

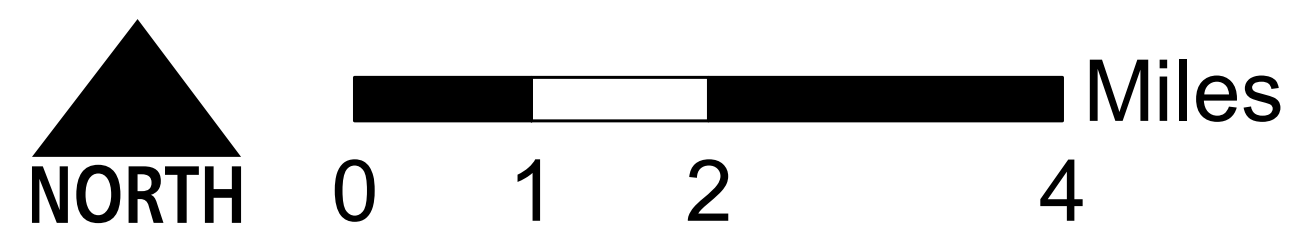
Water Resources and Use in Grant County

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

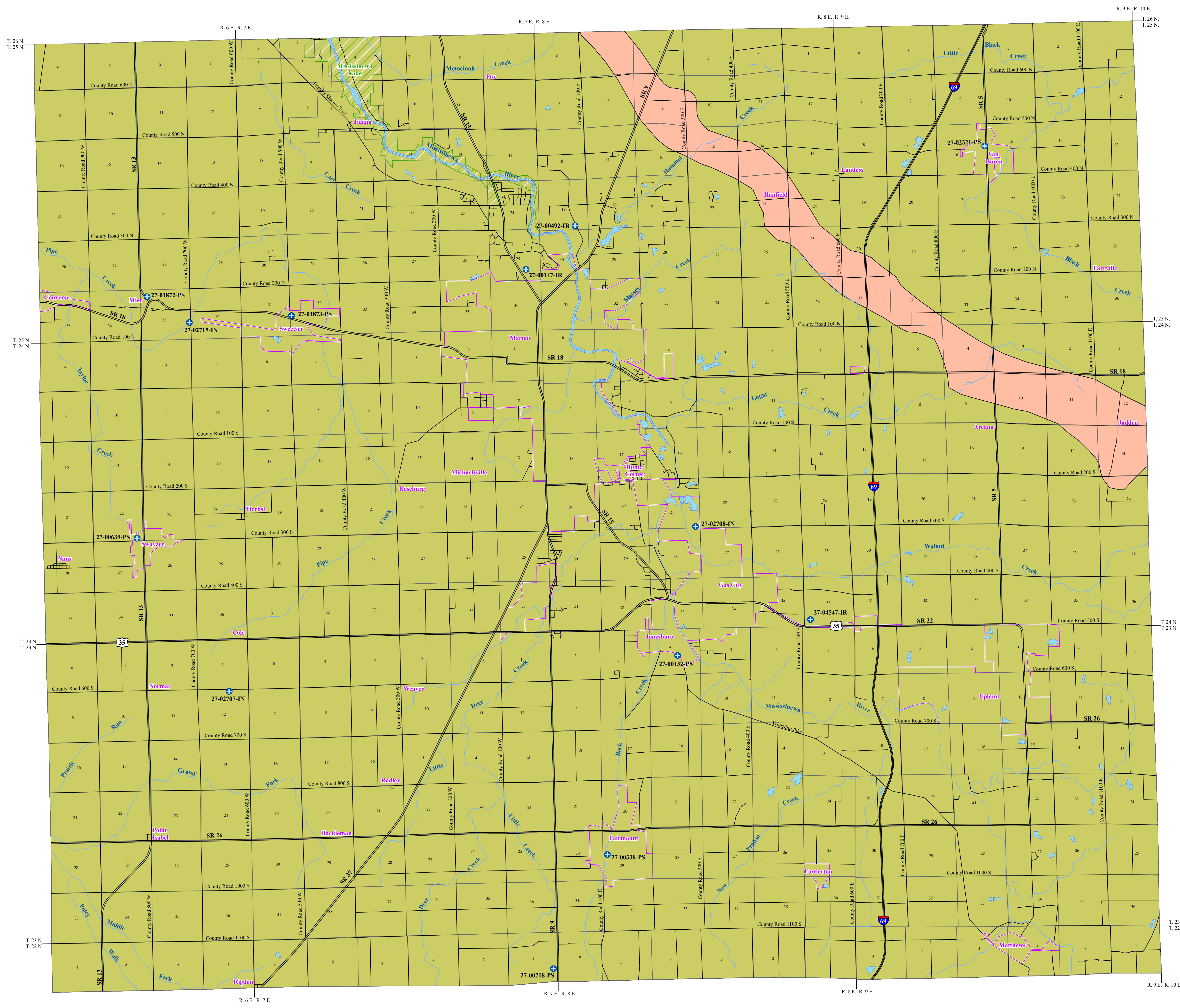
- Withdrawal Location**
- | | | |
|---|---|---------------|
| ● | ▼ | Energy/Mining |
| ● | ▼ | Industry |
| ● | ▼ | Irrigation |
| ● | ▼ | Misc. |
| ● | ▼ | Public Supply |
| ● | ▼ | Rural Use |

