



331-755 Water Main Break Response Protocol For Unchlorinated Systems

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Watermain breaks occurring in water systems that do not have a disinfectant in their distribution systems present a greater risk of microbial contamination than in disinfected water systems. Unchlorinated water systems need to focus on post-break disinfection and additional microbial testing to ensure that distribution water quality is protected. Historically the water industry focused on intestinal microbial pathogens. In recent years environmental pathogens such as Legionella have been recognized as significant threats to water systems. This protocol closely follows the steps outlined for chlorinated systems with increased emphasis on post-repair microbiological testing using two methods, coliform and heterotrophic plate count (HPC).

The water industry recognizes the need to classify water main breaks in terms of public health significance. We established four categories of water main breaks to standardize communication and response efforts in Washington State. These categories describe public health risk across the spectrum of water main failure impacts to utility operations. They are consistent with the Water Research Foundation study—Effective Microbial Control Strategies for Main Breaks and Depressurization (Kirmeyer et al. 2014).

The attached tables describe the recommended response, communication, and repair procedures for each type of water main break. We recommend water utilities incorporate these protocols into their standard operating procedures. The guidance for responding to each type of break is consistent with the requirements of WAC 246-290-451(1).

Water Main Break Categories

Table 1: Main Break Categories

Type I Break	Type II Break	Type III Break	Type IV Break
Positive pressure maintained during break	Controlled pipe repair with limited depressurization after shutdown	Loss of pressure at break site or depressurization elsewhere in the system	Catastrophic main break/water loss event resulting in complete loss of water service
Pressure maintained in pipe during repair	Pressure maintained at break site until pipe exposed & hole dewatered, shutdown limited to immediate valved off area, no loss of pressure elsewhere in system	Loss of pressure at the break site while the pipe is still buried or submerged and/or pressure loss elsewhere in the system	Water loss is extensive compared to system capacity, resulting in no pressure/no water. Storage loss leaves limited flushing capacity.
Unlikely contamination intrusion	Limited possibility of contamination intrusion	Possible/actual contamination intrusion	Possible/actual contamination intrusion

Water Main Break Response Procedures

Listed below are recommended repair and water utility response protocol for each type of water main break.

Type I Main Break Response Procedures

Assess environmental impacts and respond accordingly.
Call Washington 811.
Set up traffic control as needed.
Excavate to below break and maintain pit water level below break.
Disinfect repair parts, swab or spray repair site with 1% chlorine solution.
Complete repair with pipe still pressurized.
Conduct low velocity flush to displace water in affected piping through nearest hydrant or blow off.
A Boil Water Advisory (BWA) and bacteriological sampling is not needed.

Type II Main Break Response Procedures

Assess environmental impacts and respond accordingly.
Call Washington 811.
Set up traffic control as needed.
Excavate to below break and maintain pit water level below break
Isolate/shut off customer services in affected area.
Provide customer notification—door hanger, personal contact, email, and/or reverse 911.
Perform controlled shutdown of broken pipe segment by following established utility procedures (SOPs)
Disinfect repair parts, swab or spray repair site with 1% chlorine solution. (Refer to AWWA Standard C651 Section 4.11) If pipe is replaced disinfect new pipe section from both ends by swabbing. Also swab the cut ends of the existing pipe and flush prior to installing the new pipe section.
Complete repair.
Conduct low velocity flush to displace water in affected piping through nearest hydrant or blow off.
Turn on customer services in affected area.
Instruct customers to flush premise plumbing upon return to service. Verify service restored to all isolated customers.
If the Utility shuts off customer services in affected area and the positive pressure is maintained throughout the system prior to depressurizing the break site, a Boil Water Advisory (BWA) is not needed.
Collect coliform and heterotrophic plate count (HPC) samples to validate repair procedures. Utility may restore service prior to obtaining results. All coliform samples should be non-detect. HPC samples should be consistent with historical distribution sample levels or similar to entry to the distribution system concentrations (post storage) and less than 100 cfu/ml.*
If coliform bacteria are detected or HPC concentrations are elevated in follow up sampling the entire affected area of the water system should be disinfected. DOH publication 331-242 provides guidance on whole system disinfection. A BWA is needed.

