

# Springs

A spring is a place where ground water emerges naturally from the earth's surface, usually along hillsides, at the base of slopes, or in low areas. The following should be considered when developing or improving a spring.

## LOCATION

It is easy for springs to become contaminated if they are located downhill from a source of contamination. For this reason, all sewage systems, barnyards, livestock pastures, fuel tanks, and other sources of pollution must be located at least 100 feet away from springs. Depending on the soils, geology, and slope of the land, an even greater distance may be needed. Also avoid extremely wet areas when locating a new spring, because saturated soil can't filter out bacteria.

## CONSTRUCTION

Springs should be constructed in a way that protects against surface water contamination and prevents rodents and insects from entering. If the property around the spring is sloped so that rain water can pool around or enter the spring, consider regrading or constructing a diversion ditch so that surface water runoff is kept away from the spring.

(For proper spring construction, refer to the diagram on the back of this sheet.)

## DISINFECTION

All newly constructed or repaired springs should be disinfected because the handling of construction material can contaminate the spring water. Please read the Vermont Department of Health handout, *Disinfection*, for instructions on how to disinfect your spring.

Generally, one gallon of household bleach is enough to disinfect a 10-foot spring. For overflowing springs, consider using calcium hypochlorite tablets as an alternative to bleach. Tablets can be purchased at a pool supply store. Be sure to follow manufacturers' directions.

## TESTING

The spring water should be tested for bacteria several days after the chlorine odor disappears. Springs that are newly constructed or have persistent problems with bacteria should also have a complete chemical analysis. You may purchase test kits at the Vermont Department of Health Laboratory or by calling the laboratory at 802-863-7335 or 800-660-9997 (in Vermont).

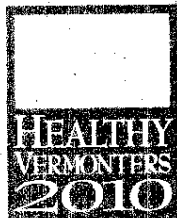
## BACTERIOLOGICAL CONTAMINATION

The most common way to determine drinking water quality is to test for total coliform bacteria which includes *E. coli* bacteria. These organisms are found in plants, soil, surface water, and in some cases, the intestines of warm-blooded animals. They do not naturally inhabit springs.

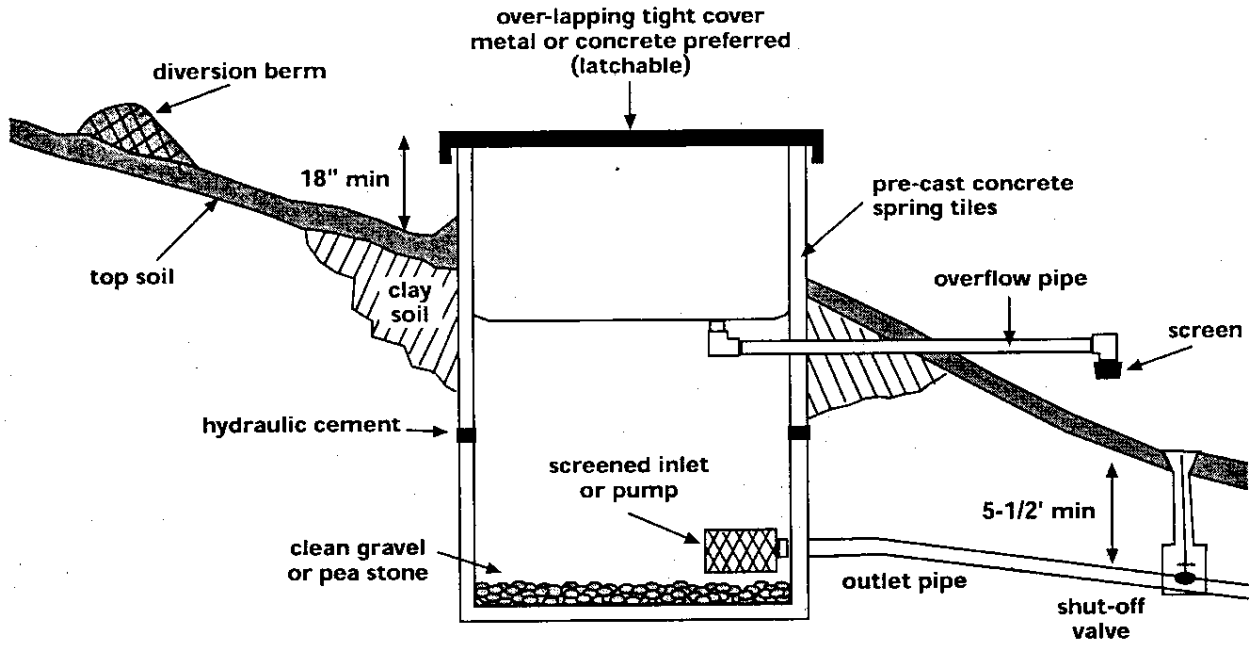
The presence of coliform bacteria in ground water (wells and springs) does not necessarily mean that disease-causing organisms (pathogens) are present. However, the presence of coliform bacteria means there is a pathway for disease-causing organisms to enter the spring.

