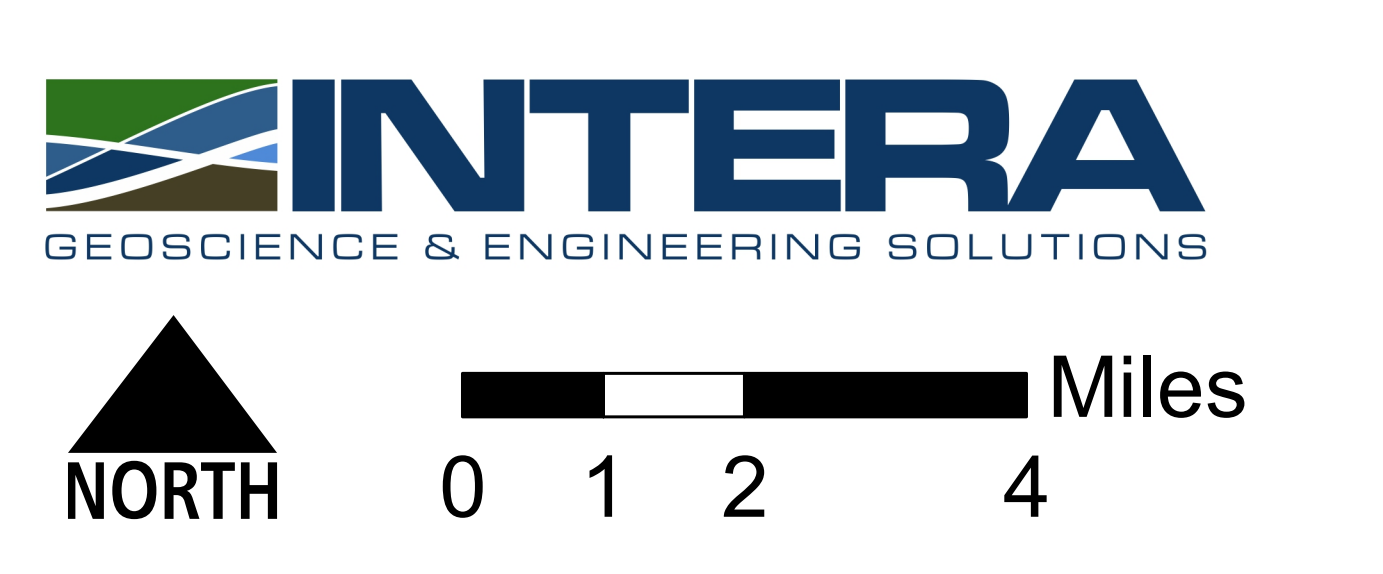
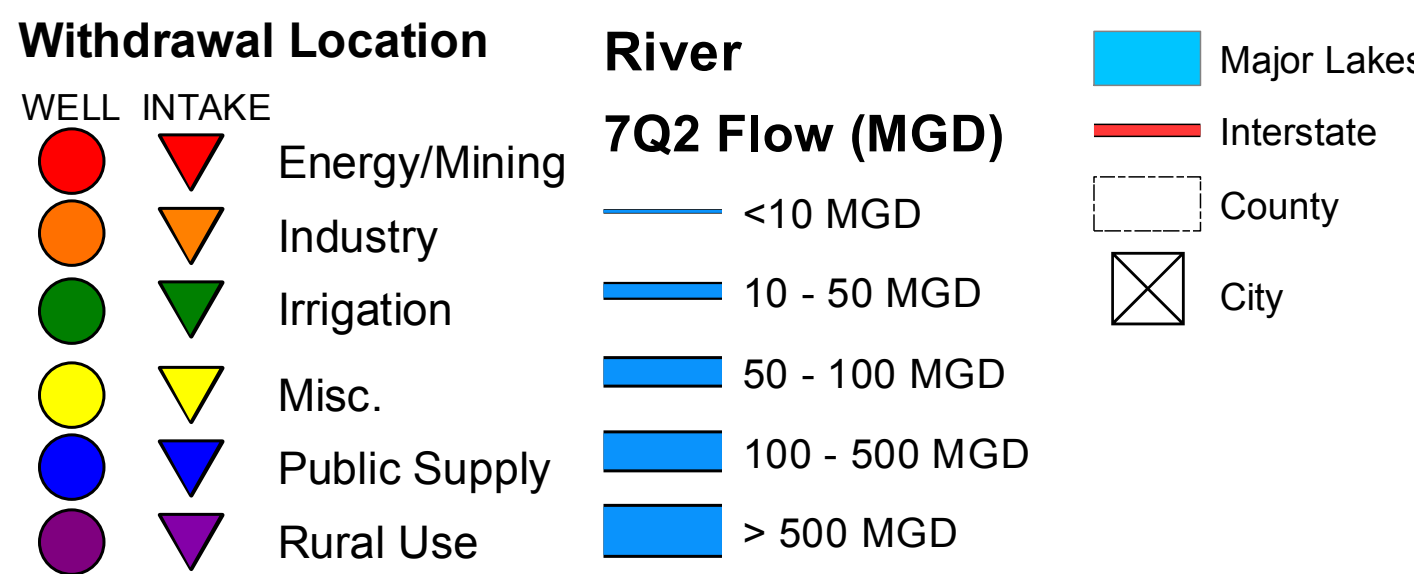