- River**
- 7Q2 Flow (MGD)**
- | | |
|---|---------------|
| — | <10 MGD |
| — | 10 - 50 MGD |
| — | 50 - 100 MGD |
| — | 100 - 500 MGD |
| — | > 500 MGD |

- | | |
|---|-------------|
| ■ | Major Lakes |
| — | Interstate |
| — | County |
| ⊠ | City |



BEDROCK AQUIFER SYSTEMS OF GRANT 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.

Bedrock aquifer systems in the county are overlain by unconsolidated deposits of varying thickness. Bedrock depth ranges from 50 feet or less below the surface on the western portion of the county to more than 450 feet below the surface in the buried bedrock valley that cuts across the northeastern portion of Grant County. However, throughout much of Grant County bedrock is commonly 100 to 200 feet below the surface. 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 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.

Two bedrock aquifer systems are identified for Grant County. They are, from younger to older: the Silurian and Devonian Carbonates, and the Maquoketa Group of Ordovician age. Bedrock wells represent about 50 percent of all wells completed in the county.

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.

Silurian and Devonian Carbonates Aquifer System

The Silurian and Devonian Carbonates Aquifer System subsurfaces throughout much of Grant County. This aquifer system consists exclusively of Silurian age carbonates in Grant County. Because individual units of the Silurian and Devonian systems consist 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.

Wells completed in the Silurian and Devonian Carbonates Aquifer System are generally capable of meeting the needs of domestic and some high-capacity users in Grant County. Domestic wells utilizing this system have reported depths ranging from 30 to 497 feet, but are typically 90 to 220 feet deep. The amount of rock penetrated in this system commonly ranges from 30 to 150 feet. Typical yields for domestic wells range from 12 to 40 gallons per minute (gpm) and static water levels are generally 20 to 55 feet below land surface. There are 14 registered significant ground-water withdrawal facilities (29 wells) with reported yields from 15 to 550 gpm.

