

Water Resources and Use in Dearborn County

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

Withdrawal Location		River	Major Lakes
WELL	INTAKE	7Q2 Flow (MGD)	Interstate
●	▼	<10 MGD	County
●	▼	10 - 50 MGD	City
●	▼	50 - 100 MGD	
●	▼	100 - 500 MGD	
●	▼	> 500 MGD	
●	▼		
●	▼		
●	▼		
●	▼		

INTERA
GEOSCIENCE & ENGINEERING SOLUTIONS

NORTH

0 1 2 4 Miles

BEDROCK AQUIFER SYSTEMS OF DEARBORN 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 is commonly greatest near the bedrock surface, bedrock units within the upper 100 feet are typically the most productive aquifers.

The Maquoketa Group of Ordovician age is the only bedrock aquifer system identified for Dearborn County. This system is overlain by unconsolidated deposits of variable thickness. The bedrock aquifer system is 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 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.

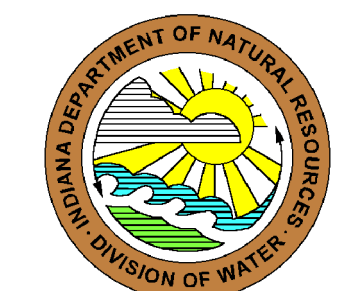
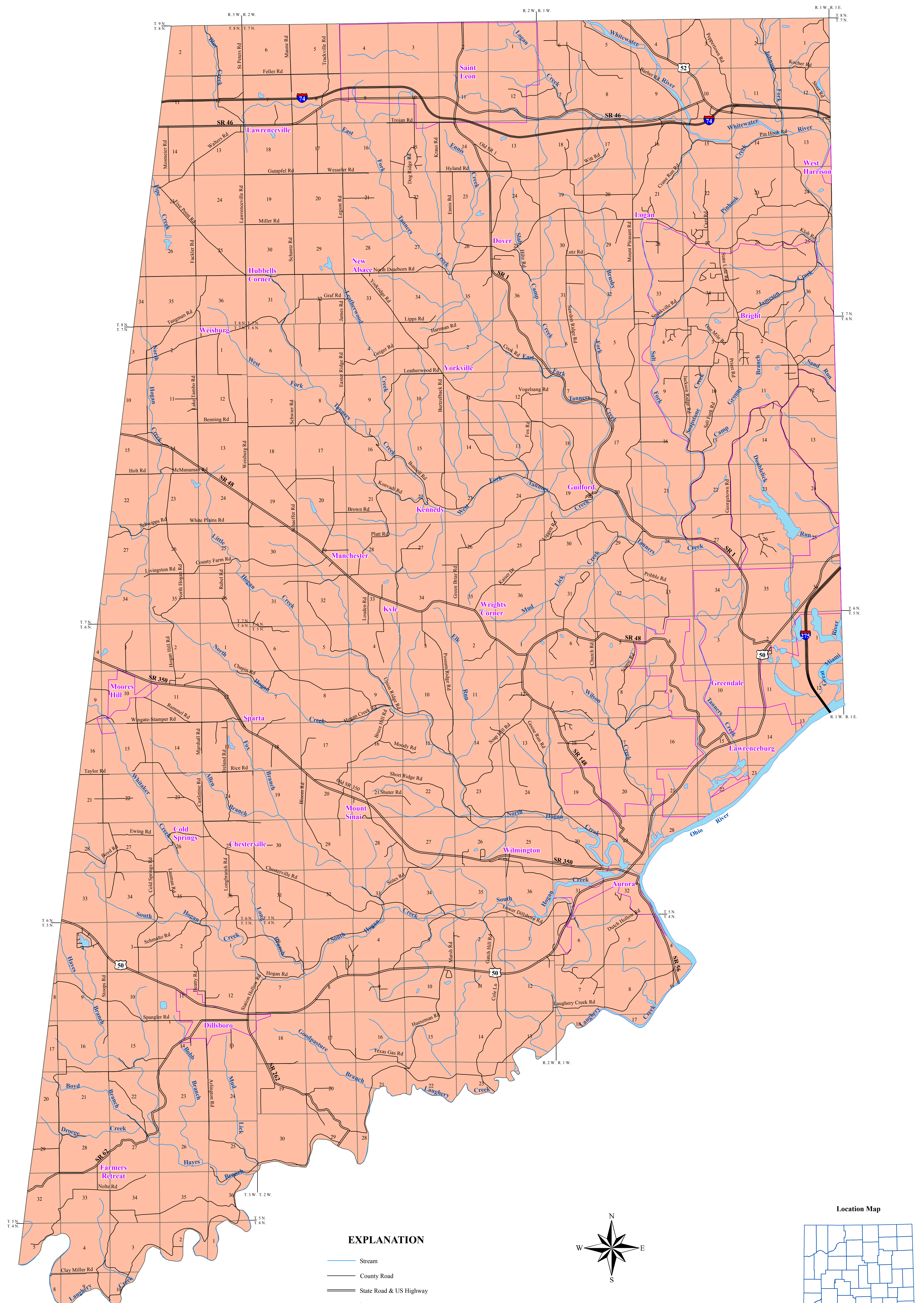
The susceptibility of bedrock aquifer systems to surface contamination is largely dependent on the type and thickness of the overlying sediments. However, because the bedrock aquifer systems have complex fracturing systems, once a contaminant has been introduced into a bedrock aquifer system, it will be difficult to track and remediate.

