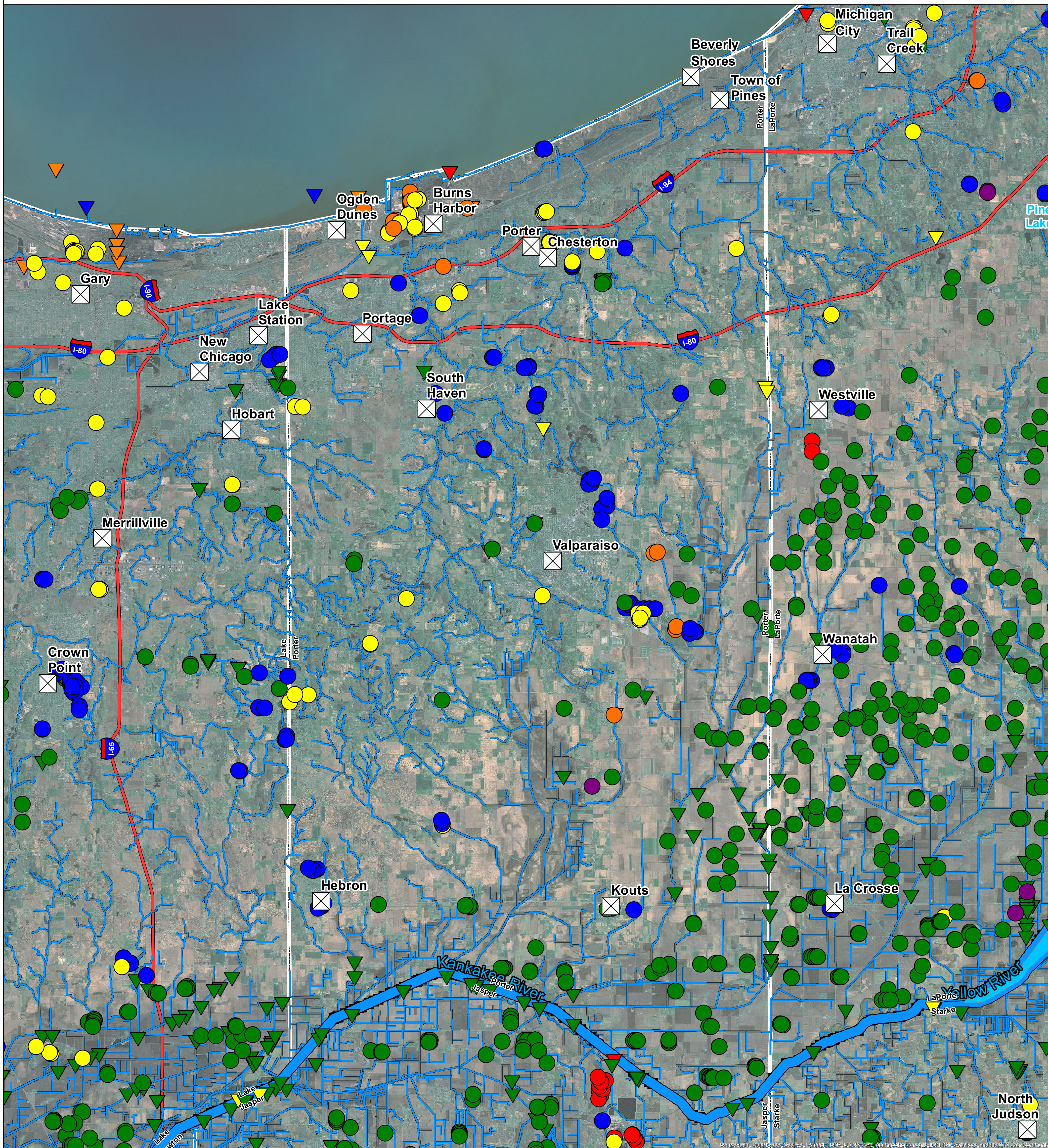
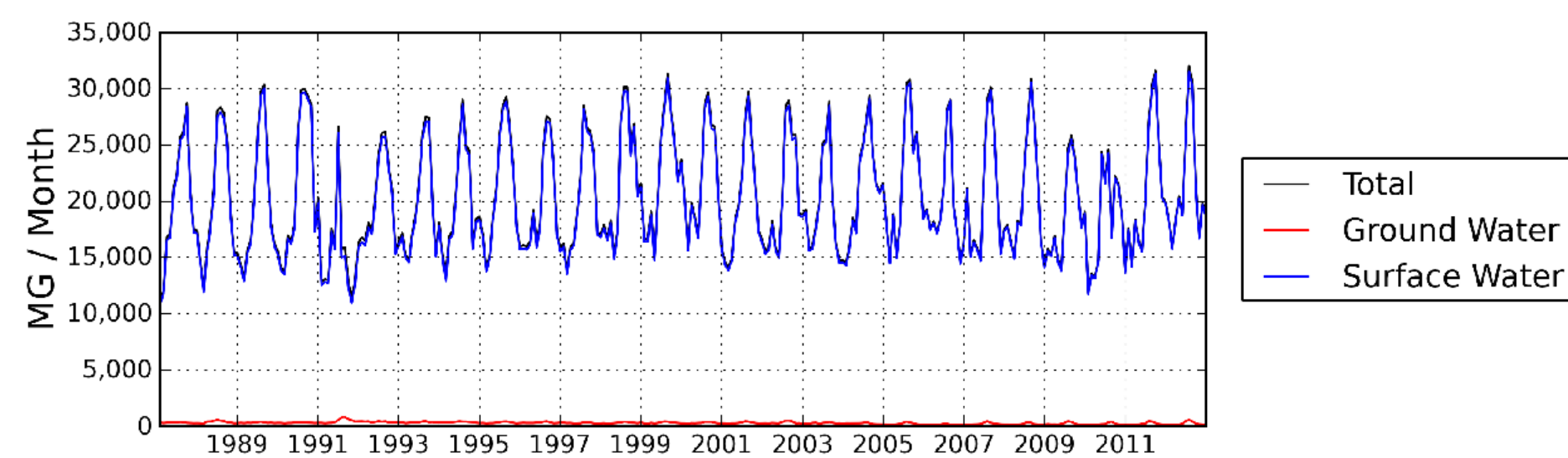
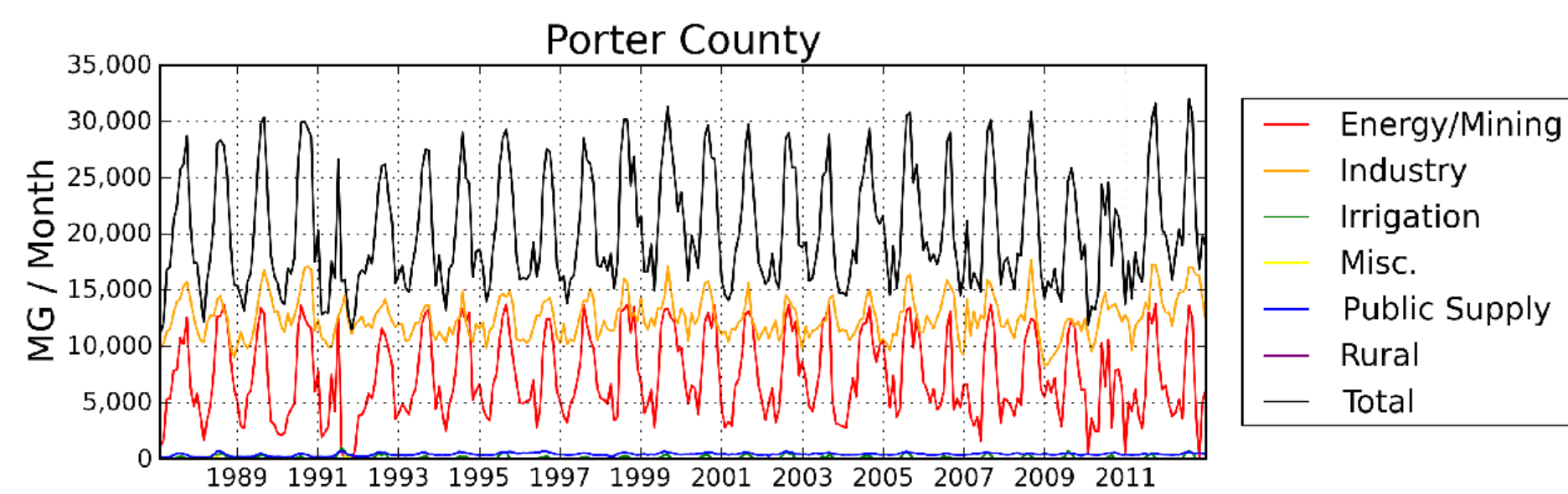