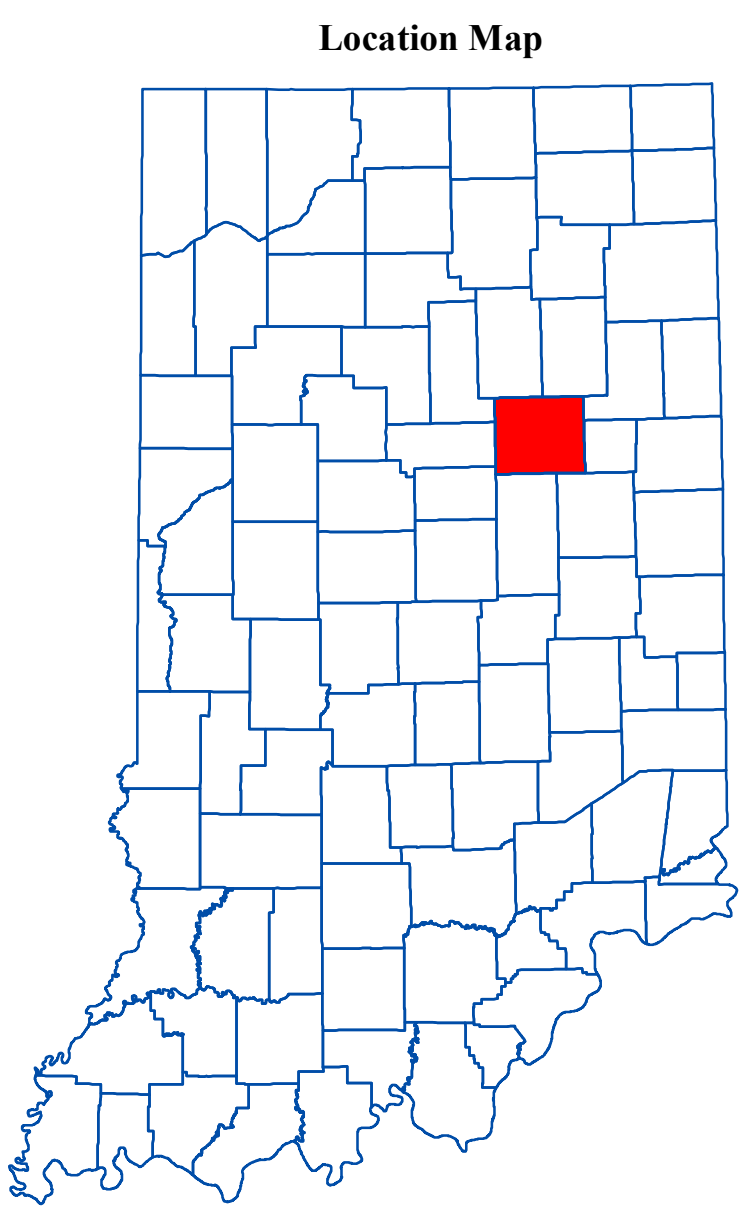
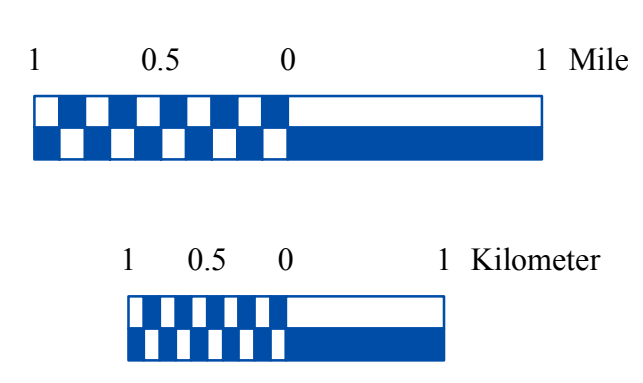
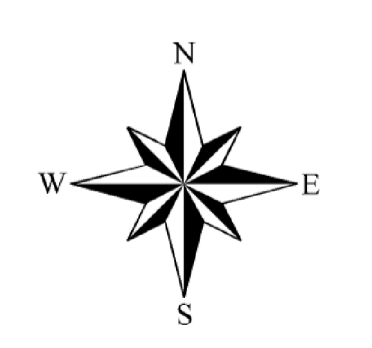
In most of Grant County the Silurian and Devonian Carbonates Aquifer System has a low susceptibility to surface contamination because it is overlain by thick clay deposits. However, solution features (caves) are described on a few well records suggesting minor karst development. Therefore, areas where overlying clays are thin or absent are at moderate to high risk to contamination.

