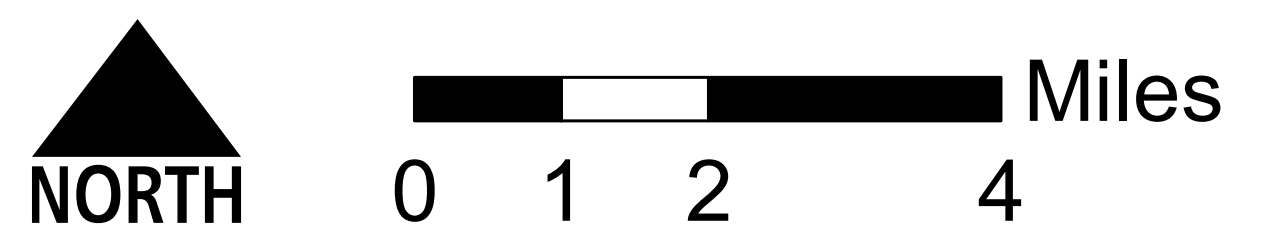
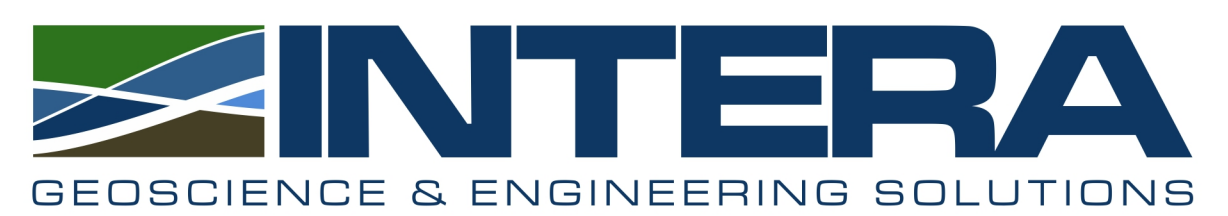


# Water Resources and Use in White County

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

Withdrawal Location		River
WELL INTAKE	▼ Energy/Mining	7Q2 Flow (MGD)
● Industry	▼ Irrigation	< 10 MGD
● Misc.	▼ Public Supply	10 - 50 MGD
● Public Supply	▼ Rural Use	50 - 100 MGD
● Rural Use		100 - 500 MGD
		> 500 MGD

■ Major Lakes
— Interstate
□ County
⊠ City



# BEDROCK AQUIFER SYSTEMS OF WHITE 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, 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 White County. Thickness of unconsolidated deposits overlying bedrock generally range from 5 to 270 feet. Most of the bedrock aquifers, therefore, 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 aquicludes, restricting recharge to underlying bedrock aquifers. However, fracturing and/or jointing may occur in aquicludes, 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 White County. They are the Pennsylvanian Raccoon Creek Group, the Mississippian Borden Group, the Devonian and Mississippian New Albany Shale, and the Silurian and Devonian Carbonates.

### Pennsylvanian -- Raccoon Creek Group Aquifer System

In White County the Raccoon Creek Group Aquifer System subgroups in two extremely small areas in the west central part of the county. Bedrock consists of mostly sandstone and shale with minor amounts of mudstone, coal, and limestone. Thickness of the Raccoon Creek Group in White County is generally less than 50 feet.

Because of the limited areal extent of the Raccoon Creek Group Aquifer System only one well record is available in White County. The depth to bedrock is 25 feet with a total depth of 30 feet. The well produces 5 gallons per minute (gpm) with a static water level of 16 feet below surface.

Clay materials are generally thick. However, in places the bedrock surface is shallow. Therefore, the Raccoon Creek Group Aquifer System is considered at low to moderate risk to contamination from the surface or near surface.

### Mississippian -- Borden Group Aquifer System

The Mississippian age Borden Group Aquifer System subgroup areas is present in the southwestern part of White 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 White County is estimated up to 50 feet.