Water Resources and Use in Jackson County

Data Sources: U.S. Geological Survey and Indiana Department of Natural Resources



BEDROCK AQUIFER SYSTEMS OF JACKSON COUNTY, INDIANA

The occurrence of bedrock aquifers depends on the original composition of the rocks and subsequent changes which influence the hydraulic properties. Post-depositional processes, such as jointing, fracturing, and solution activity, generally increase the hydraulic conductivity (permeability) of the upper portion of bedrock aquifer systems. Because permeability is generally greatest near the bedrock surface, bedrock units within the upper 100 feet are commonly the most productive aquifers.

Bedrock aquifer systems in the county are overlain by unconsolidated deposits of varying thickness. 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 aquiclads, restricting recharge to underlying bedrock aquifers. However, fracturing and/or jointing may occur in aquiclads, which can increase recharge to the underlying aquifers. Hydraulic properties of the bedrock aquifers are highly variable.

Four bedrock aquifer systems are identified for Jackson County. They are, from west to east, youngest to oldest: Blue River and Sanders Group of Mississippian age, the Borden Group of Mississippian age, the New Albany Shale of Devonian and Mississippian age, and the Silurian and Devonian Carbonates.

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 may have complex fracturing systems, once a contaminant has been introduced into a bedrock aquifer system, it will be difficult to track and remediate.

Mississippian -- Blue River and Sanders Groups Aquifer System

The Blue River and Sanders Groups Aquifer System is limited to upland areas along the western edge of Jackson County. This Middle Mississippian age aquifer system encompasses two groups: the Blue River Group and the Sanders Group. In Jackson County, bedrock associated with the Blue River Group is not present.

The Sanders Group includes the Harrodsburg and Salem limestone formations. These are primarily limestone with some dolomitic limestone content. In Jackson County, the Sanders Group has a thickness of 25 feet or less because much of it has been eroded. Depth to bedrock is generally between 7 and 30 feet below land surface.

The Blue River and Sanders Groups Aquifer System is not regarded as a major ground-water resource in the county and no known wells produce from this aquifer system. Domestic wells in the outcrop/subcrop area commonly penetrate through the Sanders Group into the underlying Borden Group. However, it is possible that large diameter wells could meet the needs of domestic users.

Clay materials of varying thickness overlie the Blue River and Sanders Group Aquifer System. Where the clay materials are thin the aquifer system has a moderate risk to contamination, where thick, there is low risk.

Mississippian -- Borden Group Aquifer System

The outcrop/subcrop area of the Mississippian age Borden Group Aquifer System includes nearly all of Jackson County. 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 Jackson County is up to 550 feet thick and generally thins as it dips to the southwest beneath younger rock formations. Well depths in the Borden Group Aquifer System range from 15 to 420 feet. However, most wells are completed at depths of 60 to 140 feet.

Because the Borden Group is generally not very productive, it is typically used only where overlying deposits do not contain an aquifer. The Borden Group is often described as an aquitard, and yields of wells completed in it are usually quite limited. Many 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. The yield of most domestic wells completed in the group range from 1 to 9 gallons per minute (gpm). Reported static water levels in the wells completed in the Borden aquifer are commonly between 15 and 40 feet below surface.

The Borden Group is composed primarily of fine-grained materials that limit the movement of ground water. In areas where overlying clay materials are present, the Borden Group Aquifer System is at low risk to contamination from the surface or near surface. However, in some areas the bedrock is overlain by outwash materials that may be capped by thin deposits of colluvium derived loess, colluvium, or lacustrine silt. These areas are at moderate risk to contamination.

