

Water Suppliers Impacted by Emergency Events

Emergency events like wildfires and flooding can impact water systems in many ways causing:

- **Physical damage to water system components and equipment.**
- **Poor quality source water**, including the loss of source water or pollution from flood waters, fire retardants, or surface water run-off.
- **Power Loss, which in turn can lead to:**
 - **Loss of supply** – if your system relies on a pumping system to distribute water to users, a loss of power can lead to pressure loss, and interrupting water supply.
 - **Backflow of contaminated water into the system** – this can occur when there is a loss of pressure in the system. When this happens, contaminated water can enter the system through cracks in the piping or through cross connections with untreated water.
 - **Water treatment equipment malfunctioning** – leading to untreated water entering the distribution system.
 - **Stagnant Water** - Water which sits in the distribution system does not flow which allows microorganisms in the system to multiply, resulting in health risks and/or taste and odour problems.



If you don't have the knowledge, skill, or experience required to conduct the activities described in this document, it may be necessary to get assistance from an appropriately qualified person as outlined in Section 12 of the *Drinking Water Protection Regulation*. Contact your local Environmental Health Officer (EHO) for assistance.

During the Event

- Refer to your Emergency Response and Contingency Plan (ERCP) for procedures specific to your system.
- If there is any doubt about your system or the safety of the drinking water, you **must immediately** issue a **Boil Water Notice (BWN)** and contact an Environmental Health Officer (EHO)
 - A copy of the Boil Water Notification template can be found at <https://www.interiorhealth.ca/YourEnvironment/DrinkingWater/Documents/bwn-template.PDF>;
 - Environmental Health Officer contact list can be found at <https://www.interiorhealth.ca/YourEnvironment/AirQuality/Documents/Health%20Protection%20Offices%20Contacts.pdf>
- If chemical contamination is a possibility – a “**Do Not Consume (DNC)**” or a “**Do Not Use (DNU)**” notice may be required. Ideally, this should be done in consultation with an Environmental Health Officer or Medical Health Officer (for after hours emergencies).

Returning to Normal Operations

- When safe to do so, inspect the water system components to ensure they have not been damaged and are working properly. Check to make sure all water treatment components (if any) are also working properly. *(If your system is damaged, refer to the “Is there damage to your water system” section below).*
- Begin performing maintenance procedures to bring the water system back into operation. The specific actions required will depend on factors including the likelihood that contaminants entered the system, whether the system was abandoned, and for how long. Maintenance procedures include:
 - **Flushing the distribution system** – this involves clearing water from the pipes through hydrants, standpipes or other discharge points. Stagnant water, debris and other contaminants will then leave the system. Flushing should be done prior to disinfecting to decrease the amount of chlorine required. Techniques for flushing can be found by referring to documents in the “Additional Resources” section. *Appendix A* contains specific information that can be supplied to homeowners to help guide them in flushing their internal plumbing systems.
 - **Disinfecting the system** – this involves introducing chlorine into all or part of the water system to kill any harmful microorganisms that may be present.
 - *Water Wells* – if the system is supplied by a well, please refer to *Water Well Disinfection Using the Simple Chlorination Method* from the BC Ministry of Environment for information on well disinfection at https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/water-wells/bc_gov_5402_water_well_disinfection_webbrochure.pdf.
 - *Distribution System* – the distribution system can be disinfected by introducing sufficient chlorine into the water mains to achieve an initial concentration of 25 mg/L (ppm). This solution should be allowed to stand in the pipes for 24 hours. At this point the water should be tested and there should be at least 10 mg/L of chlorine left. The pipes can then be flushed to remove the remaining chlorine. Refer to *Appendix B*, for more details.

- Ensure the water quality is safe by taking at least two sets of bacteriological samples at least 24 hours apart. If your system was potentially exposed to chemical contaminants, you may be required to test for additional parameters through an accredited laboratory. Consult with an EHO to see whether additional testing is required. Once acceptable water quality results have been obtained, the Boil Water Notice (BWN) or other form of public notification can then be lifted.

Is there Damage to your Water System?

When it is safe to do so, assess and take note of any damage that has occurred. Contact an Engineering or Water System Consultant for additional guidance in assessing the system and determining what repairs will be necessary.

- In the event of extensive damage to the water system, including the loss of the water source or complete loss of the system, it may be necessary to obtain additional approvals from Interior Health. Contact an EHO for further direction.
- Water suppliers are encouraged to consult with their insurance provider to determine if and to what extent coverage is available for fixing the system and/or covering other operational needs.

In some circumstances, emergency repair work can be completed without a permit although most work to repair a system requires a Construction Permit. Contact an EHO prior to doing any work to determine whether a permit is required. Permit applications can be obtained by contacting ***Engineering Direct at 1- 855-743-3550*** or engineeringdirect@interiorhealth.ca. There is also more information on our public website at <https://www.interiorhealth.ca/YourEnvironment/DrinkingWater/Pages/Permits.aspx>.



Please note – source water impacted by emergency events can contain chemical contaminants that disinfection alone may not remove. Please contact your local Environmental Public Health office for further information.

Additional Resources

Drinking Water Advisories

Advisory templates are listed on the Interior Health website -

<https://www.interiorhealth.ca/YourEnvironment/DrinkingWater/Pages/AdvisoriesNotifications.aspx>

Water System Flushing

Developing and Implementing a Distribution System Flushing Program (Free PDF) (2002). American Water Works Association.

<https://www.awwa.org/publications/journal-awwa/abstract/articleid/14615.aspx>

Unidirectional Flushing: A Powerful Tool (Free PDF) (1999). American Water Works Association.

