Land & Water
Conserving Natural Resources in Illinois
University of Illinois at Urbana-Champaign, College of Agriculture, Cooperative Extension Service

Planning Your Well

Guidelines for Safe, Dependable Drinking Water

High-Quality Water

Are you planning a new home on a site that is not served by a community water system? Or are you thinking of replacing your water well with a new well?

If so, the importance of having a dependable supply of safe, high-quality water cannot be overstated. Family health is at stake, and the market value of a home will reflect any serious shortcomings in the water supply.

Where public water is not available, most homeowners will install private wells as a source of drinking water. Almost 50 percent of Illinois residents depend on wells for their drinking water; and in rural areas, that percentage climbs to over 90 percent.

Many Illinois citizens are fortunate to reside over aquifers that, by and large, are good sources of water. Tapping these resources, though, does have some pitfalls. This publication intends to help you avoid those pitfalls and to answer many of the questions you might have about installing a private system. Questions such as...

- What is groundwater and how does its availability affect my choices in water wells?
- How much water does my well need to produce?
- What are the most common types of wells and well-construction methods in Illinois?
- Where should I locate the well to best protect my household's drinking water supply from contamination?
- How do I select a licensed water well contractor?
- How often should water be tested?
- What can go wrong with a private system?

Understanding Your Options

The first step in planning a new well is to familiarize yourself with the geologic conditions of your site. If you plan to install a new well, these conditions will influence the kind of well you put in, how deep you will have to drill to obtain a dependable supply, and even the potential for future water contamination. The better you understand the groundwater and geologic conditions of your site, the more successful you are likely to be in discussions with your installation contractor.

To learn about the conditions of your site, you can contact local well drillers, geologists, soil scientists, agricultural and civil engineers, and Cooperative Extension Service advisers. In addition, specialists at the Illinois State Water Survey and the Illinois State Geological Survey can provide advice on developing new wells and solving problems with old wells. (Addresses for the Water Survey and Geological Survey are listed at the end of this publication.)

How Geologic Conditions Affect Groundwater

Contrary to popular belief, the groundwater that wells tap is generally not found in underground lakes and rivers. Rather, it usually begins as local precipitation that seeps through the ground. This water fills the pores and crevices of soil, unconsolidated (loose) materials, and rock beneath the surface of the earth—much the way water fills open spaces and saturates a sponge.

Water percolates, or moves down, through the soil until it reaches a level where all of the available space is completely filled with water. This is called the zone of saturation. The water contained in this zone of saturation is called *groundwater*, and the uppermost limit of this zone is known as the *water table.*

Although groundwater occurs everywhere, its quality and the amount available varies from one location to the next. This is because the geologic formations that underlie different areas affect the impurities found in the water and the rate at which water can be withdrawn.

Certain geologic materials, such as clay and shale, may contain abundant supplies of water in their minute pores. However, the movement of water between pores in clay and shale is so restricted that water cannot flow into a well in usable quantities. These formations have a low water-yielding capability, or what is called *low permeability*.

Other formations, such as sand and gravel, are usually highly permeable. Sand and gravel have large spaces, or pores, between particles, and this is where water is stored. Because of these large pores, saturated formations in sand and gravel are capable of yielding large quantities of water.

Sand, gravel, and other geologic materials capable of transmitting and storing significant quantities of water are referred to as *aquifers*. In Illinois, aquifers are commonly found in bedrock (such as sandstone, dolomite, and limestone) and/or in overlying unconsolidated deposits (such as sand and gravel).

The permeability of an aquifer is not the only factor that will influence its usefulness. The size of the aquifer affects how much water it can supply, and the depth at which the aquifer is found affects the quantity and quality of the groundwater.

These factors also will influence the cost of constructing your well. For example, wells finished in very shallow aquifers may cost less to drill and may require a smaller pump, but they are subject to seasonal variations in precipitation that can cause the water table to rise or drop significantly. They are also more susceptible to surface sources of contamination than are wells that draw from deeper aquifers.

If you drill into a deeper aquifer, however, there are no assurances that the quality of the water will be good. Some deep aquifers may be too highly mineralized or salty for most domestic uses.

If you are fortunate, your home may lie over a geologic deposit that will provide a relatively inexpensive, high-yielding well. When it comes to the type of geologic formations that exist below your property, the possibilities are numerous.

Water Requirements, Well Needs

How much water does your household need?

The average amount of water used in farm and domestic supplies is 75 gallons per person per day, but a more accurate estimate requires consideration of your household's size and lifestyle. This can be determined with the assistance of Cooperative Extension Service advisers or specialists at the Illinois State Water Survey or Geological Survey. For instance, they can help you calculate the additional water needs for watering livestock.

The critical question is the amount of water your well can supply during periods of intensive use, such as in the early morning when people are bathing and showering, laundry periods, or when watering the lawn or filling a pool. The well's ability to supply water during peak periods largely depends on the rate at which water flows to the well, which is usually measured in gallons per minute. The amount of water normally expected from a domestic well is 4 to 10 gallons per minute.

For homeowners with large-diameter bored wells, the well's ability to supply water is evaluated by the rate of water flow measured in gallons per day and also by the volume of water that can be stored within the well. (This is discussed more fully in the section on bored wells.)