Ordovician - Maquoketa Group Aquifer System

In Dearborn County, the Maquoketa Group consists mostly of shales with interbedded limestone units. Although this system is approximately 850 to 900 feet thick in the county, typically little more than the top 100 feet is utilized as an aquifer resource.

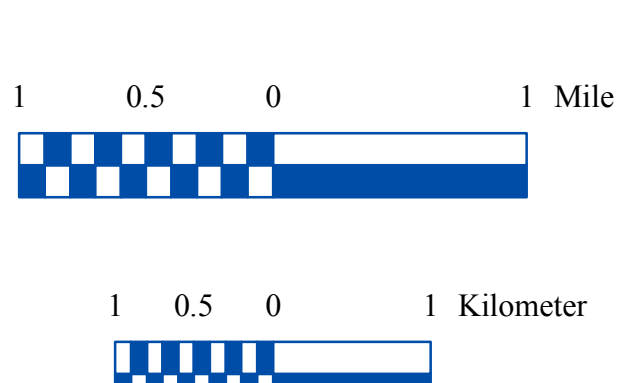
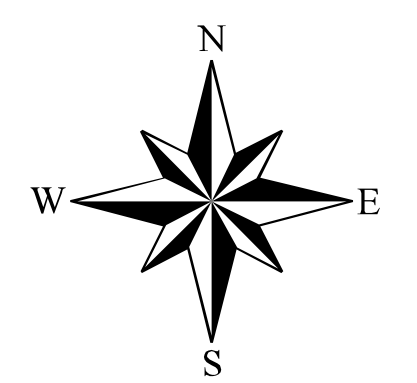
The depth to the bedrock surface is generally 15 to 65 feet in Dearborn County, but exceeds 150 feet in places. Wells penetrating this system are commonly 65 to 125 feet deep. The amount of rock penetrated in the Maquoketa Group Aquifer System typically ranges from about 30 to 90 feet. Water wells in this aquifer system are generally capable of meeting the needs of domestic users. In Dearborn County, domestic well yields typically range from 1 to 5 gallons per minute (gpm) and static water levels are commonly 15 to 25 feet below the land surface. However, several dry holes have been reported.

The quality of water in the Maquoketa Group Aquifer System in this county is generally acceptable for domestic use. However, salt water has been reported in 3 wells in Dearborn County and 1 well in neighboring Ohio County. Except in areas where overlying clay-rich materials are thin or absent, this aquifer system is not very susceptible to contamination from the land surface.