Average Daily Use: 706.2 MGD



Water Resources and Use in Porter County

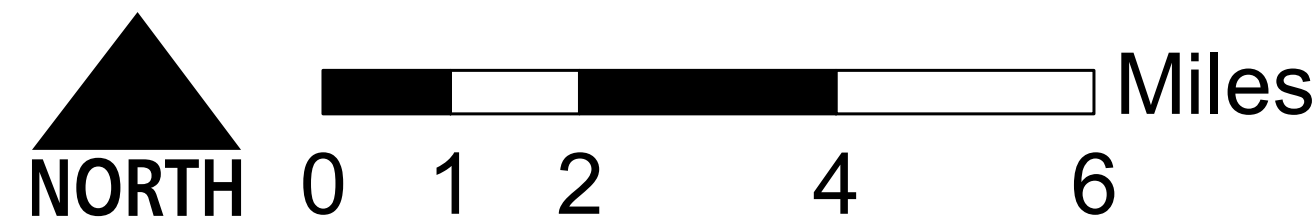
Data Sources: U.S. Geological Survey and Indiana Department of Natural Resources

Withdrawal Location		
WELL	INTAKE	
Red Circle	Red Triangle	Energy/Mining
Orange Circle	Orange Triangle	Industry
Green Circle	Green Triangle	Irrigation
Yellow Circle	Yellow Triangle	Misc.
Blue Circle	Blue Triangle	Public Supply
Purple Circle	Purple Triangle	Rural Use

River	7Q2 Flow (MGD)
Thin Blue Line	< 10 MGD
Medium Blue Line	10 - 50 MGD
Thick Blue Line	50 - 100 MGD
Very Thick Blue Line	100 - 500 MGD
Thickest Blue Line	> 500 MGD

Blue Square	Major Lakes
Red Line	Interstate
White Box	County
Black X	City

INTERA
GEOSCIENCE & ENGINEERING SOLUTIONS



BEDROCK AQUIFER SYSTEMS OF PORTER 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.

Two bedrock aquifer systems are identified for Porter County: the Devonian and Mississippian age Coldwater, Ellsworth and Antrim Shales, and the Silurian and Devonian Carbonates. Unproductive shales subcrop over almost the entire county except in the northwest and southwest sections where limestone subcrops. Bedrock aquifer systems in Porter County are overlain by unconsolidated deposits of varying thickness from about 50 feet in the southeast corner of the county with the thickness in the remaining portions ranging from about 100 to over 200 feet. 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.