Few wells produce from the Borden Group Aquifer System in White County. Approximately 84 percent of wells drilled in the area penetrate beyond the estimated thickness of this system. Most wells in the area, therefore, are likely producing from the deeper Silurian and Devonian Carbonates Aquifer System. Depth to bedrock ranges from 25 to 65 feet and well depths are from 55 to 70 feet for the few wells that appear to utilize the Borden Group Aquifer System. Typical yield of domestic wells generally ranges from 5 to 20 gpm. However, higher yields are associated with greater drawdown. Static water levels range from 10 to 31 feet below surface.

The Borden Group is composed primarily of fine-grained materials that limit the movement of ground water 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.

### Devonian and Mississippian -- New Albany Shale Aquifer System

The New Albany Shale Aquifer System in White County is an extremely limited ground-water resource. The subgroup area for the New Albany Shale is present along most of the western part of White County. This aquifer system consists mostly of brownish-black carbon-rich shale, greenish-gray shale, and minor amounts of dolomitic and dolomitic quartz sandstone.

Thickness of the New Albany Shale in White County is generally less than 150 feet. However, approximately 54 percent of bedrock wells in the New Albany subgroup area bypass the shale in favor of the underlying Silurian Devonian Carbonates Aquifer System. Thickness of the New Albany Shale in these wells range from 33 to 140 feet. Depth to bedrock ranges from 10 to 123 feet below surface.

Few wells are completed in the New Albany Shale Aquifer System. This aquifer system is considered a poor ground-water resource and is generally described as an aquiclude. However, a few domestic wells are completed in this system. Total well depths generally range from 50 to 100 feet with 3 to 97 feet of penetration into bedrock. Typical yields are 5 gpm or less with some dry holes reported. Static water levels range from 5 to 15 feet below ground surface.

