

# Flooding Can Contaminate Your Well: Testing and Corrective Actions

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## Introduction

Flooding can affect water supplies such as wells, and create health risks. If a wellhead has been submerged by flood waters, it is highly probable that contamination has occurred, but if flooding has occurred nearby, then it is a good idea to have the water supply tested to assure the water quality is still safe for humans and livestock, such as poultry and swine. If there is any doubt about whether the quality of a water supply has been compromised, then use the following guideline to identify and correct the issue.

## How To Test Your Water

### Collect a Sample

For bacteria testing, collect a water sample in a sterile container that can be obtained from your local health department or local county Extension office or sterilize a glass jar and lid by boiling them in water for 10 minutes, but cool the jar to room temperature before using it. Collect a water sample as close to the source as possible following these steps:

- Clean the faucet or outlet by exposing it to a direct flame or by wiping it carefully with 90% rubbing alcohol.
- Let the water run from the faucet for 1-2 minutes.
- Fill bottle halfway with sample water, cap the bottle and swirl around.
- Dump this water out, away from where you're collecting it.
- Do this two more times for a total of three times (this is called a "triple rinse").
- Fill bottle entirely with sample water but leave 1 inch of air space at the top.
- Cap the bottle tightly.

- As the container is being filled, be careful not to touch the lid or inside of the jar on any surfaces.
- The goal is to test the water for bacteria, not bacteria from other locations, like your hands or the floor of the well house.

### Submit to a Local Lab

Store the container on ice until it can be delivered to the Health Department or shipped to the Arkansas Water Quality Lab (contact your local county agent for more information on the lab). It is best if the sample is submitted within 24 hours after collection, but, if this is not possible, keep the sample at refrigeration temperature. As long as the sample is stored cold, it will provide realistic results for up to 4 days. Request an analysis for total bacteria, *E. coli* and coliform and the above-mentioned chemical analysis, for domestic (household use) package if needed.

### Interpret Results

If the results contain more than 10,000 colony-forming units of total bacteria per milliliter (also called cfu/mL), more than 100 cfu/100 mL of coliforms, or 50 cfu/100 mL of *E. coli*, it is a good idea to shock chlorinate the well. Contaminated wells can pose health risks immediately (within days) or there can be a delayed (within months) risk, so monitor human and animal health well past the flooding incident and be ready to test the supply if unexplained health issues begin to occur.

### Treat Well

Shock chlorination is recommended to eliminate bacterial contamination.

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Shock chlorination should only be done when the water supply WILL NOT be used by humans or animals for at least 24 hours as **SHOCK CHLORINATION LEVELS OF CHLORINE ARE NOT SAFE TO DRINK**. For optimal shock chlorination, the goal is to achieve 100-200 parts per million (ppm) chlorine in the system. Remove any activated carbon filters that might be in the system to prevent filter damage. While household bleach can be used for shock chlorination, it can be damaging to the well casing and pump, thus a better option is coated calcium hypochlorite tablets that are dropped directly into the well. If liquid bleach is the only option available, approximately 3 pints per 100 gallons of water will give a 200 ppm solution and the procedure below describes how to calculate the exact amount. Chlorine tablets (follow the instructions on the label) can be ordered from Amazon.com. Use caution when handling chlorine compounds and minimize human exposure to the chlorine fumes in confined areas, such as well houses. Even a small dose of inhaled chlorine can be extremely irritating to the lungs, so protect nose and mouth to prevent inhaling chlorine fumes.

### Shock Chlorination Procedure

**Step 1.** Determine the depth of water in the well. It might be necessary to contact the company that constructed the well to get an exact well depth and water level.

**Step 2.** Determine the volume of water in the well. Measure the inside diameter of the well and then refer to Table 1 to determine gallons per foot of water depth.

**Step 3.** Estimate the volume of water in the distribution system and then calculate the total amount of water in the system. Plan for at least 50 gallons in the pipelines and also calculate how much is in water heaters, holding tanks etc. **DO NOT** run the concentrated chlorine through poultry drinkers. This high level can be very damaging to the equipment.

**Step 4.** Determine the amount of chlorine product required for a 100-200 ppm solution for all of the water in the system (see example). Dissolve the

**Table 1: Volume of water contained per foot of well depth**

Well casing diameter (inches)	Water volume per foot of water depth (gallons)
4	0.65
6	1.47
8	2.61
10	4.08
12	5.88
18	13.22
24	23.50
30	36.72
36	52.87



**Figure 1. Shock chlorination is an inexpensive way to disinfect a well using a chlorine solution made from household bleach. (Photo courtesy of Virginia Tech University Cooperative Extension Service.)**

amount of bleach solution needed into a clean 5-gallon plastic bucket.