Devonian and Mississippian -- New Albany Shale Aquifer System

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

In Jackson County, thickness of the New Albany Shale ranges from 0 to 120 feet and generally thickens as it dips southwest beneath younger strata. The outcrop/subcrop area for the New Albany Shale is present along most of the eastern edge of the county. It is overlain by unconsolidated deposits that range in thickness from 5 to 115 feet.

This aquifer system is considered a poor aquifer resource and is often described as an aquitard. Dry holes and the occurrence of "sulphur" water and "salt" water have been reported. However, a few domestic wells have been completed in this system. Completed well depths are typically 20 to 65 feet. Typical capacities are from 2 to 9 gpm. Static water levels range from 15 to 35 feet below surface.

The permeability of shale materials is considered low. The New Albany Shale Aquifer System, therefore, has a low susceptibility to contamination introduced to or near the surface.

Silurian and Devonian Carbonates Aquifer System

The Silurian and Devonian Carbonates Aquifer System in Jackson County is limited to a very small outcrop/subcrop area in the extreme northeastern part of the county. This system includes middle-Devonian age carbonates (limestone and dolomite) of the Muscatatuck Group and the underlying carbonates of Silurian age. Because carbonate units of Silurian and Devonian age are similar, and cannot easily be distinguished on the basis of water well records, they are considered as a single water-bearing system.

