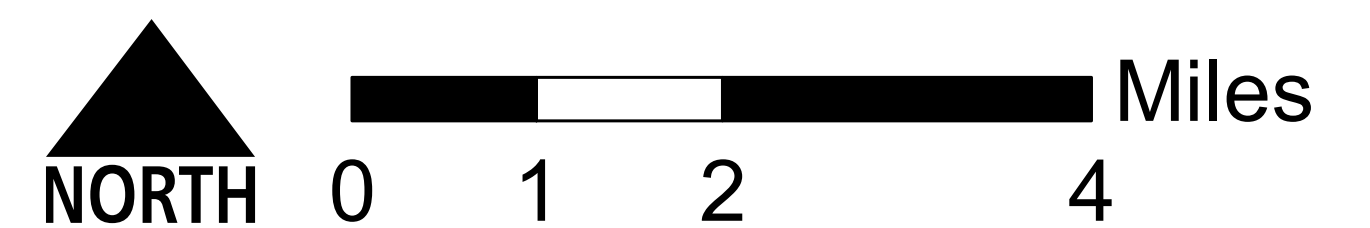
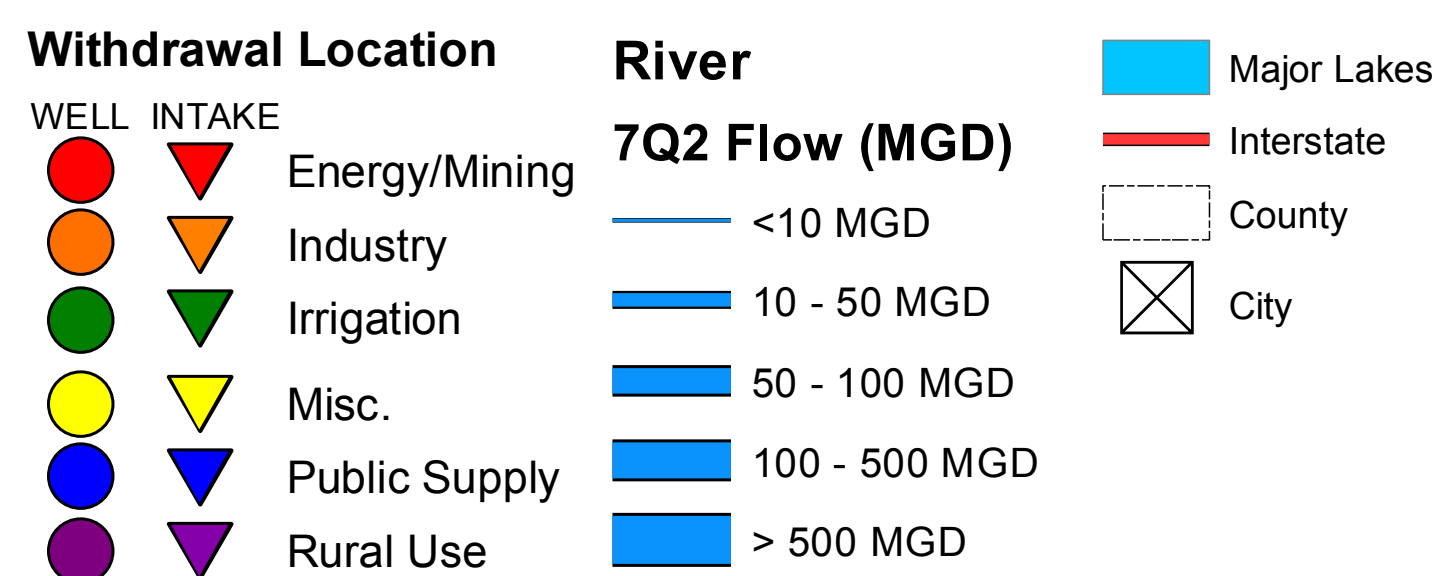
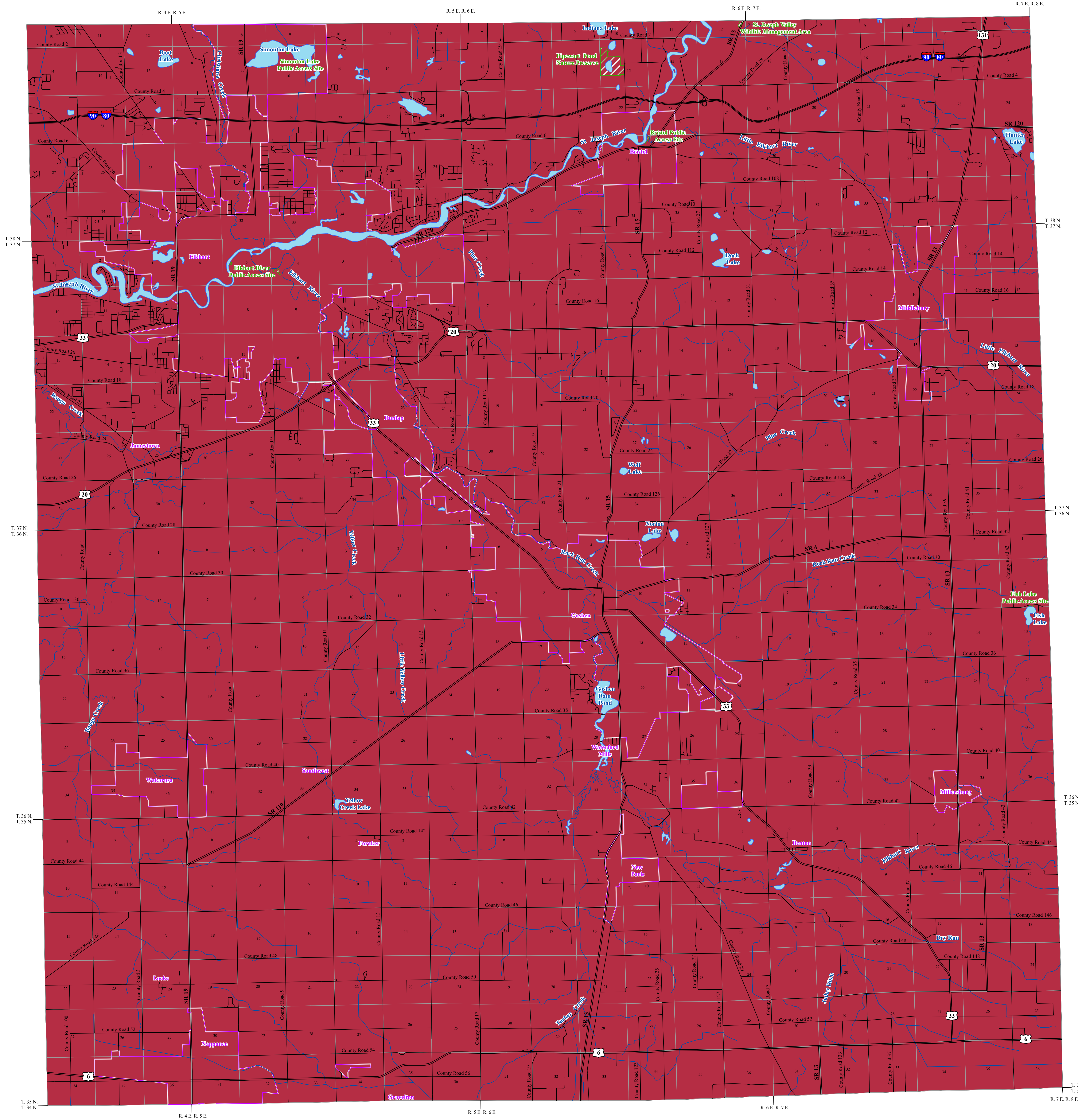