If a water test results show that bacteria are present, construction of the spring should be thoroughly checked (see diagram). In addition, the surrounding area should be checked for likely sources of contamination.

Do not drink the water from a spring that has been contaminated until the problem is corrected, the system is disinfected, and a follow-up test shows that no coliform bacteria are present, or unless the water is boiled for one minute.



# Typical Spring Construction



# Dug Wells

**B**ecause they draw from shallow water tables, dug wells are generally more vulnerable than drilled wells to contamination. However, a properly constructed dug well in a good location can produce high-quality water. The following should be considered in developing or improving a dug well.

## LOCATION

The well should be located at least 100 feet from all sources of contamination. Depending on the soils, geology, and slope of the land, an even greater distance may be needed. The well should be located uphill of septic systems, barnyards, livestock pastures, and fuel tanks, and at least 25 feet from streams and ponds. In addition, wells should not be located in extremely wet areas.

## CONSTRUCTION

Refer to the sketch on the back of this sheet for proper construction. If the well is on sloping ground, build up soil to create a barrier to divert surface water from running toward the well.

## DISINFECTION

All newly dug or repaired wells should be disinfected, because the handling of construction material and pump equipment can contaminate the well water. Disinfect the well by adding one gallon of household bleach for every 10 feet of depth (3 foot diameter well). Scrub the sides of the well with a longhandled brush using a bleach solution. When done, the chlorinated water will disinfect the well, the pipeline between the well and the house, and the indoor plumbing. Run the water at each faucet until there is a chlorine odor, then turn faucet off and allow the chlorine to stay in the system for about 12 hours or overnight.

The chlorinated water can be run out through a garden hose to a safe area after the disinfection is complete. Plan ahead to get a safe source of drinking water during the disinfection period and until test results are re-

turned. An alternative is to boil water for five minutes. Use caution when bathing because the chlorine may irritate the eyes and skin of sensitive individuals.

## TESTING

The well water should be tested for bacteria two to three days after the chlorine odor disappears. Wells that are newly dug or have persistent problems with bacteria should have a complete chemical analysis. Sample containers for both the bacteria and chemical tests may be ordered from the Vermont Department of Health Laboratory (telephone 863-7335 or 1-800-660-9997).

## BACTERIAL CONTAMINATION

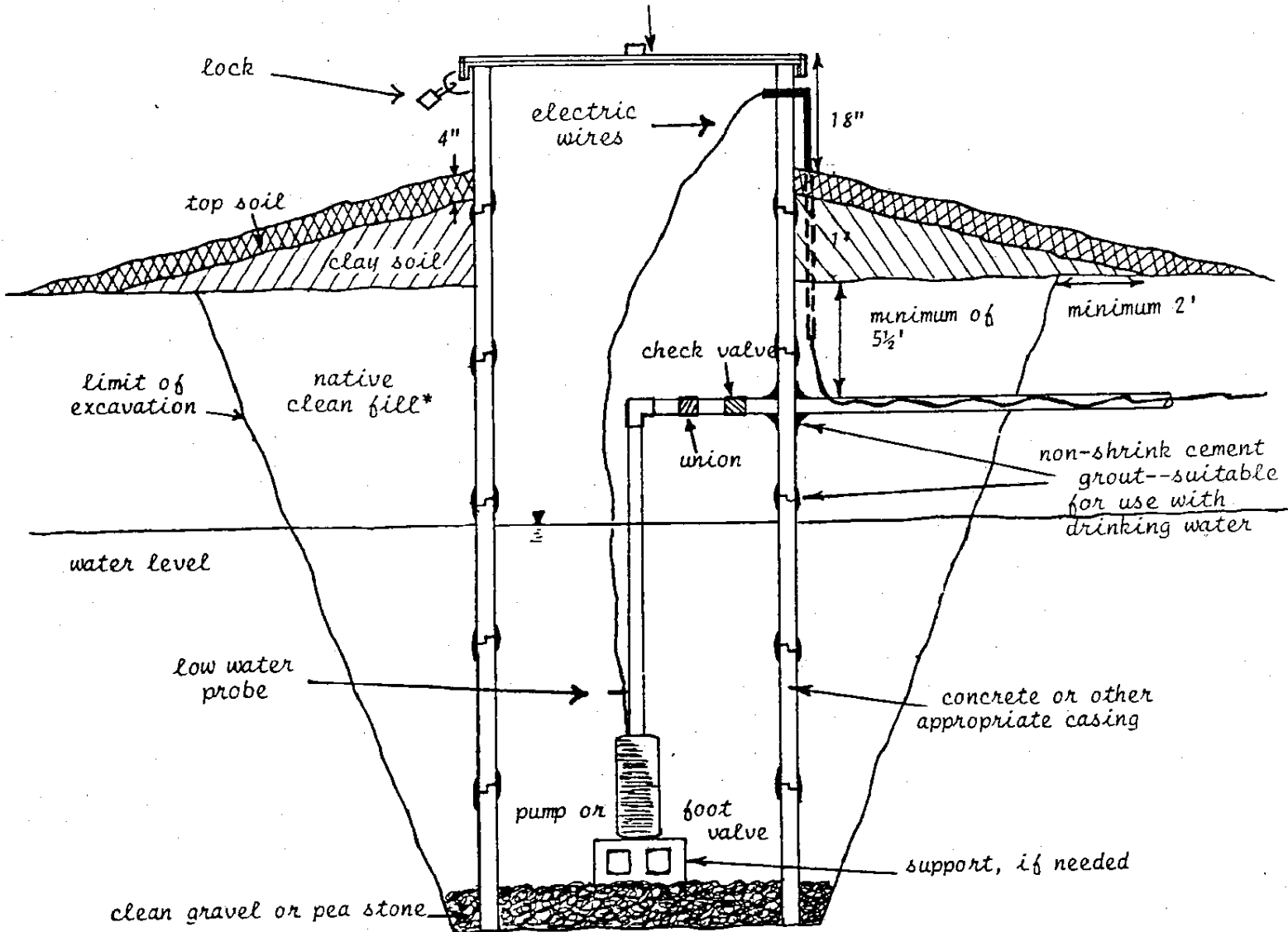
The most common way to determine drinking water quality is to test for coliform bacteria, a common bacteria found in soil, plants and surface water. Though coliform bacteria does not generally cause disease, its presence in the well water means that contamination has entered the well. Inspect the well and the area around the well to determine how runoff water may have entered. The water should not be consumed as there is a possibility that it could contain disease-causing organisms. Boil the water for one minute before drinking.