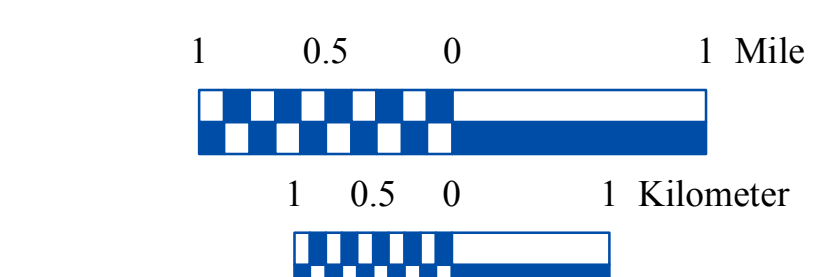
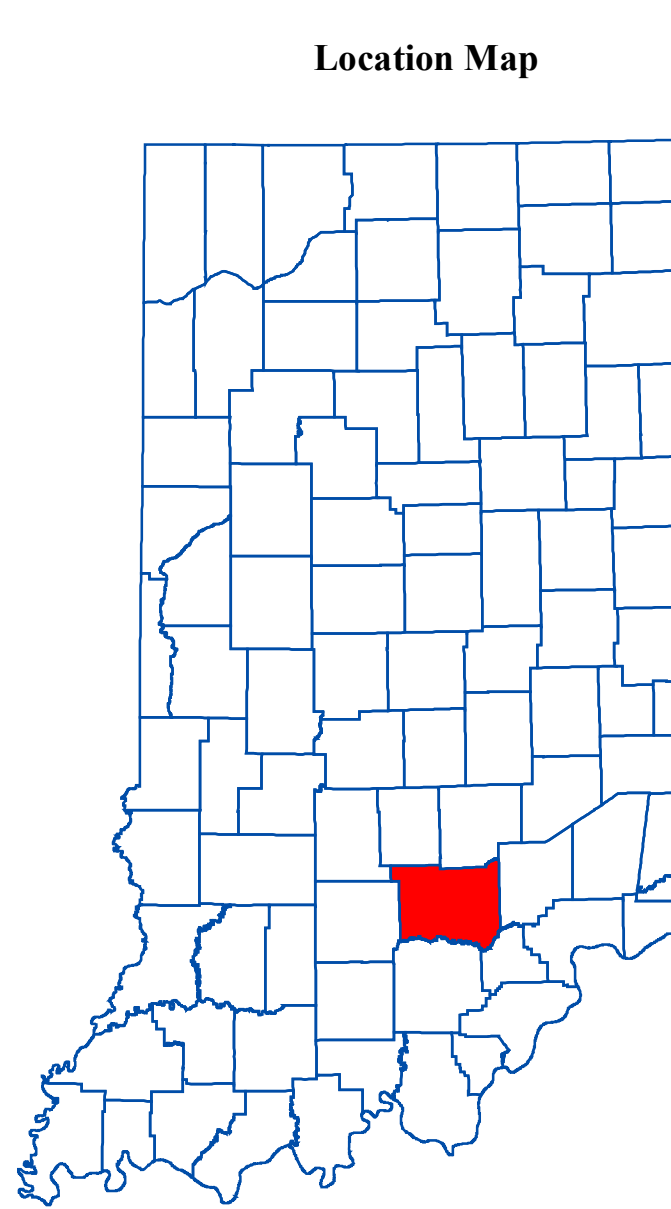
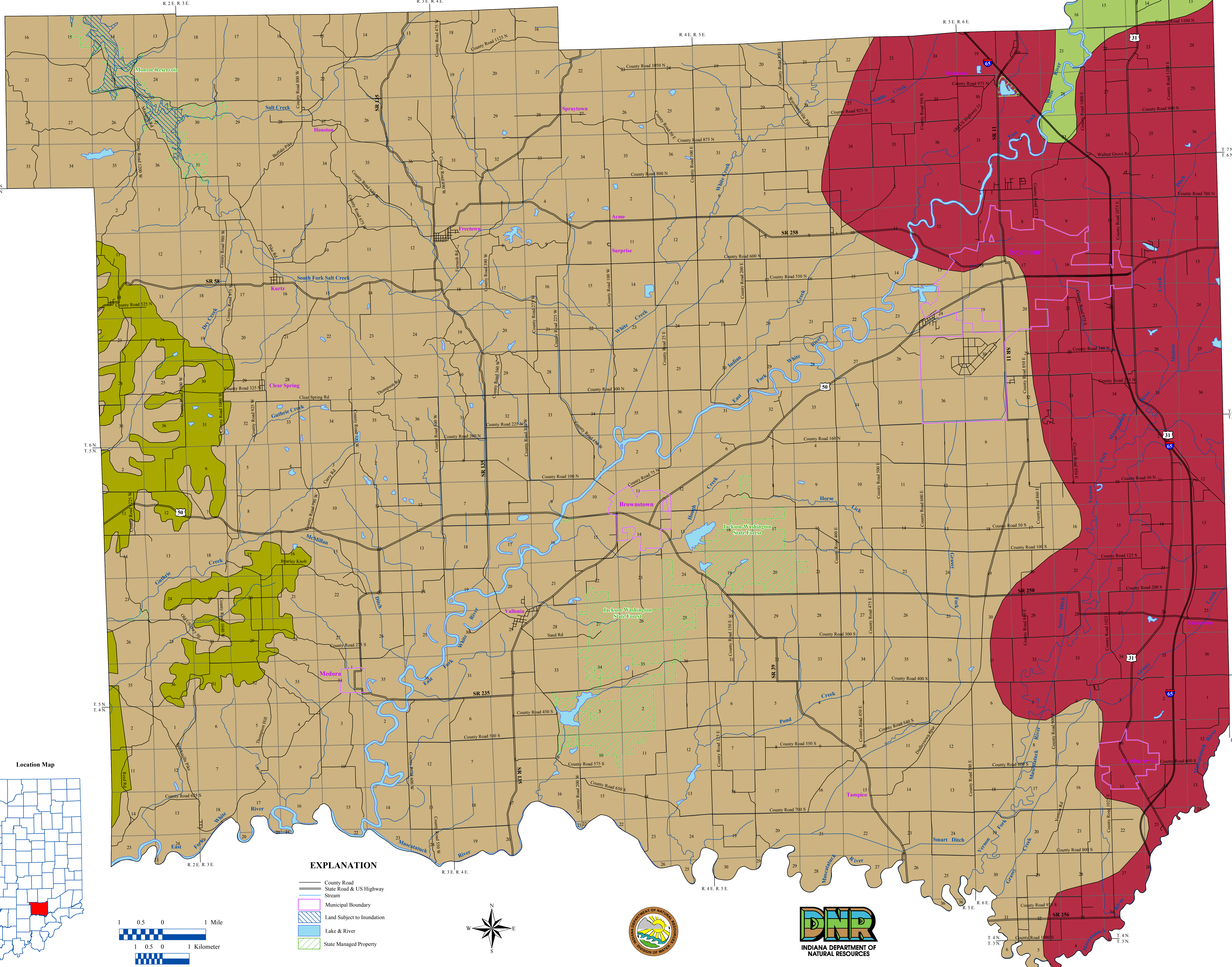
In Jackson County the Muscatatuck Group is less than 75 feet thick and generally increases in thickness as it dips to the southwest beneath younger rock formations. The underlying Silurian carbonates range from 100 to 250 feet thick and also thicken as they dip to the southwest.