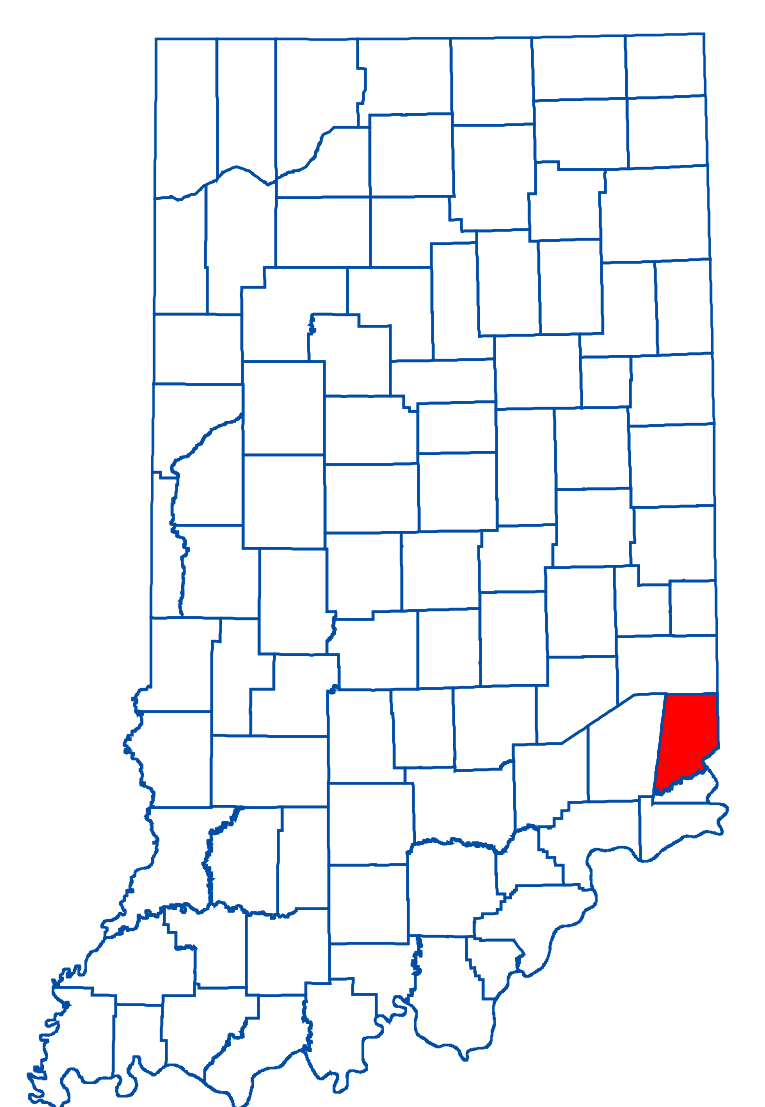


EXPLANATION

- Stream
- County Road
- State Road & US Highway
- Interstate
- Lake & River
- Municipal Boundary



Location Map



Map Use and Disclaimer Statement

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Map generated by Joseph L. Phillips, Jennifer K. McMillan, and Adam B. Watts
DNR, Division of Water, Resource Assessment Section

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.

Bedrock Aquifer Systems of Dearborn County, Indiana

by
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June 2006

UNCONSOLIDATED AQUIFER SYSTEMS OF DEARBORN COUNTY, INDIANA

Six unconsolidated aquifer systems have been mapped in Dearborn County: the Dissected Till and Residuum; the Alluvial, Lacustrine, and Backwater Deposits; the Muscatuck Plateau / Dearborn Upland Till Subsystem; the Whitewater Valley; the Ohio River Outwash; and the Ohio River Outwash Subsystem. The first system includes deposits left by continental ice sheets as well as eroded residuum (a product of bedrock weathering). The next five systems comprise sediments deposited by, or resulting from, glaciers, glacial meltwaters, and post-glacial precipitation events. Boundaries of these aquifer systems are commonly gradational and individual aquifers may extend across aquifer system boundaries.

Thickness, type, and areal extent of unconsolidated sediments in Dearborn County are variable. Throughout much of the county, sediments overlying bedrock are less than 5 feet thick. In Dearborn County, bedrock outcrops along portions of some deeply incised streams and in Laughery Creek from the Ripley County line to just east of the confluence of Mud Lake and Laughery Creek. However, in the northwestern part of Dearborn County, where glacial deposits are thicker, unconsolidated materials are nearly 80 feet thick in places. Unconsolidated sediments are thickest in the valleys of the Whitewater River and the Ohio River, where, in places, the combined thickness of outwash, alluvial, and lacustrine deposits exceeds 150 feet.

