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Guidance on Issuing Drinking Water Orders to Protect Public Health during an Event Resulting in Low, Zero, or Negative Water Pressure

PURPOSE: This document is written to provide guidance to Drinking Water Program and Water System Personnel on issuing Drinking Water Orders during events that cause the loss of water pressure, such as water main breaks.

SCOPE: This document applied to all Maine Public Water Systems

ORIGINATOR: Various DWP personnel over many years.

CURRENT-OWNER: Nathan Saunders P.E.

DEFINITIONS:

BWO: Boil Water Order
DNDO: Do Not Drink Order
DNUO: Do Not Use Order
DWP: Drinking Water Program
DWO: Drinking Water Order
PWS: Public Water System

RESPONSIBILTIES: All DWP and water system personnel involved with making decisions on whether to issues a Drinking Water Order during a low pressure situation, including water main breaks, should review and apply the decision making process included in this document.

POLICY & PROCEDURE: See pages 3 - 7

ASSOCIATED DOCUMENTS:

DWP Policy for Issuance and Removal of Drinking Water Orders (DWP0061)
DWP Standard Operating Procedure for Issuing and Removing DWOs (DWP0042)

SUPERCEDED DOCUMENTS:

Appendices A, B, and C from DWP0061 prior to the original date of this document.

RETENTION:

1. This document is retained per the DWP Record Retention Schedules.

REVISION LOG:

Section	Page	Rev.	Date	Description Of Change	Approved by:
		Original	12-5-16	Original	Nathan Saunders for Roger Crouse

APPENDICES: None

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"Are you confident all your customers will receive safe water after a loss of pressure event?"

Positive pressure in the distribution system is a protective barrier to keep contamination out. Zero or negative pressure in a water system may allow contamination to enter the distribution system. When a public water system loses pressure because of a main break or other event, the operator must consider the possible risks to all consumers. The operator is responsible for the safety of all water served and for communicating appropriate notifications when the safety of the drinking water is in question.

During a water main break, loss of system pressure, or other event (including backflow causing suction) that may create water that is unsafe for consumption, the operator is responsible for protecting public health by managing (minimizing) the risks to consumers.

When a Low or Zero Pressure Event Occurs, Follow These Three Steps:

Step 1. Determine if the overall risk of delivering contaminated water to consumers is Low or High.

Step 2. Complete the actions listed that are associated with a Low or High risk event.

Step 3. If a Drinking Water Order was placed, follow removal instructions provided.

STEP 1:

Use the following examples of low and high risk conditions to determine if the overall risk to consumers is **LOW** or **HIGH**.

The Table below highlights areas of consideration during a loss of pressure event. Operators must consider these factors when deciding whether or not the water is safe.

Risk to Consumers is Low if:	Risk to Consumers is High if:
1. System has **Low Pressure**, still positive pressure; has not experienced zero or negative pressure. Low pressure may occur due to a crack in a pipe or a partially fractured connection. A pipe that has partially or fully dewatered cannot be considered low pressure.	**1.** System has experienced **zero or negative pressure** where groundwater, sewage, or soil can or have entered the pipe. Any portion of the distribution system that has partially or fully dewatered is considered to have zero or negative pressure. Over time, joined pipe will develop leaks. A pipe with leaks that dewaters will allow ground water to flow back into the pipe, making the risk of contamination high.

