

Bedrock Aquifer Systems of Parke 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.

Unconsolidated deposits of varying thickness overlie bedrock aquifer systems in Parke County. Total thickness ranges from less than one foot where bedrock is shallow or outcrops along sections of tributaries to the Wabash River, to an estimated 250 feet in the southwestern portion of the county. 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 formation.

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.

Four bedrock aquifer systems are identified for Parke County. They are the Pennsylvanian Carbondale Group; the Pennsylvanian Raccoon Creek Group; the Mississippian Blue River and Sanders Groups; and the Mississippian Borden Group.

Pennsylvanian -- Carbondale Group Aquifer System

The Carbondale Group Aquifer System outcrop/subcrop area is limited to the southwestern part of Parke County. Bedrock deposits include mostly shale and sandstone with some limestone and coal. Estimated thickness of the Carbondale Group in Parke County ranges from less than one foot, where it is in contact with the underlying Raccoon Creek Group, to about 350 feet.

Few wells are completed in the Carbondale Group Aquifer System. Depth to the bedrock surface generally ranges from 5 to 189 feet below surface. Total well depth ranges from about 38 to 350

feet. The amount of rock penetrated ranges from 11 to 270 feet. The Carbondale Group is considered a minor groundwater source with domestic wells ranging from 1 to 6 gallons per minute (gpm) in Parke County. Some dry holes have been reported. Static water levels range from 14 to 130 feet below the land surface.

In areas where overlying clay materials are present, the Carbondale Group Aquifer System is at low risk to contamination. However, in some areas fine sand, gravel and silt materials directly overlie the bedrock surface. These areas are at moderate to high risk from surface contamination.

Pennsylvanian -- Raccoon Creek Group Aquifer System

The Raccoon Creek Group Aquifer System outcrop/subcrop area occurs throughout most of Parke County. Bedrock consists of mostly sandstone and shale with minor amounts of mudstone, coal, and limestone. The basal formation of the Raccoon Creek Group, the Mansfield Formation, rests unconformably on Mississippian rocks.

The Raccoon Creek Group is generally considered a limited groundwater resource. However, the Mansfield Formation is considered a moderately dependable source of groundwater. Depth to bedrock ranges from 25 to 90 feet. Wells completed in the Raccoon Creek Group are typically 95 to 190 feet deep with 35 to 130 feet of penetration into the bedrock. Domestic well capacities range from 3 to 17 gpm with static water levels of 20 to 75 feet below surface. Greater capacities have been reported in isolated areas. There is one registered significant groundwater withdrawal facility (one well) with a reported capacity of 140 gpm. However, greater yields are commonly associated with significant to complete drawdown.

Clay materials that overlie bedrock are generally thick. These areas are considered at low risk to contamination. However, in some areas outwash, alluvial, and lacustrine sands directly overlie the bedrock surface. These areas are at moderate to high risk from surface contamination.

Mississippian -- Blue River and Sanders Groups Aquifer System

The Blue River and Sanders Groups Aquifer System is present over portions of north-central and eastern Parke County. The Sanders Group includes primarily limestone with some dolomitic limestone content. The overlying Blue River Group includes mostly limestones containing significant amounts of gypsum, anhydrite, shale, chert, and calcareous sandstone.

The Blue River and Sanders Groups Aquifer System is not regarded as a major groundwater resource. Well depths in Parke County range from 90 to 190 feet. Depth to bedrock is generally between 15 and 80 feet below land surface. Domestic well capacities range from 2 to 18 gpm with reported static water levels that range from 20 feet to 65 feet below surface. Greater capacities have been reported in isolated areas. However, higher yields are commonly associated with significant to complete drawdown.

In areas where overlying clay materials are present, the Blue River and Sanders Group Aquifer System is at low risk to contamination. However, in some areas outwash, alluvial, and lacustrine sands directly overlie the bedrock surface. These areas are at moderate to high risk from surface contamination.

Mississippian -- Borden Group Aquifer System

The Borden Group Aquifer System outcrop/subcrop area is limited to extremely small portions of northeastern Parke County. This bedrock aquifer system is composed of siltstone and shale, but fine-grained sandstones are also common. Although carbonates are rare, discontinuous interbedded limestone lenses are present, mainly in the upper portion of the group. Thickness of the Borden Group in Parke County is estimated up to 700 feet.

There is little well information available on the Borden Group in Parke County; however, there is one known well completed in the Borden Group subcrop area. The total well depth is 200 feet with bedrock encountered at 55 feet. The reported well yield is 2 gpm with a static water level of 68 feet below surface.

The Borden Group is composed primarily of fine-grained materials that limit the movement of groundwater and is overlain with thick clay materials. The Borden Group Aquifer System, therefore, is at low risk to contamination from the surface or near surface. However, to the northeast along Sugar Creek bedrock is shallow and may be fractured. Therefore, these areas are at moderate to high risk from surface contamination

Underground Mine Areas

In Parke County various underground coal seams have been removed by underground mining methods. In underground mines, approximately 50 percent of the coal seam was typically removed leaving the potential for storage of substantial amounts of water in the larger mines. Although the Division has no records of wells drilled into these mines, yields of a few hundred gpm may be possible. A limitation on use of the water could be its more mineralized nature.

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