Very few wells are completed in this aquifer system due to the availability of unconsolidated aquifers in the area. However, a few wells do exist in the aquifer system, mostly in the outcrop/subcrop area of the New Albany Shale. Because the New Albany Shale is considered a poor aquifer, drillers typically bypass the shale and complete wells in the underlying carbonates.

Total well depths range from 25 to 225 feet, but are typically 90 to 160 feet. The amount of rock penetrated in the Silurian and Devonian Carbonates Aquifer System typically ranges from 5 to 70 feet beneath the New Albany Shale. New Albany Shale thickness ranges from 10 to 120 feet.

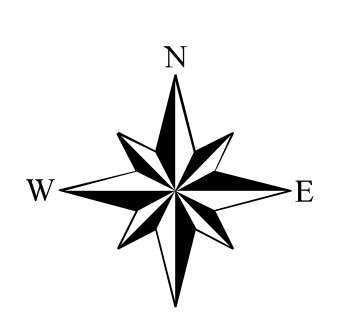
Water wells in the Silurian-Devonian Carbonates Aquifer System are capable of meeting the needs of domestic users. However, some wells note the occurrence of "sulphur water" and "salt water" and a few dry holes have been reported. Typical capacities are commonly from 2 to 10 gpm. Static water levels range from 20 to 90 feet below surface.

Where the Silurian-Devonian Carbonates Aquifer System is overlain by the New Albany Shale, the aquifer system is considered at low risk to contamination. However, in the outcrop/subcrop area, the aquifer system is overlain by 25 to 70 feet of unconsolidated deposits composed primarily of sand and gravel outwash materials. These deposits may have a thin clay at the surface. In such areas, the aquifer system is considered at moderate risk.



EXPLANATION

- County Road
- State Road & US Highway
- Stream
- Municipal Boundary
- Land Subject to Inundation
- Lake & River
- State Managed Property



Map Use and Disclaimer Statement

We request that the following agency be acknowledged in products derived from this map: Indiana Department of Natural Resources, Division of Water.

This map was compiled by staff of the Indiana Department of Natural Resources, Division of Water using data believed to be reasonably accurate. However, a degree of error is inherent in all maps. This product is distributed "as is" without warranties of any kind, either expressed or implied. This map is intended for use only at the published scale.

This map was created from several existing shapefiles. Township and Range Lines of Indiana (line shapefile, 20020621), Land Survey Lines of Indiana (polygon shapefile, 20020621) and County Boundaries of Indiana (polygon shapefile, 20020621), were all from the Indiana Geological Survey and based on a 1:24,000 scale, except the Bedrock Geology of Indiana (polygon shapefile, 20020318), which was at a 1:500,000 scale. Draft road shapefiles, System1 and System2 (line shapefiles, 2003), were from the Indiana Department of Transportation and based on a 1:24,000 scale. Populated Areas in Indiana 2000 (polygon shapefile, 20021000) was from the U.S. Census Bureau and based on a 1:100,000 scale. Streams27 (line shapefile, 20000420) was from the Center for Advanced Applications in GIS at Purdue University. Managed Areas 96 (polygon shapefile, various dates) was from IDNR.

Bedrock Aquifer Systems of Jackson County, Indiana

by
Randall D. Maier
Division of Water, Resource Assessment Section

March 2004

Map generated by Jennifer McMillan
IDNR, Division of Water, Resource Assessment Section
March 2004

UNCONSOLIDATED AQUIFER SYSTEMS OF JACKSON COUNTY, INDIANA

Six unconsolidated aquifer systems have been mapped in Jackson County: the Unglaciated Southern Hills and Lowlands / Dissected Till and Residuum; the Alluvial, Lacustrine and Backwater Deposits; the Scottsburg Lowland Till Subsystem; the Buried Valley; the White River and Tributaries Outwash; and the White River and Tributaries Outwash Subsystem. Boundaries of these aquifer systems are commonly gradational, and individual aquifers may extend across aquifer system boundaries.

