

# Kentucky Division of Water Public Water System Consumer and Boil Water Advisory Guidance

Revised February 2014

## Background

Consumer advisories provide pertinent, important information to the public regarding their drinking water. Such advisories cover microbiological as well as chemical contamination in addition to other information of concern. In practice, the majority of consumer advisories are “boil water advisories.”

The term “coliform bacteria” refers to a large group of facultative aerobic bacteria common in the environment and generally not harmful. The presence of coliform bacteria, as measured by the total coliform test, is simply an indicator that a problem with the water treatment plant or distribution system exists and that the water may be contaminated. There are two (2) groups of coliform used as measures of drinking water quality in Kentucky:

- Total coliform; and
- *Escherichia coli* (*E. coli*): a sub-group of fecal coliform bacteria

Positive total coliform tests go through a confirmation stage to determine if the coliform bacteria found are of fecal (*E.coli*) origin. Further investigation is necessary, including the collection of additional samples. If fecal coliforms or *E. coli* are **confirmed** in drinking water, then it is likely that disease-causing microorganisms are present. “Results from a single sample or set of samples are typically not cause for issuing a BWA... Detection or sudden increase of any microbial indicators in a single sample or set of samples is not sufficient grounds to issue a BWA [boil water advisory].” (AWWA M48)

“Boil water advisories require a considerable amount of thought if they are to be carried out in timely fashion. One of the most important aspects of BWAs is determining what circumstances trigger the event ... Customer confidence may be eroded or elevated depending on the timeliness and accuracy of the information they receive. Professional judgment and discretion are necessary in making decisions on the issuance of an advisory ... In situations where microbial results are available and system failures are documented, the decision to issue an advisory should be straightforward.” (AWWA M48) If the problem is isolated to a specific zone or tap, system-wide boil water advisory may not be warranted. The advisory should be issued only for that area.

Boil Water advisories are a safeguard to protect the public. When reasonable doubt exists, the protective decision is to issue the advisory. Public water systems (PWS) should develop BWA standard operating procedures specific to their system, discuss those procedures with their DOW Regional Office and communicate the procedure to all employees.

## **Regulatory Language**

### **Definitions: 401 KAR 8:010**

Consumer Advisory: A notice to the consuming public through radio, television, direct mail, electronic mail, posting, newspaper or other media and that conveys the quickest and most effective manner:

- a) Information that the water provided by a system may cause adverse human health effects if consumed and what action the public is advised to take; or
- b) Other information that the public needs to know about its water.

Boil Water Advisory (BWA): A type of consumer advisory that provides notice to the consuming public through radio, television, direct mail, electronic mail, posting, newspaper or other media and that conveys the quickest and most effective manner:

- a) Information that water provided by a system may cause adverse human health effects due to possible biological contamination if consumed, unless it is first boiled for three (3) minutes at a rolling boil; and
- b) What action to take.

### **Advisory Regulatory Requirements: 401 KAR 8:020**

Public water systems (PWSs) and semipublic water systems **may** issue boil water advisories if the system believes an advisory is warranted.

The Energy and Environment Cabinet **may** direct that a boil water advisory be issued when confirmed positive bacteriological sample results have been received (including E. coli or fecal coliform) or conditions exist within a water system that indicate a possible adverse health effect from the consumption of the water distributed by the system.

The cabinet **may** issue a consumer advisory if conditions exist within a water system that indicate a possible adverse health effect from the consumption of water by the public or when other information of interest to the consumer needs to be communicated.

In addition, a public or semipublic water system is required to **immediately** notify the local health department serving the affected area of a BWA [Section 2(9)(c)(1-2)]. The notification can be made by phone, fax or email during normal business hours or through a mutually agreed-upon manner for after-hours notification. A PWS can also develop a written protocol with the local health department that describes when and how the system shall notify the affected health department if the system issues a boil water advisory or consumer advisory. The protocol shall address:

- a. For which types of advisories the system shall notify the affected health department;
- b. What procedures shall be used to notify and under what circumstances;
- c. How soon after the occurrence the notification shall be made; and
- d. To whom the notification shall be made, during and after business hours.

### **Line Break Reporting Requirements: 401 KAR 8:150**

1. A PWS shall notify the cabinet immediately if it experiences a loss of pressure below twenty (20) pounds per square inch (psi) in the area surrounding the break or if line breaks require more than eight (8) hours to repair. These reports are not required if the loss of pressure or line break occurs in a service line serving a single family residence. The issuance of a BWA is NOT mandated by regulations.

NOTE: The eight hours begin when the system becomes aware of the break.

