Unconsolidated Aquifer Systems of Tippecanoe County, Indiana

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The unconsolidated aquifer systems of Tippecanoe County are composed of sediments deposited by, or resulting from, a complicated sequence of glaciers, glacial meltwaters, and post-glacial precipitation events. Six unconsolidated aquifer systems have been mapped in Tippecanoe County: the Till Veneer; the Iroquois/Tipton Till; the Iroquois/Tipton Till Subsystem; the Iroquois/Tipton Complex; 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.

The thickness of unconsolidated deposits in Tippecanoe County is quite variable, due to the deposition of glacial material over an uneven bedrock surface. Bedrock outcrops or is near the surface in places in the southwestern quarter of the county. Additionally, bedrock is at or near the surface along the Wabash River and a few of its tributaries in the northeastern and the western parts of the county.

A buried bedrock valley system, the Lafayette (Teays) Bedrock Valley System, covers nearly 40 percent of Tippecanoe County and the thickness of unconsolidated deposits exceeds 400 feet in several places. Several buried valleys converge around Lafayette to form the main trunk of the Lafayette (Teays) Bedrock Valley System. One major valley enters the county from the northeast just west of the Tippecanoe River and trends southwest toward Lafayette. Another major buried valley trends northwest from around the town of Clarks Hill and converges around Lafayette. Both of these valleys are 2 to 3 miles wide before they join the main trunk around Lafayette. Another buried bedrock valley enters the county from Montgomery County southeast of Romney and trends to the north converging with the other buried valleys around Lafayette. This valley is relatively narrow, usually less than a mile wide. These buried bedrock valleys converge around Lafayette forming the main trunk valley. West of Lafayette the width of the trunk valley ranges from 4 to 7 miles across as it exits the county south of the town of Otterbein. Several test holes drilled in the county, and just outside the county, indicate the basal sand and gravels in the main trunk valley are at least 50 feet thick and in places greater than 150 feet thick.

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 Tippecanoe County, the Till Veneer Aquifer System consists of areas where the unconsolidated material is predominantly thin till overlying bedrock. Along some of the major streams, this system also includes thin alluvium and surficial sand and gravel outwash deposits overlying shallow bedrock. The Till Veneer Aquifer System in Tippecanoe County is primarily mapped in the southwestern quarter of the county, along Flint Creek and some areas around Little Wea Creek and Big Shawnee Creek. The system is also mapped along the Wabash River in the northeastern corner of the county, and a small area west of Klondike around Indian Creek. Total thickness of the Till Veneer Aquifer System generally ranges from about 20 to 50 feet. This system has the most limited ground-water resources of the unconsolidated aquifer systems in the county.

There is little potential for ground-water production in this system in Tippecanoe County. The system is commonly bypassed in favor of the underlying bedrock. Potential aquifers within this system include thin isolated sand and/or gravel layers, and surficial sand and gravel outwash or alluvium. However, very few of the reported wells penetrating this aquifer system in the county are completed in unconsolidated materials. In this county the depth of the few wells completed in the Till Veneer Aquifer System range from 36 to 50 feet deep with static water levels ranging between 5 and 35 feet below the surface. Most of the wells have reported capacities of less than 10 gallons per minute (gpm).

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.

Iroquois/Tipton Till Aquifer System

The Iroquois/Tipton Till Aquifer System primarily consists of glacial till with intratill sand and gravel layers. In Tippecanoe County, this aquifer system ranges in thickness from about 50 feet to around 350 feet. However, the sand and gravel aquifers in this system tend to be thin and discontinuous.

Wells completed in this system are capable of meeting the needs of most domestic and some high-capacity users in Tippecanoe County. Saturated aquifer materials include sand and/or gravel deposits that are commonly 8 to 16 feet thick and are generally overlain by 45 to 90 feet of till. Wells producing from this aquifer system are typically 60 to 100 feet deep. Domestic well capacities are commonly 10 to 30 gpm. Static water levels generally range from 15 to 40 feet below the surface. There are 3 registered significant ground-water withdrawal facilities (7 wells) using the Tipton Till Aquifer System and all these facilities are used for irrigation. The reported pumping rates range from 400 to 800 gpm.

> A few small areas of the Iroquois/Tipton Till Aquifer System overlie the Lafayette (Teays) Bedrock Valley System in Tippecanoe County. The total unconsolidated thickness generally exceeds 250 feet in these areas. Only a few

wells that utilize the deeper aquifers within the buried bedrock valleys have been reported. These wells indicate the deep sand and gravel deposits are 8 to 17 feet thick in places. Reported domestic well yields are greater than 30 gpm.

