

Unconsolidated Aquifer Systems of Sullivan County, Indiana

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The unconsolidated aquifer systems of Sullivan County are composed of sediments deposited by, or resulting from, a complex sequence of glaciers, glacial meltwaters, and post-glacial precipitation events. Six unconsolidated aquifer systems have been mapped in Sullivan County: the Till Veneer; the Alluvial, Lacustrine and Backwater Deposits; the Wabash Lowland Till; the Wabash Lowland Till Subsystem; the Wabash River and Tributaries Outwash; and the Wabash River and Tributaries Outwash Subsystem. Because of the complicated glacial geology, boundaries of the aquifer systems in this county are commonly gradational and individual aquifers may extend across aquifer system boundaries. Approximately 43 percent of all wells in this county are completed in unconsolidated deposits.

The thickness of unconsolidated deposits in Sullivan County is quite variable due to the deposition of glacial material over an uneven bedrock surface. Unconsolidated deposits range from about 4 to 132 feet thick throughout Sullivan County.

Regional estimates of aquifer susceptibility to contamination from the surface can differ considerably due to a wide range of variation within geologic environments. In addition, man-made structures such as poorly constructed water wells, unplugged or improperly abandoned wells, and open excavations can provide contaminant pathways that bypass the naturally protective clays.

Till Veneer Aquifer System

In Sullivan County, the Till Veneer Aquifer System occurs in areas where the unconsolidated material is predominantly thin till overlying bedrock. This system is chiefly the product of the deposition of glacial till over an uneven, eroded bedrock surface, and is generally less than 50 feet thick. Most of central and eastern Sullivan County is mapped as Till Veneer.

Potential aquifers within the Till Veneer Aquifer System in Sullivan County include thin isolated sand and/or gravel layers, and surficial sand and gravel outwash or alluvium. However, there is little potential for groundwater production in this system with most wells being completed in the underlying bedrock.

Wells producing from the Till Veneer Aquifer System typically have reported capacities of 5 gallons per minute (gpm) or less with some wells being reported as “dry”. Static water levels in this system range between 2 to 60 feet below the surface. There are no registered significant groundwater withdrawal facilities utilizing this system.

This system is generally not very susceptible to contamination from surface sources because of the low permeability of the near-surface materials. However, there are areas where protective clay layers are thin or absent. These areas are very susceptible to contamination.

Alluvial, Lacustrine, and Backwater Deposits Aquifer System

The Alluvial, Lacustrine, and Backwater Deposits Aquifer System in Sullivan County is mapped within several wide floodplains along tributaries of the Wabash River. This system consists of deposits resulting from glacial meltwater drainage, fine-grained glaciolacustrine deposits formed in relatively static water, or colluvium from the surrounding upland areas.

This system is an extremely limited resource and the Division has no records of wells that produce from these deposits in Sullivan County. However, large-diameter bucket wells may be adequate to meet the needs of some domestic users. Typical materials overlying bedrock include fine sand, silt, and clay deposits that are generally greater than 25 feet thick. Aquifer materials commonly include thin sand seams that are typically less than a few feet thick. Yields are generally expected to be less than a few gpm. There are no registered significant groundwater withdrawal facilities utilizing this system.

Thick deposits of clay that have a low susceptibility to surface contamination commonly characterize this aquifer system. However, the susceptibility is greater in areas where surficial clay deposits are thin and directly overlie sand deposits.

Wabash Lowland Till Aquifer System

The Wabash Lowland Till Aquifer System is mapped primarily in two areas of west-central Sullivan County. This aquifer system is up to about 60 feet in thickness, and consists primarily of glacial till with intertill sand and gravel layers. However, the sand and gravel aquifers in this system tend to be relatively thin and discontinuous.

This aquifer system is capable of meeting the needs of domestic and some high-capacity users in Sullivan County. Individual sand and gravel units are commonly 5 to 15 feet thick with well depths ranging from about 40 to 55 feet. Domestic well yields range from about 10 to 25 gpm, and static water levels range from flowing to about 20 feet below the land surface. There are no registered significant groundwater withdrawal facilities using the Tipton Till Aquifer System.

The Wabash Lowland Till Aquifer System typically has a low susceptibility to surface contamination because intertill sand and gravel units are commonly overlain by thick glacial till.

Wabash Lowland Till Aquifer Subsystem

The Wabash Lowland Till Aquifer Subsystem is found throughout portions of west-central, central, and northeastern Sullivan County. The subsystem is mapped similar to the Wabash Lowland Till Aquifer System. However, potential aquifer materials are generally thinner and potential yields are less in the subsystem.

