

# **Bedrock Aquifer Systems of Wayne County, Indiana**

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July 2011

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.

In Wayne County thickness of unconsolidated deposits overlying bedrock ranges from less than 5 feet in the east-central part of the county along Middle Fork East Fork Whitewater River near the town of Middleboro, to as much as 355 feet in the west-central part of the county where a buried bedrock valley is present.

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.

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.

Two bedrock aquifer systems are identified for Wayne County. They are the Silurian and Devonian Carbonates and the Ordovician Maquoketa Group. Approximately 19 percent of all located wells in Wayne County are completed in bedrock.

## **Silurian and Devonian Carbonates Aquifer System**

The Silurian and Devonian Carbonates Aquifer System subcrops along portions of northern, eastern, and southern Wayne County. In this county only the older Silurian age carbonates are present. Bedrock generally consists of limestone and dolomite with some shale.

Due to the availability of overlying unconsolidated deposits and the limited extent of the bedrock aquifer system, less than 5 percent of located wells are reported in the Silurian and Devonian Carbonates Aquifer System in Wayne County. However, this system is capable of meeting the needs of some domestic and high-capacity users. Depth to the bedrock surface ranges from less than 5 feet to 240 feet. Total well depths are commonly from 30 to 130 feet. Well yields

generally are from 1 to 12 gallons per minute (gpm) with static water levels from 15 to 45 feet below surface. In places, dry holes have been reported. There is one registered significant groundwater withdrawal facility (3 wells) with reported yields of 123 to 150 gpm.

Most of the Silurian and Devonian Carbonates Aquifer System in Wayne County is overlain by thick clay deposits. These areas are considered at low risk to contamination. However, areas where bedrock is shallow and overlain by alluvial and outwash deposits are considered at moderate to high risk.

### **Ordovician -- Maquoketa Group Aquifer System**

The outcrop/subcrop area of the Maquoketa Group includes most of Wayne County. The Maquoketa Group consists of the Kope, the Dillsboro, and the Whitewater Formations. However, in Wayne County, only the Dillsboro and Whitewater Formations are present. This bedrock aquifer system includes mostly shale with some interbedded limestone units.

In Wayne County, the Maquoketa Group is considered a limited groundwater resource. Large diameter bucket wells are often used where overlying unconsolidated sands and gravels are limited and bedrock is shallow. Depth to the bedrock surface ranges from 4 to 290 feet but is typically 25 to 140 feet. Total well depths are commonly 50 to 165 feet. The amount of penetration into the Maquoketa Group is generally from 8 to 70 feet. Well yields are commonly 2 to 9 gpm with static water levels from 20 to 55 feet below surface. Also, significant drawdowns and dry holes are reported in this system.

Most of the Maquoketa Group Aquifer System in Wayne County is overlain by thick clay deposits. These areas are considered at low risk to contamination. However, in some places clay deposits are thin and/or sands and gravels directly overlie the bedrock surface. These areas are considered at high risk to contamination.

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