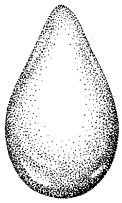
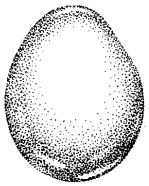
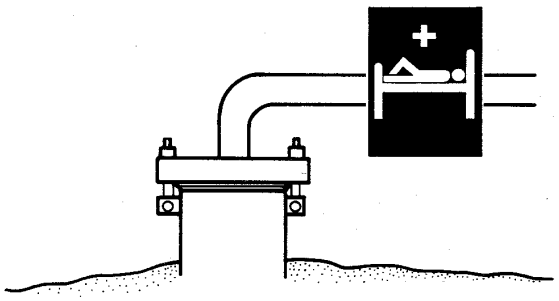
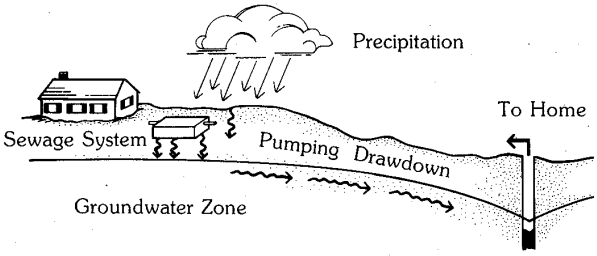


Is your drinking water

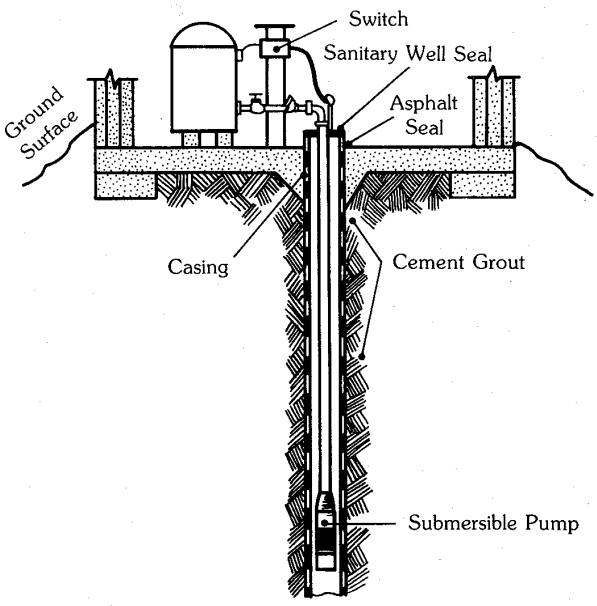


SAFE?





PROPERLY CONSTRUCTED WELL



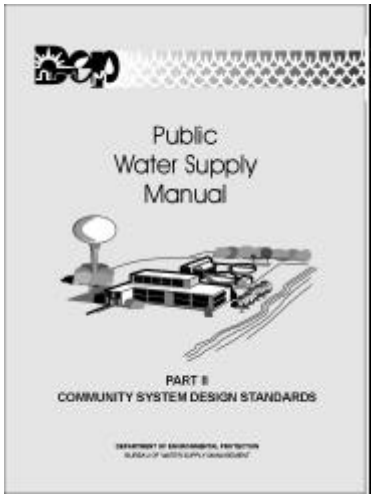
THE PURPOSE OF THIS PAMPHLET IS TO MAKE PENNSYLVANIANS AWARE OF:

1. The hazards of using water from contaminated individual supplies

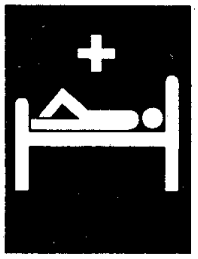
- Sewage
- Typhoid Fever
- Gastroenteritis
- Pesticides
- Acid Mine Waste

2. How these water supplies become unsafe

3. The methods of preventing contamination of this precious resource, your drinking water.



DESIGN STANDARDS



IS YOUR DRINKING WATER SAFE?

