

Bedrock Aquifer Systems of Scott 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. In Scott County, rock types exposed at the bedrock surface are generally unproductive shales and siltstones. In very small areas, limestone of limited productivity is exposed at the surface.

Bedrock aquifer systems in the county are overlain by unconsolidated deposits of varying thickness. Refer to the text and map of unconsolidated aquifer systems for more information. 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 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.

Three bedrock aquifer systems are identified for Scott County. They are, from west to east, youngest to oldest: Borden Group of Mississippian age; New Albany Shale of Devonian and Mississippian age; and Silurian and Devonian Carbonates. The bedrock aquifer systems extend across Scott County generally as a series of bands trending north-northwest to south-southeast. The Borden Group and New Albany Shale are considered to have extremely low potential as aquifer systems, and combined they cover about 93 percent of the county. This is reflected in the limited number of water well records on file (under 70) for all of Scott County.

The susceptibility of bedrock aquifer systems to surface contamination is largely dependent on the type and thickness of the overlying sediments. Just as recharge for bedrock aquifers cannot exceed that of overlying unconsolidated deposits, susceptibility to surface contamination will not exceed that of overlying deposits. However, 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.

Mississippian -- Borden Group Aquifer System

The outcrop/subcrop area of the Mississippian age Borden Group includes the southwestern third of Scott County, primarily in the hilly areas. This bedrock aquifer system is composed mostly of siltstone and shale, but fine-grained sandstones are common. Carbonates are rare, but do occur as discontinuous interbedded limestone lenses, mostly in the upper portion of the group.

The Borden Group in Scott County has a maximum thickness in excess of 350 feet. Well depths in the Borden Group Aquifer System range from 25 to 552 feet. However, domestic wells are commonly completed at depths of 50 to 100 feet.

Because the Borden Group is generally not very productive, it is typically used only where overlying deposits do not contain aquifer material. The Borden Group is often described as an aquitard, and yields of wells completed in it are typically quite limited. A few wells, however, are able to produce sufficient water for domestic purposes by relying on extra well-bore storage created by drilling relatively large diameter and relatively deep wells. Most domestic wells completed in this aquifer system in Scott County have been reported as dry holes. Additionally, most domestic wells from adjacent counties that were completed in the Borden Group Aquifer System have reported testing rates of less than 5 gallons per minute (gpm).

The Borden Group is composed of primarily fine-grained materials that limit the movement of ground water to fractures, joints, and along the bedrock surface. This, along with the overlying, typically fine-grained clay materials, puts most of the Borden Group Aquifer System in Scott County at low risk to contamination from the surface or near surface sources.

Devonian and Mississippian -- New Albany Shale Aquifer System

The outcrop/subcrop area of the New Albany Shale includes about 56 percent of Scott County, extending in a broad band from the northwest to the southeast corner of the county. The New Albany Shale is primarily Devonian age, except for the upper few feet that are Mississippian age. The total thickness of the New Albany Shale ranges from 0 at its eastern outcrop to a maximum of about 120 feet near Austin in the northern part of the county.

The New Albany Shale Aquifer System in Scott County is a limited aquifer resource. This aquifer system consists mostly of brownish-black carbon-rich shale, greenish-gray shale, along with minor amounts of dolomite and dolomitic quartz sandstone.

Although a few wells produce water from the New Albany Shale, the formation is not considered a significant aquifer in the county. Most drillers will penetrate the New Albany Shale, case it off, and continue drilling into the underlying Devonian limestones. Most wells greater than 75 feet penetrate into the underlying Devonian limestones. Domestic well depths range from 54 to 225 feet, but are generally completed at depths between 75 and 125 feet. Reported yields typically range from 0 to 5 gpm with drillers reporting many dry holes.

Water quality in this aquifer system in Scott County is generally satisfactory for domestic use. However, a few drillers report “sulfur water” in scattered wells within the outcrop/subcrop area of the New Albany Shale. This aquifer system typically has 10 to 25 feet of fine-grained materials (clay, silt, or residuum) that overlie bedrock and it is not considered very susceptible to surface contamination.

Silurian and Devonian Carbonates Aquifer System

The outcrop/subcrop area of the Silurian and Devonian carbonate rocks covers about 7 percent of Scott County. Limestone of the Muscatatuck Group is exposed in a few stream valleys and adjacent lowlands in the eastern third of the county. The maximum thickness of the Silurian and Devonian carbonates is about 200 feet where overlain by the New Albany Shale in the western part of the county.

This aquifer system is composed primarily of limestone and dolomite with some interbedded shale units. Because most individual units of the Silurian and Devonian systems are composed of similar carbonate rock types and cannot easily be distinguished on the basis of water-well records, they are considered as a single water-bearing system.

The elevations of water-bearing zones in this aquifer system vary substantially. Water well data from other counties indicate that the most productive part of the carbonate aquifer commonly occurs within the upper 100 feet, and in many places, within a few feet of the bedrock surface. However, other zones of relatively high permeability do occur at greater depth.

Although it is not a major resource in the county, the Silurian and Devonian Carbonates Aquifer System is the most productive bedrock aquifer system and could meet most domestic needs. However, the water quality may be very poor, especially in the western half of the county, where the New Albany Shale overlies this system. In the outcrop/subcrop area of this aquifer system the depth to the bedrock surface is generally less than 50 feet in Scott County. Well depths range from 33 to 115 feet. Reported testing rates vary from 0 (dry hole) to 40 gpm, but would typically range between 1 and 10 gpm based on well records from adjacent counties. Static water levels range from 0 to 80 feet below the land surface, but are typically between 10 and 35 feet.

This aquifer system in Scott County is generally not very susceptible to contamination from the land surface, except in limited areas where the overlying New Albany Shale and/or clay-rich till and residuum is thin or absent.

Registered Significant Ground-Water Withdrawal Facilities

There are no registered significant ground-water withdrawal facilities in Scott County.

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