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

The Coldwater, Ellsworth and Antrim Shales Aquifer System is present at the bedrock surface in all but the northwestern and southwestern portions of Porter County. This system is generally not utilized as a source of water in the county because of the typically low permeability of shale, and unconsolidated aquifers are commonly abundant in the overlying deposits. In some instances, wells are completed in the underlying carbonate rocks in areas where the Coldwater, Ellsworth and Antrim Shales Aquifer System is relatively thin. However, the water may be of poor quality.

Water wells utilizing the Coldwater, Ellsworth and Antrim Shales Aquifer System penetrate approximately 100 to 150 feet of unconsolidated material, and are completed into more than 50 feet of shale. However, only the upper 25 feet of the shale has typically been made permeable due to post-Devonian weathering, jointing and fracturing. Static water levels in the shale range from 40 to 80 feet below the surface. The Coldwater, Ellsworth and Antrim Shales Aquifer System is capable of supplying some domestic users requiring less than 10 gallons per minute (gpm). 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 two relatively small areas located in the southwestern and northwestern corners of the county. It is the principle bedrock aquifer and the only one capable of supporting high-capacity pumping in the county.

In Porter County the Silurian and Devonian Carbonates Aquifer is overlain in most places by about 100 to more than 200 feet of unconsolidated material. The majority of domestic water wells that penetrate the Silurian and Devonian Carbonates Aquifer System are completed in the upper 15 to 100 feet of bedrock, which is the most transmissible part of the aquifer. However, few wells have been completed in this carbonate aquifer system in Porter County, because of the availability of the overlying sand and gravel aquifers. In some areas near the contact between the Coldwater, Ellsworth and Antrim Shales Aquifer System, and the Silurian and Devonian carbonates, wells are drilled through the shales and into the more productive underlying carbonate rocks. Because the overlying shales inhibit 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.

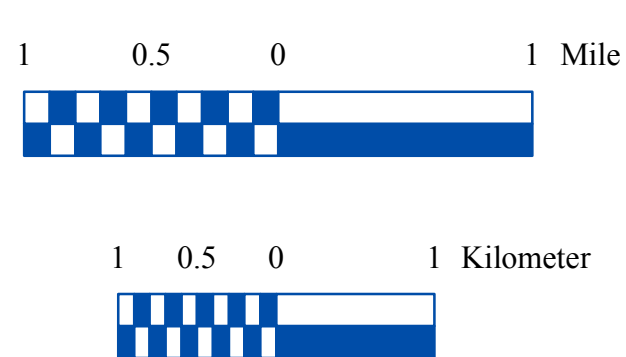
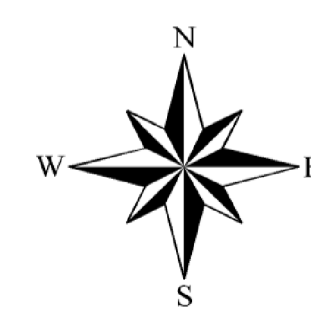
Water wells completed in the Silurian and Devonian Carbonates Aquifer System in Porter County are drilled to an average depth of about 250 feet and static water levels range from flowing to 117 feet below the surface; however, water levels usually are between 10 to 40 feet. Only a few dry holes have been reported in this aquifer system. Most domestic wells can be expected to produce between 10 and 30 gpm with yields ranging from 8 to 200 gpm. There are no registered significant groundwater withdrawal facilities in this system.

The Silurian and Devonian Carbonates Aquifer System has a low susceptibility to surface contamination because the overlying unconsolidated deposits are relatively thick.