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 improperly abandoned wells, and open excavations can provide contaminant pathways that bypass the naturally protective clays.

Dissected Till and Residuum Aquifer System

This aquifer system, which covers about 92 percent of Dearborn County, has the most limited groundwater resources of the unconsolidated aquifer systems in the county. The Dissected Till and Residuum Aquifer System predominantly consists of extremely thin pre-Wisconsin till deposits with very thin layers of sand and gravel, or thin, eroded bedrock residuum. Total thickness of this aquifer system generally ranges from about 15 to 40 feet.

There is little potential for water production in the Dissected Till and Residuum Aquifer System in Dearborn County. However, this aquifer system is best chosen for well development rather than the underlying bedrock. Potential aquifer units within this system include thin sand and gravel layers that are typically less than 2 feet thick and are generally separated by tills within the saturated zone. Large-diameter bored (bucket rig) wells are commonly used in this county to produce water from these thin seams of coarse-grained material. Typically constructed at depths of 30 to 45 feet with 30-inch diameter porous casing, these wells are built to maximize storage and are generally adequate for domestic use. These wells typically yield 0.5 to 6 gallons per minute (gpm) and static water levels are generally 12 to 20 feet below land surface. This system is not very susceptible to contamination from surface sources because the near-surface materials generally have low permeability.

Alluvial, Lacustrine, and Backwater Deposits Aquifer System

In Dearborn County this system is mapped along portions of tributaries of the Whitewater and Ohio Rivers. The most notable of these tributaries is Laughery Creek at the southern county line. The Alluvial, Lacustrine, and Backwater Deposits Aquifer System consists of deposits that come from two primary sources. The first is alluvium deposited by streams along with colluvium eroded from valley walls and upland areas. The second is from pre-Wisconsin and Wisconsin fine-grained glaciolacustrine deposits formed in relatively stagnant lake water. Typical materials include fine sand, silt, and clay deposits that are commonly greater than 25 feet thick.

Few wells produce from the Alluvial, Lacustrine, and Backwater Deposits Aquifer System in Dearborn County. Throughout much of this system, large-diameter bored (bucket-rig) wells are commonly used to produce water from sand and gravel units within the predominantly clay and silt materials of this aquifer system. Constructed at depths of 25 to 50 feet with 30-inch diameter porous casing, these wells are built to maximize storage. Reported capacities for these wells are 0.5 to 6 gpm. However, there is greater potential in downstream areas near the Whitewater and Ohio Rivers where deposits of coarse-grained materials are thicker. The few wells completed in these areas have reported capacities of 20 to 150 gpm, although this aquifer system would not typically support high-capacity usage.

Thick deposits of silt and clay that have a low susceptibility to surface contamination generally mark this aquifer system. The susceptibility is greater in areas where the surficial silt and clay deposits are thin and directly overlie outwash deposits.

Muscatuck Plateau / Dearborn Upland Till Aquifer Subsystem

The Muscatuck Plateau / Dearborn Upland Till Aquifer Subsystem is mapped as small isolated areas in the northwestern part of Dearborn County. These small areas were once isolated but downcutting by streams has separated them and reduced their areal extent. This aquifer system predominantly consists of pre-Wisconsin glacial materials that range in thickness from about 30 to 80 feet.

This aquifer system is generally capable of meeting the needs of domestic users. In Dearborn County, nearly all of the reported wells penetrating this system were completed in unconsolidated materials rather than in the underlying bedrock. Potential aquifer materials within the glacial till include discontinuous intertill sand and gravel layers. Individual sand and gravel units are commonly 2 to 6 feet thick. Wells in the Muscatuck Plateau / Dearborn Upland Till Aquifer Subsystem are commonly completed at depths ranging from 10 to 50 feet with 30-inch diameter porous casing to allow for maximum storage. Domestic wells typically yield from 1 to 10 gpm and static water levels are generally 15 to 25 feet below land surface. Wells constructed in this system in Dearborn County would not typically support high-capacity usage.