Ordovician - Maquoketa Group Aquifer System

In Grant County, the Maquoketa Group subsurfaces only in the buried pre-glacial valley where the overlying Silurian and Devonian bedrock has been removed by erosion. The Maquoketa Group consists mostly of shale with interbedded limestone units. In general, this system ranges from 650 to 750 feet thick in the county. However, no known wells utilize this aquifer system in Grant County because the Maquoketa Group lies about 250 to 450 feet below the ground surface and adequate water supplies are typically found in the overlying unconsolidated deposits or in the Silurian and Devonian Carbonates, where present. This aquifer system has a low susceptibility to surface contamination because thick clay deposits cover the subcrop area.

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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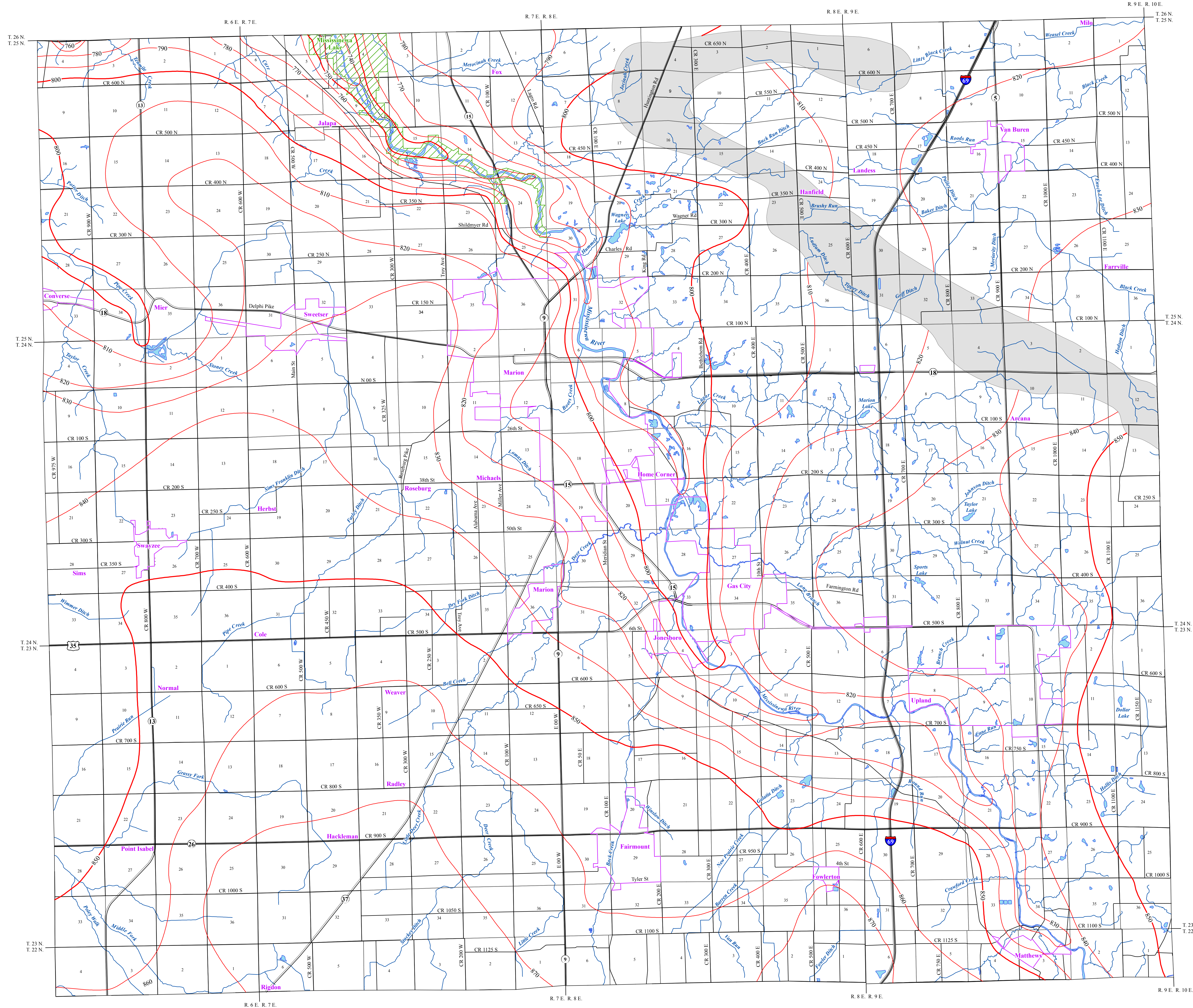
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Bedrock Aquifer Systems of Grant County, Indiana