Yield sometimes has to be balanced against construction costs, though. A well contractor may install a well at an agreed maximum depth, only to find that the yield of water is much too low. A decision must then be made about whether the well should be deepened or if another well should be drilled at a new location. Your knowledge of the typical depths and yields of neighboring wells will help you make this decision.

In rare instances, your well contractor may have to drill several "nonproducing" or "dry" wells before he or she finds one that yields enough water for your use.

In some cases, you may be forced to live with a low-yielding well. If so, consult with the Illinois Department of Public Health to find out what minimum water yields are acceptable. Also, you will need to carefully manage your use of water. Water conservation practices, such as the use of low-flow toilets, flow restrictors, and staggered water-use activities, would likely be necessary. If your well still is not able to supply enough water to meet peak demands, you may want to install a water storage tank.

Remember, your well is only one part of your water system. Whatever options you and your contractor agree upon, your water system must supply the quantity of water you will need throughout the year.

Well Location

When locating a new well, most people do not have a site large enough to offer a wide range of options. This is because a well's location is expected to meet several requirements. The following specifications are described in the Illinois Water Well Construction Code (any variances must be approved in writing by the Illinois Department of Public Health):

- The well must be within your property lines. The exact distance that it must be from property lines is governed by local codes.
- The well must be accessible for maintenance, inspection, and pump replacement. For example, wells should not be located directly under trees or power lines or inside a house or basement. Wells also must be at least 2 feet clear of an overhang.
- The well must be as far removed as possible from potential contamination sources, such as septic tanks, road salt, underground gas storage tanks, manure piles,

fertilized cropland, and solid waste disposal sites. Ideally, the well should be placed on the side of the contaminant source *opposite* the flow of groundwater. For example, if you know groundwater flows to the south, place the well as far north of the contaminant source as possible. To find out the direction groundwater flows in your area, contact a well driller, an engineering firm, or the Illinois State Water Survey.

The distance that your well must be from sources of contamination depends on many factors, such as geologic formations, depth to the aquifer, direction of groundwater flow, effects of well pumping on groundwater movement, and susceptibility of the site to flooding. However, the Illinois Department of Public Health has established the following minimum setbacks for common sources of contamination (see Figure 1):

- At least 200 feet from potential sources and routes of contamination (see Chart 1). Waivers or exceptions can be obtained in certain circumstances.
- 150 feet from existing cesspools. (New installations of cesspools are not approved in Illinois.)
- 100 feet from leaching pits.
- 75 feet from septic subsurface seepage tile or manure piles (which should be downslope from a well).
- 50 feet from a barnyard or sanitary sewer line and septic tank.
- 25 feet from lakes, ponds, or streams.

These lateral distances apply to clay- and loam-textured soils; they should be increased for more permeable soils. For example, these distances should be doubled for highly permeable, coarse-textured soils such as loamy sand.

It is important to the health of your household that you realize activities on the surface of the earth can affect the groundwater below. We used to think water was filtered and cleansed of all contaminants as it percolated through the soil. Unfortunately, tests for contaminants in wells in Illinois and across the nation have shown this not to be true.

If dangerous chemicals reach groundwater, they can travel over large distances without being degraded in the soil. And once groundwater is contaminated, it can be extremely costly to clean. Preventive measures now can protect your drinking water for the future.

Chart 1: Potential Sources and Routes of Groundwater Contamination

Potential Sources of Contamination

- Landfills or land disposal areas for municipal, special, or hazardous wastes
- Underground storage tanks containing over 500 gallons and aboveground tanks containing over 25,000 gallons of petroleum products
- Storage or handling areas for de-icers, hazardous substances, road oils, agricultural chemicals, or animal waste

Potential Routes of Contamination

- Abandoned and improperly plugged wells
- Injection wells (most commonly used to drain surface water or dispose of industrial and municipal waste water)
- Excavations related to the production of stone, sand, or gravel

Types of Wells

The two most common types of wells constructed in Illinois are small-diameter drilled wells and large-diameter bored wells (see Figures 2 through 5). The type of well and

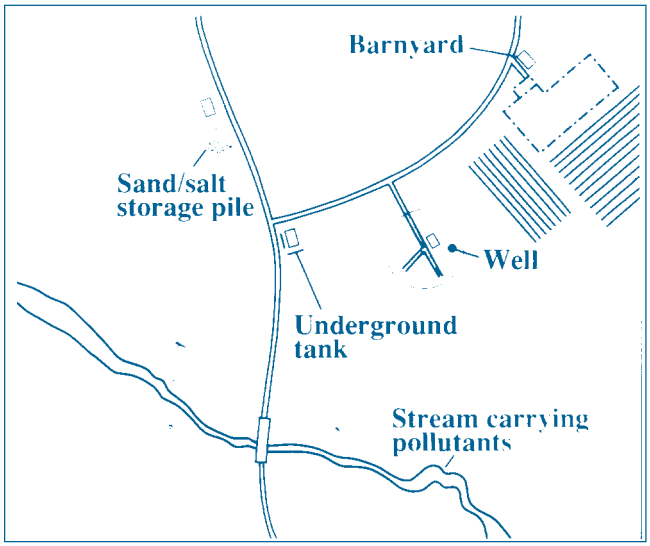

Figure 1. In the illustration above, the well is placed out of reach from several sources of contamination. The well is over 50 feet from the barnyard, over 25 feet from the stream, and over 200 feet from the sand/salt storage pile and the underground tank.