The Muscatuck Plateau / Dearborn Upland Till Aquifer Subsystem has a low susceptibility to surface contamination because intertill sand and gravel units are generally separated from the surface by till layers within the system.

Whitewater Valley Aquifer System

In Dearborn County, the Whitewater Valley Aquifer System is mapped in the main valley of the Whitewater River. This valley carried great quantities of outwash from the melting glaciers during the Wisconsin and pre-Wisconsin glacial times. This aquifer system contains large volumes of sand and gravel that partially fill the main river valley. As the glaciers melted, the sediment contained within them was delivered to the Whitewater River in quantities too large for the stream to transport. As a result, the increased sediment load was stored in the valley as vertical and lateral accretionary deposits. As long as the retreating glaciers continued to provide sediment in quantities too large for the stream to transport farther downstream, the valley continued to be filled.

The Whitewater Valley Aquifer System is about 40 to 140 feet thick in Dearborn County. However, not all of these unconsolidated deposits are saturated with water. Actual aquifer thickness (saturated sand and gravel) of this system ranges from about 10 to 80 feet, but the typical aquifer thickness is 20 to 40 feet. In some areas 5 to 15 feet of sandy clay or silt overlie the aquifer materials. Well depths are commonly 45 to 65 feet. This aquifer system has the potential to meet the needs of domestic and high-capacity users in Dearborn County. Domestic well yields typically range from 12 to 25 gpm and static water levels are generally 15 to 25 feet below surface. There are 4 registered high-capacity facilities (9 wells) utilizing the Whitewater Valley Aquifer System in Dearborn County. Reported well yields range from 160 to 1,000 gpm.

This aquifer system is highly susceptible to contamination from surface sources in areas that lack overlying clay layers. Where clay or silt deposits overlie the aquifer units, this system is moderately susceptible to surface contamination.

Ohio River Outwash Aquifer System

This aquifer system is mapped along the main valley of the Ohio River in Dearborn County. Aggradation of the Ohio River Valley with large amounts of outwash sand and gravel from pre-Wisconsin and Wisconsin retreating glaciers filled the river valley. Recent alluviation continues to fill the valley. These outwash and alluvial deposits form the most prolific aquifer system in the county.