# Water Resources and Use in Elkhart County

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



# BEDROCK AQUIFER SYSTEMS OF ELKHART COUNTY, INDIANA



T. 38 N.  
T. 37 N.  
T. 36 N.  
T. 35 N.

R. 7 E. R. 8 E.  
R. 6 E. R. 7 E.  
R. 5 E. R. 6 E.  
R. 4 E. R. 5 E.

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.

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.

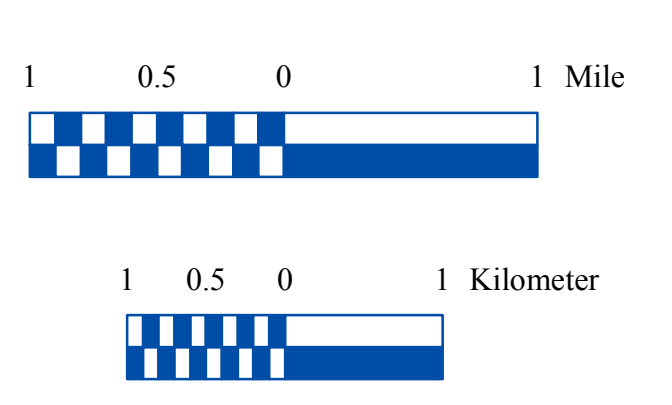
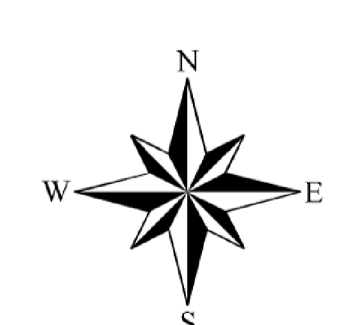
**Devonian and Mississippian - Coldwater, Ellsworth, and Antrim Shales Aquifer System**

One bedrock aquifer system is identified for Elkhart County: the Devonian and Mississippian age Coldwater, Ellsworth, and Antrim Shales. The Coldwater, Ellsworth, and Antrim Shales Aquifer System is about 300 to 380 feet thick and subcrops throughout Elkhart County. These shales are commonly considered an aquitard; therefore, the system is an extremely limited groundwater resource.

Elkhart 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. This system is overlain by unconsolidated deposits ranging in thickness from 150 feet to over 400 feet. Because of the availability of the overlying unconsolidated resources, no water wells have been completed in the Coldwater, Ellsworth, and Antrim Shales Aquifer System in Elkhart County.