The Tipton Till Aquifer System typically has a low susceptibility to surface contamination because intratill sand and gravel units are commonly overlain by thick glacial till. Shallow wells completed in this system are moderately susceptible to contamination.

Iroquois/Tipton Till Aquifer Subsystem

The Iroquois/Tipton Till Aquifer Subsystem is mapped predominantly in the southwest quarter of the county. The subsystem is mapped similar to that of the Iroquois/Tipton Till Aquifer System. However, potential aquifer materials are generally thinner and potential yields are less in the subsystem.

The unconsolidated deposits vary between 50 feet to around 200 feet thick for the subsystem in this county. However, the depth to bedrock is generally less than 75 feet. Potential aquifer materials include thin, discontinuous intratill sand and gravel deposits. Where present, these deposits are typically capped by till that is commonly 45 to 65 feet thick.

About 60 percent of wells started in this subsystem in Tippecanoe County are completed in the underlying bedrock aquifer system. However, the Iroquois/Tipton Till Aquifer Subsystem is capable of meeting the needs of some domestic users in the county. The wells producing from this subsystem are completed at depths ranging from 40 to 70 feet. Intratill sand and gravel aquifer materials are typically less than 5 feet thick. Domestic well yields are commonly 5 to 15 gpm and static water levels are generally 10 to 30 feet below the surface. There is one registered significant ground-water withdrawal facility (2 wells) using the Tipton Till Aquifer Subsystem. These wells are used for irrigation. The reported pumping rates are 50 gpm.

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

Iroquois/Tipton Complex Aquifer System

The Iroquois/Tipton Complex Aquifer System is characterized by unconsolidated deposits that are quite variable in materials and thickness and is mapped throughout most of Tippecanoe County. Aquifers within the system range from thin to thick, and include single or multiple discontinuous intratill sand and gravel layers. The aquifers are highly variable in depth and lateral extent and are typically confined by thick clay layers. The total thickness of unconsolidated deposits ranges from about 50 feet to over 400 feet.

In many places, the Wabash River and its major tributaries have cut deeply into glacial sediments forming high terraces that commonly rise over 100 feet above the valley bottom. These terraces

are composed mostly of sand and gravel with a few clay layers. The sands and gravels above the valley typically are not saturated and generally have static water levels ranging from 70 to 120 feet below the surface. In some places, a few domestic wells make use of the shallower sand and gravel aquifers that are perched above a low permeability clay layer. However, most domestic wells utilize the deeper more prolific aquifers.

The deeper more prolific aquifers of this system are capable of meeting the needs of domestic and high-capacity users in Tippecanoe County. Saturated aquifer materials in the Iroquois/Tipton Complex Aquifer System are generally 20 to 50 feet thick. Away from the terraces near the Wabash River and its major tributaries, the aquifers are generally overlain by a till cap which is commonly 30 to 100 feet thick. Wells in this system are typically completed at depths ranging from 70 to 135 feet. Domestic well yields are commonly 10 to 50 gpm and static water levels are generally 30 to 70 feet below the surface. There are 15 registered significant ground-water withdrawal facilities (27 wells) using this system. These facilities are used for industry, irrigation, public water supply, and rural uses. The reported capacities for the high-capacity wells range from 75 to 2000 gpm.

> Portions of this system overlie the Lafayette (Teays) Bedrock Valley System. The total unconsolidated deposits are commonly 250 feet thick and, in a few areas, exceed 400 feet in thickness. The deeper portions of the buried bedrock valleys are filled with thick sand and gravel deposits. A test well reported over a hundred feet of sand and gravel above the bedrock valley.
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> Very few wells are completed in the deepest parts of the valley because most wells use the prolific shallower aquifers. Wells that overlie the buried bedrock valley for this system are typically completed at depths ranging from 80 to 180 feet. Domestic well yields are commonly 10 to 50 gpm and static water levels are generally 30 to 110 feet below the surface. There are 32 registered significant ground-water withdrawal facilities (80 wells) using this system. These facilities are used for industry, irrigation, public water supply, and rural uses. Reported capacities for the high-capacity wells ranges from 85 to 3000 gpm.