by
Gregory P. Schrader and Robert A. Scott
Division of Water, Resource Assessment Section

June 2009

POTENTIOMETRIC SURFACE MAP OF THE BEDROCK AQUIFERS OF GRANT COUNTY, INDIANA



Grant County, Indiana is located in the north-central section of the state. The entire county lies within the Upper Wabash River Basin. The Potentiometric Surface Map (PSM) of the bedrock aquifers of Grant County was mapped by contouring the elevations of approximately 1300 static water-levels reported on well records received primarily over a 20 year period. These wells are completed in aquifers at various depths, and typically, under confined conditions (bounded by impermeable layers above and below the water-bearing formation). However, some wells were completed under unconfined (not bounded by impermeable layers) settings. The potentiometric surface is a measure of the pressure on water in a water bearing formation. Water in an unconfined aquifer is at atmospheric pressure and will not rise in a well above the top of the water bearing formation, in contrast to water in a confined aquifer which is under hydrostatic pressure and will rise in a well above the top of the water bearing formation.

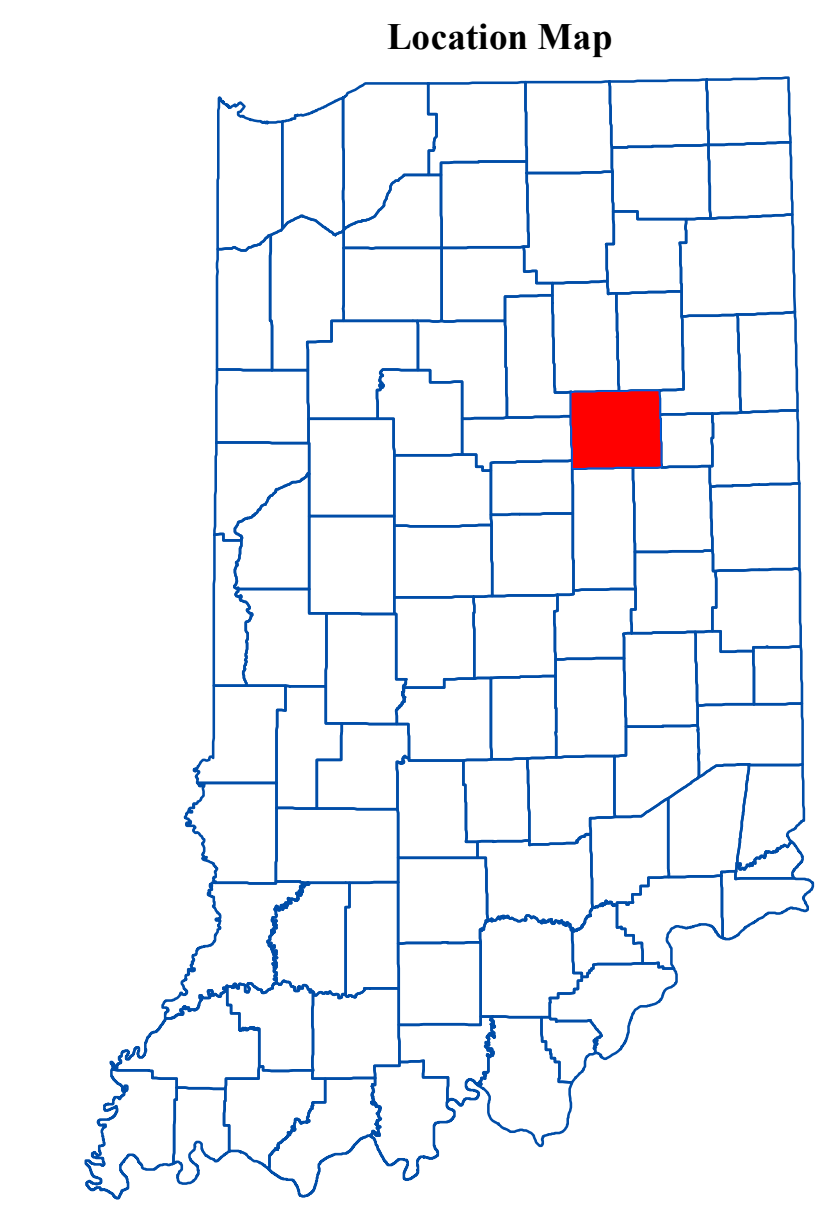
Static water-level measurements in individual wells used to construct county PSM's are indicative of the water-level at the time of well completion. The groundwater level within an aquifer constantly fluctuates in response to rainfall, evapotranspiration, groundwater movement and pumping. Therefore, measured static water-levels in an area may differ due to local or seasonal variations. Because fluctuations in groundwater are typically small, static water-levels can be used to construct a generalized PSM. As a general rule, but certainly not always, groundwater flow approximates the overlying topography and intersects the land surface at major streams.