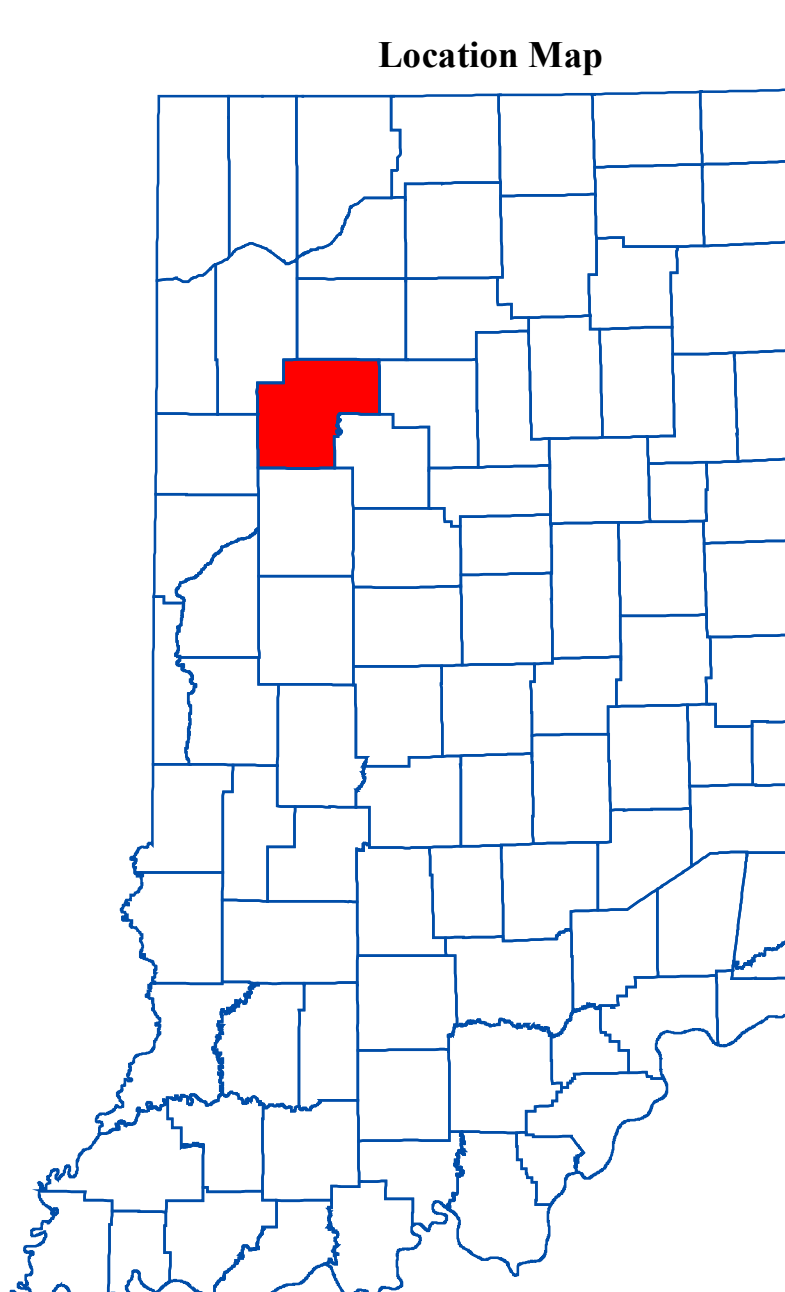
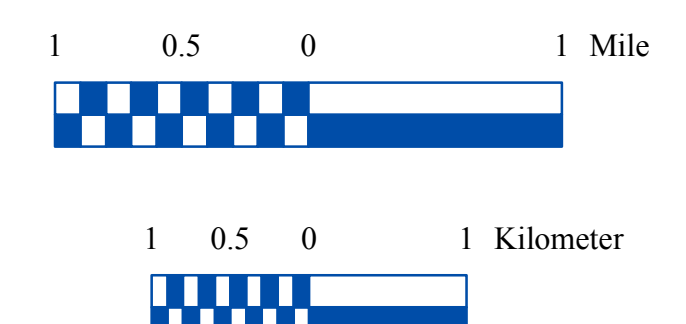
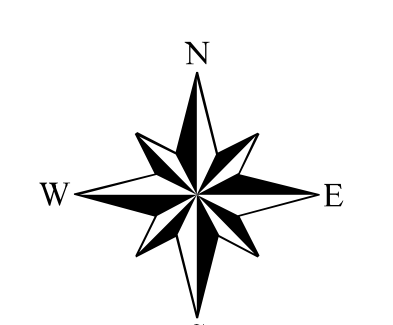
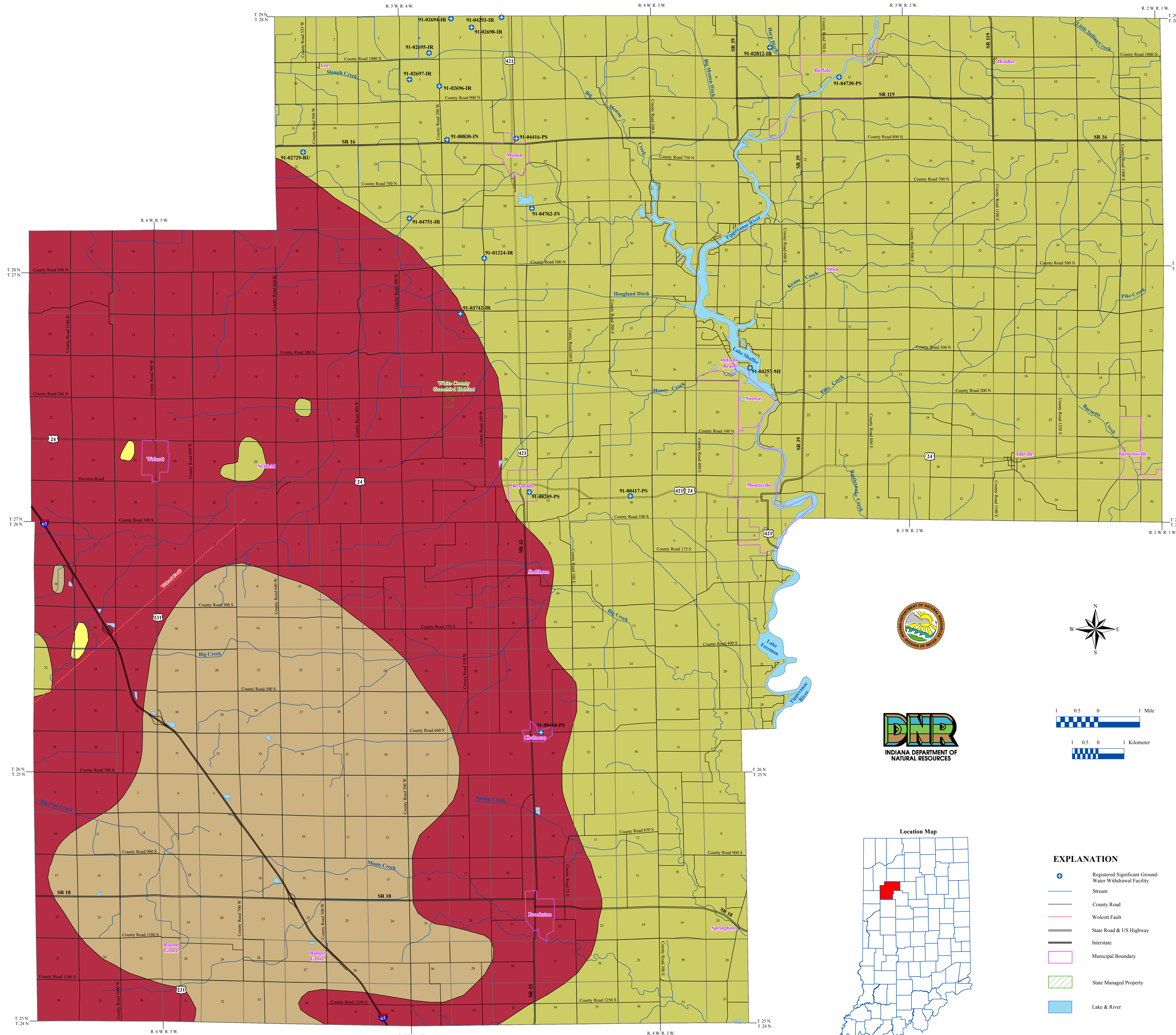
Because the permeability of shale materials is considered low and thick clay deposits generally overlie the New Albany Shale Aquifer System, susceptibility to contamination introduced at or near the surface is low.