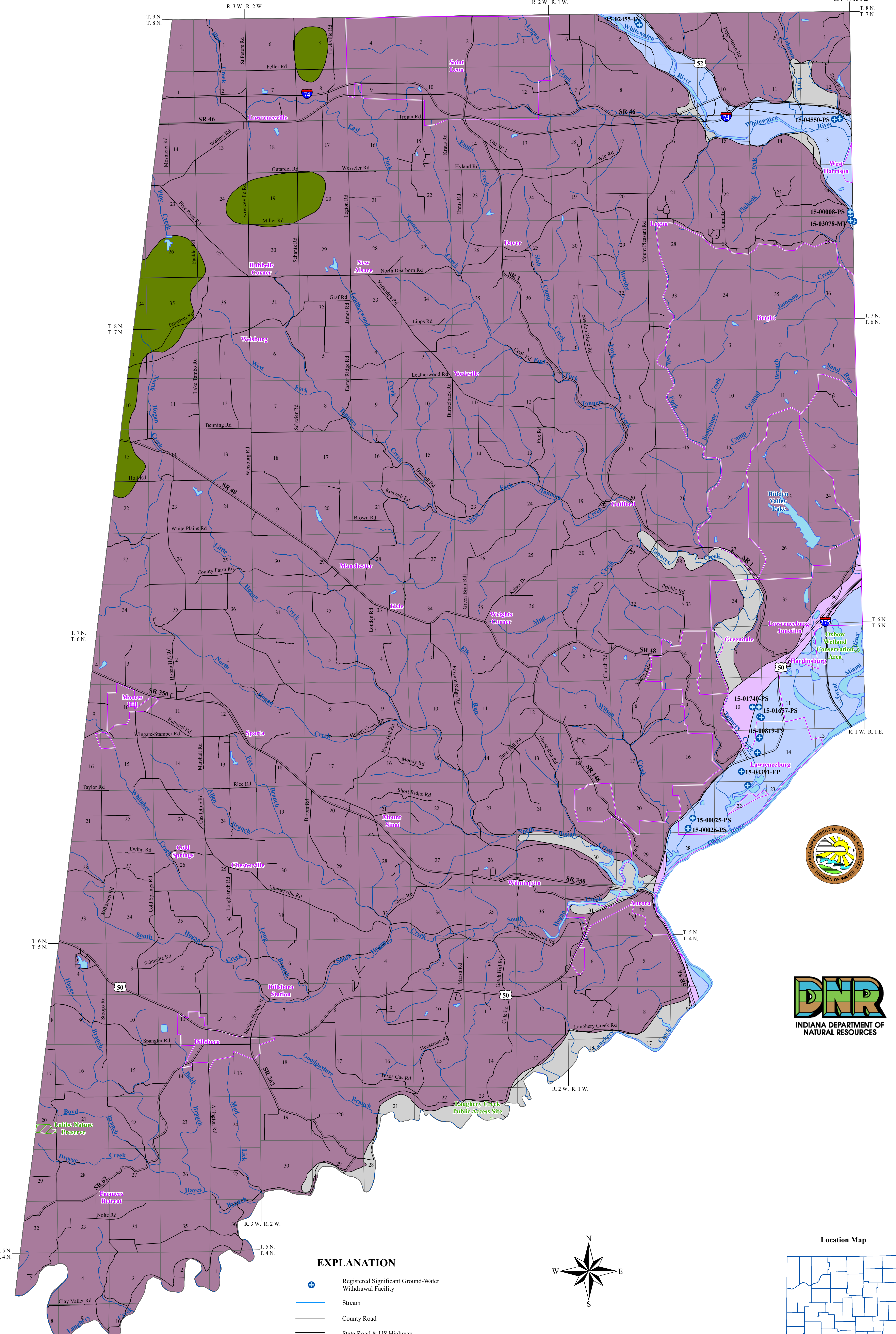
In places the Ohio River Outwash Aquifer System exceeds 150 feet in thickness with nearly 100 feet of continuous sand and gravel. However, the outwash is typically 60 to 70 feet thick with the thickness of saturated sands and gravels generally ranging from 30 to 60 feet. Well depths are commonly 65 to 110 feet. In some areas 15 to 35 feet of sandy clay or silt overlie the aquifer materials. The Ohio River Outwash Aquifer System has the potential to meet the needs of domestic and high-capacity users. Nearly all of the reported wells utilizing this aquifer system in Dearborn County are associated with high-capacity facilities. Seven registered significant groundwater withdrawal facilities (total of 25 wells) currently use the Ohio River Outwash Aquifer System in Dearborn County. Reported yields for high-capacity wells in this aquifer system are 450 to 3,000 gpm with 1 collector well that has been tested as high as 6,000 gpm.

This aquifer system is highly susceptible to contamination from surface sources in areas that lack overlying clay layers. The system is only moderately susceptible where it is overlain by thick clay or silt deposits.

