



Directions for Disinfecting a Home Well in New Jersey

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Disinfection of Wells

A common problem of New Jersey well waters is bacterial contamination. These bacteria may or may not be harmful. Because it is difficult to test a well water for all types of harmful and harmless bacteria, a certain group, known as the coliform bacteria, are used to indicate possible contamination. These coliform organisms live in the intestinal tract of warm-blooded animals (e.g., humans), hence they are excreted in large numbers. Any well water that shows the presence of coliform bacteria is considered contaminated and should be disinfected.

Conditions that May Cause Contamination of Existing Wells

Well waters may become contaminated by coliform bacteria from any of the following conditions:

- 1) Loose or worn seal on drilled and driven wells.
- 2) Defective, too short, or inadequately sealed casings in drilled and driven wells.
- 3) Cracked or loose-fitting cover on a dug well.
- 4) Defective wall lining, or cracked concrete apron of a dug well.
- 5) Repair to well structure or submerged pump.
- 6) Flooding of the well due to hurricanes, floods, heavy rainfall, or other natural disasters.

- 7) Breakdown and repair of a septic tank system.
- 8) Wells drilled into fractured rock formations.
- 9) Wells located in areas where ground water is subject to continuous contamination from outside sources.

When Wells Should Be Disinfected

Well waters should be disinfected whenever any of the following situations prevail:

- 1) Suspected contamination by any one of the nine conditions listed above.
- 2) After repair of an existing well or pump.
- 3) After construction of a new well and before any water is used.
- 4) Upon receipt of a laboratory report showing an unsafe coliform bacteria analysis.

Methods of Temporary Disinfection

- 1) **Boiling water.** If contamination is known or suspected, the water from the well may be boiled for at least one minute. This is a simple and effective way of providing immediate disinfection for small quantities of water. It does not provide treatment, however, to all the water in the well or the water in the distribution system.



2) **Chlorination.** If a well is temporarily contaminated by coliform bacteria, disinfection is accomplished most effectively with a chlorine-containing chemical. Any common household liquid bleach that contains approximately 5 percent "active" ingredient, usually sodium hypochlorite, is the most convenient chemical to use. Chlorination has been studied extensively and is the standard by which other disinfection methods are judged. Chlorine is a strong oxidizing agent. It is inexpensive, easy to use and to monitor, and is safe at low doses. A dose of chlorine large enough to be harmful smells too bad to drink and will cause the eyes to burn or water. Chlorine is also easy to remove. Exposure to the atmosphere, heating or filtering through activated carbon will remove chlorine from water.

In the case of shallow dug wells, the chlorine solution can be added directly to the water by simply raising the cover, whereas the seal on existing driven and drilled wells must be removed first. After adding the solution, make sure that the well seal or cover is properly replaced.

The table below shows the proper amount of liquid bleach to be added directly to the well. Be sure to use regular household laundry bleach, avoiding scented products. Pour the bleach down the well. To circulate the chlorine throughout the water system, rinse down the inside surface of the well casing with a garden hose for 5 to 10 minutes.

Next, go to each water tap connected to the plumbing system and run the water until you begin to detect the odor of chlorine bleach. Check all hot and cold outlets, including dishwashers, laundry, shower heads, outside faucets, and ice makers. Allow the chlorine solution to remain in the well for at least 12 hours. A longer contact time, up to 24 hours, is even better.

After this period of time, attach a garden hose to the system and run water to an area where the chlorine will cause no damage. Chlorine can kill grass and fish, so avoid these areas. Also avoid running the water into a

Shock Chlorination

New water wells, wells where the pump has been pulled for service, and wells that are occasionally contaminated by animals should be treated by "shock chlorination." Shock chlorination involves pouring a strong solution of chlorine, usually in excess of 50 parts per million, into the well and pumping it through the equipment and piping.

Chart below shows volume of 5 percent bleach solution required. (Disinfection strength equals approximately 50 parts per million. All measurements are liquid ounces. (NOTE: 32 ounces = 1 quart. A standard measuring cup = 8 ounces.

Depth Of Well						
Diameter of well	20 feet	30 feet	40 feet	50 feet	100 feet	200 feet
up to 6 inches	4 ounces	6 ounces	8 ounces	10 ounces	20 ounces	32 ounces
6" - 12"	16 ounces	24 ounces	32 ounces	2 quarts	3 quarts	4 quarts
12" - 24"	2 quarts	3 quarts	4 quarts	-----	-----	-----
24" - 48"	2 gallons	3 gallons	4 gallons	-----	-----	-----

septic system. Run the water until you can no longer detect the chlorine odor. Follow this procedure for your plumbing system by running each of the cold water taps.

To ensure its safety for drinking, the well water should then be tested for coliform bacteria. Do not sample until all traces of chlorine have been flushed from the system, usually 48 to 72 hours after you initially flushed the system. This will ensure that all water in your system has been replaced with a fresh supply from underground sources.