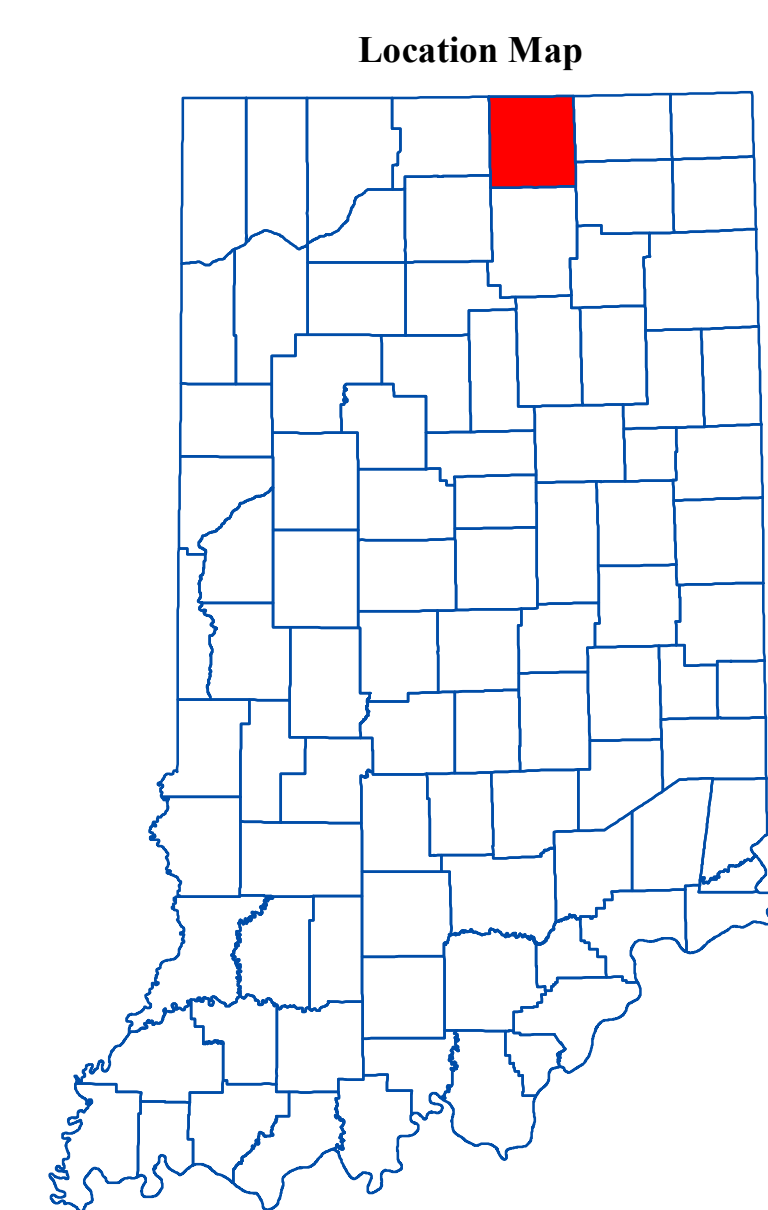
In nearby St. Joseph County a few wells have been completed in this aquifer system and are capable of meeting the needs of some domestic users. Domestic well yields are commonly less than 5 gallons per minute (gpm) with a few dry holes (pumps) reported. Well depths range from 45 to 140 feet deep and static water levels typically range from 5 to 50 feet below the land surface. The amount of rock penetrated in this system ranges from 30 to 60 feet.

Since the permeability of shale materials is considered low and the overlying unconsolidated deposits are thick, susceptibility to contamination introduced at or near the surface is low.



### EXPLANATION

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



### Map Use and Disclaimer Statement

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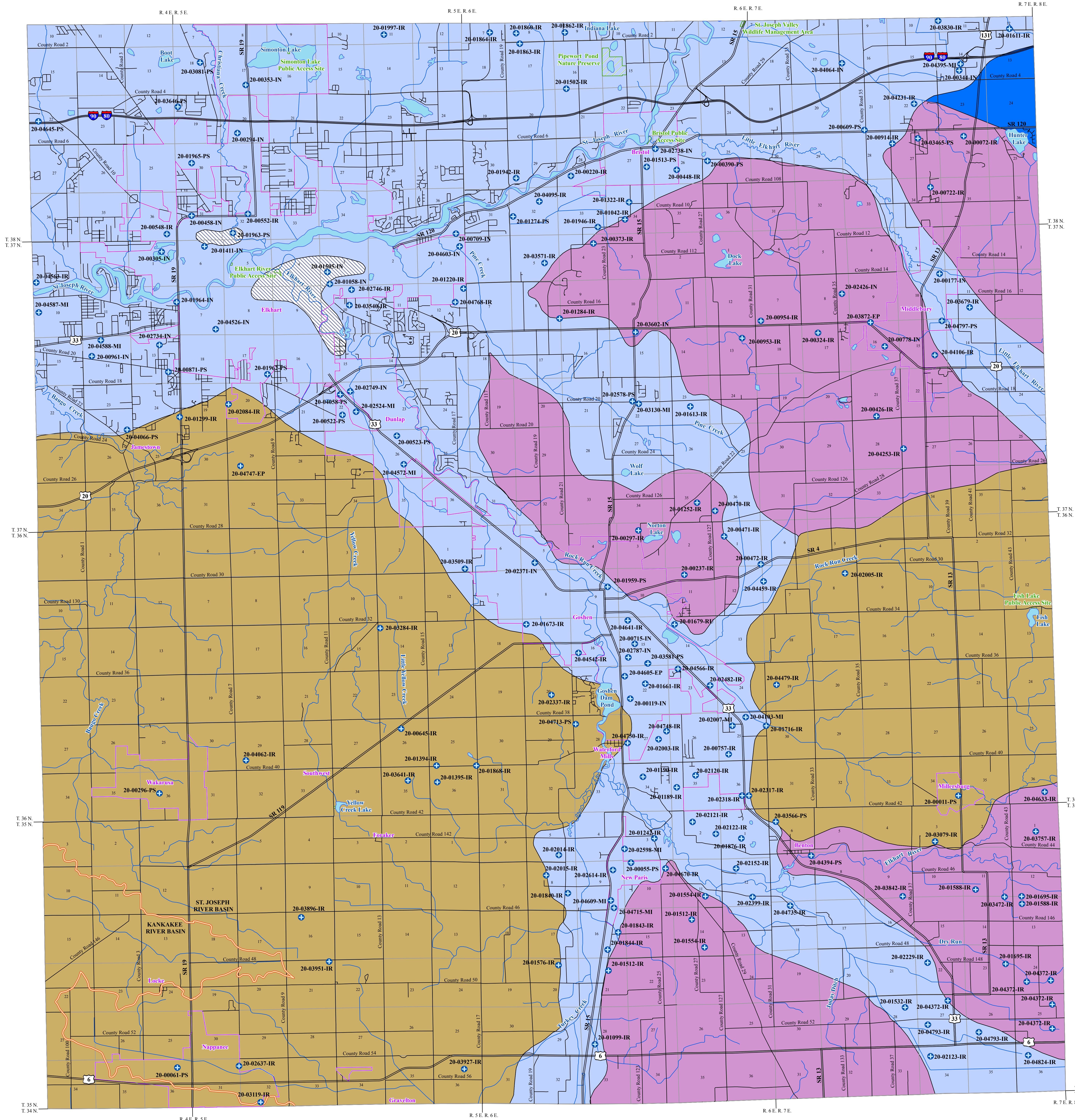
This map was created from several existing shapefiles. Township and Range Lines of Indiana (line shapefile, 20020621), Land Survey Lines of Indiana (polygon shapefile, 20020621) and County Boundaries of Indiana (polygon shapefile, 20020621), were all from the Indiana Geological Survey and based on a 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 Elkhart County, Indiana

