



Ohio Department of Health
Bureau of Environmental Health
Private Water Systems

“To protect and improve the health of all Ohioans”

Disinfection Fact Sheet for Flooded Drinking Water Wells

Simple Procedures for Homeowners

Revised September 2012

The following well disinfection procedures may be carried out by homeowners on an existing well after flooding of the well has occurred. During flooding, contaminated water enters the well casing and forces flood water out into the geologic formations providing the water supply. This water will need to be removed from the well and then the well must be disinfected.

This disinfection procedure can also be followed when the presence of large numbers of non-pathogenic bacteria such as slime formers or iron bacteria have been identified. Do not attempt this disinfection procedure on your own if the well borehole conditions are potentially unstable as a collapse of the well is possible. Be aware that this procedure could also potentially damage old corroded plumbing.

After completing the disinfection procedure, a total coliform bacteria sample should be collected and tested. A total coliform bacteria sample is used as an indicator of cleanliness of the well. *E. coli* is used to determine the sanitary condition of a well. The Ohio Department of Health set new microbiological standards for private water systems through the revisions of the Private Water Systems rules effective April 1, 2011. These standards are summarized in the [Microbiological Standards for Private Water Systems in Ohio](#) fact sheet.

If total coliform or *E-coli* positive samples persist after disinfection, then an experienced registered private water systems contractor should be contacted to professionally disinfect your drinking water well using enhanced chlorine disinfection methods and the construction of the well should be evaluated.

Step 1. Pump the well

Turn on as many faucets in the home as possible, and run the water for several hours (24 hours if possible) to waste in the yard or other drainage way. The well should be heavily pumped to remove as much flood water as possible from the casing and the geologic formation. When a well is flooded, the contaminated water enters the well and can move out into the geologic materials that supply water to the well. Over pumping will help remove flood water from the ground water supply. Do **not** discharge this water to the septic system, as it will cause the system to become overloaded.

Step 2. Determine the total volume of water stored in your well. (click to see calculator on page 5)

The volume of chlorine used for disinfection depends on the total volume of water stored in the well casing and the distribution lines (plumbing). The total volume of water stored in the well casing can be calculated based on the total depth of the well and the static water level in the well. Information on the total depth and static water level (water level under non-pumping conditions) of the well can be obtained from the well log. The well log is a record of the construction, depth and geologic material encountered in the well and is filled out by the water well driller. After the well is drilled, copies of the well log are filed with the Ohio Department of Natural Resources (ODNR), Division of Water, the local county health department, and a copy is provided to the well owner. If you do not have a copy of your well log, search the ODNR website at <http://www.dnr.state.oh.us/water/maptechs/wellogs/appNEW/> or contact ODNR, Division of Water at (614) 265-6740. The total depth of the well will be recorded at the right side of the well log, and the static water level will be recorded under the well test section of the well log. Subtract the static water level from the total depth of the well to determine the total feet of water held in the well casing.

Step 3. Determine the volume of chlorine to use for disinfection . (click to see calculator on page 5)

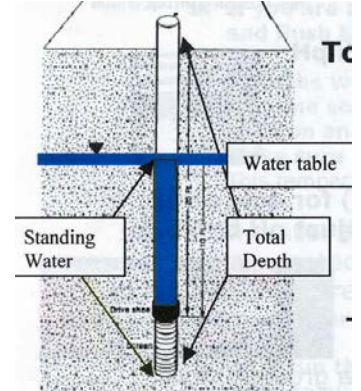
Once the total feet of water stored in the casing is known, then the volume of water stored in the casing can be calculated based on Table 1. Take the total feet of water stored in the well, and based on the well diameter, multiply the total feet times the appropriate gallons per foot of water.

Example:

Total well depth is 100 feet, static water level is 60 feet, well casing diameter is 5 inches.
 100 feet – 60 feet (static water level) = 40 feet of water in the well casing
 From Table 1, a 5 inch casing has 1 gallon stored per foot.
 40 feet of water in the casing x 1 gallon per foot = 40 gallons volume of water in casing

Diameter of well (inches)	Gallons per foot of water
3	0.37
4	0.65
5	1.0
6	1.5
8	2.6

The total volume of chlorine to be used for disinfection can be calculated based on the Table 2. For the example cited above (40 gallons of water in the well casing), use approximately one-half of the amount of chlorine necessary to disinfect 100 gallons.



Chlorine concentration (parts per million)	Gallons of 5.25% sodium hypochlorite - liquid bleach	Pounds of dry calcium hypochlorite	Minimum contact time
100	0.25 gallons (4 cups)	0.2	8 hours
150 ppm	.4 gallons (6.5 cups)	0.4 pounds	8 hours

If the total volume of water stored in the well casing is unknown, add ½ to 1 gallon of fresh 5.25 % unscented laundry bleach, also called sodium hypochlorite, to five gallons of water and three gallons vinegar.

Step 4. Precautions to take before disinfecting the well.

Do not to consume the water during the disinfection treatment process. Arrange for an alternative source of drinking water.

If you are not comfortable working with chemicals, the well disinfection should be performed by a registered private water systems contractor. Please follow all directions and warnings for the chemical products used. Always use rubber gloves, eye protection, and protective clothing when handling mild acids and chlorine products (such as bleach). Avoid contact with the mild acids and chlorine products. If you should splash chlorine or acid solutions on your person or clothing,

immediately rinse thoroughly with water. If you are using purchased well cleaning products, be sure to follow the manufacturer's recommendations for personal protection and safety.

Step 5. Prepare a vinegar and chlorine solution.