2. Community and nontransient noncommunity public water systems shall maintain a log of all breaks or ruptures (including single family residential service line breaks) which includes:
  - Location of the break or rupture,
  - Date and time it was discovered,
  - Population affected,
  - Length of time required to repair,
  - Date and time disinfectant residuals are detected,
  - Date and time bacteriological samples are taken, and
  - Results of bacteriological tests.

The log shall be available for inspection by the cabinet. The PWS is NOT required to report all line breaks and ruptures to the cabinet, only those that meet the criteria in #1 above.

### **Emergency Repairs: 401 KAR 8:150**

For line repairs due to breaks or ruptures (including single family residential service line breaks), the system shall thoroughly flush the break area and maintain at least a minimum detectable disinfectant residual (depending upon type of disinfectant used).

Public water systems may leave the line in service before bacteriological sampling and may forgo a boil water advisory if:

- The line can be repaired under pressure (i.e. maintain a minimum of 20 psi in the line under repair);
- The break area is thoroughly flushed; and
- At least the minimum disinfectant residual (depending upon type of disinfectant) is maintained.

The system shall take at least two (2) bacteriological tests, one (1) located before or just upstream of the break or rupture and one (1) located behind or just downstream of the break or rupture, as close to the break or rupture as practical. If necessary, additional samples may be required to be representative of the area affected by the break. The sample bottles shall be clearly labeled as “special” tests and the results submitted to the cabinet clearly identified as “special” samples.

Records of the bacteriological results shall be submitted to the cabinet with the routine monthly compliance bacteriological samples unless the “special” samples are required to lift a boil water advisory. Samples needed to lift boil water advisories shall be submitted to the cabinet as soon as results are known and attached to the Incident in TEMPO. The results of “special” bacteriological samples shall be maintained for one (1) year.

## **Boil Water Advisory Guidance (other than a main break situation):**

### **Issuing a BWA**

A BWA should generally be issued if:

1. High turbidity levels in filtered surface water indicate the potential for pathogen breakthrough and interference with disinfection efficiency. Sustained combined filter effluent turbidity readings greater than 1 NTU for 6 or more hours, OR a confirmed turbidity level greater than 5 NTU shall trigger a boil water advisory unless the turbidity is attributable to other circumstances unrelated to filter malfunction (i.e., iron or manganese particles). A BWA is NOT warranted for iron and manganese problems.
2. The occurrence of a key water treatment plant process malfunction, not immediately repaired, which results in unfiltered surface water OR non-chlorinated water being discharged into the distribution system.
3. There is free chlorine disinfectant residual at the entry point to the distribution system less than 0.2 mg/L or total chlorine disinfectant residual less than 0.5 mg/L for chloraminated systems for more than 4 hours **or** in situations in which the system has difficulty restoring a chlorine residual after measures to do so have not succeeded;
4. A water main break, pump failure or other water distribution system malfunction results in portions of the system having zero (“0”) pressure or with negative pressure zones.
5. There is the occurrence of a cross connection or known back siphon episode with an unapproved water supply in which the microbiological quality of the water may be compromised. Examples: flooded wellhead or treatment plant, water main break in a stream crossing.

6. A Groundwater source is confirmed under the direct influence of surface water (GWUDI) and the water systems associated with that source has not installed filtration.
7. The presence of other pathogens such as *Giardia* and *Cryptosporidium* is confirmed at a level and under circumstances that the Division of Water and the state epidemiologist deem a risk.

Strong consideration should be given to issuing a BWA in the following cases:

1. Breaks impacting a school (some utilities make this a policy, but prior consultation with the Board of Education involved is recommended);
2. Breaks in remote part of system which cause delay and difficulty finding or isolating the break;
3. Breaks in a low elevation segment of a high relief (hilly) area where some residents will have pressure loss/water outage;
4. Breaks adjacent to older or damaged sewer lines;
5. Breaks in very low flow/demand areas that may have lower disinfectant residuals;
6. An acute bacteriological violation has occurred (confirmed presence of fecal coliforms or E. coli bacteria). Best professional judgment must be used with regard to the scope or severity of the problem, based on the number and location of positive samples in relation to the size of the system. If chlorine/chloramine residuals in the distribution system are greater than the minimums required, the option exists to wait for complete speciation to issue the BWA; and
7. State or local health department officials have confirmed a waterborne disease outbreak directly associated with the public water supply.

### **Customer Notification Content**

PWS shall carefully determine the appropriate area to which it issues the advisory. The area should include only those customers potentially at risk. The PWS should clearly define the boundary of the affected area using local landmarks or roadways (e.g. "James Bickford Road") to provide clear information to customers. Do not place a system wide BWA when the affected area may be isolated. For example, if only three houses on a dead end spur main lack water pressure after a break on that line, then a system-wide BWA is not appropriate.