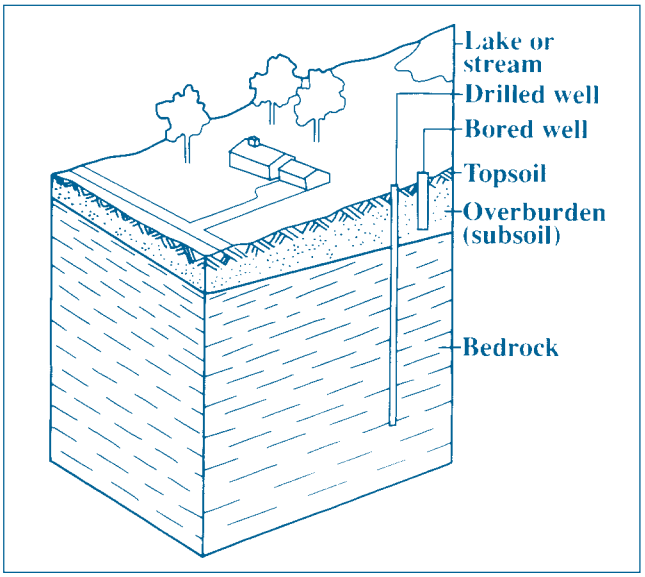

Figure 2. This cross-section of land shows the two most common types of wells—drilled wells and bored wells. Generally, bored wells are wider and shallower than drilled wells.

the method of well construction you choose will depend on the costs involved and on the recommendations of your well contractor. The contractor's recommendations will be based on your site's geologic and groundwater conditions.

Small-Diameter Drilled Wells

Small-diameter drilled wells for farm or domestic use average 4 to 6 inches in diameter. They are constructed where the aquifers are capable of supplying water to the well as quickly as it is pumped.

Drilled wells tap water-bearing sand and gravel formations, as well as bedrock formations of permeable sandstone or cracked and creviced limestone and dolomite (see Figure 4). The depth to which these wells are drilled varies greatly, depending on your geologic conditions.

Drilled wells may be constructed by one of two methods. The faster of the two ways is the rotary method. This procedure uses a rotating shaft and drill bit to bore through compacted sand, gravel, clay, or glacial till. Drilled materials are then brought to the surface mixed with drilling fluid, referred to as "mud."

If the well is being drilled into a sand and gravel aquifer, a steel or plastic pipe is inserted into the bore hole and extends from the land surface into the aquifer. This process, known as "casing out" the bore hole, prevents the overlying materials from caving in and minimizes contamination of the water. A length of commercially-made well screen is placed immediately below the casing to hold back sand particles and permit water to flow freely into the well. The size of the well screen openings vary. Their selection is based on the size of the sand and gravel particles in the aquifer.

If the well is being drilled into bedrock, the bore hole is cased out above the aquifer, with the casing set firmly into the bedrock. Below this, the bore hole is usually left open without casing or a well screen.

The other method for drilling wells uses a percussive cable tool. The well is advanced by raising and dropping a heavy drill bit repeatedly. This breaks the rock formations into fragments that are periodically flushed to the surface. With this method, the casing is installed as the hole is being drilled, following the bit closely, to keep the bore hole open.

Large-Diameter Bored Wells

In contrast to drilled wells, large-diameter bored wells generally are 24 to 36 inches in diameter and are constructed in areas where water yields are low. Their wide diameter helps to overcome the disadvantages of the aquifer's low flow rate. They can do this for two reasons:

(1) Large-diameter wells sometimes store several hundred gallons of water, which can be tapped during periods of peak demand.

What About Surface Water as Drinking Water?

Surface waters (lakes, streams, ponds) generally are undesirable sources of drinking water for private water systems because they require a high degree of maintenance and are easily contaminated.

However, if groundwater is unsuitable for a domestic supply in your area, then you may need to consider this option. For technical assistance and advice on the potential costs and effectiveness of a surface water supply, contact the nearest office of the Soil Conservation Service or the Cooperative Extension Service.

(2) Water can continuously seep into the wells and refill them during the times when they are not being pumped.

Unfortunately, large-diameter bored wells sometimes extend only several feet into the water table; consequently, they can go dry when the water table drops during periods of drought. Because of this drawback, a large-diameter bored well is usually constructed only when no better option is available.

Once the decision to build a large-diameter bored well has been made, construction generally will proceed as follows. The hole for the well is bored using an earth auger. A casing, usually made from concrete pipe, is then inserted in the hole. A layer of gravel, usually 4 inches thick, is placed around the casing from about 10 feet below the land surface to the bottom of the well.

The upper 10 feet of the well must be protected from surface contamination in either one of two approved construction methods. These methods are shown in Figure 5.

Because the bore holes for these wells must remain open until the casing is installed, the construction of bored wells is most successful in fine-textured soils that contain silt and clay. Silt and clay will prevent the hole from caving in.

Developing and Testing Your Well

Once your well has been drilled, it must then be "developed." A well usually is developed by pumping it or by surging it with air. This process clears debris from the sides and from the bottom of the well bore or screen. If it is done properly, it will result in clear, sediment-free water. Little development work is possible for large-diameter bored wells.

After development work is completed, the well is tested for its water-yielding capability. This will help determine the size of pump you will need, the depth at which the pump should be set, and the size of the pressure tank.