Most of Jackson County has been covered by pre-Wisconsin glacial sediments followed by further deposition of Wisconsin outwash, alluvial and lacustrine sediments. However, there are areas along the western third of the county and southeast of Brownstown where glacial materials are absent and only thin deposits of bedrock residuum overlie bedrock.

Thickness of sediments overlying bedrock ranges from 3 feet in areas where only residuum is present to as much as 130 feet where glacially-derived till, outwash, alluvial, and lacustrine deposits are present.

Unglaciated Southern Hills and Lowlands / Dissected Till and Residuum Aquifer System

The Unglaciated Southern Hills and Lowlands / Dissected Till and Residuum Aquifer System covers areas along the western edge of Jackson County, areas to the south and east of Brownstown (Brownstown Hills), and upland areas where thin glacially-derived sediments overlie bedrock. They are mapped as one system because they are similar in composition and aquifer characteristics.

Unconsolidated deposits of the Unglaciated Southern Hills and Lowlands Aquifer System lie beyond the pre-Wisconsin glacial limit and consist predominantly of thin, eroded bedrock residuum. Thicknesses of these sediments typically range from 3 to 25 feet; however, some thicker deposits occur in areas near the White River where collan sand deposits are present. In upland areas within the limits of glaciation, the unconsolidated deposits of the Dissected Till and Residuum Aquifer System consist of pre-Wisconsin tills and deposits of Wisconsin age loess, alluvium, lacustrine silt and clay, and colluvium. Thicknesses of these sediments are generally less than 50 feet but are commonly 10 to 30 feet in Jackson County. These areas may also include scattered in-trail sand and gravel deposits up to 5 feet thick.

The Division has no record of drilled wells producing from the Unglaciated Southern Hills and Lowlands / Dissected Till and Residuum Aquifer System because drillers prefer to complete wells in the underlying bedrock. However, large diameter bucket-rig wells may meet the needs of some domestic users.

Because of the low permeability of the surface materials, this system is not very susceptible to contamination from surface sources.

Alluvial, Lacustrine, and Backwater Deposits Aquifer System

The Alluvial, Lacustrine, and Backwater Deposits Aquifer System in Jackson County is mapped along a portion of the South Fork Salt Creek in the northwest part of the county, along the Muscatatuck and Vernon Fork Muscatatuck Rivers in the east and southeast part of the county, and along small tributaries near the north central part of the county. Unconsolidated deposits within this system come from two sources. The first is alluvium deposited by streams along with colluvium eroded from valley walls and upland areas. The second source is glaciolacustrine deposits formed in bodies of relatively stagnant water.

Total thickness of unconsolidated materials overlying bedrock in this system is commonly less than 50 feet. Fine sand and gravel lenses, where present, are typically less than 5 feet thick and may be confined within the glaciolacustrine deposits or directly overlie bedrock. This aquifer system is a limited resource and the Division has no record of wells actually producing from these deposits. The potential does exist, however, for completion of adequate domestic wells in some places where unconsolidated deposits are thicker than 25 feet. In many places large diameter bucket-rig wells could meet the needs of some domestic users.

This aquifer system is generally marked by surface deposits of soft silt and clay that have a low to moderate susceptibility to surface contamination.

Scottsburg Lowland Till Aquifer Subsystem

The Scottsburg Lowland Till Aquifer Subsystem is mapped in portions of central and eastern Jackson County. This aquifer system is limited with large diameter bucket-rig wells completed in unconsolidated deposits that are often drilled below the aquifer unit in order to provide extra borehole space for groundwater storage. Also, approximately 56% of wells in the mapped area are completed in bedrock.

Well depths in the Scottsburg Lowland Till Aquifer Subsystem range from 25 to 97 feet. Thicknesses of sand and gravel aquifer units vary widely ranging from less than one foot, to as much as 33 feet. However, upper portions of the thicker deposits are often noted as "dry". Domestic well yields are generally less than 9 gallons per minute (gpm). A few wells note greater yields, however many are associated with deeper static water levels and significant to complete drawdown. Static water levels generally range from 3 to 54 feet below land surface.

The Scottsburg Lowland Till Aquifer Subsystem is generally not very susceptible to surface contamination because sand and gravel aquifer units are overlain by thick clay deposits. However, in some isolated places thin to no clay deposits overlie the aquifer resource. These areas are considered at high risk to contamination.