by  
Division of Water  
1987, 1990



# UNCONSOLIDATED AQUIFER SYSTEMS OF ELKHART COUNTY, INDIANA



T. 38 N.  
T. 37 N.  
T. 36 N.  
T. 35 N.  
T. 34 N.

R. 4 E. R. 5 E.  
R. 5 E. R. 6 E.  
R. 6 E. R. 7 E.  
R. 7 E. R. 8 E.

The following is a summary of the availability of groundwater in Elkhart County and was derived from the Indiana Department of Natural Resources 1987 publication Water Resource Availability in the St. Joseph River Basin, Indiana, and the Indiana Department of Natural Resources 1990 publication Water Resource Availability in the Kankakee River Basin, Indiana. Each report describes the availability, distribution, quality, and use of groundwater and surface water in the St. Joseph River Basin, and the Kankakee River Basin. The full reports can be viewed and downloaded at <http://www.in.gov/dnr/water>.

Unconsolidated deposits of glacial sands and gravels are the principle source of groundwater in Elkhart County. Four unconsolidated aquifer systems have been mapped and defined on the basis of geologic environments and aquifer characteristics. They are: the Howe Outwash Aquifer System, the Nappanee Aquifer System, the Natural Lakes and Moraines Aquifer System, and the St. Joseph Aquifer System and Tributary Valleys. Due to the availability of prolific unconsolidated aquifer systems and the extreme limitations of shale materials, the underlying bedrock is generally not used as an aquifer resource.

**Howe Outwash Aquifer System**

The Howe Outwash Aquifer System occurs in the northeastern corner of Elkhart County. The prevailing character of this aquifer system is moderately thick near surface sand and gravel deposits that overlie an altered till plain. The near surface outwash deposits are the most extensive granular deposits in this system and vary from 15 to 135 feet in thickness. Within the underlying till sequence, clay zones alternate with sand and gravel layers. These sand and gravel layers average 5 to 25 feet in thickness, although some localized lenses reach thicknesses of 100 feet. The tops of the sand and gravel lenses characteristically occur between 780 to 805 feet mean sea level (msl) in Elkhart County. Two or more sand and gravel deposits often occur at depth within the till sequence, but are only continuous locally. This is an area with good to excellent groundwater availability (100 to 1200 gallons per minute (gpm)). However, there are no registered significant groundwater withdrawal facilities utilizing this system in Elkhart County. The surficial deposits are highly susceptible to contamination and the deeper sand and gravels are moderately so.

**Nappanee Aquifer System**

This aquifer system is composed of interbedded medium to coarse sand and gravel zones contained within a thick till sequence. The individual layers of sand and gravel range from 3 to 10 feet in thickness. Individual aquifers thicken locally to 30 feet or more but are seldom more than one to two square miles in area. It is not uncommon to have two or more of the aquifer units at an approximate elevation of 750 feet msl. In the Millersburg area this cluster occurs at an elevation of about 780 to 800 feet msl and commonly thickens at the boundary where it blends into the outwash deposits of the major stream and valleys. This aquifer system is present under the glacial till plain in western Elkhart County. This is an area of moderate to good groundwater availability (50 to 600 gpm). There are 27 registered significant groundwater withdrawal facilities (39 wells) with yields from 30 to 1300 gpm. This system, exclusive of areas where surficial gravel is present, is moderately susceptible to contamination.

**Natural Lakes and Moraines Aquifer System**

The Natural Lakes and Moraines Aquifer System contains two potential sand and gravel aquifers, one near the surface, the other at depth. The surface and near surface aquifers vary from 10 to 50 feet in thickness and typically occur within 100 feet of the ground surface. These surface sand and gravel layers are often continuous over many square miles and may be related to the thick surficial outwash deposits to the west. Often, the near surface aquifers are directly connected to areas of surficial sands and gravels and thus are more prone to contamination than are the deeper sand and gravel aquifers.