Ohio River Outwash Aquifer Subsystem

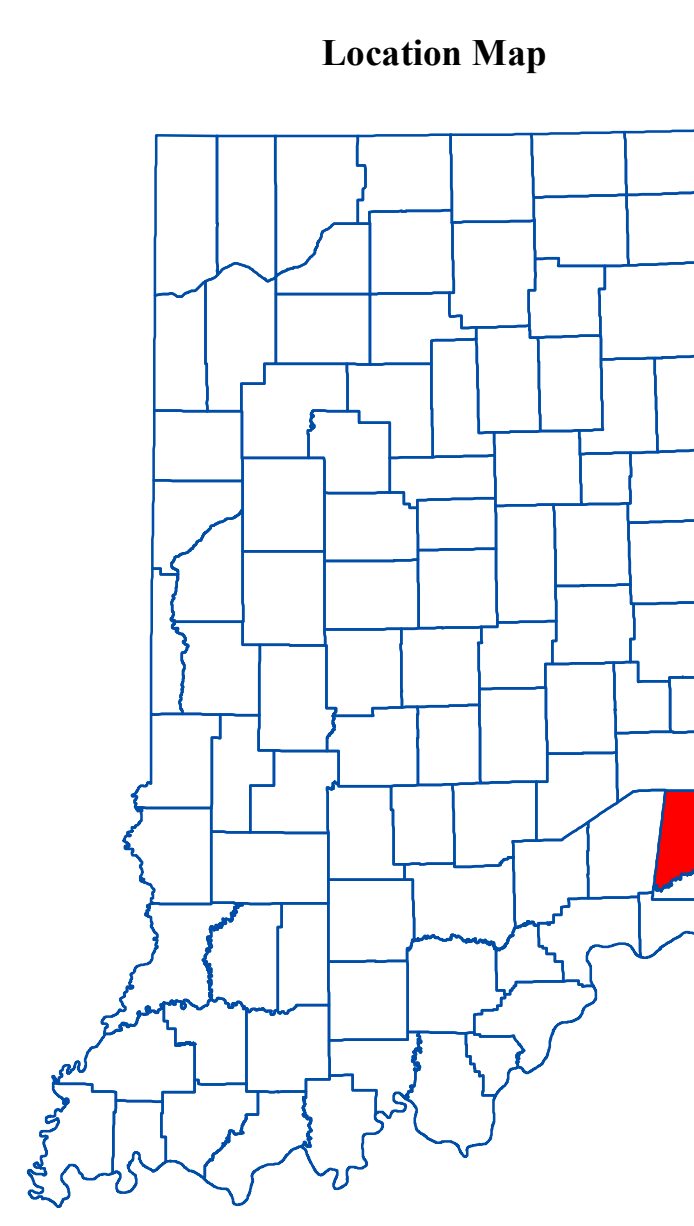
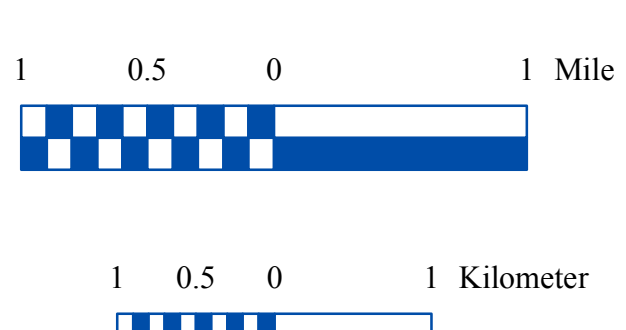
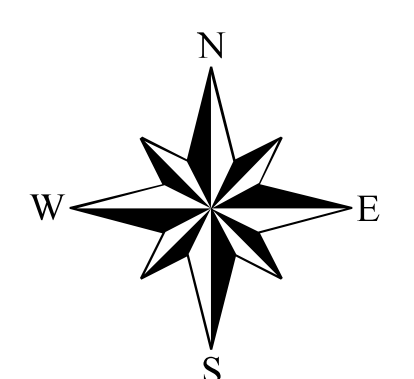
In Dearborn County, this system is mapped parallel to the Ohio River Outwash Aquifer System. In general, the Ohio River Outwash Aquifer Subsystem is mapped where the topographic position is higher and thickness of saturated outwash materials is considerably less than the main outwash system. Individual sand and gravel aquifer units are generally overlain by greater thicknesses of silt and clay.

There are few reported wells utilizing this aquifer system in Dearborn County. However, information from these wells and from wells in other counties where the Ohio River Aquifer Subsystem is mapped suggests that this subsystem in Dearborn County has the potential to meet the needs of domestic and some high-capacity users. Areas within this aquifer system that have overlying clay or silt deposits are moderately susceptible to surface contamination; whereas, areas that lack overlying clay or silt deposits are highly susceptible to contamination.



EXPLANATION

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



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Unconsolidated Aquifer Systems of Dearborn County, Indiana

by
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Division of Water, Resource Assessment Section
June 2006

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