**Step 5.** Slowly pour the chlorine/water mixture into the well and distribution system. Splash it onto the well casing if possible. A safer and easier option is to drop the required number of calcium hypochlorite tablets directly into the well and then allow 1-2 hours to dissolve (Figure 1). Next, for both procedures, it is recommended that a hose be attached to a nearby water hydrant and then recirculate the water in the well down the well casing (Figure 2). This will help mix the chlorine with the well water. Once the solution is in the well and recirculated down the casing, turn off hydrants and let bleach stand in system for at least 2-3 hours or overnight if possible.

**Step 6.** Flush the system to remove the chlorine. The entire system must be emptied of chlorine and thoroughly flushed. Do not put the chlorinated water into a septic system. Drain the water where it will have a minimal impact on vegetation and animals. Once you no longer smell chlorine in the water, it is safe to use.

### Example

A private well with an 8-inch diameter casing is 173 feet deep, while the water level is 120 feet below the surface. The well serves a house with a 20-gallon hot water heater. How much bleach should be added for a shock chlorination of 200 ppm chlorine treatment?

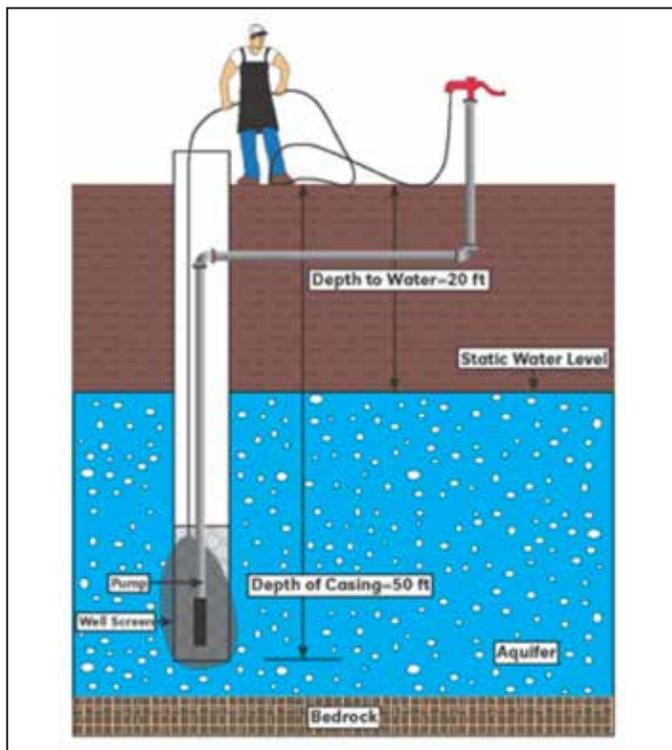
**Step 1.** Determine depth of water in well:  
 $173 - 120 = 53$  feet of water

**Step 2.** Using Table 1, calculate volume (gallons) of water per foot of water depth. For an 8-inch casing, there are 2.61 gallons per foot of water depth.

**Step 3.** Calculate volume (gallons) of water in well: 53 feet deep x 2.61 gallons/foot = 138 gallons.

**Step 4.** Add 50 gallons for water in pipe system within the house and 20 gallons for a 20-gallon hot water heater:  $138 + 50 + 20 = 208$  gallons of water to treat.

**Step 5.** Determine the amount of bleach to add to make a 200 ppm chlorine solution for 208 gallons of water: First remember, we need 3 pints of bleach for 100 gallons of water. Now multiply 208 gallons x 3 pints/100 gallons = 624/100 or approximately 6 pints or 3 quarts of bleach are needed to raise the chlorine concentration to 200 ppm.



**Figure 2.** Recirculating well water during shock chlorination using a water outlet and hose aids the mixing of chlorine within the well. (Image courtesy of the University of Nebraska Cooperative Extension Service.)

## Summary

Contamination of wells with bacteria during and after flooding is a serious concern, especially if the wellhead was submerged by flood waters. It is good safety protocol to get your well tested. If it tests high for total bacteria, coliform or E. coli, then follow the simple and inexpensive shock chlorination treatment described above.

If your well is not high in bacteria but the water is discolored, taste or smells different than before flooding, then you may also want test the well for chemical or physical impurities depending on the use of the well. For example, the University of Arkansas' Water Resource Center's Water Quality Lab offers testing packages for domestic (household use), poultry, livestock and crop irrigation. To submit a sample to the Arkansas Water Resources Lab, simply download the submission form ([Click here to download](#)) and select the testing package that you need or visit your local Extension office where you will be provided a form.

## References

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