BEDROCK AQUIFER SYSTEMS OF NEWTON 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.

Four bedrock aquifer systems are identified for Newton County: the Mississippian Borden Group, the Devonian and Mississippian New Albany Shale; the Silurian and Devonian Carbonates, and the Kentland Anomaly (consisting of Ordovician, Silurian, Devonian, Mississippian, and Pennsylvanian age rocks). Carbonates subcrop throughout the northern two-thirds and southeast portions of the county, while mostly unproductive shales subcrop over the central and southern one-third of the county. It should be noted that groundwater conflicts caused by high-capacity pumpage of the Silurian and Devonian Carbonates Aquifer System have occurred in Newton and Jasper counties. For details, see the 1990 IDNR publication Water Resource Availability in the Kankakee River Basin, Indiana located on the Internet at www.in.gov/dnr/water.

Newton County has a complex glacial history and was subjected to multiple glacial advances from the north and northeast resulting in glacial sediment deposits completely covering the county. The thickness of unconsolidated sediments ranges from about 100 feet in most of the northern and central portions of Newton County to approximately 50 feet in the southern, and a relatively small portion in the northwest, sections of the county. Major sand and gravel aquifers occur in these thick unconsolidated deposits overlying the bedrock.

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. 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 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.

Mississippian -- Borden Group Aquifer System

The Mississippian Borden Group Aquifer System subcrops along the southern portion of the county and around the Kentland Anomaly. This aquifer system is comprised of siltstone and shale having interbedded limestone lenses. Many deep wells are completed in this aquifer system which may pass through the shales to reach more productive limestones, or to increase the storage capacity of a well completed in a low-yield aquifer. Wells penetrate between 8 and 270 feet of bedrock but generally penetrate less than 70 feet. Bedrock well depths range from 40 to 325 feet with most wells more than 100 feet deep.

Domestic wells completed in the Borden Group generally yield from 5 to 15 gallons per minute (gpm), although reported yields range from 4 to 55 gpm. A few dry holes have been reported. Static water levels range from 3 to 150 feet but are usually between 20 and 50 feet. High-capacity production from this system is unlikely, and there are no registered significant groundwater withdrawal facilities in this system.

Since the permeability of shale materials is considered low and the overlying unconsolidated deposits are relatively thick, this bedrock system is not very susceptible to contamination introduced at or near the surface.

Devonian and Mississippian -- New Albany Shale Aquifer System

The New Albany Shale Aquifer System subcrops throughout most of the southern one-third of Newton County. Although there are wells producing from the New Albany Shale, the formation is not considered a significant aquifer. Wells often are drilled through the New Albany Shale into the underlying carbonates in an attempt to get greater well yields.

Wells developed in the New Albany Shale typically penetrate from 11 to 102 feet of shale with the majority of wells penetrating at least 30 feet. Most domestic wells in the Devonian and Mississippian New Albany Shale Aquifer System yield 5 gpm or less, but a few wells having yields up to 20 gpm have been reported. A number of dry holes have been reported in the New Albany Shale. Well depths range from 45 to 120 feet and static water levels are typically between 4 and 15 feet. High-capacity production from this system is unlikely, and there are no registered significant groundwater withdrawal facilities in this system.

Since the permeability of shale materials is considered low and the overlying unconsolidated deposits are relatively thick, this bedrock system is not very susceptible to contamination introduced at or near the surface.

Silurian and Devonian Carbonates Aquifer System

The Silurian and Devonian Carbonates Aquifer System subcrops in the southeastern portion, and throughout the northern two-thirds of the county. Because individual units of the Silurian and Devonian systems are composed of similar carbonate rock types and cannot easily be distinguished on the basis of water well records, they are considered as a single water-bearing system. This is the principle bedrock aquifer in the county.

Deep high-capacity wells commonly penetrate 200 to 450 feet of carbonate rock, and some wells have been reported to penetrate up to 550 feet of rock. Domestic wells commonly only penetrate the upper 15 to 100 feet of the carbonate bedrock. In some areas near the contact between the New Albany Shale and the Devonian carbonates, wells are drilled through the shale and into the more productive underlying carbonate rocks. Because the overlying shale inhibits recharge and fracturing may not be well developed in the carbonates, these wells are less productive than wells completed in carbonates not overlain by shale.

Most domestic wells can be expected to produce between 10 and 30 gpm, with yields ranging from 8 to 200 gpm. Water levels ranging from 1 foot to 117 feet below the surface have been reported; however, levels usually are between 10 to 40 feet. Flowing wells, and a few dry holes, have been reported in the Silurian and Devonian Carbonate Aquifer System.