To prevent any surface pollutants from contaminating the well, the top of the new well will extend at least 8 inches above ground; and if the area is subject to flooding, it will extend at least 24 inches above any maximum known

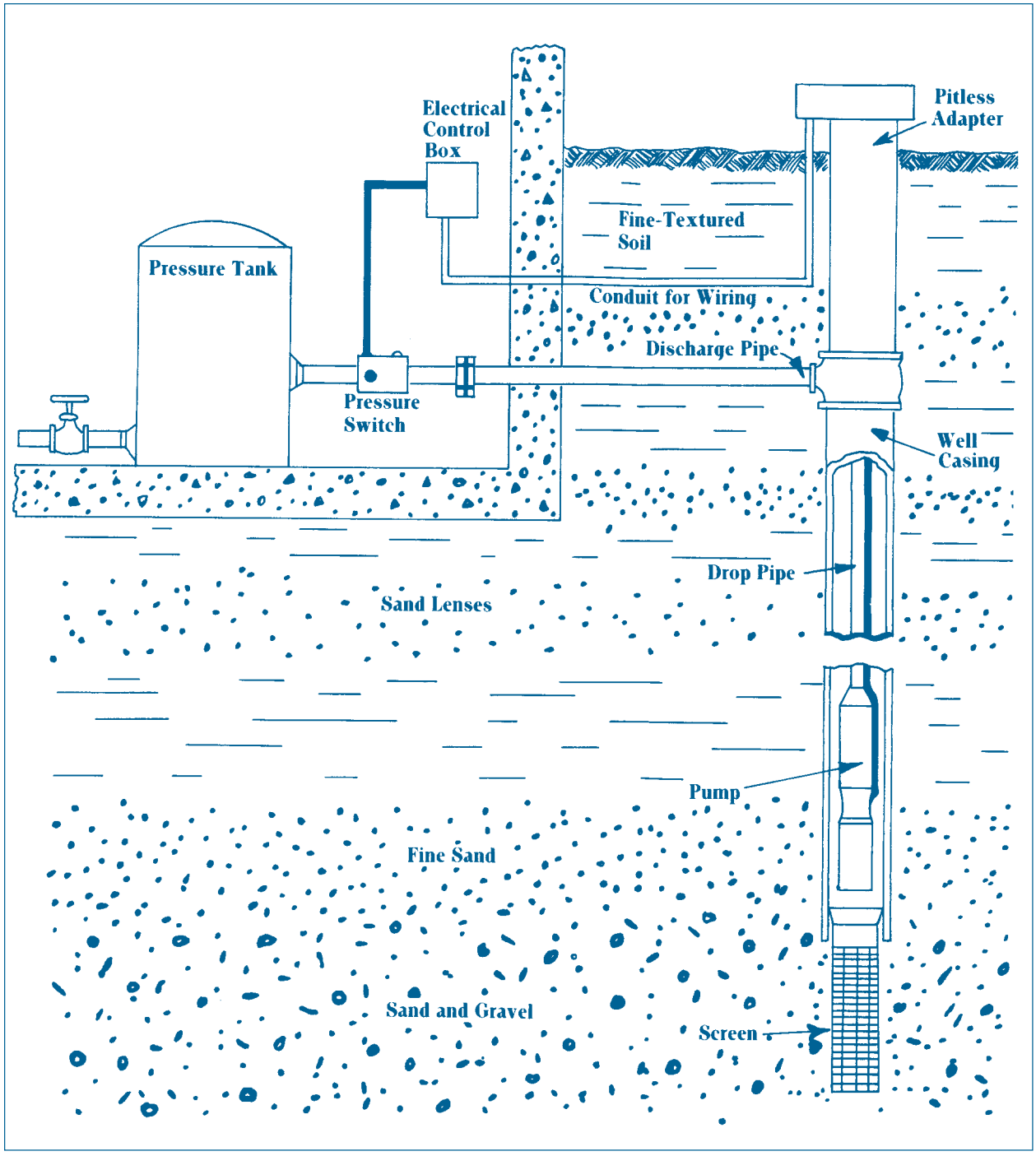

Figure 3. Here is a typical domestic well installation with the discharge pipe extending into the home.