CONTAMINATION OF NEW AND EXISTING INDIVIDUAL WATER SUPPLIES

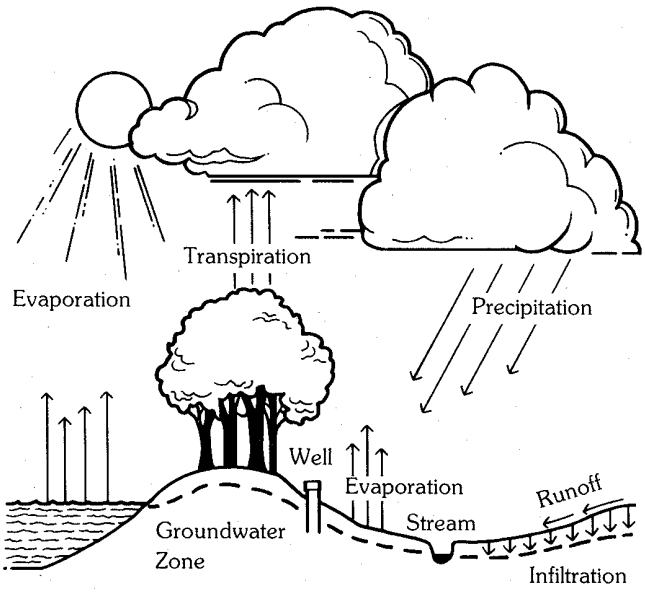
The average person consumes about two quarts of water every day for drinking and cooking and uses up to 62 gallons daily for bathing and other activities. Most of us assume that this water is safe to use. However, the Department of Environmental Protection (DEP) estimates that of the approximately 970,000 private individual water supplies in Pennsylvania, approximately 400,000 supplies are unsafe for human consumption due to groundwater polluted with contaminants such as human sewage, animal wastes, petroleum products from leaky underground storage tanks, pesticides and other toxic chemicals. This means that about 1.5 million residents risk becoming ill from their private drinking water supplies. If the visitors to Pennsylvania are included, many more people are being exposed to unsafe drinking water.

In addition, a number of the approximate 15,000 ***new*** water wells drilled each year in Pennsylvania are not constructed according to the design standards recommended by DEP.

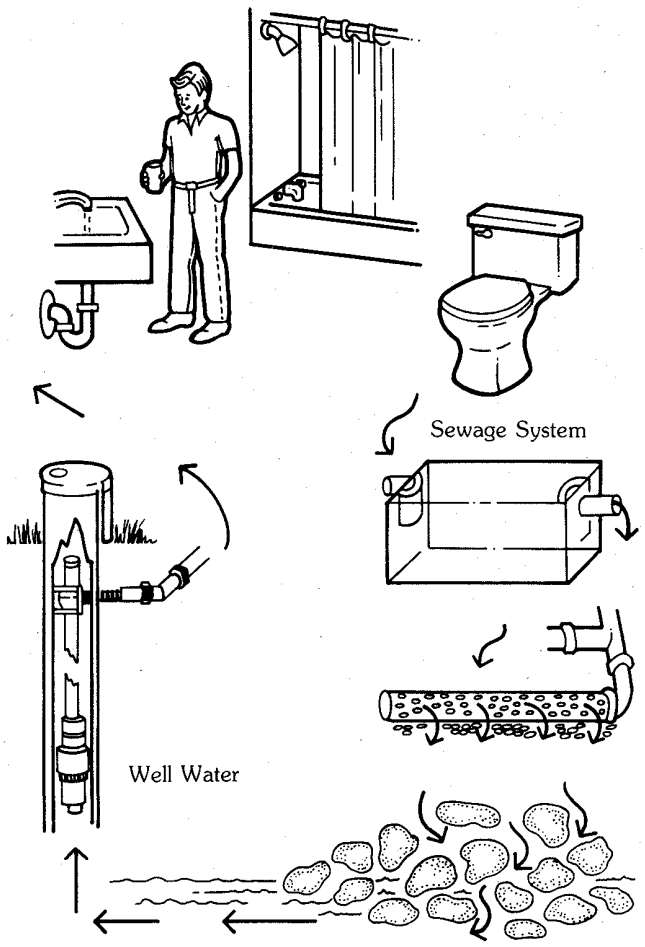
As a result of these unsatisfactory individual groundwater supplies, there are numerous confirmed waterborne illnesses in Pennsylvania each year.