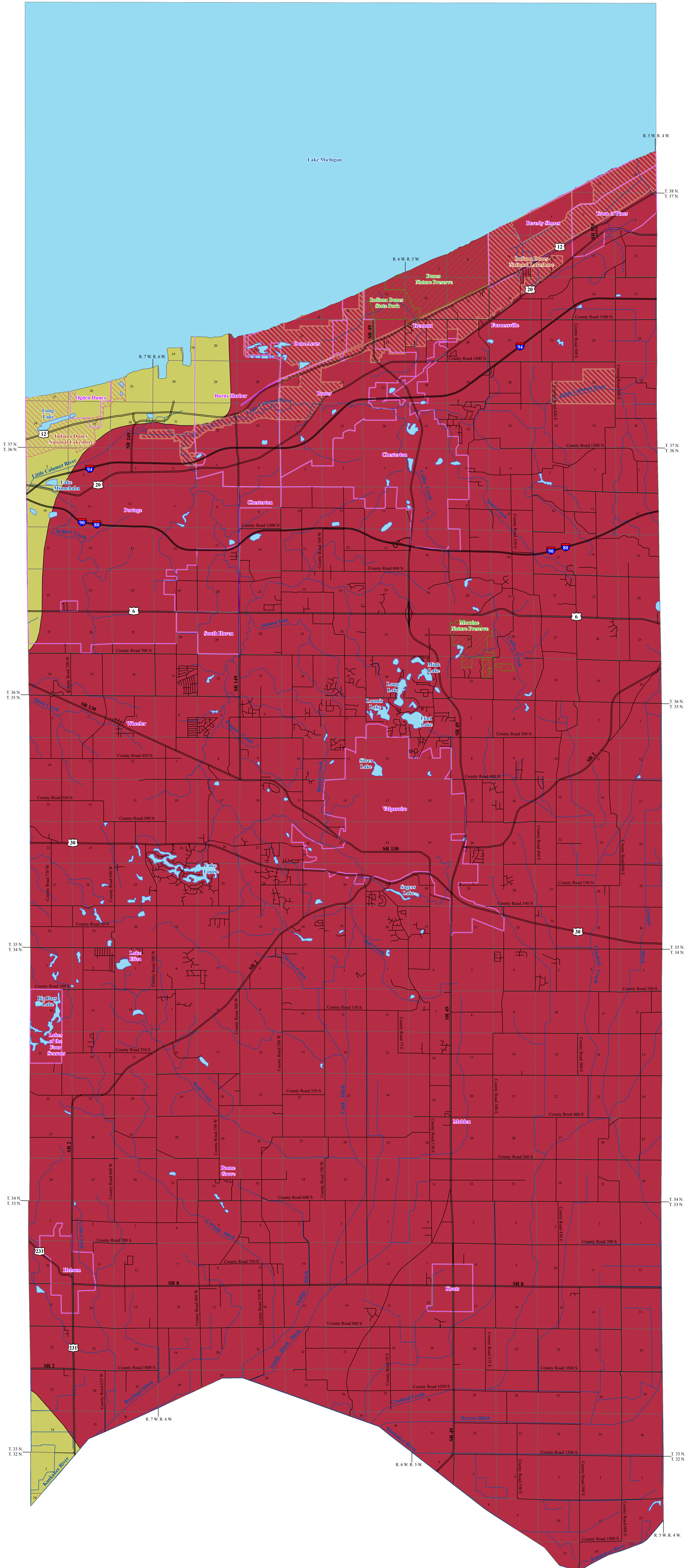
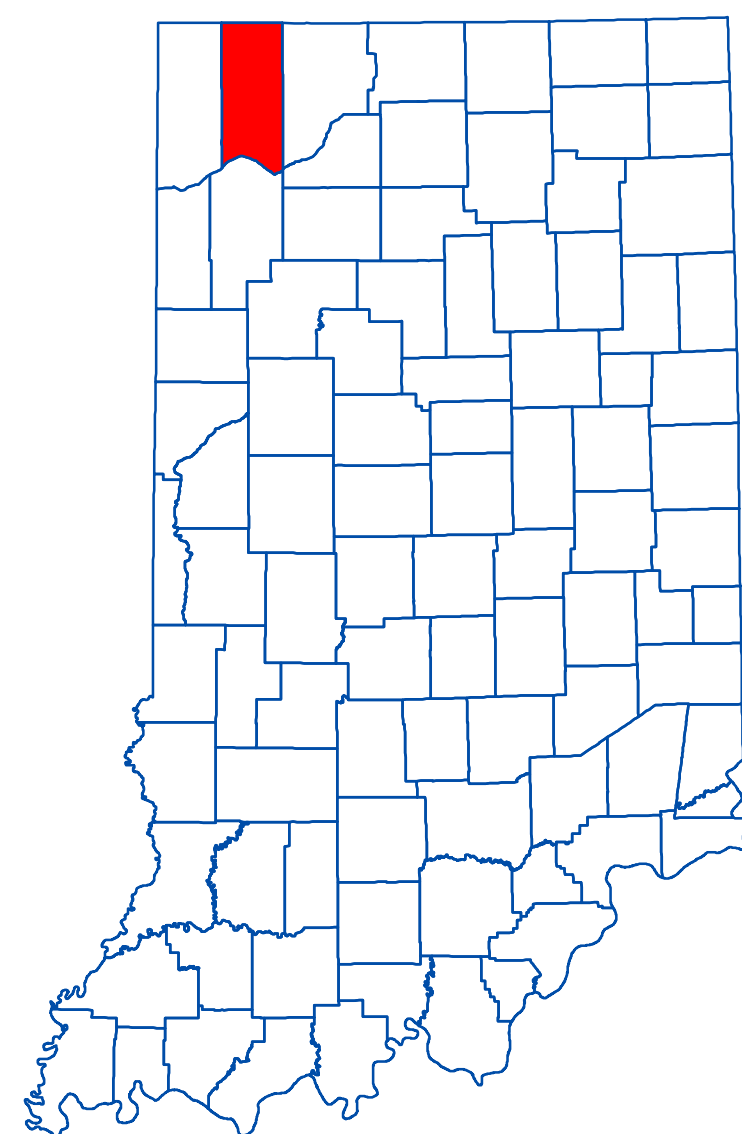


EXPLANATION

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



Location Map



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Bedrock Aquifer Systems of Porter County, Indiana

by

Division of Water

1990, 1994

UNCONSOLIDATED AQUIFER SYSTEMS OF PORTER COUNTY, INDIANA

The following is a summary of the availability of groundwater in Porter County and was derived from the Indiana Department of Natural Resources 1990 publication Water Resource Availability in the Kankakee River Basin, Indiana and the Indiana Department of Natural Resources 1994 publication Water Resource Availability in the Lake Michigan Region, Indiana. Each report describes the availability, distribution, quality, and use of groundwater and surface water in the Kankakee River Basin and the Lake Michigan Region. 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 Porter County. Five unconsolidated aquifer systems have been mapped and defined on the basis of geologic environments and aquifer characteristics: the Calumet, the Kankakee, the Lacustrine Plain, the Valparaiso Moraine, and the Valparaiso Outwash Apron. 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.

Calumet Aquifer System

The Calumet Aquifer System consists of fine- to medium-grained sand with dispersed lenses of gravel. Beds of intertillated silt and clay, and deposits of peat and muck confine the aquifer in small areas across the county. This system is underlain by a relatively impermeable clay and till unit that in places exceeds 100 feet in thickness. Static water levels in the Calumet Aquifer System vary accordingly to surface elevation. Areas of subdued relief in the northwestern portion of the county have static water levels that are frequently less than 15 feet below the surface. However, static water levels can be as much as 100 feet below the crests of high dunes in the northern portion of the county. Ponds and marshes in the interdunal depressions define areas where the water-table intersects the ground surface. Saturated thickness of the Calumet Aquifer System ranges from less than 5 feet along its southwestern extent to about 40 feet in areas containing broad water-table mounds.