Buried Valley Aquifer System

The Buried Valley Aquifer System consists of aquifer materials deposited in pre-glacial bedrock valleys. There is one main buried bedrock valley system mapped in Jackson County. It includes an area that extends from approximately 2.5 miles south of Seymour and fans out to the south-southwest towards the Muscatatuck River. It cuts as deeply as 125 feet into rock of the Mississippian Borden Group.

Well depths range from 25 to 114 feet, but are typically 35 to 60 feet deep. Aquifer materials include multiple outwash deposits that vary in thickness. In some cases drillers report more than one outwash unit separated by clay materials that range from 4 to 20 feet thick. Upper outwash deposits range from 1 to 94 feet, but are typically 5 to 30 feet. Thickness of the lower outwash deposits ranges from 2 to 15 feet. Some well records also note clay underlying the lower outwash deposits. Most wells do not penetrate the full thickness of the aquifer system.

Domestic well yields range from 1 to 34 gpm but are typically 4 to 20 gpm. Static water levels range from 5 to 81 feet below surface but are typically 15 to 30 feet below surface. The Division has no records of high-capacity wells in this aquifer system. However, in some areas this aquifer system has sufficient thickness of sand and gravel to support high-capacity wells.

Because its in-trail sand and gravel units are overlain by thick till and lacustrine deposits, the Buried Valley Aquifer System is generally not very susceptible to surface contamination.

White River and Tributaries Outwash Aquifer System

The White River and Tributaries Outwash Aquifer System is located throughout portions of central and eastern Jackson County. This system contains large volumes of outwash and alluvial deposits that filled the main river valley of the East Fork White River. Thickness of unconsolidated deposits overlying bedrock can be as much as 130 feet.

Aquifer materials include predominantly sand and gravel deposits that range from 6 to 96 feet thick but are more commonly from 20 to 60 feet thick. However, outwash areas mapped near the Muscatatuck and Vernon Fork Muscatatuck Rivers will include thinner aquifer deposits and more fine-grained sands and lacustrine sediments.

Well depths are typically 35 to 70 feet below surface. In some areas 6 to 15 feet of clay or silt overlie the aquifer materials. Static water levels range from 4 to 20 feet below surface but are typically 5 to 15 feet. Because the level of ground water is near the surface, most of the aquifer materials are saturated.

This system has the greatest potential of any aquifer system in Jackson County and can meet the needs of domestic and high-capacity users. Domestic yields range from 7 to 30 gpm. There are 25 registered significant water withdrawal facilities (67 wells) in this system. Typical yields for high-capacity wells range from 100 to 1000 gpm.

White River and Tributaries Outwash Aquifer Subsystem

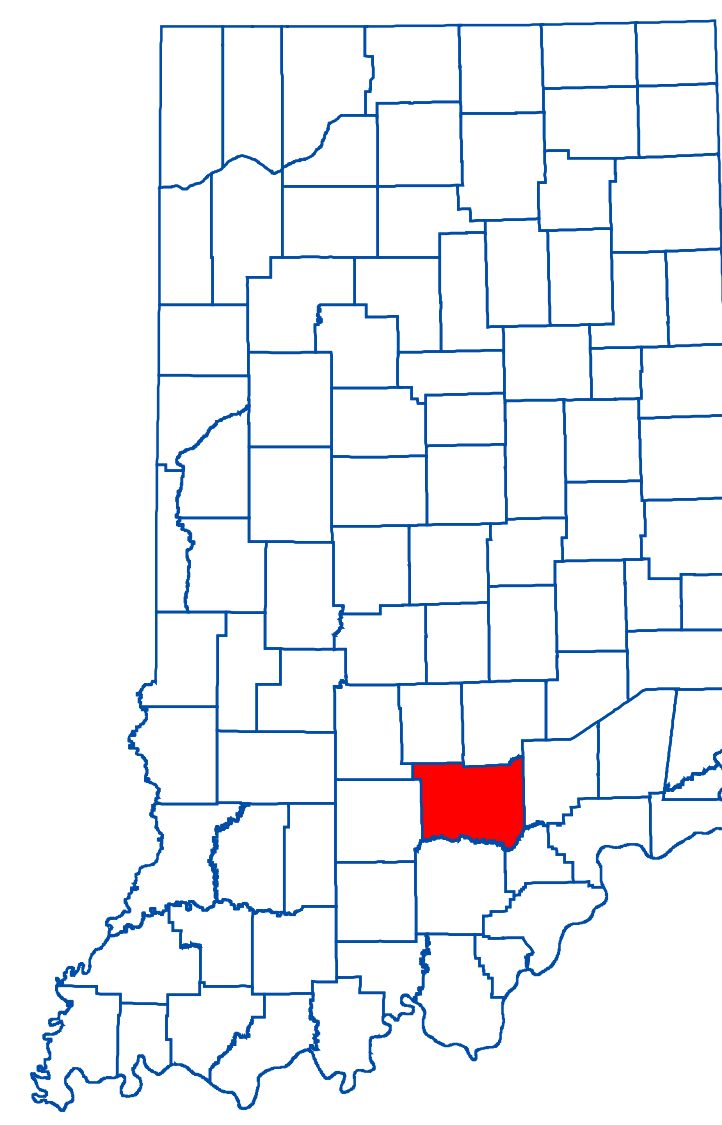
The White River and Tributaries Outwash Aquifer Subsystem includes areas adjacent and parallel to the White River and Tributaries Outwash Aquifer System. This system typically occupies a higher topographic position than that of the outwash system and is marked by thinner outwash deposits overlain by sandy clay, clay, lacustrine, or collan-derived loess and sand. These materials overlie aquifer deposits and range from 1 to 28 feet thick but are typically between 10 and 20 feet thick.