### Silurian and Devonian Carbonates Aquifer System

The Silurian and Devonian Carbonates Aquifer System subgroups over most of the eastern half of White County. The system includes Silurian age carbonate rock units of the Wabash Formation and Devonian age carbonate rock units of the Muscatatuck Group. Total thickness of the Silurian bedrock is up to 500 feet. Total thickness of the Devonian bedrock is up to 50 feet. Depth to the bedrock surface ranges from about 5 to 270 feet.

The Silurian and Devonian Carbonates Aquifer System is capable of meeting the needs of domestic and some high-capacity users. Total well depths are typically 70 to 165 feet with typical penetration into bedrock ranging from 20 to 70 feet. Domestic yields generally range from 10 to 45 gpm with static water levels ranging from 7 to 40 feet. There are 19 registered significant ground-water withdrawal facilities (45 wells) utilizing the Silurian and Devonian Carbonates Aquifer System with reported yields of individual wells ranging from 95 to 800 gpm.

Most of the Silurian and Devonian Carbonates Aquifer System in White County is overlain by thick clay deposits. These areas are generally considered at low risk to contamination.



- EXPLANATION**
- Registered Significant Ground-Water Withdrawal Facility
  - Stream
  - County Road
  - Wolcott Fault
  - State Road & US Highway
  - Interstate
  - Municipal Boundary
  - State Managed Property
  - Lake & River

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### Bedrock Aquifer Systems of White County, Indiana

by  
Randal D. Maier  
Division of Water, Resource Assessment Section  
March 2009

# UNCONSOLIDATED AQUIFER SYSTEMS OF WHITE COUNTY, INDIANA

Six unconsolidated aquifer systems have been mapped in White County: the Till Veneer, the Iroquois Basin, the Kankakee / Iroquois Till, the Kankakee / Iroquois Complex, the Wabash River and Tributaries Outwash, and the Kankakee / Iroquois Complex. Characteristics of the Iroquois Basin Aquifer System have been described and mapped as part of the previously published regional basin study report, Water Resource Availability in the Kankakee River Basin, Indiana, IDNR, 1990. Although characteristics and descriptions of the basin study aquifer systems are generalized over large portions of northern Indiana, the descriptions of the aquifer systems have been modified here to accommodate the individuality of White County. Boundaries of all aquifer systems described are commonly gradational, and individual aquifers may extend across aquifer system boundaries.