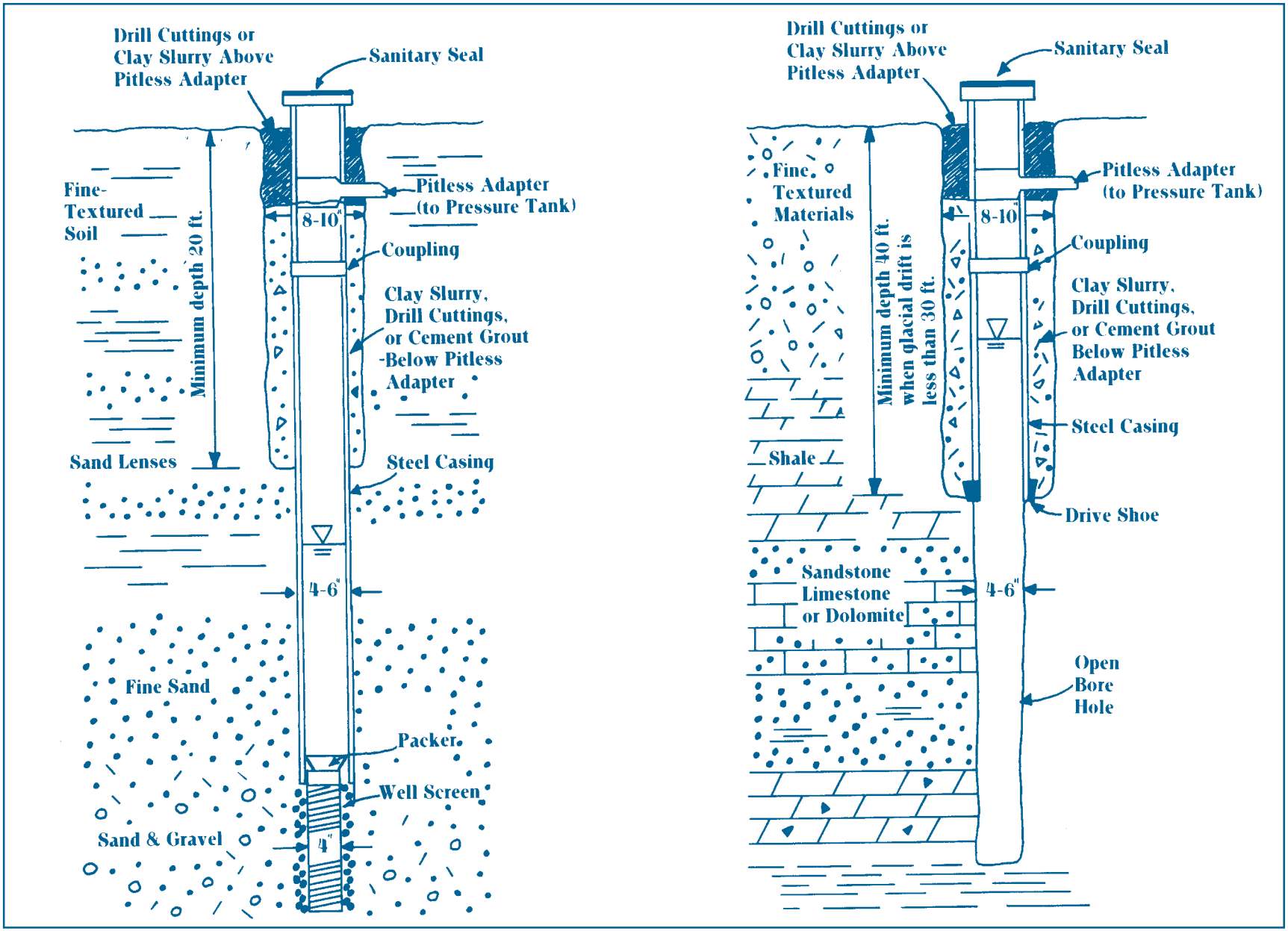

Figure 4. Pictured here are two types of small-diameter drilled wells, one into sand and gravel and the other into bedrock. When digging these wells, installers had to dig down to water-bearing formations that were large enough to provide a sufficient amount of water. They drilled past smaller water-bearing formations that wouldn't provide enough water to meet the homeowner's needs. With the well on the left, for example, installers bypassed thin layers of sand, known as "sand lenses." These thin layers yield water, but they are too small to yield a sufficient amount.