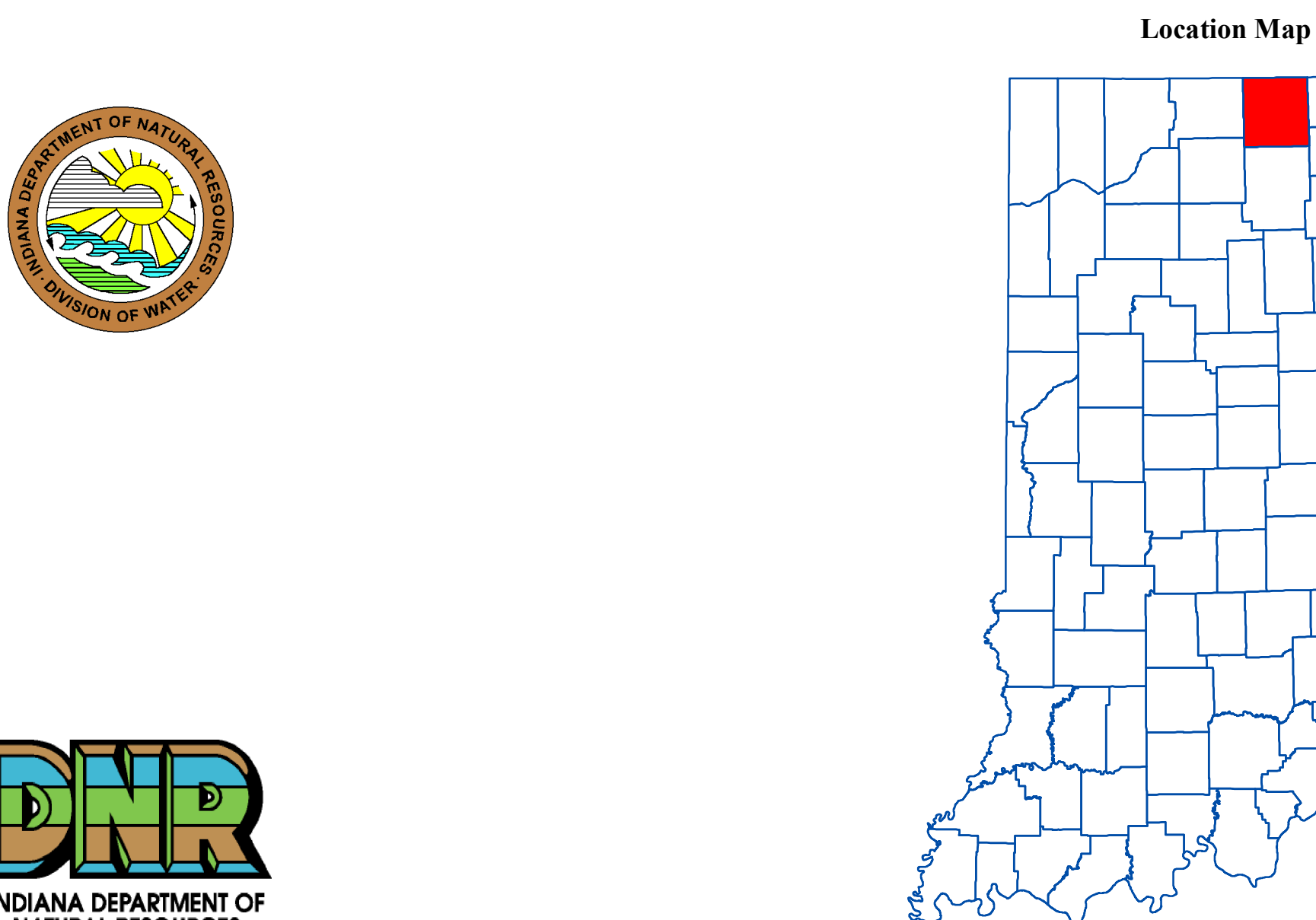
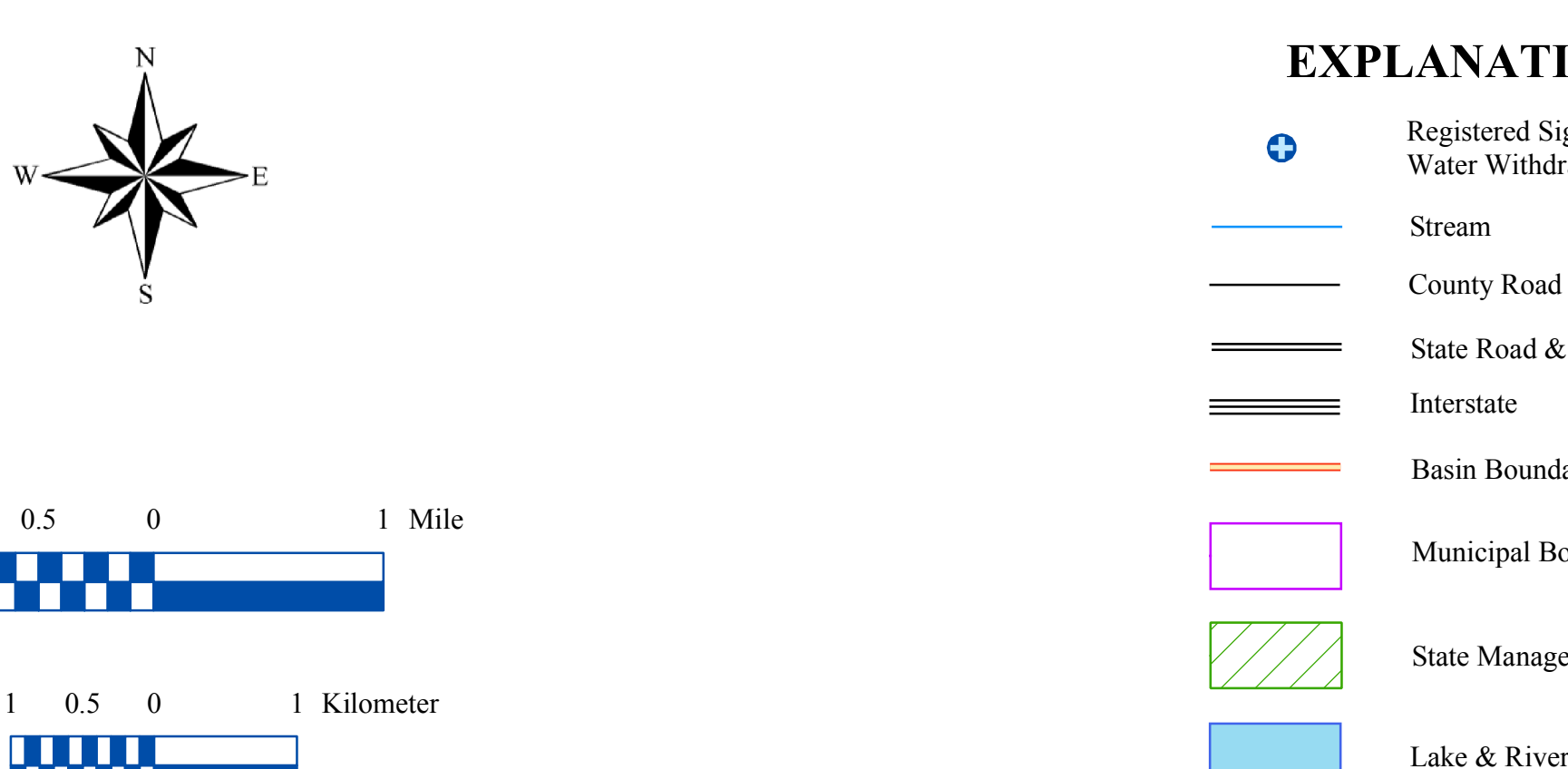
The deeper sand and gravel aquifers of the Natural Lakes and Moraines Aquifer System are more variable in depth and thickness, and typically occur as discontinuous lenses and layers below a thick clay layer. They are usually 10 to 30 feet thick and occur at depths of 100 feet or more. Because these deeper sands and gravels occur below or within thick clays, they are less susceptible to surface contamination. Most of the wells in the Natural Lakes and Moraines Aquifer System are completed at shallower depths. This is an area of regular, but generally good groundwater availability (25 to 800 gpm). There are 30 registered significant groundwater withdrawal facilities (58 wells) with yields from 70 to 2000 gpm. The system, exclusive of surficial and near surface sand and gravel, is moderately susceptible to contamination.