Thicknesses of unconsolidated sediments that overlie bedrock are quite variable in White County. Total thickness ranges from approximately 5 feet in the western part where bedrock is shallow, to as much as 270 feet in the southeast portion of the county where a section of a major buried bedrock valley, the Lafayette (Fox) Bedrock Valley System, is present.

Regional estimates of aquifer susceptibility to contamination from the surface can differ considerably from local reality. Variations within geologic environments can cause variation in susceptibility to surface contamination. In addition, man-made structures such as poorly constructed water wells, unplugged or imperfectly abandoned wells, and open excavations, can provide contamination pathways that bypass the naturally protective clays.

### Till Veneer Aquifer System

In White County, the Till Veneer Aquifer System is mapped along portions of the northwest and west-central area of the county. This system generally consists of thin till, 10 to 20 feet thick that directly overlies an unconsolidated bedrock surface. In places, intratill and/or surface sand and gravel deposits up to 20 feet thick are present. However, nearly all wells started in the Till Veneer Aquifer System are completed in the underlying bedrock. This system is the most limited ground-water resource of the unconsolidated aquifer systems in the county.

The few wells that are completed in the Till Veneer Aquifer System are generally 20 to 45 feet in depth and produce from sands and gravels that are less than 12 feet thick. Well yields are less than 15 gallons per minute (gpm) and commonly have large drawdowns. Static water levels range from 2 to 15 feet below surface.

This aquifer system is generally not very susceptible to surface contamination because intratill sand and gravel units are overlain by thick till deposits. However, some areas have surface sands and gravels or thin to no clay deposits above the aquifer resource. These areas are considered at moderate to high risk to contamination.

### Iroquois Basin Aquifer System

The Iroquois Basin Aquifer System in White County is an extension of a broad regional aquifer system initially described in the published report, Water Resource Availability in the Kankakee River Basin, Indiana, IDNR, 1990. The system is mapped along part of the northwestern corner of the county. Characteristics of this system generally involve either thick clay deposits with thin intermittent sands and gravels that overlie shallow bedrock, or isolated surface sands with thin to no clay that directly overlie bedrock. Total thickness of these deposits is 50 feet or less.

Nearly all wells completed in the mapped area utilize the underlying bedrock aquifer system. However, this system is capable of meeting the needs of some domestic users. Potential aquifer sands and gravels generally range from 1 to 26 feet thick and may directly overlie the bedrock surface. Domestic well yields generally range from 7 to 20 gpm with static water levels from 5 to 15 feet below surface. However, large drawdowns are associated with higher yields.

This aquifer system is generally not very susceptible to surface contamination where sand and gravel units are overlain by thick till deposits. However, areas where overlying clays are thin or absent are at moderate to high risk of contamination.

### Kankakee / Iroquois Till Aquifer System

The Kankakee / Iroquois Till Aquifer System is mapped primarily in portions of the west and central White County. The system typically consists of thick clay with discontinuous intratill sands and gravels. Well depths are generally 40 to 90 feet. Typical aquifer sands and gravels range from 3 to 15 feet thick and are capped by 20 to 75 feet of clay. This system is capable of meeting the needs of domestic and some high-capacity users. Domestic well yields are generally from 10 to 35 gpm with static water levels that range from 10 to 25 feet below surface. There are 3 registered significant ground-water withdrawal systems (6 wells) with yields that range from 70 to 1300 gpm.

A portion of this system overlies part of a buried bedrock valley. The few wells completed in the deeper portion of these areas are up to 250 feet in depth with aquifer thicknesses up to 30 feet. Well capacities are generally up to 40 gpm with static water levels from 15 to 65 feet below surface.

This system is generally not very susceptible to surface contamination because intratill sand and gravel units are overlain by thick till deposits. However, in places isolated surface sands and gravels are present with thinner clay deposits above the aquifer unit. These areas are considered at moderate to high risk of contamination.