Adapted from an illustration provided by the Illinois State Water Survey

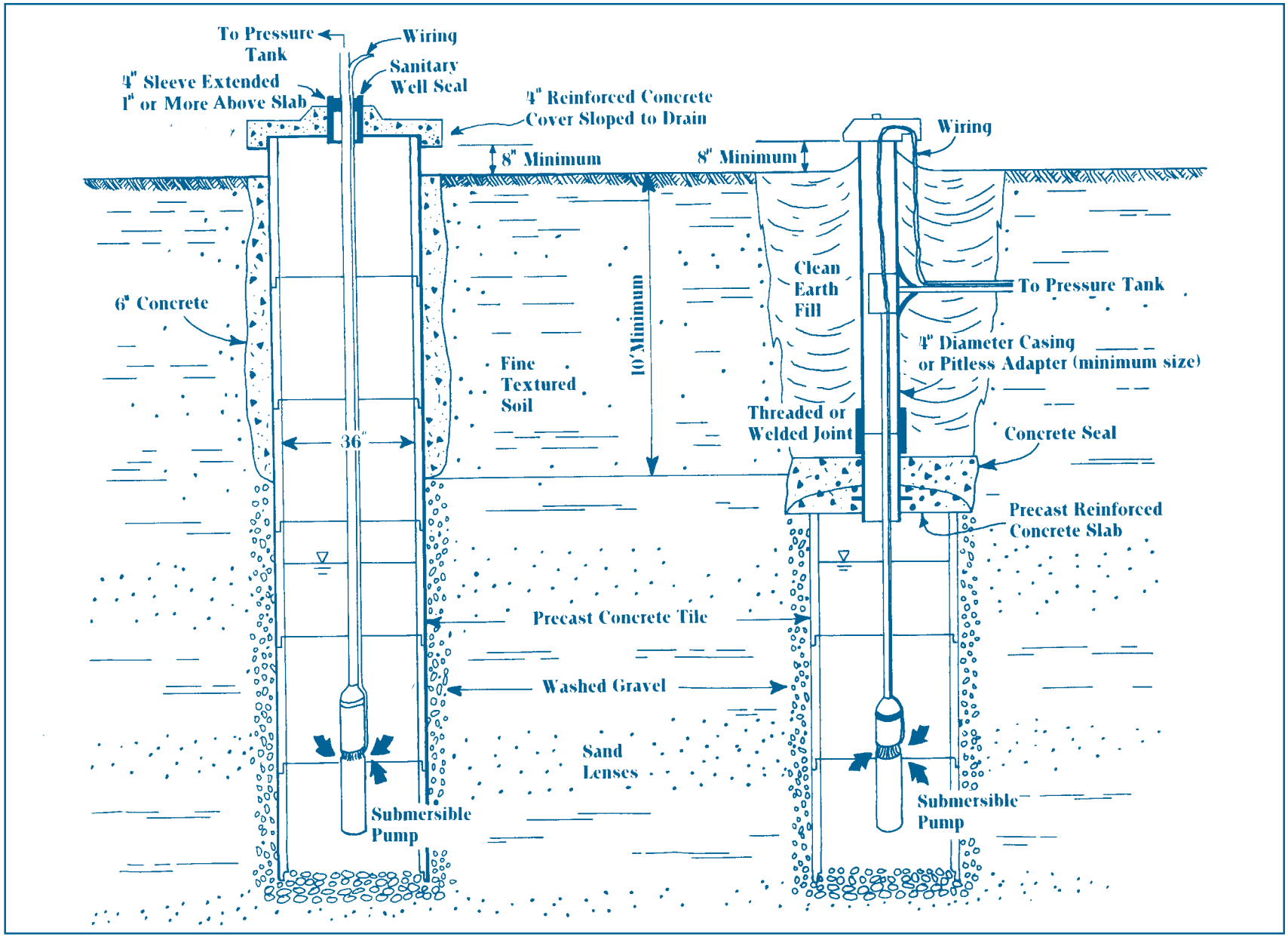

Figure 5. Here are two types of large-diameter bored wells, each showing a different way to protect the upper 10 feet of the well from surface contamination. Note that the reinforced concrete cover is at ground level on the well to the left. In contrast, the concrete cover is at least 10 feet below the surface on the well to the right. Because its cover is below the ground, the well on the right is generally better at keeping out surface contaminants.

Chart 2: Potential Contaminants

The following chart lists the contaminant advisory levels that are recommended by the Department of Public Health, based on standards set by the Environmental Protection Agency. When the level of a contaminant exceeds the advisory level, there is the potential for harmful effects.

This chart also describes the likely causes and effects of various contaminants. Although your well is most susceptible to only two of them—bacteria and nitrate—you should be aware of the other possibilities.

Bacteria

Advisory Level: This contaminant exceeds the advisory level when *any* coliform bacteria or fecal bacteria is detected in the water.

Likely Causes: Bacteria can be introduced when surface water or water near the surface gets into the well. Contamination also may be introduced during well construction.

Effects: Infectious diseases such as dysentery, typhoid, and hepatitis may occur. Water should not be used for drinking unless it is boiled for five minutes or disinfected by other means.

Nitrate

Advisory Level: 10 milligrams of nitrate (as nitrogen) per liter of water

Likely Causes: These are naturally occurring substances created during the decay of organic matter. High levels may occur near manure piles, fertilized fields, or subdivisions using septic systems.

Effects: High concentrations can cause potentially fatal "blue baby" syndrome in infants and are also a threat to young farm animals. If water exceeds standards, it should not be drunk by infants under one year of age.

Metals

Advisory Level: 0.05 milligrams (mg) of arsenic per liter of water
1.00 mg of barium per liter
0.01 mg of cadmium per liter
0.05 mg of chromium per liter
0.05 mg of lead per liter
0.002 mg of mercury per liter
0.01 mg of selenium per liter
0.05 mg of silver per liter
1.0 mg of copper per liter
5.0 mg of zinc per liter

Likely Causes: These metals occur naturally in the environment in small "trace" amounts. However, such concentrations can be increased as a result of (1) pollution from human activities, or (2) lead in pipe solder, if the water is acidic.

Effects: Toxic effects can result if levels are very high, but the presence of these "trace" metals does not currently represent a significant health threat in Illinois.

Acidity (pH)

Advisory Level: A pH less than 6.0

Likely Causes: A pH less than 6.0 can be caused by natural geologic conditions at the site, or by past or present mining activity.

Effects: Well water in Illinois generally is not so acidic as to cause health problems. However, highly acidic water can be corrosive and may leach metals from pipes, pumps, and fixtures.

flood water elevation. The casing is sealed with an approved "pitless adapter," and the upper portion of the drill hole is filled with clay slurry, drill cuttings, or cement grout.

Within 30 days from the completion or modification of your well, your contractor will submit a construction report to the Department of Public Health, but the Department will not inspect your well unless you request it to. Be certain to request a well log from your contractor describing the methods and materials used to construct your well. Keep this log in a safe place because you will need this information later to properly maintain or repair your well.

Disinfecting and Testing Your Well's Water

Disinfection following construction is necessary to eliminate any bacterial contamination that may have occurred during the drilling process. Disinfection also is necessary after the pump is installed or any time the system is opened for repair.

The well contractor or pump installer is the one responsible for making sure this is done correctly. The contractor will mix a chlorine chemical disinfectant with the well water to provide a concentration of at least 100 parts per million. The chlorine solution will then be left in your well for several hours, preferably overnight, before it is pumped out.