**St. Joseph Aquifer System and Tributary Valleys**

The St. Joseph Aquifer System is composed of fine to medium sand with zones of coarse sand and gravel. Interspersed within these deposits are thin clay or silt units of limited areal extent. Locally at Elkhart, thick clay deposits are present below the surface sands and gravels. These clay or silt units extend, in places, close to the bedrock surface. The St. Joseph Aquifer System varies from 20 feet near the southern boundary of the St. Joseph River Basin to approximately 400 feet thick over the buried bedrock valley in the western edge of Elkhart County. Numerous high capacity industrial, municipal, and irrigation wells obtain water from this aquifer which constitutes one of the major aquifer systems in the state. This aquifer system is generally an area of excellent groundwater availability (100 to 1500 gpm) and is highly susceptible to groundwater contamination. There are 121 registered significant groundwater withdrawal facilities (239 wells) with high-capacity yields from 70 to 2260 gpm.

The Tributary Valleys Aquifer System is similar to the main stem St. Joseph Aquifer System, but often contains coarser outwash deposits. In the vicinity of Goshen these deposits exceed 150 feet in thickness. In the Little Elkhart River Valley and northwest of Goshen in the Elkhart River Valley the surficial outwash ranges up to 60 feet in thickness. This unit is underlain by a thick clay/silt which in turn is underlain by a sand and gravel aquifer ranging up to 50 feet in thickness. The deeper aquifers are utilized by Goshen, Middlebury, and many industrial concerns. This area exhibits good to excellent groundwater availability (100 to 1000 gpm). The surficial sand and gravel deposits of this system are highly susceptible to contamination and the deeper aquifers are slightly susceptible.

In northwestern Elkhart County, this area is contained within the St. Joseph Aquifer System and is composed of thick clay deposits which are overlain by surficial outwash sand and gravel deposits. The clay deposits extend to bedrock in several places, but commonly will contain thin zones of sand and gravel prior to encountering the bedrock surface. Well depths are quite erratic in this area. This is an area of minor groundwater availability (0 to 50 gpm). There are 3 registered significant groundwater withdrawal facilities (19 wells) with yields from 75 to 807 gpm. The aquifer is moderately susceptible to groundwater contamination.