Affected customers should be notified that:

- A line break has occurred;
- Repairs have been made;

- Customers should flush household pipes/faucets, home automatic icemakers, water fountains, etc.

The notification should state that customers with infants, elderly or immunocompromised individuals in the household, should seek advice about drinking water from their health care providers. This is a standard notification required to be included in each PWS's annual Consumer Confidence Report (Water Quality Report).

The BWA notification is similar to that given customers when a PWS conducts its annual or semi-annual flushing program. The flushing notification, however, does not trigger notification of Health Departments or the requirement of DOW authorization to end the incident (as required of BWAs). The PWS should carefully label notifications to minimize confusion between BWAs, Consumer Advisories and routine flushing. For example, "Water Line Break Notification".

### **Distribution of the Notification**

If a BWA is issued by the water system, then the system shall immediately notify the Division of Water and the local health department via a protocol established between the system and the health department. The Division of Water may check to ensure appropriate local health departments have been contacted by the system and may contact the Division of Local Health, Sanitation Branch for major incidents such as those of system wide impact.

If the Division of Water issues a BWA, the same distribution protocol should be followed as if the system had issued the BWA.

The water system shall notify the affected public via doorknob hangers, newspapers, TV, radio or any other media (such as Facebook, Twitter or emergency ring-down systems) having an immediate public impact. When feasible, door-to-door public notification of an advisory should be conducted, with the advisory placed in plain site of the resident.

The public water system shall notify hospitals, nursing homes and other sensitive populations about the event, if appropriate.

### **Bacteriological Sampling to Lift the Boil Water Advisory**

An adequate number of samples shall be collected and analyzed for total coliform bacteria as follows:

- With regard to an acute Total Coliform Rule violation, the minimum number of total coliform samples to be collected shall follow the normal protocol for repeat sampling pursuant to the Total Coliform Rule.
- With regard to a **system-wide BWA**, it is recommended that the minimum number of samples to be collected should be:

<u>Population Served*:</u>	<u>Minimum # of Samples</u>
25-1000	3
1001-2000	4
2001-3000	5
3001-4000	6
4001-7000	7
7001-10,000	8
10,001-25,000	9
25,001-50,000	10
> 50,000	10 or 10% of required monthly samples (whichever is greater)

\*Population is determined as in 401 KAR 8:200 Section 3 by either a service connection multiplication factor, census data or actual population count (if in a small area).

If 10 samples or fewer are collected, all sample results shall be negative for total coliform to remove the BWA. If a system serving a population less than or equal to 50,000 elects to take more than 10 samples, no more than one sample shall be positive for total coliform, but it **must** be *E. coli* negative. NOTE: If any samples are positive, the appropriate resampling shall occur.

If a BWA is restricted to a smaller portion of the distribution system, then the required number of total coliform samples should be proportionally lower.

A consecutive system (purchaser) affected by a BWA from their producing system shall also issue a BWA for the area in their system that receives water from that producer.

- Sampling to lift the BWA in the consecutive system shall occur in conjunction with or after the BWA in the producing system has been lifted and with consultation with the appropriate DOW Regional Office.
- Consecutive system sampling may be based on flow, hydraulic modeling or other means to determine the movement of the potentially contaminated water.
- The number of samples from the consecutive system would be based only upon the population of the area affected.

### **Lifting a Boil Water Advisory**

BWAs remain in effect until DOW or the Department for Environmental Protection's Environmental Response Team (ERT) determines or approves that the advisory may be lifted.

A laboratory certified by the cabinet to perform drinking water analyses shall perform microbiological, chemical and radiological testing.

Analytical results shall be forwarded by the laboratory to the cabinet prior to the cabinet's authorizing the lifting of a BWA issued for public health reasons. Outside of routine working hours, the cabinet will cooperate to authorize lifting a BWA when the laboratory verbally informs the cabinet's designated representative of the results. The representative can be reached through the cabinet's 24-hour reporting line (800/928-2380).

Should the ERT lift a BWA during off-hours, weekends and holidays, the information used to lift the BWA should be forwarded to the appropriate Regional Office on the next business day.

The following criteria must be met:

1. Satisfactory analytical results (bacteriological and/or turbidity) coupled with free chlorine residuals of 0.2 mg/L or greater, or total chlorine residuals of 0.5 mg/L for chloraminated systems, throughout the distribution system;
2. Sufficient flushing has occurred in the distribution system to eliminate water that was or might have been contaminated;
3. Treatment deficiency has been corrected; **or**
4. For a waterborne disease outbreak, the state epidemiologist, local health department and DOW must confirm that the health risk is now minimal.