Many people are concerned with constructing a safe new water supply at their residence or place of business or want to correct a problem with their existing water system. We are all becoming increasingly aware that our groundwater and surface water sources are often polluted and not safe to drink. One of the reasons for this growing awareness is that thousands of people each year are having their water supply sampled by private or public laboratories for bacteriological or chemical analyses. The motivation for sampling a water supply may be suspected illness from the water or a chemical problem, such as staining of fixtures or foul tasting water. All too often, the sample results indicate contamination and the homeowner has the responsibility and expense of making his water supply safe to drink.

THE HYDROLOGIC CYCLE



CYCLE OF SEWAGE DRAINING TO UNDERGROUND WELL WATER SUPPLY

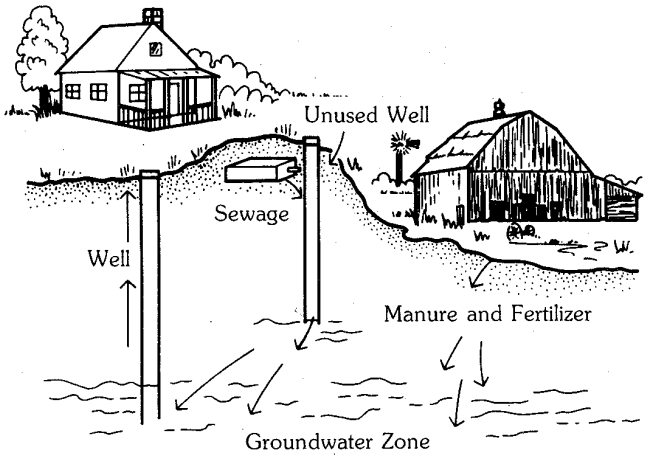


HOW WATER SUPPLIES BECOME CONTAMINATED

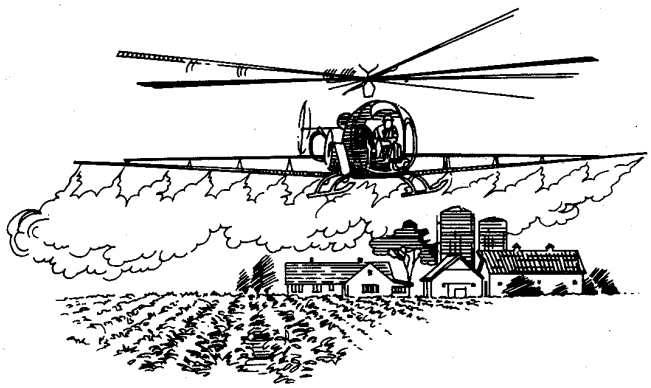
The famous cartoon character summed up how water supplies usually become contaminated when he said, "We have met the enemy, and they is us." Most contaminants in our drinking water have been placed there by us, or are allowed to enter our water supplies through faulty well construction. The only exceptions are the naturally occurring minerals dissolved out of the rocks and soils, such as calcium deposits from limestone. Precipitation infiltrates the soil and flows vertically through the underlying rock until it reaches the water table or saturated bedrock. Once water reaches the water table, it flows downhill under gravity until it eventually reaches the ocean where it evaporates to form clouds and rain which renew the cycle. The earth's process by which water is renewed is called the "hydrologic cycle."

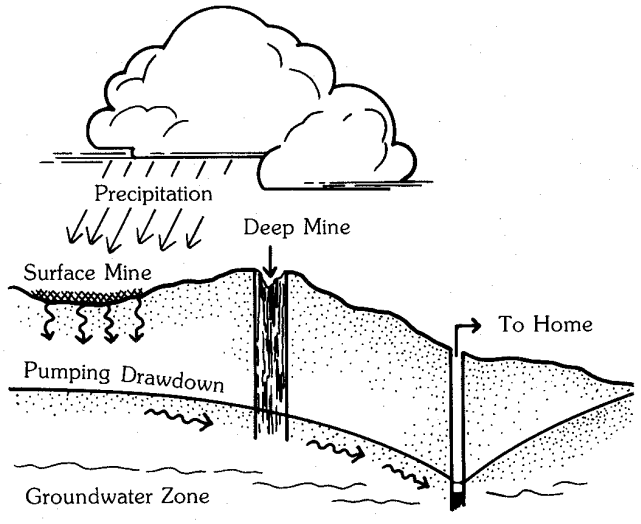
Let us examine some examples of how people have contaminated private water supplies.