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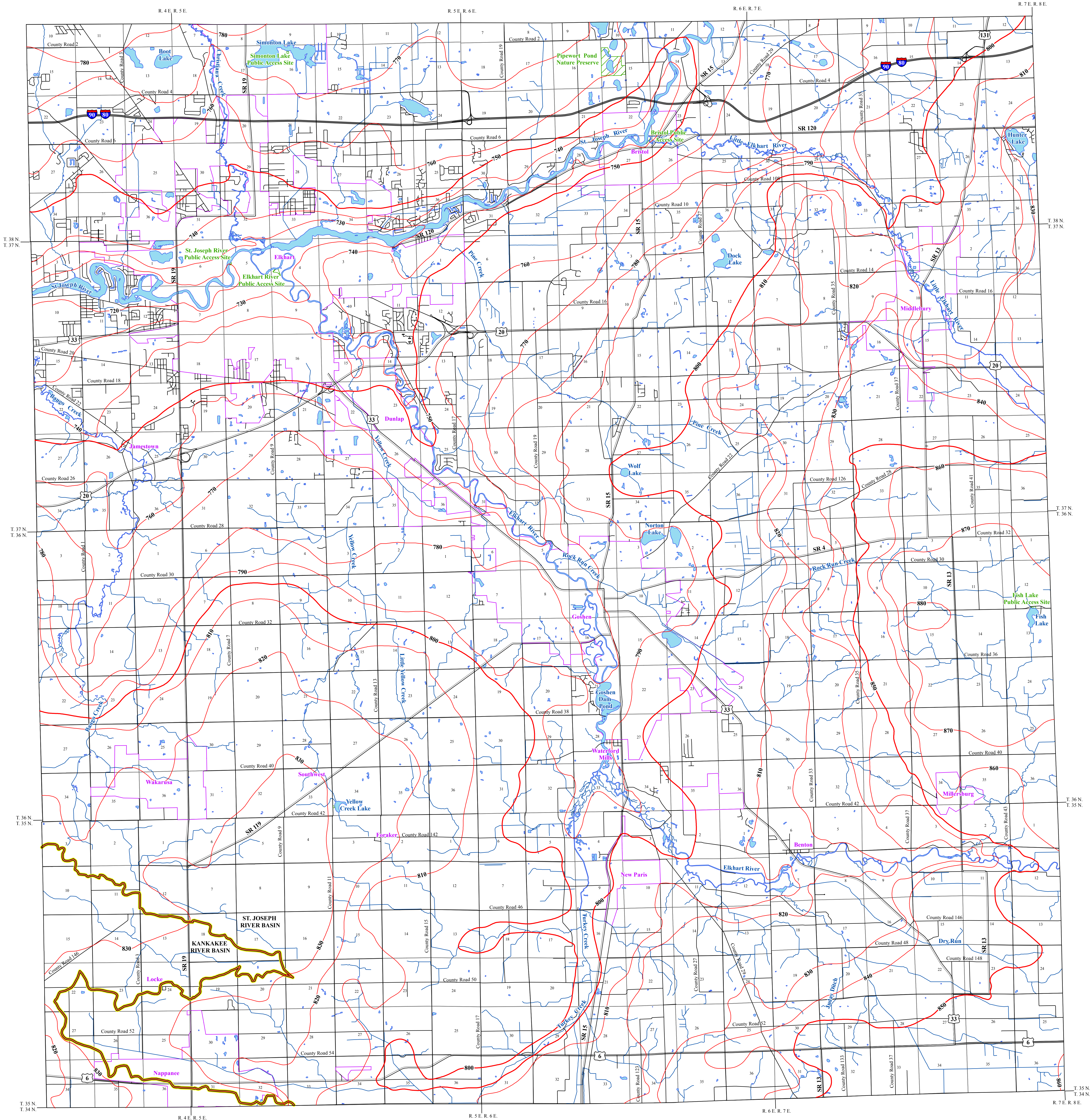
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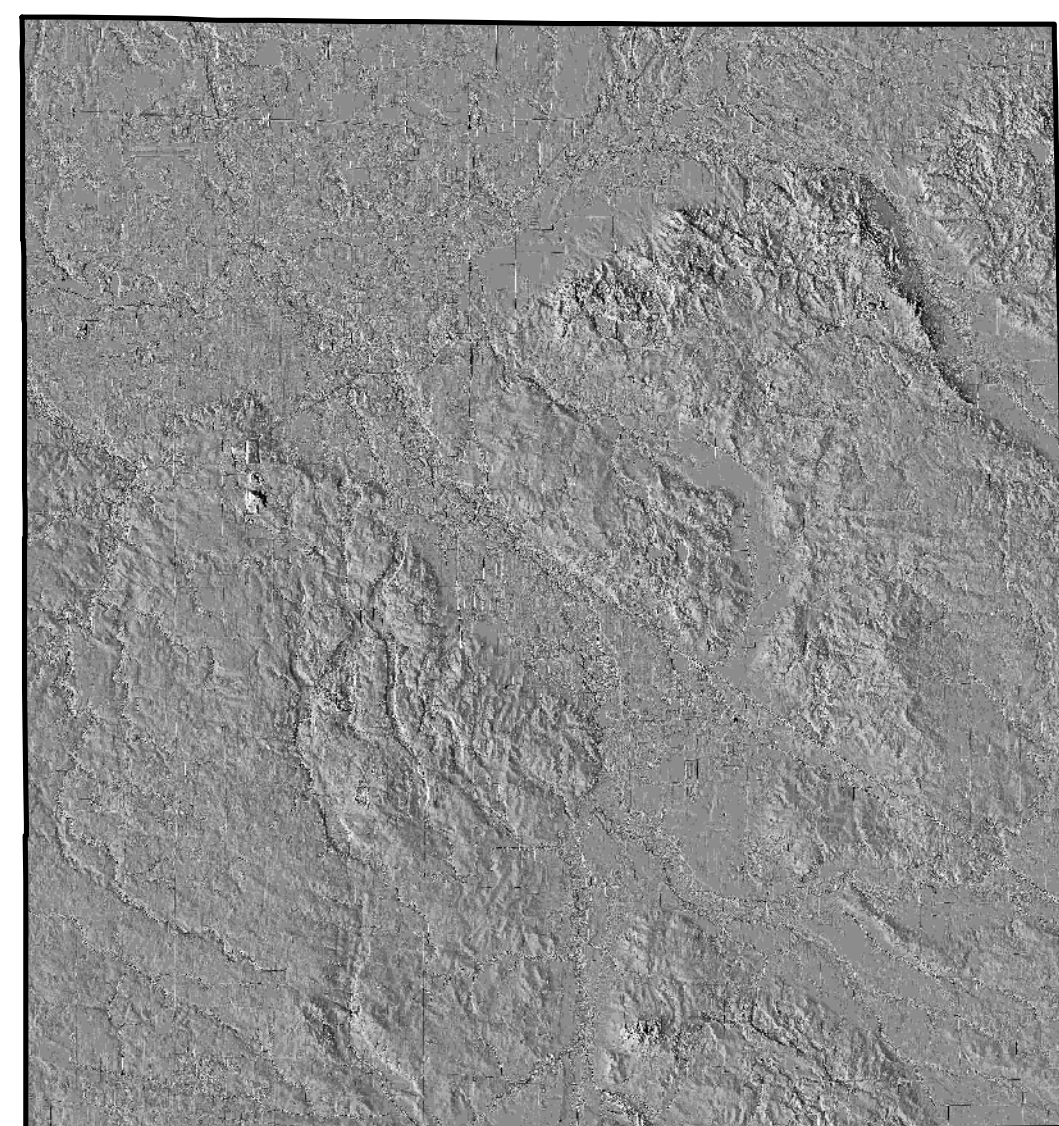
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**Unconsolidated Aquifer Systems of Elkhart County, Indiana**  
by  
Division of Water  
1987, 1990