### Kankakee / Iroquois Till Aquifer Subsystem

The Kankakee / Iroquois Till Aquifer Subsystem is mapped throughout portions of central, southwestern and northeastern White County. The subsystem is mapped similar to that of the Kankakee / Iroquois Till Aquifer System. However, potential aquifer materials are thinner and potential yield is less in the subsystem than in the system.

Approximately 90 percent of the wells drilled in areas mapped as Kankakee / Iroquois Till Subsystem are completed in the underlying bedrock aquifer system. However, the subsystem has the potential of meeting the needs of some domestic users. Potential aquifer materials include sand and gravel deposits that generally range from 2 to 20 feet thick and are capped by 50 to 110 feet of till. The few wells that utilize the available sand and gravel deposits have yields that range from 1 to 30 gpm. However, most wells have significant drawdowns, especially wells reporting greater yields.

The subsystem is generally not very susceptible to surface contamination because intratill sand and gravel units are overlain by thick till deposits.

### Kankakee / Iroquois Complex Aquifer System

The Kankakee / Iroquois Complex Aquifer System is mapped in the southwest and throughout most of the eastern half of White County. Several glacial advances resulted in a complex sequence of multiple, stacked, till and outwash units that are quite variable in position and thickness. Characteristics of this system also include surface sands, generally 9 to 25 feet thick, that overlie a thick clay cap with discontinuous intratill sands and gravels above the primary aquifer unit.

Well depths are commonly 60 to 125 feet. In places the system exhibits multiple sand and gravel deposits above the primary aquifer resource that are also a potential source of ground-water. The sand and gravel deposits vary from thin to massive and are typically discontinuous and overlain by a thick till. Total accumulative unconsolidated thicknesses above the aquifer unit are generally 35 to 100 feet of clay. Individually, the discontinuous sands and gravels are typically 3 to 20 feet thick and the deeper, more productive aquifer deposits are 7 to 30 feet thick.

A portion of this system overlies part of a buried bedrock valley. Wells completed in these areas are up to 270 feet in depth with aquifer thicknesses up to 30 feet. Well capacities are generally 15 to 60 gpm with static water levels from 20 to 90 feet in depth. There is one registered significant ground-water withdrawal facility (2 wells) with reported yields of 125 gpm.

The Kankakee / Iroquois Complex Aquifer System is capable of meeting the needs of domestic and some high-capacity users. Typical domestic yields range from 10 to 80 gpm. Static water levels commonly range from 10 to 40 feet below surface with some flowing wells reported. There are 22 registered significant ground-water withdrawal facilities (32 wells) with reported yields that range from 100 to 2000 gpm.

This aquifer system is not very susceptible to contamination where thick clay deposits overlie aquifer materials. However, in places clay deposits are thin or not present. These areas are at moderate to high risk to surface contamination.

