Ohio Department of Natural Resources
Division of Soil and Water Resources
Fact Sheet

Fact Sheet 97–46

Well Construction in a Buried Valley

Ground water resources vary greatly throughout Ohio. Some of the highest yielding aquifers in the state are located in the buried valley system of western Ohio. Extensive deposits of sand and gravel make these underground reservoirs some of the largest producers of ground water in the Midwest.

A buried valley is simply an ancient river or stream valley that existed perhaps hundreds of thousands to millions of years ago and since has been filled with glacial or unconsolidated sediment. This sediment is comprised of gravel, sand, silt, and clay. These types of sediment can often store and transmit large amounts of ground water. Constructing a well in a buried valley requires special considerations to ensure an adequate supply and a long-lasting installation.

Drilling Methods

Prior to beginning your search for a drilling contractor to construct your private water well, a decision on a drilling method must first be made. The two primary methods of drilling water wells in Ohio are the cable tool method and the rotary method.

The cable tool method employs a large, heavy drill bit to break up the subsurface by repeatedly lifting and dropping the bit into the borehole. The cuttings are then removed from the hole by an elongated scoop called a bailer. The well casing is driven in the hole just behind the drill bit. The process is very basic and uses little advanced technology. It can often be less expensive than the rotary method. The major drawback to this method is the extended time needed to complete drilling the well.

The rotary method uses a drill bit to continuously loosen or grind up the subsurface by rotating the bit in the borehole. The cuttings are pumped out of the well using drilling fluid that also cools the drill bit. The rotary method is extremely fast and moves easily through most earth materials.

Because buried valleys contain unconsolidated material, drilling into the subsurface can often be done easily by the cable tool or the rotary method. The rotary rigs can drill quickly through large boulders and thick glacial till whereas a cable tool rig may experience some difficulty.

Well Design

Steel Versus PVC Casing

Prior to a borehole drilling, the decision of what type of casing needs to be made. Casing is used to keep the borehole from collapsing and maintains the structural integrity of the well. Cable tool drillers drive the casing during the drilling process, while rotary drillers generally install the casing after completing the well. The two most common materials used are low-carbon steel and poly-vinyl chloride (PVC). PVC is a synthetic plastic compound.

If an extremely deep well is going to be drilled, steel casing would be the best material to utilize. Steel is heavy, durable, and has a high tensile strength. It can hold up under extensive pressure. Steel, however, is more expensive and less resistant to corrosion.

PVC casing works well in shallower wells. PVC is less expensive, is resistant to acid and corrosion, and is easy to install. At the depth of most water wells in Ohio, PVC has sufficient strength to withstand the natural pressures. The decision on casing type will be made based on the type of drilling method used for the well. Cable tool drillers use steel and most rotary drillers use PVC.

Screens and Filter Packs

It is recommended that wells completed in unconsolidated material use a well screen. A well screen is a filtering device attached to the bottom of the well casing and serves as the water intake portion of the well. It is used to keep unconsolidated or semi-consolidated material from entering the well. The appropriate sizing of the screen slots are determined by the grain size of the material surrounding the bore hole.

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The correct size and spacing of the screen slots directly relates to the efficiency at which water can move into the well. A screen with relatively large slots may transmit a great amount of water, but may also allow sediment to enter the well. Conversely, a screen with smaller slots may restrict the entrance of sediment into the well, but also may restrict the flow of water. This may result in substantially reduced yields. A knowledgeable drilling contractor can analyze the sediment size and select the correct screen size for your needs.

Filter packs are highly recommended for use in buried valley aquifers. They reduce problems caused by sediment entering the well through the screen. Filter packs are uniform-sized and well-rounded sand and/or gravel placed between the borehole and the well screen. Filter packs effectively increase the permeability and porosity around the screen and allow for more exact screen sizing. Water yield is improved, but more importantly, smaller grained sediments are filtered out. For a long-lasting life, wells drilled in unconsolidated aquifers should have a combination of a well screen and a filter pack.

For more information on wells constructed in buried valleys and other geologic settings contact:

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This publication was financed in part through a grant from Ohio Environmental Protection Agency under provisions of Section 319 of the Clean Water Act as amended in 1987.