1. Improper sewage disposal has been one of the main causes of pollution of drinking water. A properly functioning sewage system will remove disease-producing bacteria from the home wastewater by filtration through the soil. However, even the best subsurface system will allow some portion of the wastes to enter the groundwater. Before the Pennsylvania Sewage Facilities Act became law in 1966, home wastewater was discharged into the ground or streams with little guidance or concern as to the effect of the sewage. In many cases, home sewage systems installed before 1966 were improperly constructed and allow bacteria and visuses to reach the groundwater. We now know that sewage from a malfunctioning system can travel relatively unfiltered through cracks and fissures in the underlying rock. A nearby drinking water supply well can be contaminated when sewage is drawn into the well. This condition demonstrates the importance of proper sewage disposal. In order to prevent contamination from this source, the Pennsylvania Sewage Facilities Act requires that tests of soil depth and percolation (permeability) as well as the proper design of disposal systems be made before an on-lot sewage system can be installed. This assures adequate renovation of wastewater in the soil prior to reaching the underground water supply.



PESTICIDE SPRAYING





2. The use of ***sink holes in limestone areas*** for refuse disposal allows pollutants to drain directly into the groundwater via natural channels in the limestone bedrock. In this way, pollutants can be carried long distances in groundwater with very little renovation to a well supply.

3. ***Abandoned wells*** that are not adequately filled with concrete, grout or an impermeable material, create an open pipe from the ground surface to the underground water supply. Unfortunately, some people have used abandoned wells to dispose of home and industrial waste. The result is the pollution of water in wells throughout a large geographical area.

4. ***Nitrate*** originating from animal wastes generated at ***animal feed lots*** can percolate into groundwater. Nitrates in agricultural applications also may degrade groundwater quality with the over use or improper storage of ***fertilizer***. Nitrate in drinking water is a leading cause of an illness called methemoglobinemia. This condition involves a serious blood change in infants ("blue babies") and has led to occasional fatalities.

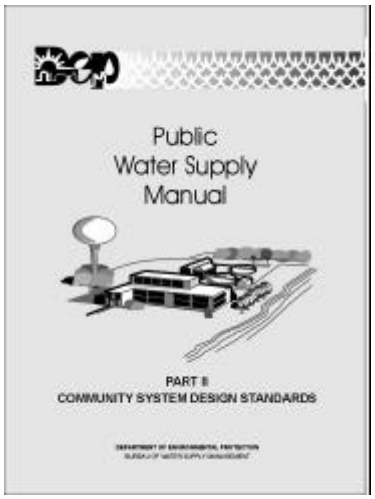
5. Improperly protected ***storage piles for highway deicing salts*** have caused numerous cases of well water contamination. As the salts dissolve in rain water, they slowly sink vertically through the soil and bedrock until reaching groundwater. The water supply is often undrinkable until the salts are flushed out of the groundwater.

6. ***Pesticides*** improperly used or stored around houses, industries and farms have caused many surface and groundwater supplies to be contaminated, resulting in a health risk to families, employees and livestock.

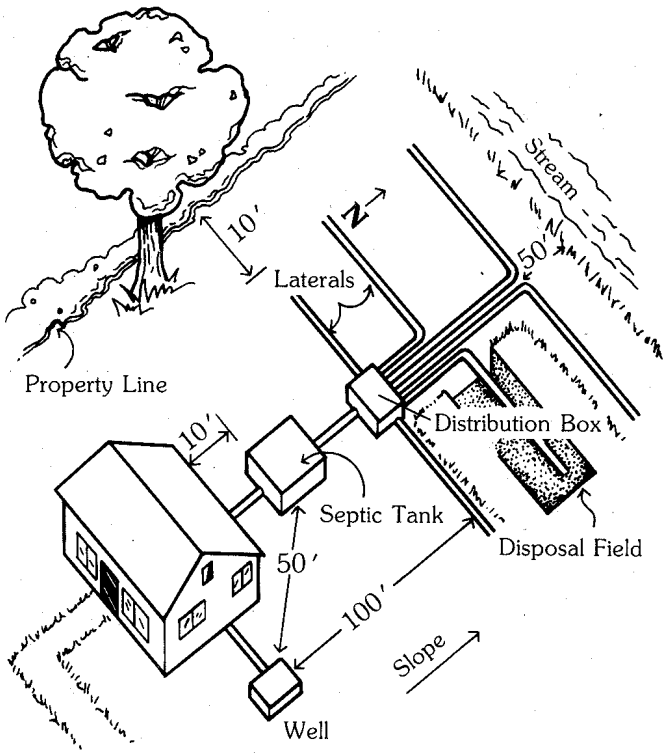
7. In ***surface and deep coal mines,*** the naturally-occurring iron and sulfur in coal deposits are exposed to air and water which often causes highly acid, and unpalatable drinking water supplies.