Specific types of coliform bacteria called fecal coliform or *E. coli* can originate in the intestines of animals and humans. If your water sample tests positive for total coliform bacteria, a second test is automatically conducted to determine whether fecal coliform or *E. coli* are present. Results showing the presence of these kinds of coliform indicate a strong likelihood that human or animal wastes have entered the water system.

Do not drink contaminated water until the source is corrected, the system is disinfected, and a follow-up test shows that the water is safe to drink; or unless the water is boiled for one minute.



Easily removable, over-lapping  
tight-fitting and locking cover  
metal preferred



"DUG WELL"

\*do not substitute gravel or sand

# Drilled Wells

**D**rilled wells draw water from deep below the ground and are the source of drinking water for many households and communities throughout Vermont. As a well is drilled, steel casing is inserted into the hole. This casing is secured 10 feet into bedrock. Drilling will continue deeper into bedrock until an adequate supply of water is discovered. A different method is used if the well driller encounters gravel instead of bedrock. Once the drilling is completed, a submersible water pump is installed in the well to pump water to the home.

The well casing extends about 18 inches above the ground, it has a watertight well cap with a screened vent, and there is a conduit for the electrical wires for the pump close to the casing. Wells drilled since 1987 may have a metal tag with identifying numbers stamped into it. These numbers correspond to the well drillers report filed on this specific well.

Consider the following when planning to construct or improve a drilled well.

## LOCATION

Before drilling, determine the location of all possible sources of contamination in the area. The well should be located uphill and as far as possible from them. Examples include leachfields, barnyards, livestock pastures, fuel tanks, roads, etc. Do not situate the well in a floodplain or close to streams, ponds or wetlands. In some instances, you may want to hire a hydrogeologist to assist in this decision; in other instances, the well driller's experience can be helpful. On small parcels of land where a permit may be required, the well location may already be specified in the permit.

Additional protection can be gained by having the driller grout the well. Grout is a mud-like mixture of concrete or clay that is pumped between the casing and the soil forming a seal. This seal effectively prevents surface water from flowing down the outside edge of the casing so that no contamination will be able to enter the well hole.

## DISINFECTION

After a well is drilled, repaired or serviced, it should be disinfected. Disinfection will en-

sure that any bacteria or viruses that may have gotten into the well during construction or other work are killed and flushed out of the plumbing system. Liquid household bleach can be used to disinfect the well. Use one gallon of bleach per 350 feet of well depth. This solution should be left in the system 12 hours and then flushed out over several days using an outside faucet. See the handout "Guidelines for Disinfection" for specific instructions. If the well water has iron or manganese present, disinfection could temporarily cause the water to change color (rust or grey).

## TESTING

After there is no longer any chlorine odor, arrange for a laboratory bacteria test. The test will determine whether coliform bacteria are present. These bacteria do not naturally live in well water; they are common in soil and are found in the intestines of warm blooded animals. Their presence in your well indicates that water from the surface has entered your well. This means that there is a possibility, but not a certainty, that disease organisms can enter the well by the same route.

Your laboratory sample will be checked more specifically for the presence of fecal coliform (animal or human waste) if total coliform are found. A properly constructed and maintained well and piping system should not have total coliform bacteria.

A bacterial test kit can be ordered from the public health laboratory by calling (802)863-7335 or 1-800-660-9997.

## STAY SAFE

Do not drink water that is contaminated with bacteria until corrections are made to the well, the system is disinfected and a follow-up water sample shows that no coliform organisms are present. Boiling your water for one minute will make it safe for drinking, ice cubes, produce washing and teeth brushing.