Risk to Consumers is Low if:	**Risk to Consumers is High if:**
2. The event is **planned or controlled.** When the shut-down of a water system is preplanned, providing controls such as valve isolation of the system/section being repaired, best practices for trench management and a flushing strategy will reduce the risk of the public consuming contaminated water.	**2.** The event is **unplanned or uncontrolled.** When a loss of pressure event is uncontrolled due to a water main break (not a pre-planned event), it can be difficult to determine the extent of the impact on a water system. Unless the operator has a thorough knowledge of the water system and can determine the extent of the event's impact, a higher risk of the public consuming contaminated water exists.
3. Suction (negative pressure) **has not occurred** within the distribution system; distribution system is relatively flat (no hills) and no multistory or high-rise buildings are affected.	**3. Suction** (negative pressure) **has occurred** within the distribution system. When a water main breaks or is opened for a repair, water that is elevated above the break will naturally flow towards the break. When water systems serve hilly areas and/or multistory buildings, without backflow protection (valves) in place, water will run down toward the break and will also create suction at service connections and water taps. In this situation, any direct connections to non-potable water or other substances enable these substances to be drawn into the potable water system, contaminating it. If the potential for backflow of hazardous substances is present during an event causing loss of pressure, there is a high risk that the water system will be contaminated. For example, if a water system serves an industrial facility that experiences loss of water pressure during an event, unless that facility is protected by proper backflow protection valves, a high risk of water system contamination is present.
4. Adequate flushing can be performed. After a repair, thoroughly flush water pipe/mains affected, preferably toward the repair from both directions if possible, flushing by the repair when possible. Flush until three volumes of water turnover, making sure that the flushed water is visibly clear, and take samples to determine water quality. Flush using scouring velocities of 3.0 feet per second if possible. If scouring velocities are not possible for larger-diameter pipe (12 in. and greater), it is desirable to flush at the maximum flow for the main until three pipe volumes have been	**4. Flushing is inadequate or cannot be performed**. When a loss of pressure event occurs unexpectedly in a complex distribution system with inadequate or inoperable isolation valves, and hundreds of homes are dewatered, the ability to properly flush the water system is compromised. When a mobile home park with 1" diameter pipe is dewatered and flushing can only occur through half inch services and outside spigots, the ability to properly flush the system is compromised. Inadequate flushing presents a high risk to consumers.

displaced before returning the main to service. See AWWA C651. For systems that disinfect, flush until residuals are restored. For small pipe diameters (1-2 in. dia.), flush by opening as many taps as possible. Do not flush into septic systems; use outside spigots. If piping or well is shock chlorinated, flush until the smell of chlorine is not noticeable.	
Risk to Consumers is Low if:	**Risk to Consumers is High if:**
5. The **distribution system is well known**. An example would be a municipal system with up-to-date distribution system maps. Thorough knowledge of a water system (knowledge of the piping layout, where operational isolation valves are located, where the risk of cross connections are higher [industrial operations or residential practices of concern]) helps when making decisions on the amount of risk present to consumers. When water system operators thoroughly understand their water system, a knowledgeable evaluation of the whole-system condition enables better decisions on issuing, or not issuing, a drinking water order.	**5.** The water system has **limited knowledge of the distribution system.** An example might be a Manufactured Housing Community with no record of where water pipe is buried or where isolation valves are placed. When the layout of water system piping/equipment is not well known and the type and number of connections to the water system is not thoroughly known, the risk of providing contaminated water to the consumer is high.
6. A minimal area of the distribution system is affected.	**6. A large area of the distribution system is affected.** The larger the area affected by the low or negative pressure, the greater risk of encountering unprotected cross-connections, and the less likely the operator will be able to properly flush in a timely manner.
7. There is **Adequate Trench Control.** When repairing an underground water pipe/main, certain practices will help reduce the risk of contaminating the potable water supply: • Divert surface water from entering the trench • Continuously dewater (pump) the trench to a level below the pipe • Keep pipe, fittings, and valves clean and spray and/or swab with minimum1% chlorine solution. • Shut down pipe/main for repair after trench controls are in place A trench with raw sewage in it cannot be considered low risk.	**7.** If there is **Poor Trench Control** **If there is sewage in the open trench, place a Boil Water Order on the affected area**. Sewage in the trench creates a high risk of contamination which <u>cannot</u> be mitigated by determining other risk categories are low risk. Note that a broken sewer pipe does not necessarily mean contamination has occurred; the determining factor is whether the broken sewer line has resulted in sewage in the trench.