Type III Main Break Response Procedures

Assess environmental impacts and respond accordingly.
Call Washington 811.
Set up traffic control as needed.
Provide generic water main break notification and customer response steps on Utility website or directly to customers by door hangers, personal contact, email, or reverse 911 as soon as possible.
Review cross connection control program status, particularly compliance with premise isolation of high health hazards and assess risk of back siphon/backflow accordingly.
Call DOH and local health jurisdiction and decide appropriate public notification message and methods.
Issue Boil Water Advisory (BWA) and update Utility website to reflect impacted area(s).
Evaluate firefighting capacity and sanitation impacts and communicate with appropriate entities.
Isolate / shut-off customer services at the break site.
Shut down affected water main. Lock-out tag-out valves.
Disinfect repair parts, swab or spray repair site with 1% chlorine solution. (Refer to AWWA Standard C651 Section 4.11) If pipe replacement disinfect new pipe section from both ends by swabbing. Also swab the cut ends of the existing pipe and flush prior to installing the new pipe section.
Complete repair.
Complete post-repair disinfection of the distribution system: <ul style="list-style-type: none"> • Post-repair disinfection is necessary if pressure is lost at the break before dewatering of the trench and isolating the break. Refer to AWWA Stand C651 Section 4.11.3.3, Water Research Foundation Project 4307, or other applicable standard for guidance on disinfectant levels needed to inactivate potential microbial pathogens. • Post-repair disinfection throughout the affected distribution system (in addition to immediate pipe break area) may be necessary if break results in loss of pressure at distal points from the break site, depending on the degree of risk associated with the extent, duration, and type of services affected by loss of pressure.
Conduct a scour flush (at least 3 ft/sec) to remove any break-related sediment. For pipes greater than 12-inch diameter a scour flush may not be practical. Flush at the maximum practical flow rate until at least three pipe volumes are displaced and the flushed water runs visually clear.
Conduct low velocity flush throughout area(s) subject to low pressures to displace water.
Instruct customers to flush premise plumbing upon return to service.
Collect coliform and heterotrophic plate count (HPC) samples to verify the effectiveness of the response and to provide the basis for lifting the BWA. The number of samples should reflect the impacted service population and service area. All coliform samples should be non-detect. HPC samples should be consistent with historical distribution sample levels or similar to entry to the distribution system concentrations (post storage) and less than 100 cfu/ml.
If coliform bacteria are detected or HPC concentrations are elevated keep the BWA advisory in place and conduct system wide disinfection. DOH publication 331-242 provides guidance on whole system disinfection.
Rescind BWA based on water quality monitoring results.

Type IV Main Break Response Procedures

Note: A Type IV break is a Type III break with significant impact on system-wide performance.

Response to a Type IV break/event will be the same as Type III response procedures with additional emphasis on the following steps.

Assess Utility capacity to deal with event and seek aid as soon as possible.

Significant depletion of storage tank reserves could affect fire flow capability. Notify local fire authority of current and expected status of storage tank reserves.

Storage depletion may also affect ability to flush the distribution system following repairs, leading to delays in fully restoring water service and lifting the BWA.

Utility may need to include conservation messages with BWA notification.

**Water systems should use their historical HPC sampling results as a benchmark to determine if main breaks and resulting pressure loss have compromised the distribution water quality. For systems lacking distribution HPC histories, the HPC levels in water sources and in storage tanks can be compared to distribution HPC concentrations to help determine if distribution water quality has degraded. Generally, distribution HPC levels should be less than 100 cfu/ml.*

For More Information

Find more resources on our [Publications and Forms webpage](#).

Contact our nearest regional office from 8 AM to 5 PM, Monday through Friday. If you have an after-hours emergency, call 877-481-4901.

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