8. Leaking ***underground storage tanks and associated piping*** can contaminate drinking water supplies with toxic chemicals such as benzene and toluene. Most leaks are associated with corroded tanks at gasoline service stations. Remediation of contaminated groundwater is usually expensive and may take years.

Groundwater pollutants can be prevented from entering our drinking water through proper storage and disposal of materials as well as proper drinking water source construction methods. In recent years, the more hazardous products have been regulated by federal or state laws so that indiscriminate storage and disposal are controlled.



MINIMUM DISTANCE FROM SOURCES OF POLLUTION



METHODS OF PREVENTING CONTAMINATION OF YOUR DRINKING WATER

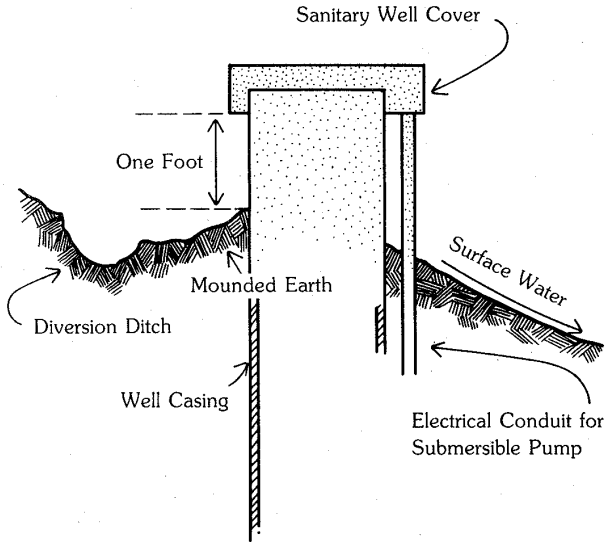
There are many methods available to prevent contamination of wells, springs and cistern water supplies. A well, spring or cistern must be properly located, constructed, maintained and operated to avoid groundwater contamination. If a water supply is not adequately protected, it may become contaminated with bacteria, viruses and chemicals present in surface water. Much attention has been given to *Giardia* and *cryptosporidium* which are pathogens that contaminate both surface and groundwater sources. DEP distributes free copies of the ***Public Water Supply Manual, Part II - Community System Design Standards*** to help interested persons become familiar with the recommended methods of constructing a safe water supply.

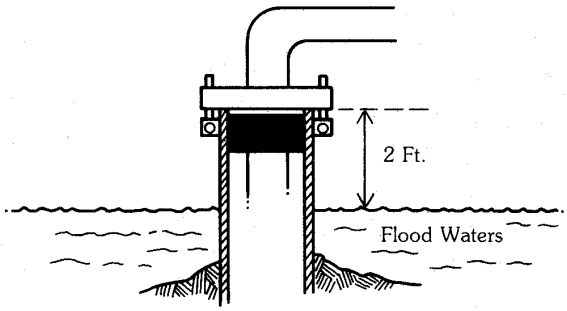
It is also important that a reputable well drilling contractor be employed when you are drilling a new well. Many well drillers in Pennsylvania are members of the Pennsylvania Water Well Contractors Association, an affiliate of the National Water Well Association (NWWA). NWWA recommends that the homeowner secure a written contract from the drilling contractor which states the work to be performed and the materials to be used.

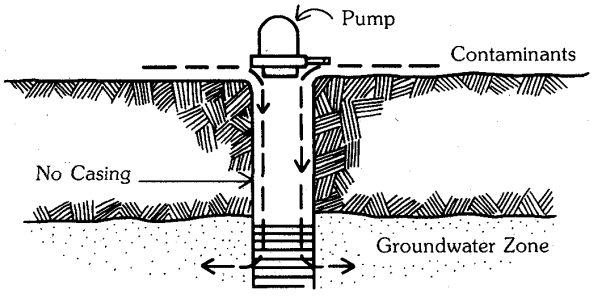
WHEN LOCATING AND CONSTRUCTING A WELL, SPRING OR CISTERN, BE SURE TO CONSIDER THE FOLLOWING ITEMS:

