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Drilled wells can be a reliable water source

DRILLED WELLS ARE A WATER SOURCE for many greenhouse operations. They provide clean water with very few impurities. The yield is usually limited and as additional greenhouse space is added, another well may have to be drilled.

Aquifer basics

Groundwater is found in aquifers located below the earth's crust. As rainfall occurs, some of it evaporates, some of it is removed by plant transpiration and the remaining water filters through the topsoil and flows into sand, gravel and fractured rock. The upper level of groundwater is the water table. The height of this varies with the amount of rainfall and the formation of the aquifer zone. Artesian wells (natural flowing) form when the aquifer uphill creates water pressure that forces the water out of the top of the well.

There are three main types:

1. A common type of aquifer is the gravel deposits found along many rivers. These hold large amounts of water and may be hundreds of feet deep. As the water can move fairly rapidly, a gravel-type aquifer can have a yield of 50 to 100 gallons per minute (gpm).
2. Another aquifer type is formed from veins of sand or gravel. The water flows through these from one area to another. A good supply of water can be had by tapping into a vein. The problem comes in locating these belowground areas, although sometimes the vein intercepts the soil surface and water flows out by gravity. These are referred to as springs.
3. A third type of aquifer is in the fractured bedrock deeper below ground. Water flow depends on the size of pores and cracks in the rock and is usually slower. As most bedrock has cracks, almost anywhere a well is drilled some water is available, although the yield may be much smaller.

The flow of water obtained from a well depends on the permeability and size of the aquifer, its recharge area and the amount of rainfall. To some extent, the diameter and depth of the well also influence yield. In some areas, a well may be 1,000 feet deep and yield less than 1 gpm.

Depending on the type of aquifer, hitting water with a well is like the lottery. A well in one location may provide a very low water yield, whereas moving the well over 10 feet may intercept a good vein and give 30 gpm. In most areas, well drillers keep an accurate record of the depth and yield of wells they drill. In some states, the departments of health maintain records available to well drillers.

Well drilling methods

There are two main methods of drilling a well.

Cable-tool drilling. This older method uses a drill bit attached to a cable that is continually raised and then dropped. The drill breaks up the rock, water is added and then the debris is removed with a bailer. This is a slow method but there is less chance of sealing up the pores and cracks. Cable drilling is limited to several hundred feet deep.

Rotary drilling. In rotary drilling, a drill is attached to a hollow shaft rotated by an engine and transmission. Drill mud is pumped through the pipe and out through perforations in the drill. The mud and ground-up rock flows up through the bore hole and into a settling pit where the solids settle out. Depending on the soil or rock being drilled, the drill is rotated at 30 to 150 revolutions per minute and is faster than cable drilling. Rotary drilling can make a well several thousand feet deep.

Both methods can be modified to use compressed air instead of water for lubrication and debris removal. This reduces sealing of the pores. An air hammer device can also be added to increase the drilling speed.

When drilling a well, a steel casing is commonly placed in the earth to the point where the well reaches the bedrock. It is hammered into the bedrock to create a tight seal that keeps surface impurities such as, clay, fine sand, fertilizer and pesticides out of the well. The casing may also be grouted for a good seal. A typical well is 6 inches in diameter, but to get greater yield, a larger diameter is often drilled.

Well location considerations

Local and state regulations need to be considered and a permit may be needed. There is usually a minimum distance from a septic system or sewer and there may be a minimum distance to a property line.

Another consideration is access for the drill rig. These heavy pieces of equipment often weigh more than 35 tons, so solid ground is needed.

The location of trees and landscape plants should also be considered. Finally, try to pick a location where the trench for the pipe to the greenhouse can be conveniently placed.

Testing

Once a well is drilled and pumped to clean out the debris, the yield, static water level and location are usually recorded and reported to the state agency. Following local codes, the well should be disinfected with chlorine bleach.

After pumping and when there is no more odor of chlorine, a water sample should be sent to a laboratory for quality testing. Besides chloroform bacteria, tests should also be run for soluble salts, carbonate hardness, mineral content and pH — factors that affect plant growth. Knowing values for these parameters will help to adjust fertilizer levels in irrigation water.

Contracting

Some well drillers contract to provide a well having a minimum yield. They usually have extensive experience drilling in the area and know the underground soil structure and typical yield. Other drillers quote on a per linear foot basis, a figure for the casing section and a lower cost for the portion of the well in the bedrock where casing is not needed. It is best to get quotes and references from more than one driller.

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