Total thickness of unconsolidated deposits overlying bedrock ranges from 27 to 130 feet. The thickness of aquifer materials within the unconsolidated deposits ranges from 1 to 74 feet but are typically between 10 and 35 feet. Well depths range from 12 to 114 feet below surface but are typically between 30 to 60 feet below surface. Many wells do not penetrate the full thickness of the aquifer system.

This aquifer system has the potential to meet the needs of domestic and some high-capacity users. Domestic yields range from 5 to 20 gpm. Static water levels range from 5 to 30 feet below surface but are commonly between 10 and 25 feet below surface. There are three registered significant water withdrawal facilities (11 wells) that report yields ranging from 90 to 350 gpm.

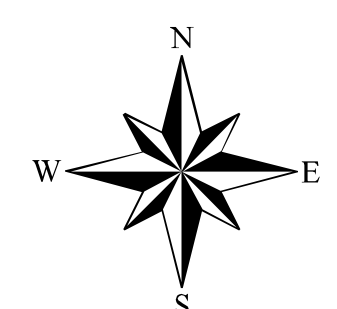
Areas within this aquifer system that have overlying clay deposits are moderately susceptible to surface contamination, whereas, areas that lack overlying deposits are highly susceptible to contamination.

Location Map



EXPLANATION

	Registered Significant Ground-water Withdrawal Well		State Managed Property
	County Road		Federal Managed Property
	State Road & US Highway		Land Subject to Inundation
	Stream		Lake & River
	Municipal Boundary		



Map Use and Disclaimer Statement

We request that the following agency be acknowledged in products derived from this map: Indiana Department of Natural Resources, Division of Water.

This map was compiled by staff of the Indiana Department of Natural Resources, Division of Water using data believed to be reasonably accurate. However, a degree of error is inherent in all maps. This product is distributed "as is" without warranties of any kind, either expressed or implied. This map is intended for use only at the published scale.

This map was created from several existing shapefiles. Township and Range Lines of Indiana (line shapefile, 20020621), Land Survey Lines of Indiana (polygon shapefile, 20020621) and County Boundaries of Indiana (polygon shapefile, 20020621), were all from the Indiana Geological Survey and based on a 1:24,000 scale. Draft road shapefiles, System1 and System2 (line shapefiles, 2003), were from the Indiana Department of Transportation and based on a 1:24,000 scale. Populated Areas in Indiana 2000 (polygon shapefile, 20021000) was from the U.S. Census Bureau and based on a 1:100,000 scale. Streams27 (line shapefile, 20000429) was from the Center for Advanced Applications in GIS at Purdue University. Managed Areas 96 (polygon shapefile, various dates) was from IDNR. Unconsolidated Aquifer Systems coverage (Maier, 2004, modified 2011) was based on a 1:24,000 scale.

Unconsolidated Aquifer Systems of Jackson County, Indiana
by
Randal D. Maier
Division of Water, Resource Assessment Section
March 2004

Map generated by Jennifer Mc Millan and Scott H. Dean
IDNR, Division of Water, Resource Assessment Section
March 2004 (modified 2011)

Jackson County