Use about three parts white vinegar to one part 5.25% chlorine to lower the pH for better disinfection. Mix the vinegar with five gallons of water then add the amount of chlorine that was determined to be needed in Step 3.



Mix the solution in a new clean garbage can, or clean and line a garbage can with a new plastic garbage bag. Laundry bleach loses its effectiveness the longer it sits on the shelf in the store or in your home. Do not use bleach with fragrance additives. Solid chlorine pellets, which are 65% to 70% calcium hypochlorite, should be dissolved in five gallons of water. Use only chlorine pellet products intended for water well disinfection. Do not use solid chlorine products used for swimming pools because they may contain additional chemicals, such as algaecides. If your water has a lot of dissolved calcium, do not use calcium hypochlorite because it may cause clogging of the well borehole.

Step 6. Add the chlorine / vinegar solution to the well

Remove the cap from the well. Place the can next to the well to pour the solution or siphon the chlorine /vinegar solution from the can directly into the well. A large clean funnel may be helpful with this step, just make sure that the funnel is *larger* than the well casing to prevent losing it down into your well.



Step 7. Flush and re-circulate.

By-pass all water treatment units during the initial chlorination process to avoid damage to the resin bed. The resin bed of the water softener can provide a place for bacteria to grow, and must be chlorinated at lower concentrations. The water softener should be disinfected separately using ¼ to ½ cup of chlorine bleach placed into the small fill tube in the large brine tank followed by a manual recharge. Please check with the manufacturer of the water softener or any treatment device regarding proper procedures or requirements during system disinfection. Remove and discard any carbon filters or cartridge filter elements and thoroughly clean the inside of the filter housing.

With a garden hose, re-circulate this solution back into the well washing down the sides of the casing for approximately ten minutes. Debris may begin to slough off the side of the casing, and iron or manganese in the water may begin to turn solid as the chlorine reacts with the minerals. Run the well to waste outside long enough and hard enough to reduce the debris that has come loose before you run anything inside the house - especially the washing machine. You may need to re-treat the well with another vinegar and chlorine solution before continuing to the next part of Step 7.



After the water has run clear for a while turn on **all** faucets connected to the well throughout the house and outside the house, including the hot water faucets. Make sure to turn on faucets that rarely or never get used, especially yard hydrants and outside spigots. Remember to run water into the washing machine and flush all toilets. Run the water until the chlorine smell is detected.

Step 8. Maintain sufficient contact time.

Once the odor of chlorine is detected in all water lines, shut off the faucets and let the water sit in the plumbing for 8 to 24 hours.

Step 9. Flush the chlorine from the water system.

After sufficient contact time has elapsed, run the water to waste until the entire odor of chlorine is gone. This will take a while depending on the volume of the well and the plumbing. Do **not** run the water into your septic system as this will cause the system to become overloaded.

Step 10. Retest the well for total coliform

Wait a few days, and then contact the local health district to have another sample collected for total coliform bacteria. Make sure that the water is checked for chlorine before collecting the water sample. If there is any indication of chlorine in the water, the sample should not be collected. This helps avoid getting an indication of a safe sample that may be due only to the continuing activity of leftover chlorine and may not reflect the true condition of the water. Do not replace carbon filters or filter elements until an acceptable total coliform result has been achieved.

What if the well has unacceptable levels of total coliform after disinfection?

There are many instances where the previously described disinfection procedures may not work sufficiently in reducing the levels of bacteria in the water well. In some cases the pH of the water may need further adjustment in order to get the optimum disinfection from the added chlorine, or enhanced disinfection methods may be required. The well casing may also need a thorough scrubbing or cleaning to remove non-pathogenic slime forming or iron bacteria that can build up on the well casing and borehole walls. Removal of this type of bacteria often requires the use of specially formulated well cleaning products and cleaning equipment and is best performed by a registered contractor. If total coliform levels persist above four colony forming units (CFUs), if *E. coli* bacteria persist in water samples, or the condition and stability of the well is questionable, then contact an experienced registered private water systems contractor

(<http://www.odh.ohio.gov/odhprograms/eh/water/PrivateWaterSystems/List-of-PWSCContractors.aspx>) to professionally disinfect your well. Persistent bacteria problems may also indicate that your well has deteriorated or that there is an existing issue with the aquifer. Contact your local health district when you experience any problems with your well or for additional assistance on private well issues.

The Ohio Department of Health registers and bonds private water systems contractors. Please contact your local health district or check for the most current list of registered contractors and other information at the Ohio Department of Health's Private Water Systems Program by going to <http://www.odh.ohio.gov/odhprograms/eh/water/PrivateWaterSystems/main.aspx>.

Questions?

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Private Water Systems: Water Well Disinfection Volume Calculator

Property Address: _____

ODNR well log ID: _____

Enter the following information from the well log:

Total Depth of Well (TD): feet

Static Water Level in Well (SWL): feet

Well Casing Diameter* must be a whole number (D): inches

*if more than one, use largest.

If reported with a part of an inch, round up to next whole number (ex: 5.5 in would be entered as 6)

Well Volume Calculation

Gal/foot factor from casing = gal/ft of water

Feet of water in well (TD-SWL) = feet

Gallons of Water in Well = gal

Volume of regular liquid bleach and vinegar needed for 100 ppm solution

100 ppm solution: Regular bleach needed
is about equal to gallons bleach
 cups bleach

100 ppm solution: Distilled white vinegar needed
is about equal to gallons vinegar
 cups vinegar

Volume of regular liquid bleach and vinegar needed for 150 ppm solution

150 ppm solution: Regular bleach needed
is about equal to gallons bleach
 cups bleach

150 ppm solution: Distilled white vinegar needed
is about equal to gallons vinegar
 cups vinegar