Disinfection, however, does not guarantee that your well is free from contamination. The only way to be sure is to have your well water tested, either by the Department of Public Health or by a private laboratory. There are many contaminants that can affect your drinking water (see Chart 2), but testing for many of them is largely unnecessary and often costly.

Your regional or local offices of the Department of Public Health will make a free test for coliform bacteria and nitrates, which are "indicators." In other words, their presence may indicate the presence of other contaminants. If tests for these indicators are within the allowable limits, then your water is most likely safe for drinking. Also, consult with your local health department about other tests

Salt (Sodium and Chloride)

Advisory Level: 20 milligrams (mg) of sodium per liter of water for people on low-sodium diets

250 mg of chloride per liter

Likely Causes: Levels that exceed the advisory level can be caused by sand or salt piles, road salt, glacially derived pockets of salty groundwater, or oil brine.

Effects: Excessive levels of sodium can be a health threat to those on low-sodium diets. High chloride levels may affect taste, cause corrosion, and shorten the life of pipes, pumps, hot water heaters, and fixtures.

Radon and Gross Alpha

Advisory Level: 20,000 picoCuries of radon per liter of water

15 picoCuries of alpha particles per liter

Likely Causes: These are radioactive elements that occur naturally, in varying concentrations, in the earth's crust and groundwater. Radon may come from well water through water-using activities.

Effects: Radon is a suspected contributor to lung cancer. Gross alpha radiation may also involve significant health risks.

Petroleum and Other 'Organic' Compounds

Advisory Level: Advisory levels vary widely for different compounds.

Likely Causes: Excessive levels can be caused by leaking underground storage tanks and improper use or disposal of solvents and pesticides.

Effects: Long-term exposure to some chemicals may result in kidney or nervous system damage, or cancer.

Turbidity (Cloudy Water)

Advisory Level: 5 turbidity units

Likely Causes: Turbidity is caused by the suspension of fine silt, clay particles, silt, and organic matter in water.

Effects: Although there is little or no health risk, the water may look muddy. Particles also may foul water softeners or impart a taste to the water.

Water Hardness

Advisory Level: Water is hard when it contains over 200 milligrams of calcium and magnesium salts per liter.

Likely Causes: Hardness results from the natural leaching of minerals from the soil and rock above the aquifer.

Effects: Hard water affects taste but not health. Also, a large amount of soap may be required to form suds with hard water and an insoluble soap curd may form on dishes and fabrics. Hard, scaly deposits may form in water tanks and pipes.

Iron and/or Manganese

Advisory Level: 0.3 milligrams (mg) of iron per liter of water

0.05 mg of manganese per liter

Likely Causes: Iron and manganese are present, often together, in much of the earth's surface and, through leaching, in water.

Effects: Iron and manganese may affect taste but not health. Other effects may be rusty water, brown stains on fixtures and laundry, and deposits in pipes and tanks.

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that might be appropriate for your area.

If the tests are over the limits, your water has some degree of contamination. The Department of Public Health may then recommend that you disinfect your well and water supply system again and submit another water sample.

Whatever the results, these tests provide a starting point. Any time you are concerned about possible contaminants in your water supply, call the regional or local offices of the Department of Public Health and discuss your concerns. The Department can help you determine if you have cause for concern *before* you request extensive and potentially expensive water testing. Be sure to keep records from the water tests to assure that you can document the history of water quality from your well.

Abandoned Wells

Care must be exercised in the construction of a well, and it must also be applied when a well is abandoned. Abandoned wells are hazards as well as avenues by which contaminants can enter groundwater. The procedures for filling abandoned wells are designed to eliminate these hazards and to restore geologic conditions that existed before the well was constructed.

In Illinois, the owner of a potable water well is responsible for sealing a well within 30 days after it is "abandoned and no longer used for the purpose for which it was constructed." The well must be sealed in accordance with the Illinois Water Well Construction Code by either a licensed water well contractor or the owner of the property on which the well is located.

In addition, the Department of Public Health must be notified both before work on sealing a well begins and again once the work is completed. If the property owner is performing the well abandonment, then he or she must obtain prior approval from the Department of Public Health and must work under the Department's supervision.

The responsibility for filling a *nonproducing* well resides with the individual who drills the well. This usually is a well contractor, but in some instances this may be the property owner. In either case, the well must be sealed in the manner specified in the Illinois Water Well Construction Code within 10 days of being drilled.

How Do You Check An Existing Well?

Much of this publication deals with the installation of new wells. But what if you suspect that your *existing* well has problems?

Begin by testing your well water, a process that is explained on pages 8 and 9. If tests show contamination, the next step is to find out whether the well construction meets present standards. To do this, obtain the well log, a record that was kept by the well driller.

If neither you nor the well driller have the well log, you may be able to obtain one from either the Illinois State Geological Survey or the Illinois State Water Survey. Addresses are listed at the end of this publication.

Next, take the well log to the local office of the Illinois Department of Public Health. Public Health officials will tell you whether construction is up to standards and what further action you may need to take.

Even if you do not suspect any problems, it is a good idea to obtain your well log. Also, you may wish to review the log yourself or take it in to the Department of Public Health. By finding out if your well does or does not meet standards, you may be able to prevent future problems.