1. Distances to Sources of Pollution

All water supplies should be located a "safe" distance from all possible sources of pollution. But what is a "safe" distance? Research has shown that the safety of your groundwater source depends mainly on the sanitary construction discussed below and various geological and soil conditions. When good filtering and renovative conditions exist, a minimum of 100 feet should be maintained between the water source and a subsurface sewage absorption area. Fine grained sands and silts, common in flood-plain deposits, allow efficient filtration of sewage effluent. Shales or clays do not readily transmit water and, therefore, have poor filtering capacity. When the filtering properties of the soil structure are in question, you should request assistance from your local health department or DEP.







Prior to drilling a well for a potable water supply, an evaluation of the watershed should be conducted to determine any sources of pollution which could adversely affect surface and groundwater water supplies.

2. Slope of the Land

Since groundwater flows slowly downslope through the underlying rock, a groundwater supply should be located upslope from sources of pollution. This location will help to prevent the natural flow of the groundwater from carrying pollutants into the well or spring.

3. Diversion of Surface Drainage

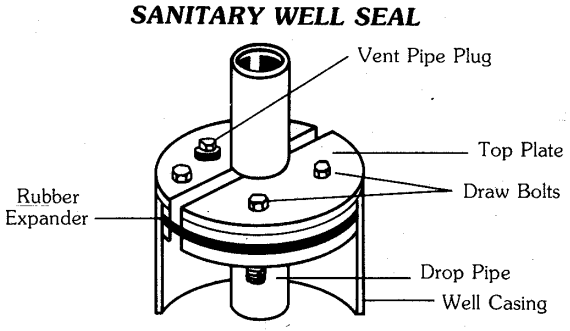
The site for a groundwater supply should be in an area where surface water will not pond and enter the well. If you have a well, the casing should extend one foot above the ground surface or floor of the enclosure. The well should also be surrounded with natural or man-made features for diverting surface water, such as mounded earth or a concrete slab which prevents surface water from entering the well bore. Springs should have storm water diversion ditches above and along the sides of the spring house. Cisterns should have a device to divert the first rain washings coming off the building roof. If you do not protect a well, spring or cistern from surface water influence, you risk contaminating your drinking water with surface pollutants such as bacteria, viruses and toxic chemicals.

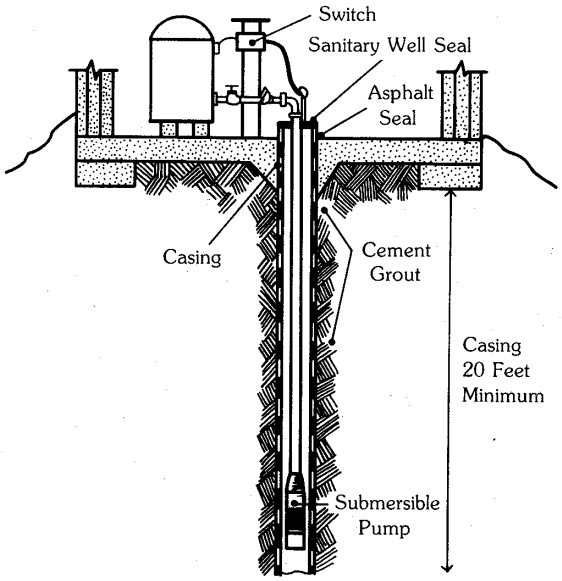
4. Flooded Areas

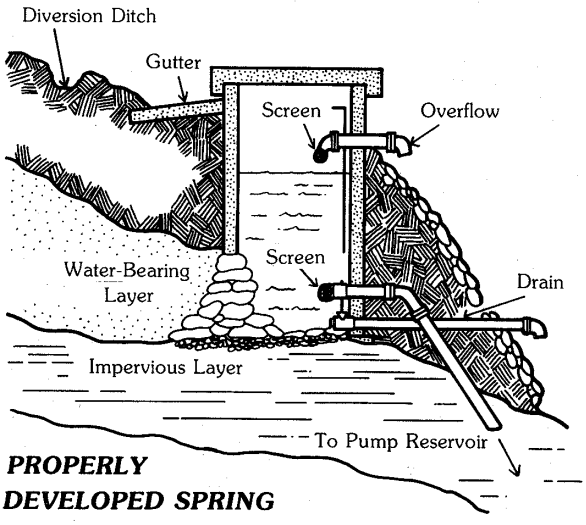
New wells, springs and cisterns should not be located in areas that flood. Existing wells in areas with a history of flooding should have the casing elevated at least two feet above the highest known flood level and also should have a watertight sanitary well seal at the top of the grouted casing.