The Iroquois/Tipton Complex Aquifer System is not very susceptible to contamination where overlain by thick clay deposits. However, in some areas where surficial clay deposits are thin or lacking, the shallow aquifer, if present, is at moderate to high risk.

Wabash River and Tributaries Outwash Aquifer System

The Wabash River and Tributaries Outwash Aquifer System is mapped along most of the Wabash River in Tippecanoe County. In places, sand and gravel from the melting glaciers (outwash) were deposited in the stream valleys. The total thickness of unconsolidated deposits in this system ranges from about 50 feet to over 150 feet.

This aquifer system is capable of meeting the needs of domestic and high-capacity users in Tippecanoe County. Wells in the Wabash River and Tributaries Outwash Aquifer System are

completed at depths ranging from 60 to 105 feet. Sand and gravel aquifers are commonly 50 to over 100 feet thick and are generally capped by silt, sandy clay, or clay ranging from 5 to 20 feet thick. However, in many places, the protective cap is missing and unsaturated sand and gravel deposits lie above the productive aquifer. Domestic well yields in this system are commonly 30 to 100 gpm and static water levels typically range from flowing to 40 feet below the surface. In Tippecanoe County, there are 5 registered significant ground-water withdrawal facilities (36 wells) in this system. Uses for these facilities are public water supply, industry, and irrigation. In Tippecanoe County the reported well yields are up to 2500 gpm with one radial collector reporting 6000 gpm.

> Most of the Wabash River and Tributaries Outwash Aquifer System overlies the Lafayette (Teays) Bedrock Valley System in Tippecanoe County. The total unconsolidated thickness exceeds 200 feet in many places. Very few wells utilize the deepest aquifers in the buried bedrock valleys because of the availability of the prolific shallower aquifers. However, based on a nearby test hole there may be as much as one hundred feet of sand and gravel above the bedrock. There are 3 registered significant ground-water withdrawal facilities (13 wells) in this system. Uses for these facilities are public water supply, industry, and miscellaneous. Reported capacities for these wells ranges up to 2250 gpm in Tippecanoe County.

This system is highly susceptible to surface contamination where sand and gravel deposits are near the surface and have little or no clay deposits. However, areas that have overlying thick clay deposits are moderately susceptible to contamination.

Wabash River and Tributaries Outwash Aquifer Subsystem

In Tippecanoe County, the Wabash River and Tributaries Outwash Aquifer Subsystem is mapped along portions of the Tippecanoe River, Wea Creek, and Wildcat Creek. Total thickness of unconsolidated deposits overlying bedrock ranges from about 50 feet to over 250 feet. The aquifer materials in this system are generally overlain by 10 to 35 feet of silt and/or clay. However, in many places, this layer is missing and unsaturated sand and gravel deposits lie above the productive aquifer.

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 system are completed at depths commonly ranging from 55 to 95 feet. Saturated aquifer materials include sand and gravel deposits that are commonly 20 to 40 feet thick. Domestic well yields typically range from 10 to 40 gpm with static water levels ranging from flowing to 25 feet below the surface. There are no registered significant ground-water withdrawal facilities using this system.

> In a few areas the Wabash River and Tributaries Outwash Aquifer Subsystem overlies a deep buried bedrock valley in Tippecanoe County. The total unconsolidated thickness exceeds 250 feet in many places. In this county, only a few wells utilize the deeper aquifers in the buried bedrock valleys due to the

availability of thick surficial sand and gravel deposits. The wells range from 97 to 149 feet deep with static water levels ranging between 55 and 94 feet below the surface. Most of the wells have reported capacities between 10 and 30 gpm.

Areas within this aquifer system that have overlying clay deposits are moderately susceptible to surface contamination; whereas, areas that lack overlying clay deposits are highly susceptible to contamination.

Registered Significant Ground-Water Withdrawal Facilities

There are 50 registered significant ground-water withdrawal facilities using unconsolidated aquifers in the county (total of 165 wells). Most of these facilities utilize the Iroquois/Tipton Complex Aquifer System (47 facilities, 107 wells), and the Wabash River and Tributaries Outwash Aquifer System (8 facilities, 49 wells). Three facilities use the Iroquois/Tipton Till Aquifer System (7 wells), and one facility uses the Iroquois/Tipton Till Aquifer Subsystem (2 wells). Reported capacities for individual high capacity wells vary from 75 to 6000 gpm. The main uses for the Tippecanoe County facilities are industry, public water supply, and irrigation. Refer to the table for some details on the wells and to the map for the facilities location.

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