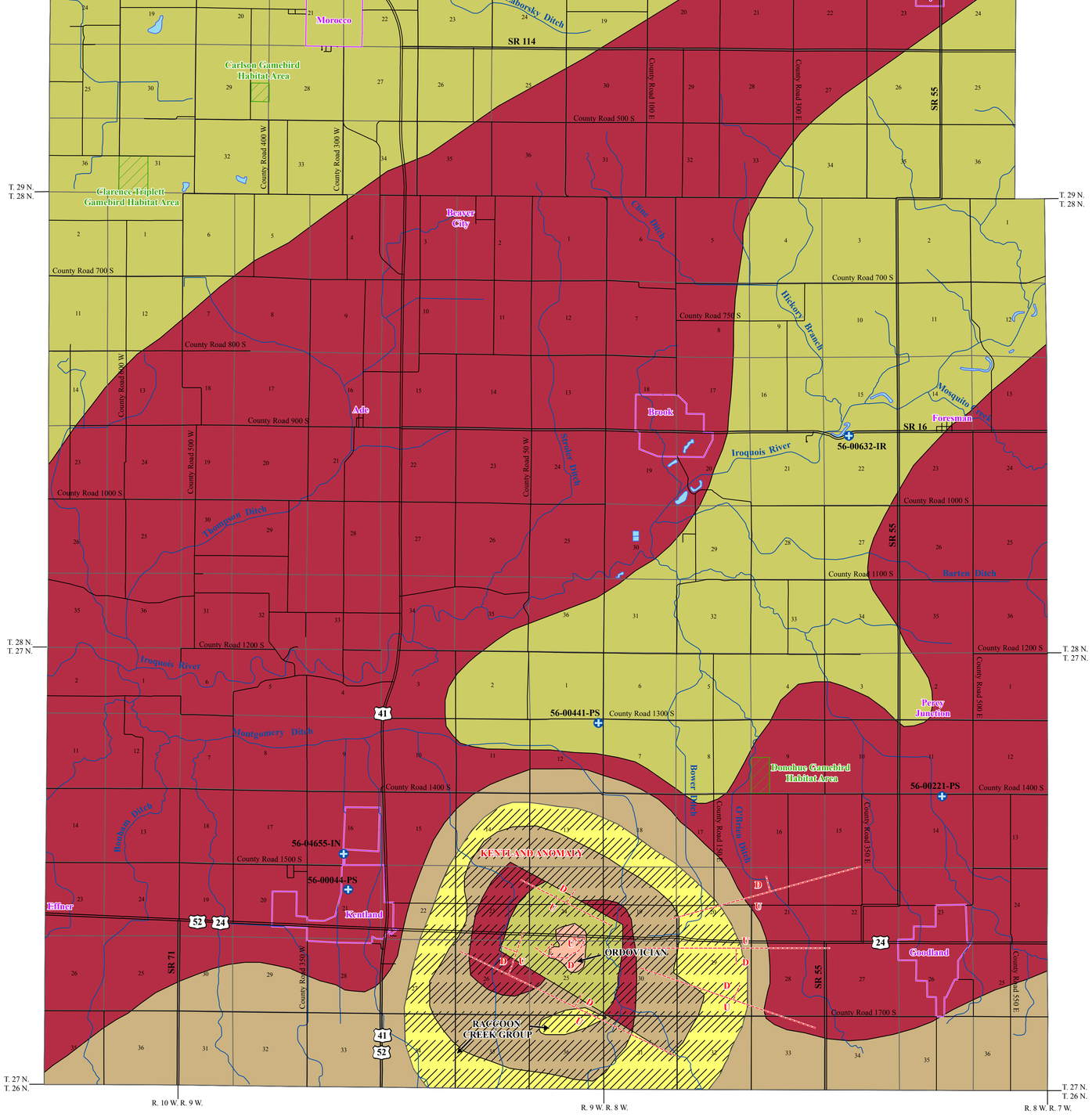
There are 29 registered significant groundwater withdrawal facilities (41 wells) in this system. Reported yields range from 50 to 1600 gpm. Uses for these facilities are public supply, industry and irrigation. Because of historic groundwater conflicts, additional proposed high-capacity well sites should be evaluated with regard to not only individual needs but also proper well spacing that would help prevent or minimize interference with nearby wells and reduce impacts to the source aquifer.

The Silurian and Devonian Carbonates Aquifer System has a low susceptibility to surface contamination where the overlying unconsolidated deposits are relatively thick; however, in northwestern Newton County where unconsolidated deposits are thin, it is moderately to highly susceptible.

Kentland Anomaly Aquifer System

The Kentland Anomaly Aquifer System is located adjacent to the border of Benton County in a relatively small portion of south-central Newton County. The bedrock in this area has been faulted and folded by undetermined forces that brought deeply buried Ordovician age rocks consisting mostly of sandstone and carbonates to the bedrock surface. Bedrock in this area also includes the Borden Group, the New Albany Shale, Silurian and Devonian Carbonates, and Pennsylvanian age rocks consisting of the Raccoon Creek Group which is composed mostly of sandstone and shale with minor amounts of mudstone, coal, and limestone. The faulting has probably increased the permeability of the bedrock in this aquifer system; however, the aquifer characteristics are unknown, but, the high degree of fracturing may increase potential well yields. There are no domestic or registered significant groundwater withdrawal facilities located in this system.

The Kentland Anomaly Aquifer System has a moderate susceptibility to surface contamination because the bedrock is heavily fractured, and the surface materials are relatively thin overlying the system.



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1 0.5 0 1 Mile

1 0.5 0 1 Kilometer

Location Map

EXPLANATION

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

INDIANA DEPARTMENT OF NATURAL RESOURCES

INDIANA DEPARTMENT OF NATURAL RESOURCES DIVISION OF WATER

Map generated by Scott H. Dean, February 2010
IDNR, Division of Water, Resource Assessment Section

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by

Division of Water

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