Permits and Regulations

Well permits are required by the state of Illinois for all drinking water wells. Before construction begins, well contractors must obtain these permits from the Department of Public Health and (in some counties) from the local health department.

When the well contractor applies for a permit, he or she must also submit a plot plan that describes the location of the proposed well and indicates the locations of all sources or routes of contamination. The Department of Public Health will review this plan before issuing a permit.

In Illinois, property owners may obtain a well permit and perform the actual water well construction *if* the well will be used only for the owner's private water supply. Otherwise, a licensed well contractor must perform the work. Well construction, whether by the owner or a contractor, must conform to the specifications established by the Illinois Water Well Construction Code.

Copies of the code and any other information that a property owner may need for the construction of the well are available from the Department of Public Health.

Selecting a Contractor

All water well contractors in Illinois must be licensed by the state. Therefore, make sure the well driller has a valid

Chart 3: A Checklist for Well Construction

When contracting to install a well, be sure to find answers to these questions:

Is it clear whether the well driller is responsible for guaranteeing a certain quantity or quality of water?

Do you, the property owner, and the contractor have a common understanding of...

- the water yield that will be sought?
- the minimum yield that will be accepted if difficulties are encountered?
- the maximum depth to drill if satisfactory amounts of water are not encountered?

Have you been provided with a written estimate that will cover...

- the drilling cost per foot?
- the cost per foot of well casing materials?
- surface sanitary sealing?
- sealing material (such as grout), if the well extends into bedrock?
- the well screen, if the well does *not* extend into bedrock?
- excavations for piping from well to house?
- the submersible pump, piping into house, and all other required equipment?
- the pressure tank inside the house, if such a tank is provided by the well contractor?
- the cost of "dry" holes?
- the cost of the well drilling permit?

Do you know when the work will start and how long construction is likely to take?

Is there an agreement about the contractor's right of access onto the site, any necessary disruption to existing land and vegetation, and disposal of debris from the drilling operation?

Is the contractor free of liability for injuries not due to the contractor's negligence?

Does the contractor provide future maintenance services? If not, who will?

Will the contractor furnish a well log when the work is completed? Such a log will include details of the well's construction, which will be invaluable for future maintenance or repairs.

Chart 4: What Can Go Wrong?

Here are some of the most common problems you might encounter when installing a well:

The well location may be poorly planned and coordinated. One homeowner putting in a new well and septic system may make it difficult for neighbors to meet spacing requirements when they put in wells or septic systems at a later time.

The well may be dry, or it may have an inadequate flow, even though it has been drilled deeply into bedrock. A drilled well may intercept too few water-bearing fractures, making the yield of water inadequate. Continued drilling may be justified, but it is sometimes better to drill a new well at a different location.

Bacterial contamination can occur during the construction process. This could occur simply through handling equipment or through entry of contaminated surface water during construction. In any event, all new wells should be disinfected and tested after the pump is installed and before the well is used. You may also request that the regional or local health department inspect the well to assure that your well has been properly constructed.

Water contamination can occur at a later time. The sources and types of contamination were already outlined in Charts 1 and 2. Because wells can become contaminated from these and other sources, well water should be tested periodically. If you notice a significant change in taste, color, or odor, then test the water immediately.

An extended power outage may shut off the pump, as well as all other household electricity. To prevent this problem, you may want to purchase an emergency generator to keep the pump operating and to maintain minimal electrical service in the house. However, the generator would need to be powerful enough to operate the pump. Also, a qualified electrician should make the installation because there is a danger from accidental electrocution.

The water pipe connecting the well with indoor plumbing may freeze. Water pipes should be placed below the maximum depth of frost penetration. The depth of the frost line varies from one end of the state to the other.

Illinois license. Another important consideration is the reputation of prospective contractors.

You can start looking for well contractors in the yellow pages, but you should also inquire about their reputations by contacting friends, town officials, county Extension advisers, water well associations, or others. That way, you can interview three or four contractors who are experienced and available. Then make a final choice on the basis of reputation, cost, feelings of trust, and ability to communicate.

A prospective well contractor should describe the type of well likely to be installed, expected depth of the well, and other questions listed in this publication's checklist (see Chart 3).

A well contractor also should consult the property owner during the construction process since there are some decisions that the contractor cannot make for the client. Because the well driller is working with a number of unknowns, problems may arise requiring your decision. Such a situation occurs, for example, when the drilling has reached considerable depth and the well yield is marginal. Chart 4 covers this and other problems that can arise during well construction.

Most important, your contractor should supply you with a contract that clearly and accurately describes the work to be performed and defines the responsibilities of both parties.

With adequate communication and planning, the entire installation process should flow more smoothly. And your well water? It should flow cleaner.

Sources of Additional Information

If you have any questions and would like additional information on private well systems, contact the local office of either the Department of Public Health or the Cooperative Extension Service, or any of the following agencies and organizations:

Illinois Department of Public Health
525 W. Jefferson
Springfield, IL 62761
(217) 782-5830

Illinois State Geological Survey
615 E. Peabody Dr.
Champaign, IL 61820
(217) 333-4747

Illinois State Water Survey
2204 Griffith Dr.
Champaign, IL 61820
(217) 333-2210

Illinois Water Well Association
P.O. Box 2145
Northbrook, IL 60065-2145
(312) 272-3930

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