The Calumet Aquifer System has not been developed significantly because of its proximity to Lake Michigan, an abundant surface-water source. However, the aquifer system is utilized as a source of water by a few domestic and small commercial facilities. Domestic wells typically produce about 5 to 20 gallons per minute (gpm). There are 4 registered significant groundwater withdrawal facilities (22 wells) with yields ranging from 100 to 200 gpm. The usage for each of these facilities is industrial. The aquifer is highly susceptible to surface contamination because there is no clay cap across most of the aquifer and a lack of clay separator beds.

Lacustrine Plain Aquifer System

The Lacustrine Plain Aquifer System consists of a series of aquifers present beneath the Calumet Lacustrine Plain. The individual aquifers consist of fine- to medium-grained glaciolacustrine and coastal sands capped by lacustrine clays or till. Thickness of individual aquifers frequently ranges from 7 to 90 feet, and averages about 24 feet. Depths to static water levels are highly variable in the many aquifers of this system. Domestic water wells in the Lacustrine Plain Aquifer System can typically produce about 5 to 20 gpm. There are 6 registered significant groundwater withdrawal facilities (9 wells) with yields ranging from 50 to 200 gpm. These facilities are used for irrigation and public supply. This aquifer system's susceptibility to contamination ranges from low to high, depending on the thickness of the surficial lacustrine clays and till.

Valparaiso Moraine Aquifer System

The Valparaiso Moraine Aquifer System consists of a heterogeneous layer of outwash sand and gravel with intertillated clay and silt lenses. The aquifer thickness ranges from about 10 to more than 150 feet, and lies about 10 to 100 feet beneath the surface of the Valparaiso Moraine; however, this aquifer system is unconfined in small isolated areas in the county where surficial tills are absent. Sand and gravel filled outwash channels of limited saturated thickness are present in western Porter County. These coarse-grained and poorly-sorted outwash channel deposits have an average thickness of about 26 feet and directly overlie the major aquifer body. However, the channel deposits may be separated from the major aquifer by a 10 to 20 foot thick clay. In the north-central part of the county, the outwash is laterally extensive and exceeds 100 feet in thickness.

In parts of the Valparaiso Moraine Aquifer System, artesian conditions exist because the overlying till behaves as an aquard. In parts of the county, water levels in the artesian wells completed in the aquifer system sometimes rise to the surface. However, static water levels are relatively deep, ranging from 25 to 80 feet below the surface.

Production from wells completed in the main aquifer body are commonly adequate for domestic use. Yields typically range from 10 to 25 gpm, although yields vary from 5 to 60 gpm. There are 14 registered significant groundwater withdrawal facilities (27 wells) with reported capacities ranging from 25 to 1000 gpm. These facilities are used primarily for irrigation, industry, and public supply. The Valparaiso Moraine Aquifer System's susceptibility to surface contamination ranges from low to high, depending on the thickness of the till cap and the stratigraphy of the moraine.

Kankakee Aquifer System

The Kankakee Aquifer System is an unconfined deposit of fine- to medium-grained sand, which is interbedded with gravel lenses in the tributary valleys. The aquifer system thickness ranges from less than 20 feet where the unit overlies bedrock highs to more than 150 feet in tributary valleys. However, the thickness is about 30 feet in most areas.

Static water levels are shallow in the Kankakee River floodplain, and are usually less than 20 feet deep. Wells typically are shallow and few exceed depths of 50 feet. However, in the tributary valleys, the depth to the water table may exceed 50 feet and well depths may exceed 150 feet. Domestic wells usually produce from 15 to 50 gpm. There are 22 registered significant groundwater withdrawal facilities (54 wells) with yields ranging from 100 to 800 gpm. These facilities are used for irrigation and public supply. Because of the absence of clay deposits, this aquifer system is highly susceptible to surface contamination.

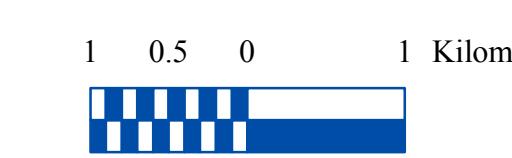
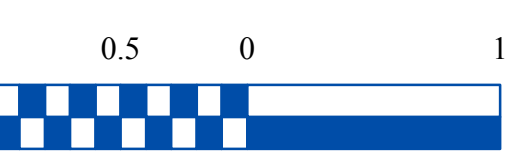
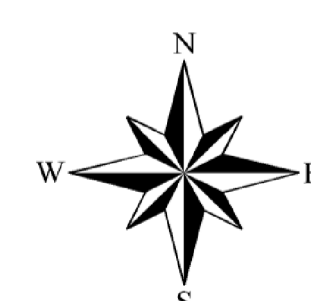
Valparaiso Outwash Apron Aquifer System

This aquifer system, which forms the southern slope of the Valparaiso Moraine, is a deposit of fine- to medium-grained sand interbedded with shale rich gravel zones and clay lenses scattered throughout the apron. The outwash apron is more than 100 feet thick in places.