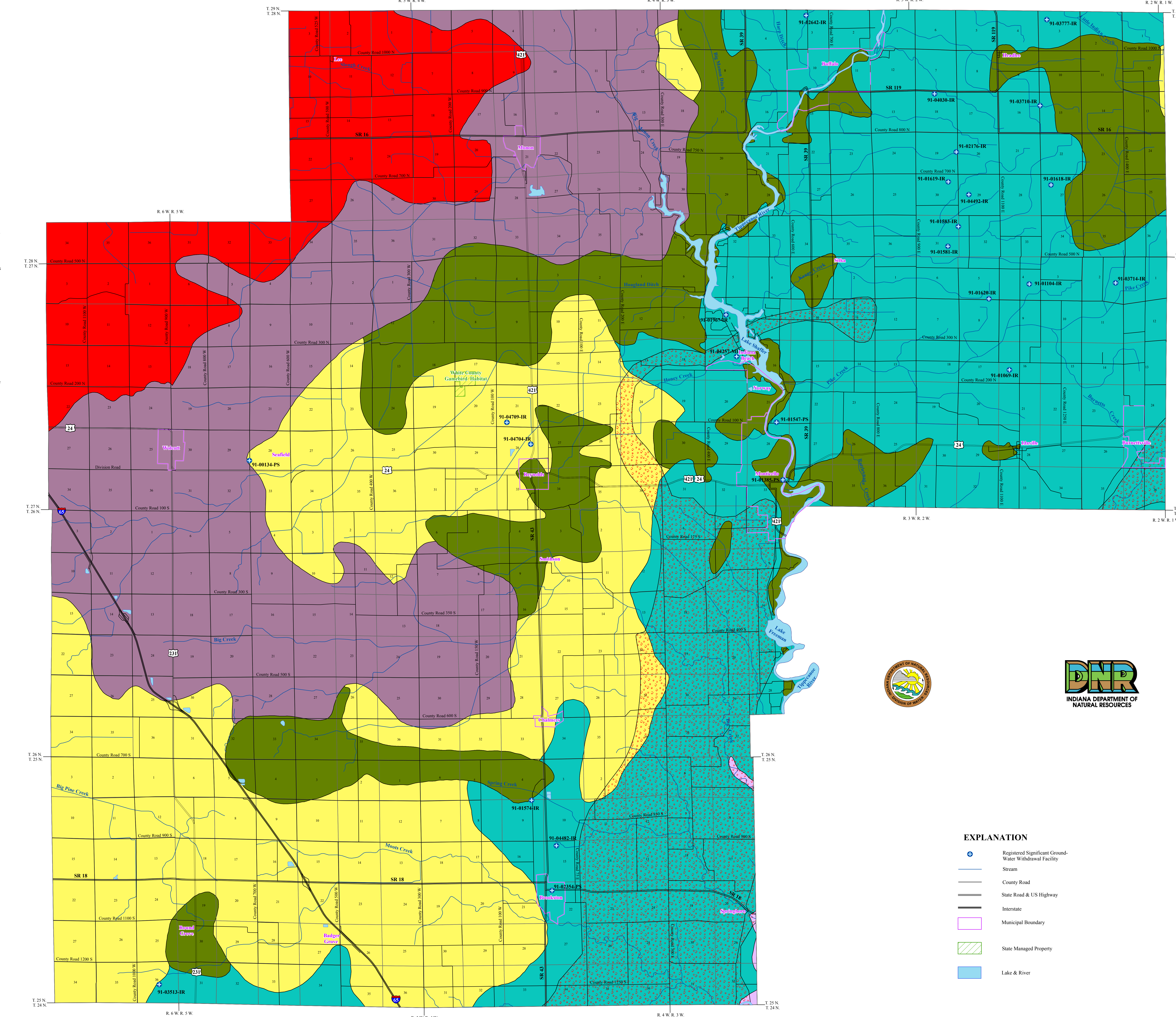
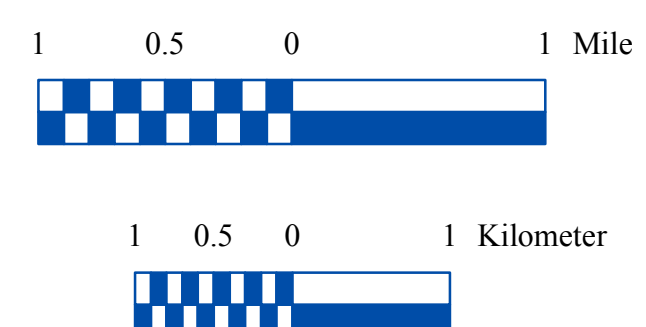
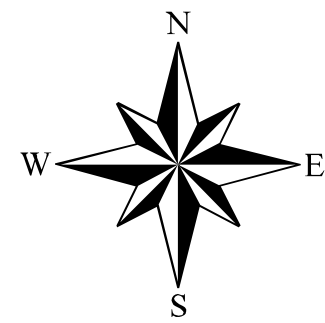
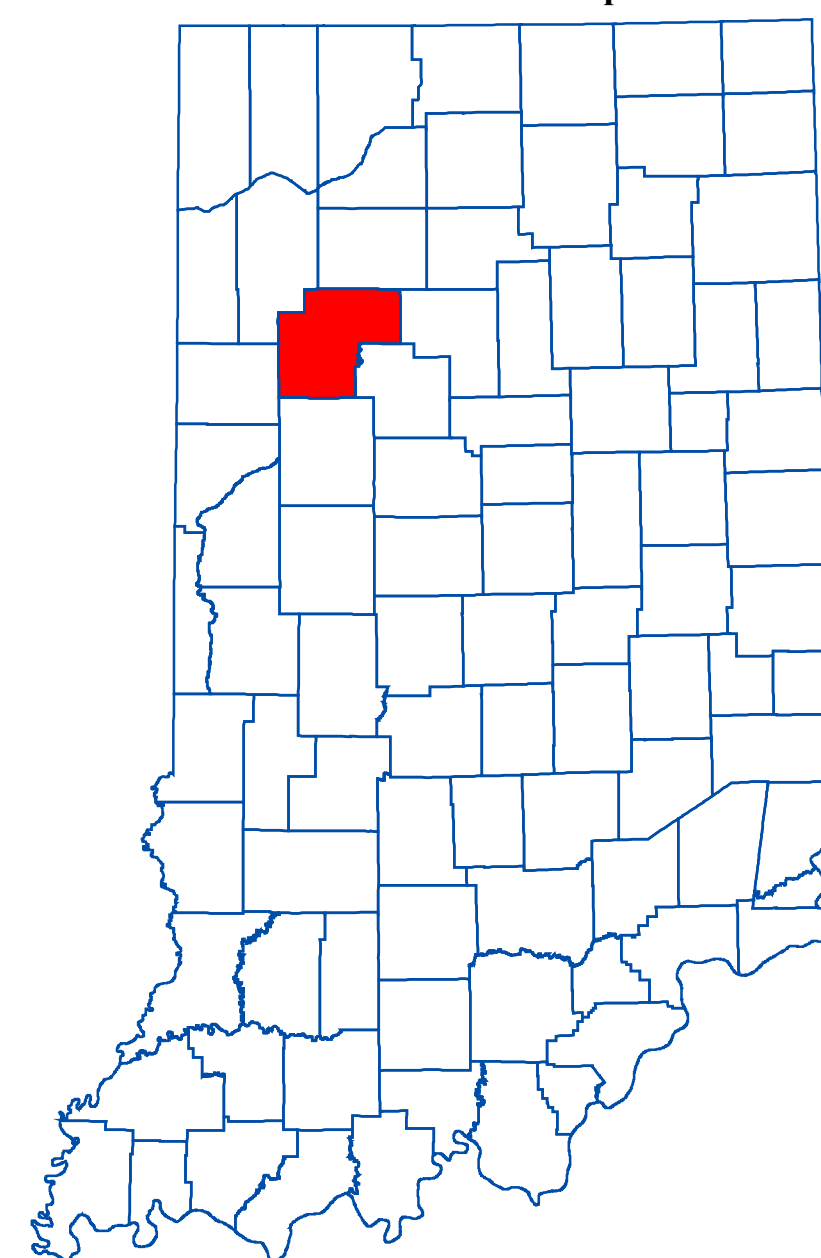
### Wabash River and Tributaries Outwash Aquifer Subsystem