Risk to Consumers is Low if:	Risk to Consumers is High if:
8. The drinking water has a **disinfection residual.** Systems that continuously chlorinate, chloraminate, or ozonate present a lower risk of the public consuming contaminated water than systems that do not disinfect. Continuous disinfection is used along with flushing practices to reduce the risk to the public after a low pressure event. The disinfection residual level makes a difference; during a low pressure event, temporarily increasing disinfection residual, within acceptable limits, helps to lower the risk of the public consuming contaminated water and protects public health.	**8.** The drinking water does not have a **disinfection residual.**
9. The system **can adequately disinfect piping and equipment.** To reduce the risk of contaminating the potable water supply, spray and/or swab all pipe and equipment with a minimum 1% chlorine solution prior to use or installation. Systems that continuously chlorinate or chloraminate provide a continuous barrier against bacterial contamination	**9.** The system **cannot adequately disinfect piping and equipment**.
10. A system's **groundwater well(s) does/do not dewater**; the system is not pumped beyond its capacity.	**10.** A system's **ground water well or wells dewater**; the well(s) are pumped beyond their capacity.

STEP 2:

Depending on the risk, **LOW** or **HIGH,** complete the following actions:

If the Overall Risk to Consumers is Low:

1. If you are confident that the overall risk to public health is low, a Drinking Water Order is not needed**.**
2. Flush the distribution or transmission main. When a drinking water order is not placed, take O&M samples whenever possible to ensure water quality. If O&M samples come back positive, reevaluate the incident, repeat flushing, and resample. O&M samples do not have to be processed by a certified laboratory.
3. If the main cannot be flushed, sample to determine if additional disinfection is necessary.

If the Overall Risk to Consumers is High:

Place a Drinking Water Order (below): If you are unsure of the safety of the water, you must appropriately communicate the risk to your customers. **If you feel that the overall risk to customers is high, then place a Drinking Water Order on the affected areas of the water system.**

Boil Water Order – A Boil Water Order is issued to protect the health of individuals consuming water from a public water system that may be contaminated by pathogenic microorganisms.

Do Not Drink Order – A Do Not Drink Order is issue to protect the health of individuals consuming water from a public water system that may be contaminated by biological, chemical, or radiological contaminants and where the public health risk cannot be mitigated due to boiling the water..

Do Not Use Order – A do Not Use Order is issued to protect the health of individuals receiving water from a public water system that may be contaminated by biological, chemical, or radiological contaminants that may cause immediate personal harm or injury due to respiratory, topical, or internal exposure.

If there is a high risk that chemical or radiological contaminants have entered all or part of a distribution system, contact the Drinking Water Program (DWP) to discuss whether a Do Not Drink Order or a Do Not Use Order is necessary for the protection of public health. Contact the DWP at 287-2070 during normal business hours, or the DWP 24-Hour Emergency Phone at 557-4214.

Notes:

- Boil Water Orders (all Drinking Water Orders) must be communicated to public water system consumers as soon as possible to ensure the safety of the public.
- When a Boil Water Order is appropriate, the public water system must contact the DWP when the Boil Water Order is placed and removed.
- If in the judgement of the water operator, the risk of contamination is limited to a portion of the water system, a Boil Water Order can be issued to only the portion of system affected by the low/zero pressure event.
- Following other established methods for working with low pressure events such as AWWA specifications may also provide public health protection.
- See AWWA C651 for more details.
- Disinfect a well that has run dry (sucking air) using disinfection methods described at www.medwp.com.

Step 3:

If a Drinking Water Order was placed, follow removal instructions provided here.

- Do Not Drink and Do Not Use Orders can only be removed after consulting with the DWP to determine the number and type of samples required.

- The number of bacteria samples required to lift a Boil Water Order is determined by the population of the area affected with a minimum of three samples for a population of up to 1,000 persons. When the population affected is greater than 1000, contact the DWP to discuss the removal of the Boil Water Order and to determine the number of bacteria samples required to lift a Boil Water Order.

- Unless otherwise instructed by the DWP, inform the DWP of the satisfactory sample results prior to lifting a Boil Water Order.