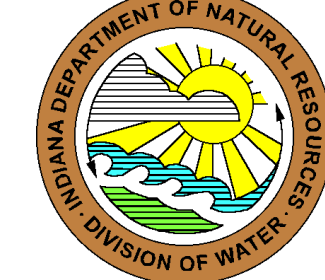
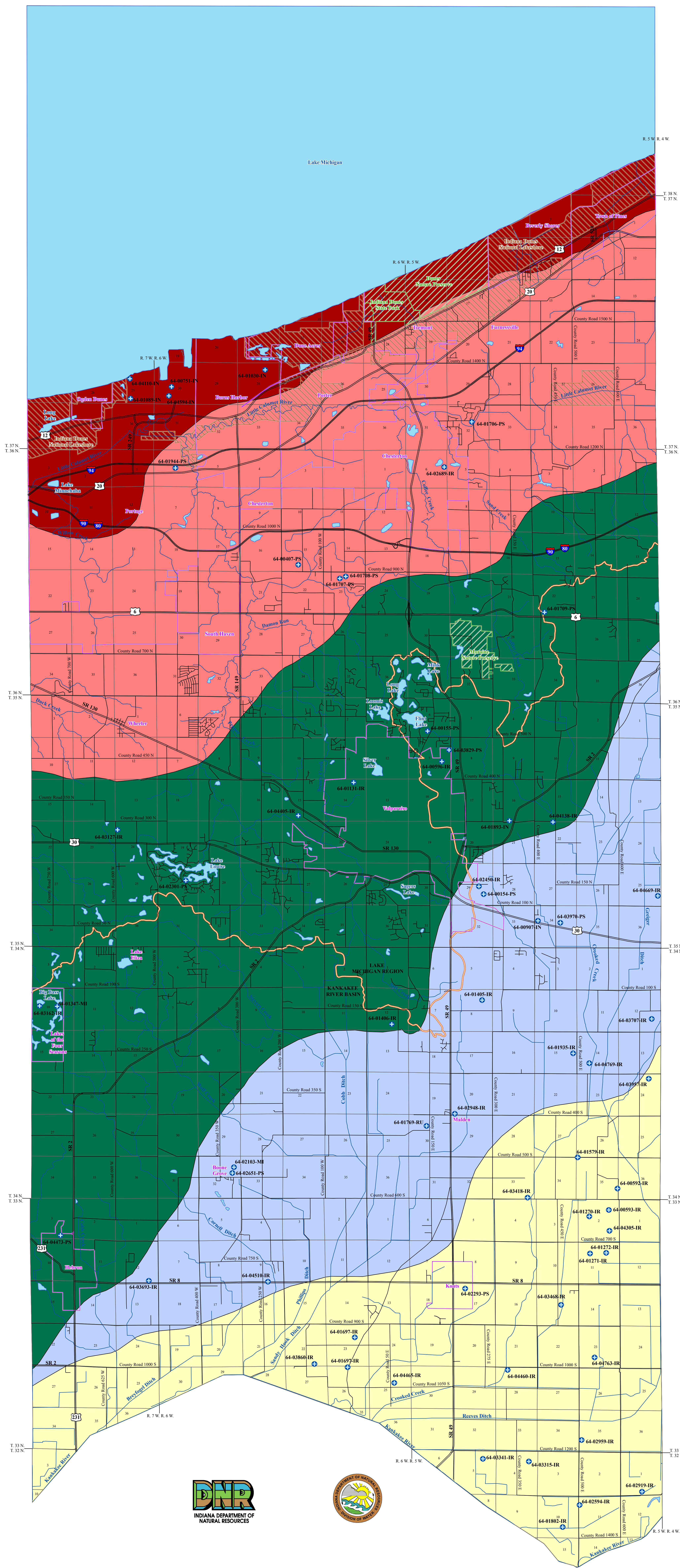
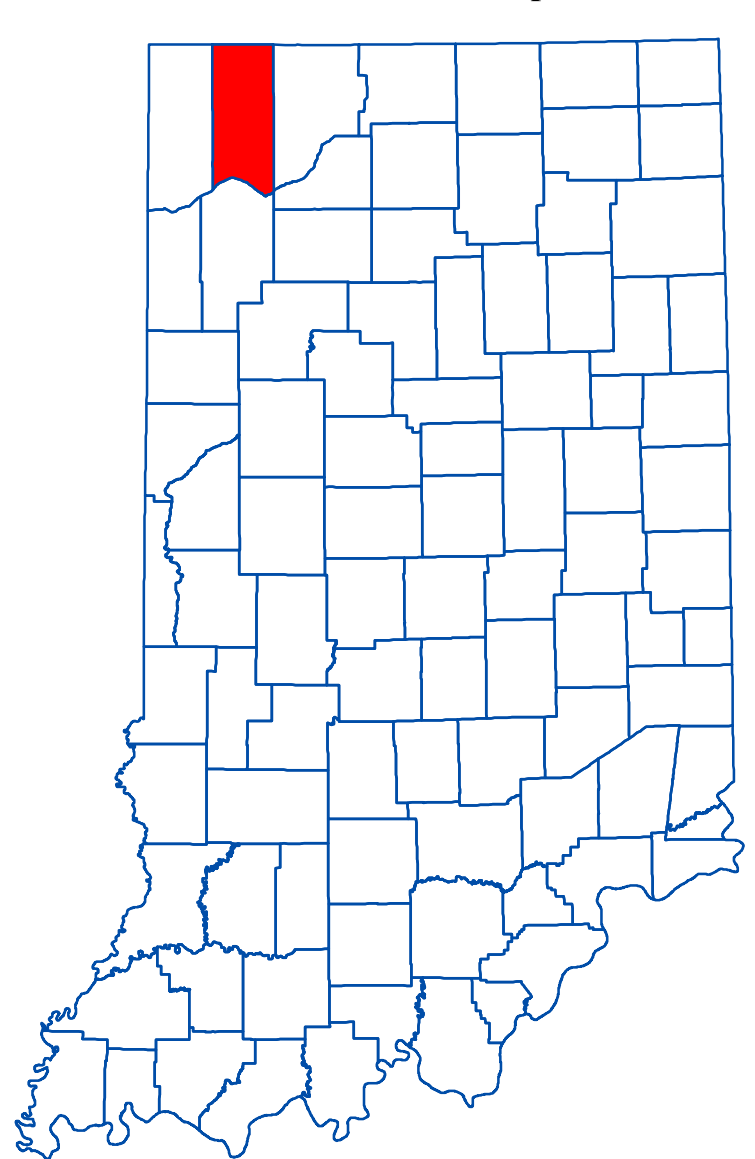
Most wells completed in the upper aquifer unit of the system have depths ranging from 30 to more than 100 feet. The wells completed in the lower aquifer unit of the system typically exceed 50 feet and may be more than 150 feet in depth. Static water levels are typically less than 20 feet deep, but at higher surface elevations, may exceed 40 feet. Yields in the upper and lower aquifer units are similar, ranging from 15 to 60 gpm for domestic wells. There are 15 registered significant groundwater facilities (35 wells) with yields ranging from 7 to 800 gpm. These facilities are used primarily for irrigation, industry, rural use, and public supply. Because there is no clay rich cap, the aquifer system is highly susceptible to surface contamination.