5. Watertight Well Casing

The drilled well should have a steel or other durable casing with watertight joints. The casing should extend a minimum of 20 feet below ground surface and preferably be driven at least five feet into bedrock. This will help to seal off any pollutants which may drain through the shallow soil zone.







6. Sanitary Well Seal

Every well should have a cap, cover or seal on top of the casing to make the wellhead watertight.

7. Cementing the Well Casing

When a well is drilled, the borehole is slightly larger in diameter than the casing. The circular opening or annular space around the casing provides a vertical channel for downward flow of contaminants from the surface and subsurface areas into the drinking water source. It is critical, therefore, that this open channel be filled and sealed. The recommended procedure is to force a cement-water mixture upward in the annular space around the casing to prevent the entry of contaminants. Forcing the cement upward is a more effective method than pouring cement from the surface since the upward pressure more completely fills all bridged areas and other open spaces. The cement surrounding the casing helps keep pollutants such as sewage from entering the drinking water source.

A sanitary seal or concrete platform should be set around the wellhead to keep pollutants from entering the well bore. The concrete at the surface should gently slope away from the well. Many old or abandoned wells lack cement grout in the annular space. To reduce the possibility of groundwater contamination, an active well should be renovated by the addition of grout around the casing.

8. Springs, Dug Wells, Cisterns and Streams

Springs, dug wells, cisterns and surface water sources such as streams all risk bacteriological and chemical contamination. This is caused by water flowing over the ground surface and transporting contaminants into a water supply source.

Water sample analyses conducted by the federal and state governments have shown the majority of these sources to be more at risk to bacteriological contamination which necessitates the addition and maintenance of water treatment devices. For these reasons, springs, dug wells, cisterns and streams are not recommended for use as water supplies when a more satisfactory source is available such as a drilled well or connection to a municipal supply.

9. Home Drinking Water Treatment Devices

If your drinking water supply is contaminated as verified by a DEP-certified laboratory, there are various point-of-use (POU) treatment devices available which can eliminate or reduce the presence of contaminants. For information on POU treatment, request a copy of ***"Citizens Guide to Home Drinking Water Treatment Devices"*** from your regional DEP office.

SUMMARY

Several different ways drinking water can become contaminated, ranging from ineffective waste disposal systems to improper construction of water supplies, have been discussed. DEP helps remedy these problems every day through the inspection and monitoring of water supplies used by the public, sampling programs, establishment of standards for water supply and sewage disposal systems, and by giving investigation of possible causes of polluted drinking water advice on improving water supplies. If you have questions regarding your water supply, you should contact the nearest DEP office or call (717) 787-5017. Similar help with water supplies is provided by the health departments in Allegheny, Bucks, Chester, Erie and Philadelphia counties. If you live in one of these areas, contact the appropriate county health department office.

REMEMBER, TO MAKE SURE YOUR WATER IS SAFE TO DRINK:

- ✓ Locate and construct your water supply and sewage disposal system in accordance with DEP standards.
- ✓ Employ a reputable water well drilling contractor and draw up a contract stating the work to be performed and the materials to be used.
- ✓ Connect to a municipal water supply and sewerage system if available.
- ✓ Properly store and dispose of waste materials and other possible pollutants.
- ✓ Test your private water supply annually for bacteria.
- ✓ Disinfect or otherwise treat your water if necessary.
- ✓ Obtain further information from an impartial and knowledgeable person, such as your county agricultural extension agent, local health officer or DEP representative.

www.GreenWorksChannel.org - A web space dedicated to helping you learn how to protect and improve the environment. The site features the largest collection of environmental videos available on the Internet and is produced by the nonprofit Environmental Fund for Pennsylvania, with financial support from the Pennsylvania Department of Environmental Protection, 800 334-3190**.**

Department of Environmental Protection

Commonwealth of Pennsylvania
Tom Ridge, Governor

Department of Environmental Protection
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