe Drinking Water*.

http://www.ccme.ca/files/Resources/water/source_tap/mba_guidance_doc_e.pdf

Health Canada. (2010). *Canadian Guidelines for Domestic Reclaimed Water for Use in Toilet and Urinal Flushing*.

<http://healthycanadians.gc.ca/publications/healthy-living-vie-saine/water-reclaimed-recyclee-eau/index-eng.php>

Health Canada. (2002). *From Source to Tap: The Multi-barrier Approach to Safe Drinking Water*. <http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/tap-source-robinet/index-eng.php>

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Health Canada. (2012). Guidelines for Canadian Drinking Water Quality – Summary Table. http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/2012-sum_guide-res_recom/index-eng.php

Health Canada. (2012). Guidelines for Canadian Recreational Water Quality. http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/guide_water-2012-guide_eau/index-eng.php

General

Canadian Standards Association. (2011). CAN/CSA-B128.1-06/B128.2-06: Design and Installation of Non-Potable Water Systems/Maintenance and Field Testing of Non-Potable Water Systems (CSA, 2011). <http://shop.csa.ca/en/canada/plumbing-products-and-materials/canca-b1281-06b1282-06-r2011/invt/27024892006>

Canadian Mortgage and House Corporation. (2012). Guidelines for Residential Rainwater Harvesting Systems, Handbook. <http://www.cmhc-schl.gc.ca/odpub/pdf/67608.pdf?fr=1357836490338>

International

Rain Water

Commonwealth of Australia. (2010). *Guidance on use of rainwater tanks*.

[http://www.health.gov.au/internet/main/publishing.nsf/Content/0D71DB86E9DA7CF1CA257BF0001CBF2F/\\$File/enhealth-raintank.pdf](http://www.health.gov.au/internet/main/publishing.nsf/Content/0D71DB86E9DA7CF1CA257BF0001CBF2F/$File/enhealth-raintank.pdf)

NSF. (N.D.). *Rainwater Collection*. <http://www.nsf.org/consumer-resources/green-living/rainwater-collection>

USEPA. (2008). *Managing Wet Weather with Green Infrastructure Municipal Handbook: Rainwater Harvesting Policies*. http://water.epa.gov/infrastructure/greeninfrastructure/upload/gi_munichandbook_harvesting.pdf

Recycled Water

Natural Resource Management Ministerial Council, Environment Protection and Heritage Council & Australian Health Minister's Conference. (2006). *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1)*.

http://www.sydneywater.com.au/web/groups/publicwebcontent/documents/document/zgrf/mdq1/~edisp/dd_045701.pdf.

USEPA. (2012). *Guidelines for Water Reuse*. <http://nepis.epa.gov/Adobe/PDF/P100FS7K.pdf>

Distribution Systems

Distribution System Contamination

Kirmeyer, G., Friedman, M., Martel, K., & Howie, D. (2001). *Pathogen Intrusion into the Distribution System*. American Water Works Association and AWWA Research Foundation: USA.

http://www.waterrf.org/PublicReportLibrary/RFR90835_2001_436.pdf

USEPA. (2006). *Causes of Total Coliform-Positive Occurrences in Distribution Systems*. A white paper published by the EPA Office of Groundwater and Drinking Water.

<http://yosemite.epa.gov/water/owrcatalog.nsf/065ca07e299b464685256ce50075c11a/7eb8e28fdcc655fd8525796d00521393!OpenDocument>

USEPA. (2002a). *Health Risks from Microbial Growth and Biofilms in Drinking Water Distribution Systems*. A white paper published by the EPA Office of Groundwater and Drinking Water.

https://www.epa.gov/sites/production/files/2015-09/documents/2007_05_18_disinfection_tcr_whitepaper_tcr_biofilms.pdf

DRAFT FOR PUBLIC CONSULTATION

USEPA. (2002b). *The Effectiveness of Disinfectant Residuals in the Distribution System*. A white paper published by the EPA Office of Groundwater and Drinking Water.

<http://yosemite.epa.gov/water/owrccatalog.nsf/e673c95b11602f2385256ae1007279fe/51f21a685f1c59468525796d0050d5bd!OpenDocument>

Biofilms and Microbial Growth

American Academy of Microbiology. (2012). *Microbes in Pipes: The microbiology of the water distribution system*.

<http://academy.asm.org/index.php/browse-all-reports/520-water-distribution-system>

Liu, G., Verberk, J., & Van Dijk, J. (2013). Bacteriology of drinking water distribution systems: an integral and multidimensional review. *Applied Microbiology and Biotechnology*, 97(21), 9265-9276.

USEPA. (2002a). *Health Risks from Microbial Growth and Biofilms in Drinking Water Distribution Systems*. A white paper published by the EPA Office of Groundwater and Drinking Water.

https://www.epa.gov/sites/production/files/2015-09/documents/2007_05_18_disinfection_tcr_whitepaper_tcr_biofilms.pdf

USEPA. (2002b). *The Effectiveness of Disinfectant Residuals in the Distribution System*. A white paper published by the EPA Office of Groundwater and Drinking Water.

<http://yosemite.epa.gov/water/owrccatalog.nsf/e673c95b11602f2385256ae1007279fe/51f21a685f1c59468525796d0050d5bd!OpenDocument>