A positive coliform bacteria test after chlorination can indicate an ongoing source of contamination (such as broken well seal or a cracked casing). It may also indicate an improper disinfection procedure. A thorough sanitary survey of the well and plumbing system should be performed by a professional and at least one more chlorination disinfection of the system should be performed *before* any treatment options are considered.

Continuous Chlorination

Continuous disinfection requires equipment to add chlorine to all water drawn from the source. The chlorine must be thoroughly mixed with the water and have sufficient contact time to kill all disease-causing and nuisance-causing organisms. The time required for disinfection depends on the concentration of chlorine, temperature and pH of the water, the amount of organic matter in the water, and the discharge rate of the pump. Disinfection for most waterborne disease-causing organisms occurs after 20 minutes of contact time when the pH is between 6 or 8 and the free available chlorine residual is in the range of .2 to .4 parts per million.

Permanent Means of Disinfection

Before installing a permanent means of disinfection, the homeowner should be sure that the contamination originates from the groundwater and that it is not a temporary condition. This is indicated by tests that show the presence of coliform bacteria even after the well has been disinfected, and after making sure that the well has been properly constructed and protected. Also, in areas where wells and septic tanks are crowded together it is almost certain that the groundwater is subject to continuous contamination. In these situations, permanent disinfection may be affected through the use of a home chlorinator that feeds chlorine continuously into the water.

Chlorination Systems

Many types of commercially available home chlorinators are available, but most of them work on the principle of feeding a chlorine solution (usually the 5 percent bleach mentioned previously) into the water whenever the well pump operates. These units are located on the discharge side of the well pump and before the pressure storage tank. Some of the chlorinators feed just enough bleach, approximately 1 to 2 parts per million (ppm) to effect adequate disinfection and yet leave a small residual, 0.2 to 0.5 ppm of chlorine, as a safety factor. Other units feed the bleach at higher dosages in the range of 5 to 10 ppm (so-called super-chlorination). In this case, the high residual chlorine imparts an objectionable taste to the water, hence a dechlorination unit must be installed after the pressure storage tank. For further information about home chlorinators, contact your local health department.

Trihalomethanes (THMs) are chemicals that form when organic material from the breakdown of plant material combines with chlorine. THMs are linked to increased risk of some cancers. Although consuming THMs in chlorinated drinking water presents some risk, the health hazards of consuming microbiologically unsafe water are much greater. THMs can be removed with certain activated carbon devices.

Ultraviolet Light Disinfection

Ultraviolet light is a method of disinfecting private water systems. Ultraviolet light adds nothing to the water and does not produce any taste or odor. The UV light is produced by a mercury vapor lamp that produces a disinfecting dose rated in microwatt-seconds per square centimeter. Values of 20,000 MWs/cm² will kill most types of pathogenic bacteria; viruses are more resistant and variable and may need up to 45,000 MWs/cm².

Distillation Disinfection

Distillation provides another water disinfection option as a "point-of-use" system. Distillers are also used to reduce nitrates, remove dissolved salts like chlorides, sulfates, and carbonates of sodium, potassium, and magnesium, organic matter and other soluble and suspended materials. Distillation units boil water, making steam that is condensed and collected as purified water. Home distillers vary in design, however the countertop single-batch ver-

sion is most common. These distillers cost up to \$1500 for deluxe models. All home electric distillers use 100 to 120 volt a.c. current. The water output of a home distillers ranges from 3 to 12 gallons per day. The power consumption of these systems varies from 3 to 5 kilowatt hours of electricity per gallon of distilled water produced. Thus the electric cost of distilled water can be high.

Drawbacks to distillation: The most serious is that liquids with organic molecules whose boiling point is less than that of water will be carried with vapor into the condensate chamber and distillate reservoir. Chloroform, phenol, and trichloroethylene have been found in the finished water.

Because distilled water is mineral-free, it tends to taste flat and is damaging toward metals. It is best to draw water directly from the distiller and not through any metal piping. Distiller tanks, if not properly used and maintained, can also become notorious breeders of bacteria because of the presence of warm water. To remove bacteria and concentrated salts, periodic disinfection and cleaning is necessary.

Well Water Testing

Well waters should be tested at least once a year for coliform bacteria. For more information on other recommended water tests, request Rutgers Cooperative Extension fact sheet FS434, "Drinking Water: What Tests Do I Need?", and fact sheet FS343, "Where to Get Your Drinking Water Tested in New Jersey."

Other relevant fact sheets include: FS435 "Drinking Water Treatment and Conditioning", FS433 Drinking Water Standards, Extension Bulletin E214, "Interpreting Drinking Water Quality Analysis - What Do The Numbers Mean?"

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