EXPLANATION

- Registered Significant Groundwater Withdrawal Facility
- Stream
- County Road
- State Road & US Highway
- Interstate
- Basin Boundary
- Municipal Boundary
- State Managed Property
- National Park Service Managed Property
- Lake & River



Location Map



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Unconsolidated Aquifer Systems of Porter County, Indiana

by
 Division of Water
 1990, 1994

POTENTIOMETRIC SURFACE MAP OF THE UNCONSOLIDATED AQUIFERS OF PORTER COUNTY, INDIANA

Porter County, Indiana is located in the northwest portion of the state and is situated within two major drainage basins. The county is split between the Lake Michigan Region to the north and the Kankakee River Basin to the south.

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.

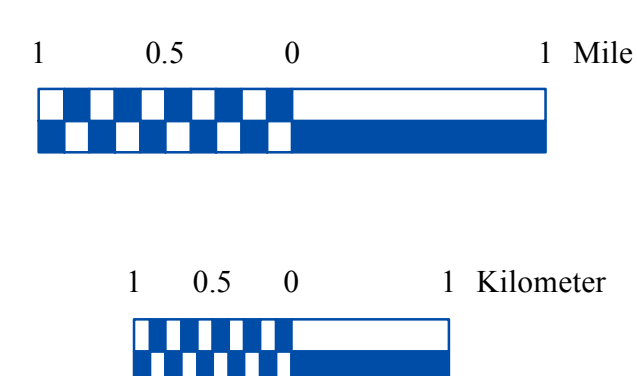
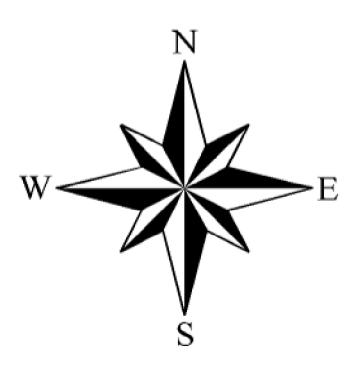
Coordinate locations of water well records were physically obtained in the field, determined through address geocoding, or reported on water well records. Elevation data were either obtained from topographic maps or a digital elevation model (DEM). Elevation and location quality control/assurance procedures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

In Porter County well depths 100 feet or less were a priority in mapping the potentiometric surface. However, deeper wells were used in areas where data was sparse. There are approximately 10,088 water well records in the county of which, 7,779 are within the priority depth range. Approximately 2,724 (35%) of wells within the priority depth range are located. Potentiometric surface elevations range from a high of 760 feet mean sea level (msl) in the east-central region of the county near the Lake Michigan-Kankakee Basin Divide, to a low of 590 feet msl in the north part of the county near Lake Michigan. Generalized groundwater flow direction for most of Porter County is towards major drainage relevant to the basin. Therefore, in the Lake Michigan Basin, groundwater flow is north-northwest towards Lake Michigan, and to the south towards the Kankakee River for the Kankakee River Basin.

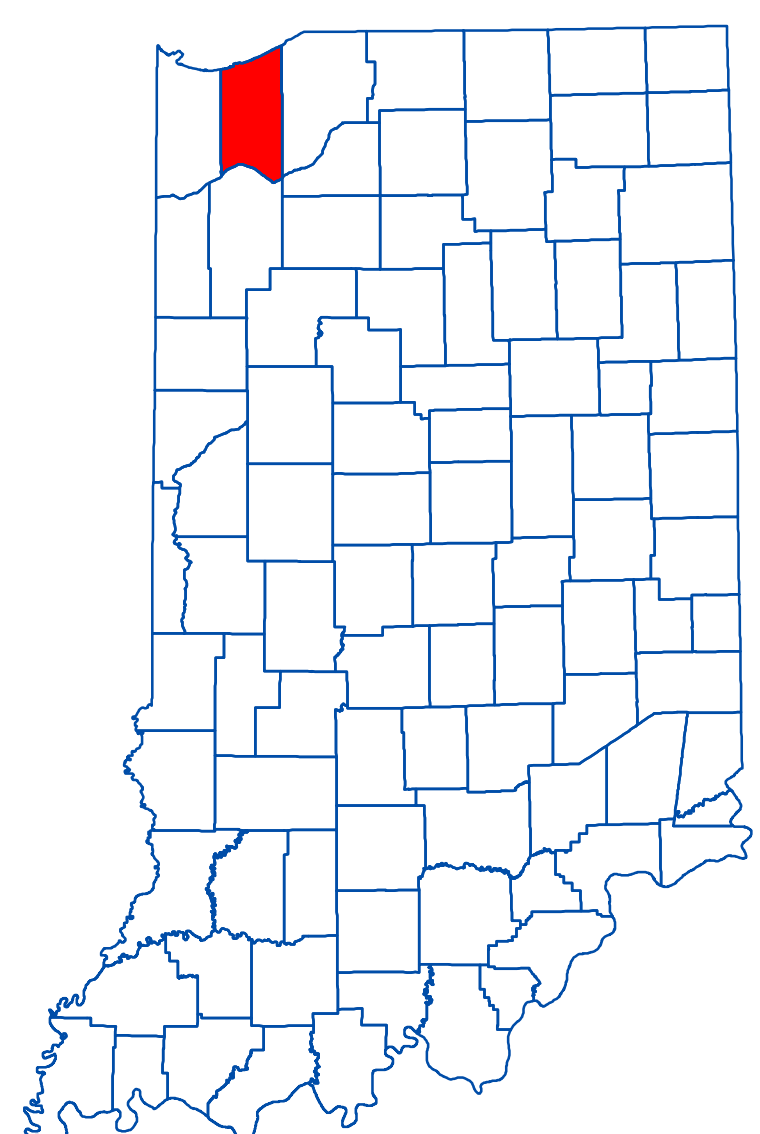
Much of northern Porter County includes lake sediments and dune sands at the surface. Southern portions include outwash plain and valley train sediments at the surface. Therefore, most of the potentiometric surface for these areas of the county is generally under unconfined or semi-confined conditions. Approximately 39% of located wells are in these areas. However, most of central Porter County includes ground and end moraine sediments at the surface. Therefore, the potentiometric surface in this region is more commonly considered under confined conditions. The remaining 61% of located wells are in this area.