About 67 percent of wells started in this subsystem in Sullivan County are completed in the underlying bedrock aquifer system. However, the Wabash Lowland Till Aquifer Subsystem is capable of meeting the needs of some domestic users in the county. Potential aquifer materials include relatively thin, discontinuous intertill sand and gravel deposits. These intertill sand and gravel aquifer materials are commonly less than 10 feet thick. The wells producing from this subsystem are typically completed at depths ranging from about 30 to 140 feet. Domestic well yields are generally 5 to 10 gpm and static water levels range from about 10 to 50 feet below the surface. There are no registered significant groundwater withdrawal facilities utilizing this subsystem.

This subsystem is generally not very susceptible to surface contamination because intertill sand and gravel units are overlain by thick till deposits. Wells producing from shallow aquifers are moderately to highly susceptible to contamination.

Wabash River and Tributaries Outwash Aquifer System

The Wabash River and Tributaries Outwash Aquifer System is mapped along the western edge of Sullivan County. The system includes thick glacial outwash sands and gravels, that are (in some areas) capped by a layer of clay and/or silt deposits.

The Wabash River and Tributaries Outwash Aquifer System is capable of meeting the needs of both domestic and high-capacity users in Sullivan County. The wells utilizing this aquifer system are completed at depths ranging from 30 to 90 feet with saturated sand and gravel aquifer materials commonly 10 to 35 feet thick. Domestic well yields are typically 10 to 60 gpm with static water levels ranging from flowing to about 35 feet below the surface.

In the Wabash River and Tributaries Outwash Aquifer System there are 48 registered significant groundwater withdrawal facilities (90 wells). Reported production for these high-capacity wells range from 150 to 2,000 gpm. The uses for these facilities are public water supply, irrigation, energy production, and industry.

The Wabash River and Tributaries Outwash Aquifer System is highly susceptible to surface contamination where sand and gravel deposits are near the surface and have little or no overlying clay deposits.

Wabash River and Tributaries Outwash Aquifer Subsystem

The Wabash River and Tributaries Outwash Aquifer Subsystem is mapped in southwestern Sullivan County. This subsystem is mapped similar to the Wabash River and Tributaries Outwash Aquifer System; however, aquifer materials in the Wabash River and Tributaries Outwash Aquifer Subsystem are generally thinner, overlying silt and/or clay materials are thicker, and potential yields are less in the subsystem.

The Wabash River and Tributaries Outwash Aquifer Subsystem has the potential to meet the needs of domestic and some high-capacity users. The wells in this subsystem are completed at depths ranging from 34 to 40 feet. Saturated aquifer materials include sand and gravel deposits that are commonly 5 to 15 feet thick. Domestic well yields are generally about 20 gpm with static water levels ranging from flowing to 20 feet below the surface. There are no registered significant groundwater withdrawal facilities utilizing this subsystem.

Areas within the White River and Tributaries Outwash Aquifer Subsystem that have overlying clay deposits are moderately susceptible to surface contamination; however, areas lacking overlying clay deposits are highly susceptible to contamination.

Coal Mine Spoil Aquifer System

The Coal Mine Spoil Aquifer System is present in the eastern portions of Sullivan County and covers about 13 percent of the county. The coal seams occur within the Carbondale Group of Pennsylvanian age. This aquifer system was formed during the process of mining coal by surface-mining methods. The overburden was typically broken up by blasting and moved aside to uncover the desired coal seam. The overburden, most of which was originally solid rock, became a heterogeneous mixture of particles ranging in size from clay, silt, and sand up to gravel, slabs, and boulders. Where extensive, these spoil areas contain considerable amounts of groundwater.

In Sullivan County, there are no reported wells producing from the Coal Mine Spoil Aquifer System. Wells started in this system are usually completed in bedrock. Information from surface coal mine areas in other counties indicate the quality of groundwater in this system is probably much poorer than in the overburden before mining took place. Typically, a significant increase in total dissolved solids, especially calcium, magnesium, bicarbonate, and sulfate occurs. High iron, and in places low pH, can severely limit potential uses of groundwater from this system.

Generally, it is expected that aquifers in coal mine spoil that are not graded and capped with compacted soil are highly susceptible to contaminants introduced at the surface. However, spoil aquifers in areas benefiting from modern reclamation methods are likely to be only moderately susceptible.

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