## **Consumer Advisories**

Consumer advisories (CA) are for those situations that necessitate public notification regarding drinking water contamination events that are not bacteriological in origin. Consumer advisories are typically related to chronic exposure (bacteria present an acute hazard) to a contaminant and can be more restrictive as to water use. A lesser use of a CA would be to provide other information that may affect customer health. Common examples include:

### **Drinking Water Contamination**

1. Elevated turbidity due to the presence of iron or manganese. These chemicals create "color" in the water, not particulates. By boiling water that contains manganese, one could concentrate the metal, resulting in a taste or staining of clothes or plumbing fixtures.
2. Detection of a chemical-based cross-connection.
3. Elevated levels of regulated contaminants (such as arsenic, lead) or non-regulated contaminants such as gasoline or crude oil in the source water or distributed water.
4. Terrorism event

## **Other Information Pertinent to the Consuming Public**

1. Notification of a chemical change at the water plant that would affect how the public would perceive the water or how the water would impact customer health (change in taste, hardness, disinfectant).
2. Distribution infrastructure improvements that could result in the shutting off of water for a period of time (new lines, replacing lines/meters, slip-lining)

Consumer advisory notifications can follow the same guidelines as those for boil water advisories. The advisories should be tailored for each event, providing easy-to-understand information through the quickest and most effective means of communication. Sufficient information should be given to explain the event and its duration, its consequences to the consuming public, actions to be taken during the event and a water system phone number.

Consumer advisories (for those incidents other than boil water advisories) can be issued by the Division or by the water system. If the event involves elevated levels of a contaminant or a terrorism event, the applicable DOW Regional Office shall be notified immediately. The Regional Offices do not need to be notified of those public information advisories that do not involve public health.

Consumer Advisories that involve public health and have been reported to the DOW remain in effect until the DOW determines or approves that the advisory be lifted. Lifting a consumer advisory will be dependent upon the event but will require resolution of the situation that led to the advisory. This may require additional sampling if related to a chemical cross-connection or elevated source water contaminants such as manganese or may simply involve notification that the event has ended (main replacement, new meters).

## **Resources**

American Water Works Association, Manual of Water Supply Practices #M48, "Waterborne Pathogens"; 1<sup>st</sup> edition 1999 and 2<sup>nd</sup> edition 2006

Environmental Protection Agency and Centers for Disease Control and Prevention, "Drinking Water Advisory Communication Toolbox"; 2013

# APPENDIX A

## EXAMPLES

BOIL WATER AND CONSUMER ADVISORIES

<b>Situation</b>	<b>Resolution</b>	<b>BWA? Yes or No</b>
High filtered water turbidity; high filtered water manganese	Turbidity reading is false due to color from the manganese; not true particulate turbidity; optimize treatment; consider flushing system	No
High filtered water turbidity; overdose of permanganate confirmed	Turbidity reading is false due to color from the permanganate; not true particulate turbidity optimize treatment; consider flushing system	No
CFE turbidity at 1.6 NTU for 4 hours	Optimize treatment; consider flushing system	No, not over 6 hours in duration
CFE turbidity spiked at 6.1 NTU for 15 minutes	Optimize treatment; consider flushing system	Yes, greater than 5 NTU regardless of duration
Chlorine cylinder empties and is not caught until operator returns from rounds	Immediately change chlorine cylinder; consider flushing system	Depends on how long residual in plant tap below 0.2 free or 0.5 total –if longer than 4 hours, yes (this is a judgment call on the part of the field)
Upgrades on filters under way Settled water inadvertently sent through an empty filter bed	Immediately valve off the empty filter bed; Consider flushing the system	Yes, as unfiltered water entered the system
On-line chlorine analyzer records a free chlorine residual of 0.15 mg/L for 20 minutes; confirmed that not analyzer/recorder malfunction	Raise chlorine residual; investigate cause of residual loss	No, as entry point chlorine residual was less than 0.2 mg/L for less than 4 hours Refer to 8:150 Section 1(2)(b). This is also a judgment call on the part of the field.
Ice storm knocks off power to the water plant for 1 day Despite conservation efforts, portions of the town are without water	Call power company; investigate backup power sources; when power restored, consider slow flushing to refill pipes	Yes, as portions of the system had no pressure or possible negative pressure
Main break that requires 6 hours to repair	Repair main, conduct bacteriological sampling Report results of sampling Maintain main break log	No, but customers affected should be notified that a break has occurred and to flush water before using. Sensitive populations should seek medical advise
Break on a small line that is repaired under pressure	Repair main; conduct bacteriological sampling; report results of sampling; maintain main break log	No