EXPLANATION

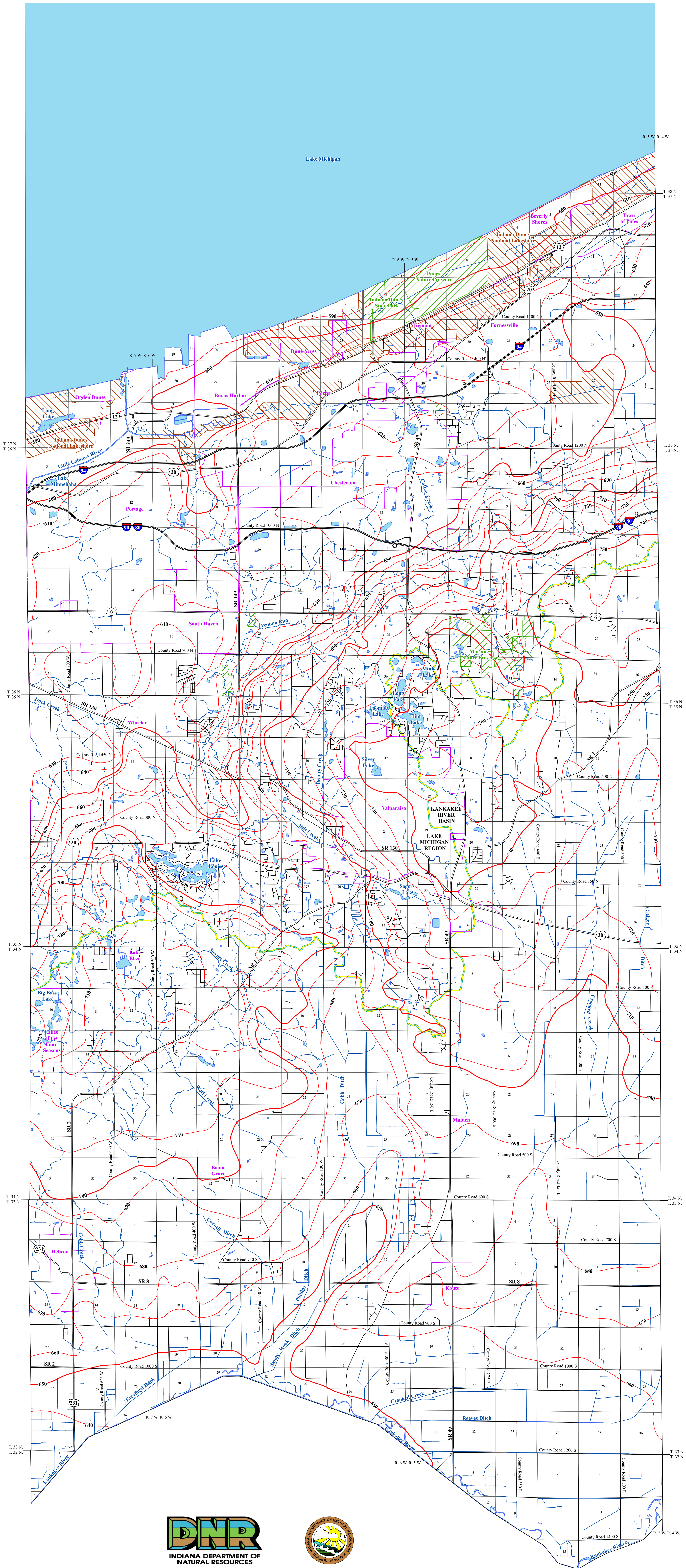
- 750 Line of equal elevation, in feet above mean sea level. Potentiometric Contour interval 10 feet
- Stream
- County Road
- State Road & US Highway
- Interstate
- Basin Boundary
- Municipal Boundary
- State Managed Property
- Indiana Dunes National Lake Shore
- Lake & River



Location Map



Hillshade Map of Porter County, Indiana



Map Use and Disclaimer Statement

Map generated by Scott H. Darr,
INDR, Division of Water, Resource Assessment Section

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Potentiometric Surface Map of the Unconsolidated Aquifers of Porter County, Indiana

by
Randal D. Maier
Division of Water, Resource Assessment Section
March, 2012

Porter County