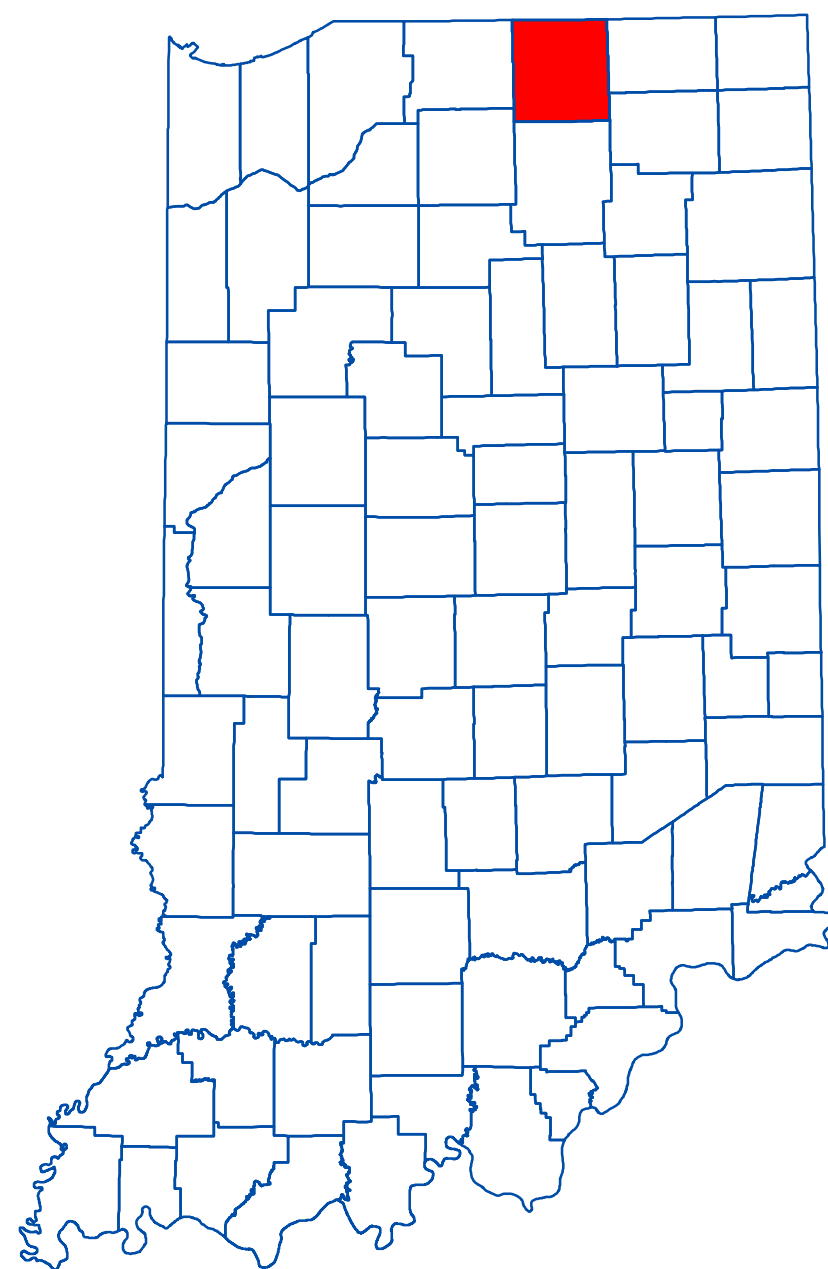
# POTENTIOMETRIC SURFACE MAP OF THE UNCONSOLIDATED AQUIFERS OF ELKHART COUNTY, INDIANA



Hillshade Map of Elkhart County, Indiana



Location Map



Elkhart County, Indiana is located in the north-central portion of the state and is situated within two major drainage basins. A small portion of the southwest corner of the county is within the Kankakee River Basin and the rest of the county is within the St. Joseph River Basin. Major drainage systems include the St. Joseph River and Elkhart River along with several tributaries.

Coordinate locations of water well records were physically obtained in the field, determined through address geocoding, or reported on water well records. Elevation data were either obtained from topographic maps or a digital elevation model (DEM). Elevation and location quality control/assurance procedures were utilized to refine or remove data where errors were readily apparent.

The generalized unconsolidated potentiometric surface map contour elevations represent lines of equal elevation to which groundwater levels will rise in wells. Static water level measurements in individual wells used to construct the potentiometric surface map are indicative of the water level at the time of well completion. Therefore, current site specific conditions may differ due to local or seasonal variations in measured static water levels.

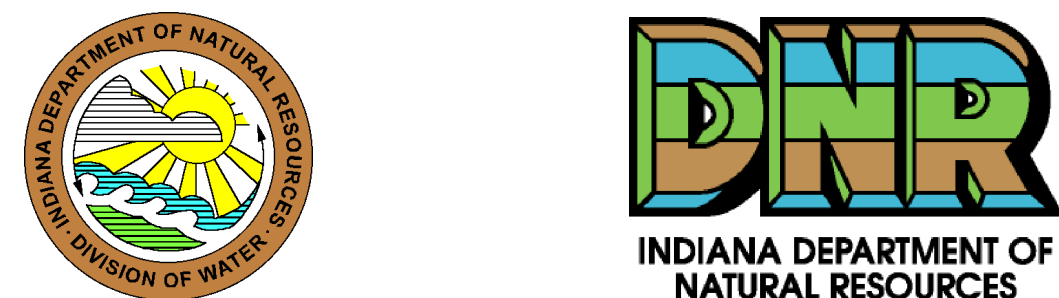
In Elkhart County well depths 100 feet or less were a priority in mapping the potentiometric surface. However, deeper wells were often completed and used in areas where data was sparse. There are approximately 25,400 water well records in the county of which, about 7,400 (29%) are located. About 5,850 (79%) of the located wells are less than 100 feet in depth. A total of 7,375 water well records were used to construct the groundwater equipotential lines. Potentiometric surface elevations range from a high of 880 feet mean sea level (msl) in the east-central portion of Elkhart County, to a low of 720 feet msl in the northwest. Generalized groundwater flow direction, therefore, appears to be from southeast to the northwest for most of the county. Groundwater flow for the extreme southwest portion of the county that is within the Kankakee River Basin appears to be to the west.

In general, most of the potentiometric surface in Elkhart County is under confined conditions. However, some locations, such as positions close to the St. Joseph River, Elkhart River and some tributaries, may be under semi-confined or unconfined conditions.

**EXPLANATION**

- 800 — Line of equal elevation, in feet above mean sea level
- Potentiometric Contour interval 10 feet
- Stream
- County Road
- State Road & US Highway
- Interstate
- Basin Boundary
- Municipal Boundary
- State Managed Property
- Lake & River

1 0.5 0 1 Mile  
1 0.5 0 1 Kilometer



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**Potentiometric Surface Map of the Unconsolidated Aquifers of Elkhart County, Indiana**  
by  
Robert A. Scott  
Division of Water, Resource Assessment Section  
December 2011

# Elkhart County

