Bedrock Aquifer Systems of Porter County, Indiana

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The occurrence of bedrock aquifers depends on the original composition of the rocks and subsequent changes which influence the hydraulic properties. Post-depositional processes, which promote jointing, fracturing, and solution activity of exposed bedrock, generally increase the hydraulic conductivity (permeability) of the upper portion of bedrock aquifer systems. Because permeability in many places is greatest near the bedrock surface, bedrock units within the upper 100 feet are commonly the most productive aquifers.

Two bedrock aquifer systems are identified for Porter County: the Devonian and Mississippian age Coldwater, Ellsworth and Antrim Shales, and the Silurian and Devonian Carbonates. Unproductive shales subcrop over almost the entire county except in the northwest and southwest sections where limestone subcrops. Bedrock aquifer systems in Porter County are overlain by unconsolidated deposits of varying thickness from about 50 feet in the southeast corner of the county with the thickness in the remaining portions ranging from about 100 to over 200 feet. Major sand and gravel aquifers occur in these thick unconsolidated deposits overlying the bedrock.

The yield of a bedrock aquifer depends on its hydraulic characteristics and the nature of the overlying deposits. Shale and glacial till act as aquitards, restricting recharge to underlying bedrock aquifers. However, fracturing and/or jointing may occur in aquitards, which can increase recharge to the underlying aquifers. Hydraulic properties of the bedrock aquifers are highly variable. Most of the bedrock aquifers in the county are under confined conditions. In other words, the potentiometric surface (water level) in most wells completed in bedrock rises above the top of the water-bearing zone.

The susceptibility of bedrock aquifer systems to surface contamination is largely dependent on the type and thickness of the overlying sediments. Because the bedrock aquifer systems have complex fracturing systems, once a contaminant has been introduced into a bedrock aquifer system, it will be difficult to track and remediate.

Devonian and Mississippian -- Coldwater, Ellsworth and Antrim Shales Aquifer System

The Coldwater, Ellsworth and Antrim Shales Aquifer System is present at the bedrock surface in all but the northwestern and southwestern portions of Porter County. This system is generally not utilized as a source of water in the county because of the typically low permeability of shale, and unconsolidated aquifers are commonly abundant in the overlying deposits. In some instances, wells are completed in the underlying carbonate rocks in areas where the Coldwater,

Ellsworth and Antrim Shales Aquifer System is relatively thin. However, the water may be of poor quality.

Water wells utilizing the Coldwater, Ellsworth and Antrim Shales Aquifer System penetrate approximately 100 to 150 feet of unconsolidated material, and are completed into more than 50 feet of shale. However, only the upper 25 feet of the shale has typically been made permeable due to post-Devonian weathering, jointing and fracturing. Static water levels in the shale range from 40 to 80 feet below the surface. The Coldwater, Ellsworth and Antrim Shales Aquifer System is capable of supplying some domestic users requiring less than 10 gallons per minute (gpm). There are no registered significant groundwater withdrawal facilities in this system.

Since the permeability of shale materials is considered low and the overlying unconsolidated deposits are relatively thick, this bedrock system is not very susceptible to contamination introduced at or near the surface.

Silurian and Devonian Carbonates Aquifer System

The Silurian and Devonian Carbonates Aquifer System Aquifer System subcrops in two relatively small areas located in the southwestern and northwestern corners of the county. It is the principle bedrock aquifer and the only one capable of supporting high-capacity pumpage in the county.

In Porter County the Silurian and Devonian Carbonates Aquifer is overlain in most places by about 100 to more than 200 feet of unconsolidated material. The majority of domestic water wells that penetrate the Silurian Devonian Carbonates Aquifer System are completed in the upper 15 to 100 feet of bedrock, which is the most transmissible part of the aquifer. However, few wells have been completed in this carbonate aquifer system in Porter County, because of the availability of the overlying sand and gravel aquifers. In some areas near the contact between the Coldwater, Ellsworth and Antrim Shales Aquifer System, and the Silurian and Devonian carbonates, wells are drilled through the shales and into the more productive underlying carbonate rocks. Because the overlying shales inhibit recharge and fracturing may not be well developed in the carbonates, these wells are less productive than wells completed in carbonates not overlain by shale.

Water wells completed in the Silurian and Devonian Carbonates Aquifer System in Porter County are drilled to an average depth of about 230 feet and static water levels range from flowing to 117 feet below the surface; however, water levels usually are between 10 to 40 feet. Only a few dry holes have been reported in this aquifer system. Most domestic wells can be expected to produce between 10 and 30 gpm with yields ranging from 8 to 200 gpm. There are no registered significant groundwater withdrawal facilities in this system.

The Silurian and Devonian Carbonates Aquifer System has a low susceptibility to surface contamination because the overlying unconsolidated deposits are relatively thick.

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