In White County the Wabash River and Tributaries Outwash Aquifer Subsystem is mapped in the southeast along a small section of Big Creek that is tributary to the Tippecanoe River as well as along a small portion of the Tippecanoe River floodplain. No known wells are completed in this system in White County. However, in nearby Carroll County descriptive characteristics of this system include thick sand and gravel sequences separated by thin discontinuous clay deposits. Well depths typically range from 85 to 125 feet below surface with up to 25 feet of continuous sand and gravel. In places, aquifer materials are capped by silt, clay or sandy clay. The subsystem is capable of meeting the needs of domestic and some high-capacity users. Reported well yields in Carroll County are up to 100 gpm.

A portion of the subsystem overlies part of a major buried bedrock valley. In nearby Carroll County wells produce at depths of up to 150 feet with total saturated thicknesses of aquifer materials up to 30 feet.

Areas that lack overlying clay or silt deposits are highly susceptible to contamination. However, where overlying clay or silt deposits are present the system is moderately susceptible to surface contamination.

### Location Map



- ### EXPLANATION
- Registered Significant Ground-Water Withdrawal Facility
  - Stream
  - County Road
  - State Road & US Highway
  - Interstate
  - Municipal Boundary
  - State Managed Property
  - Lake & River



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### Unconsolidated Aquifer Systems of White County, Indiana

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

March 2009

# White County