<https://www.awwa.org/publications/journal-awwa/abstract/articleid/14075.aspx>

Water System Disinfection

AWWA Standard C651-14: Disinfecting Water Mains (2014). American Water Works Association.
<https://www.awwa.org/store/productdetail.aspx?productId=45320336>

AWWA Standard C652-11: Disinfection of Water Storage Facilities (2011). American W
<https://www.awwa.org/store/productdetail.aspx?productId=45320336>

Conducting Planned or Unplanned Repairs

Water Research Foundation Good Practices for Preventing Microbial Contamination of Water Mains:
Field Pocket Guide (2014).
<http://www.waterrf.org/Pages/Projects.aspx?PID=4307>

Other Resources

Small Water Users Association of British Columbia – the association website provides information to
small water suppliers about assistance programs, local equipment suppliers, consulting engineers,
and other issues related to small water systems.
<http://www.smallwaterusers.com/>

Appendix A – Information for Homeowners

Procedure for Flushing Your Home and/or Building Plumbing System

All water systems that have been shut down should be flushed as there will be stagnant water in the lines.

- If in doubt, seek the services of a trained professional such as a plumber. In most cases, instructions for flushing various appliances can be found in owner's manuals provided with water softeners and other equipment. It is recommended that these instructions should be followed.
- For homes on a septic system, make sure that your septic system will be able to handle large volumes of water before you begin flushing. Consider running inside taps using a hose and/or buckets to drain the water outside instead of into the septic tank.

General Plumbing System Flushing Procedure:

1. Flush the water line to the house by running outside taps to waste for five minutes. Once the main line is flushed, then the house plumbing system can be flushed.
2. Flush household pipes/faucets by running each cold water faucet on full for at least five minutes. Remove all aerators (screens on end of taps) to ensure there is enough flow through taps.
3. Follow the manufacturer's instructions for flushing the hot water tank. Shut off the breaker at the electrical panel and wait at least two hours before flushing the hot water tank to allow the water to cool. (For gas or propane hot water tanks, please follow the manufacturer's instructions for turning off the element and pilot light). Run the hot water taps until the warm water runs out and cold water is coming from the hot taps. Once all of the water has been flushed from the hot water taps, turn off all of the taps and turn the breaker back on to the hot water tank.
4. For other appliances such as in-line filters, treatment systems, water softeners, fridge water dispensers with direct water connections or water tanks: Run enough water to completely replace at least one full volume of all lines and tanks. If your filters are near the end of their lives, replace them.
 - Water softeners: Run through a regeneration cycle.
 - Reverse Osmosis (RO) units: Replace pre-filters, check owner's manual.
 - Replace other water filters, as they are disposable and may be contaminated. This applies especially to carbon filters.
5. Other appliances such as coffee makers, Brita filters, or bathroom Water Piks that are not directly connected to a water line but may have been used during the event should also be thoroughly cleaned and flushed.

Appendix B – Information for Water Suppliers

Chlorine required to produce 25 mg/L concentration per 100ft (30.5m) of water main, by diameter (as described in AWWA Standard C651-05)

Pipe Diameter		100% Chlorine		1% Chlorine Solution*	
Inches	Millimetres	Pounds	Grams	Gallons	Liters
4	100	0.013	5.9	0.16	0.6
6	150	0.030	13.6	0.36	1.4
8	200	0.054	24.5	0.65	2.5
10	250	0.085	38.6	1.02	3.9
12	300	0.120	54.4	1.44	5.4
16	400	0.217	98.4	2.60	9.8

**Please note that commonly used sources of chlorine are household bleach (5.25% chlorine) and industrial strength bleach (12-15% chlorine). These will need to be diluted to achieve a 1% chlorine solution.*

To determine how to obtain the required 1% chlorine (sodium hypochlorite) solution, go to the following webpage - <https://www.publichealthontario.ca/en/ServicesAndTools/Tools/Pages/Dilution-Calculator.aspx> which has a dilution calculator.

If the online calculator cannot be accessed, the conversion calculation formula is as follows:

$$C1 \times V1 = C2 \times V2 \text{ where,}$$

C1 is the initial concentration of the bleach (sodium hypochlorite) solution.

V1 is the volume of the bleach to be diluted with water. This is what you are trying to calculate.

C2 is the concentration of the diluted bleach solution you are preparing.

V2 is the volume of bleach solution you are preparing.

An example using sample figures from the table above is demonstrated on the following page.

Sample Conversion

Using the information in the table above, 25 mg/L concentration of chlorine is the desired endpoint in all situations. Given a pipe diameter of 4 inches, and assuming that a 5.25% chlorine solution is what is available for use, 0.3 ml of bleach would need to be added to 0.6 L of water to obtain 0.6 litres of 1% chlorine solution, as shown in the calculator output below.

Chlorine Dilution Calculator



This easy-to-use calculator tells you how much bleach product to dilute with water to get your desired concentration (ppm) of chlorine solution. It is intended for use by public health units, health care facilities, child care centres, swimming pool operators, and the general public (e.g., for disinfection of wells and homes).

Important: Always add the bleach solution to the water when preparing the solution, not vice versa.

Concentration of bleach product i

% sodium hypochlorite

Desired concentration of chlorine solution

ppm or mg/L

Desired volume of chlorine solution

litres ▼

Desired unit of measure for bleach product i

▼

To make your chlorine solution add 0.3 millilitres of bleach to 0.60 litres of water.

Dilution of bleach to water ratio is 1:1,999.

[View Assumptions](#)

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