<b>Situation</b>	<b>Resolution</b>	<b>BWA? Yes or No</b>
Main break that lowers pressure in the area to 13 psi; repaired in 2 hours	Repair main,; conduct bacteriological sampling,; notify cabinet; report results of sampling; maintain main break log	No, but customers affected should be notified that a break has occurred and to flush water before using. Sensitive populations should seek medical advise
Booster pump in remote area burns up; pressure drops from 52 psi to 30 psi	Repair pump to restore pressure	No
Riverbank well for a true GW system is flooded during a record flood event; wellhead protection questionable for this event	Once flooding recedes, inspect wellhead and make necessary repairs	Yes, as this is considered a cross-connection with a non-potable source
Utility receives reports of sewer odors coming from faucets in a subdivision hair-like particles in water	Investigate immediately; check storage tanks (this really happened—dead body in tank)	YES (this would most likely become a Consumer Advisory)
During routine bacteriological sampling, notice a hard-piped cross-connection between water supply and fertilizer	Immediately notify company and utility of cross-connection; disconnect cross-connection; monitor until install approved backflow protection devices	No, as not microbiological contamination; flush system
During a routine inspection, field finds documentation that GW system is considered “under the influence of surface water” and has not yet installed treatment	Enforcement?	Yes, as unfiltered surface water is entering the distribution system
A customer has their water tested for Giardia and the test comes back positive; lab is not certified to test for Giardia; no confirmation was done; no reports of giardiasis in area and no treatment upsets	Consult with medical community; consult with DOW	No, as the Giardia result is suspect and not supported by water plant malfunctions or by disease occurrence
Main break in the middle of a stream crossing during a flood event	Repair main; conduct bacteriological sampling; report results of sampling; maintain main break log	Yes, as the potential is high for contamination from the turbid water

<b>Situation</b>	<b>Resolution</b>	<b>BWA? Yes or No</b>
Laboratory confirms presence of E.coli in a distribution sample	Consider flushing area. If chlorine residual is low, raise residual in area	Yes—this could become a Consumer Advisory
Laboratory reports a positive total coliform sample; confirmation not done yet; free chlorine residual was 1.7 mg/L		No, as this is not a confirmed sample positive for E.coli or fecal coliform and the free chlorine residual was greater than 0.2 mg/L. Wait for confirmation
Water main break in contaminated soil (i.e. sewage lateral lines, sewer line in same ditch) regardless of repair mechanism or if under pressure	Repair main; conduct bacteriological sampling; report results of sampling; maintain main break log	Yes, as sewage is contaminated. Could issue BWA for localized area.
Contractor breaks water line while excavating petroleum UST with significant free product around line and pressures drop to 13 psi	Repair main; conduct bacteriological sampling; report results of sampling; maintain main break log. Depending upon water main material, may need to replace entire line; hazardous waste cleanup issues	No, as boiling the water would release the petroleum products into the air. This could cause explosions as well as illness. This would be a Consumer Advisory with specific instructions.
System (or inspector) discovers that entire system has no chlorine residual; flushing did not resolve the situation	Check residual at master meters, investigate any sources of chlorine demand, etc. Determine if a chemical issue (i.e. high Mn)	Yes, as no chlorine residual could be an indication of bacteriological contamination; rule out any chemical contamination first Situation may also warrant an NOV
Pressure routinely below 20 psi in the distribution system or below 30 psi on the discharge side of customer meters	Contact DWB for sanction documentation	If the potential for backflow exists, Yes. Base decision on experience with system
Low to no chlorine residual in one area of the distribution system; system is doing HPCs in lieu of chlorine residuals with results less than 500 cfu/ml	Investigate cause of low or no chlorine residual and resolve	No, as water in the distribution system with an HPC count less than 500 cfu/ml is deemed as having “adequate disinfection residual”
Water system will be doing an extensive main relocation in a subdivision	Customers could experience low pressure/see and hear construction work	No, issue a Consumer Advisory

<b>Situation</b>	<b>Resolution</b>	<b>BWA? Yes or No</b>
Water system decides to use booster chlorination in one area of the distribution system	Customers notice slight chlorine smell	No, issue a consumer advisory for that area explaining the situation
Contamination detected in a suburban area not traceable to a cross-connection—possible terrorist event	Work with federal authorities and other responders to determine contaminant then decontaminate the system.	No, as most likely not bacteriological. May need to issue a “Do not drink” notification