The bedrock potentiometric surface elevation contours have not been extended through some portions of northern and central Grant County. This area is lacking in data and/or covered by more prolific unconsolidated deposits that limit the necessity to complete wells in bedrock. In this area, glacial sediments with thicknesses more than 400 feet in places have filled a deep bedrock valley, the Lafayette (Teays) Bedrock Valley System.

Universal Transverse Mercator (UTM) coordinates for the water wells were obtained in the field, determined through address geocoding, or reported on water well records by the drillers. However, the location of the majority of the water well records used to make the PSM were field verified. Elevation data were obtained from a digital elevation model. Quality control/quality assurance procedures were utilized to refine or remove data where errors were readily apparent.

Bedrock potentiometric surface lines in Grant County range from a southerly high of 870 feet mean sea level (msl) near the towns of Fowlerton and Hacklemans, to a northward low of 740 feet msl just above the headwaters of Mississinewa Lake. Groundwater flow direction is generally to the west and northwest, and towards major streams in the county, the Mississinewa River and its tributaries, and Pipe Creek.

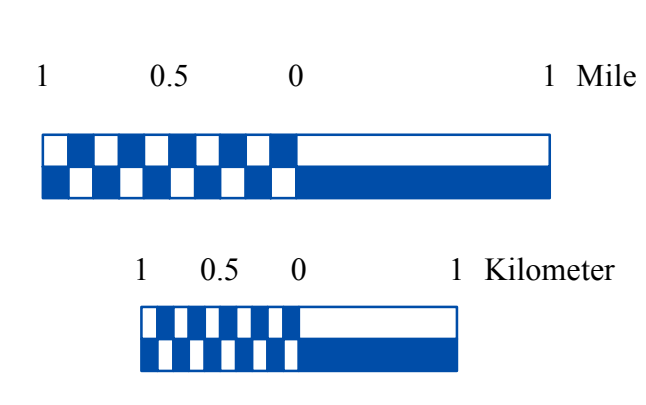
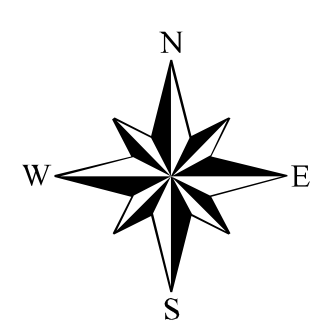
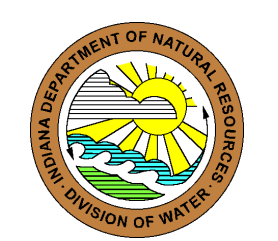
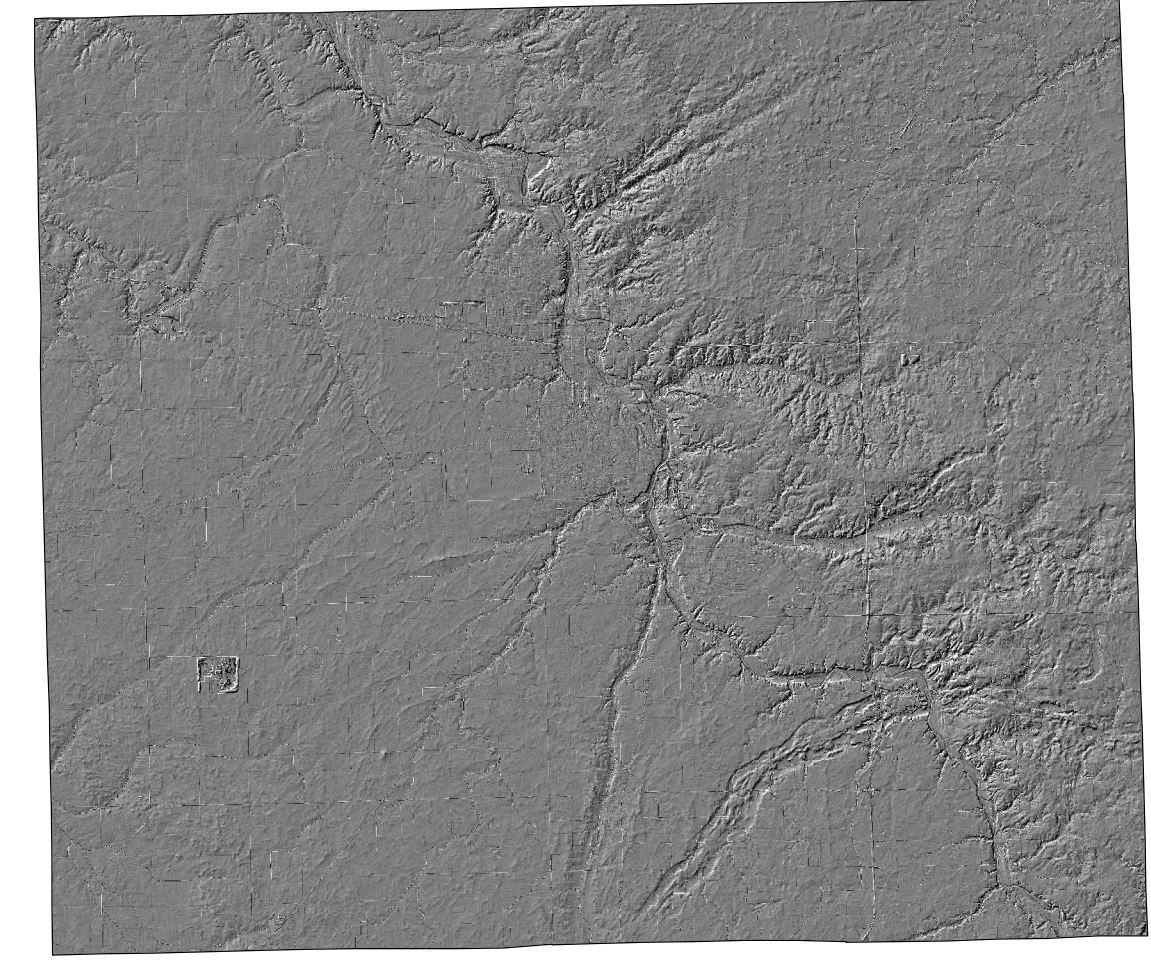
The county PSM can be used to define the regional groundwater flow path and to identify significant areas of groundwater recharge and discharge. County PSM's represent overall regional characteristics and are not intended to be a substitute for site-specific studies.



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
- Municipal Boundary
- State Managed Property
- Lake & River
- No Aquifer Material or Limited Data

Hillshade Map of Grant County, Indiana



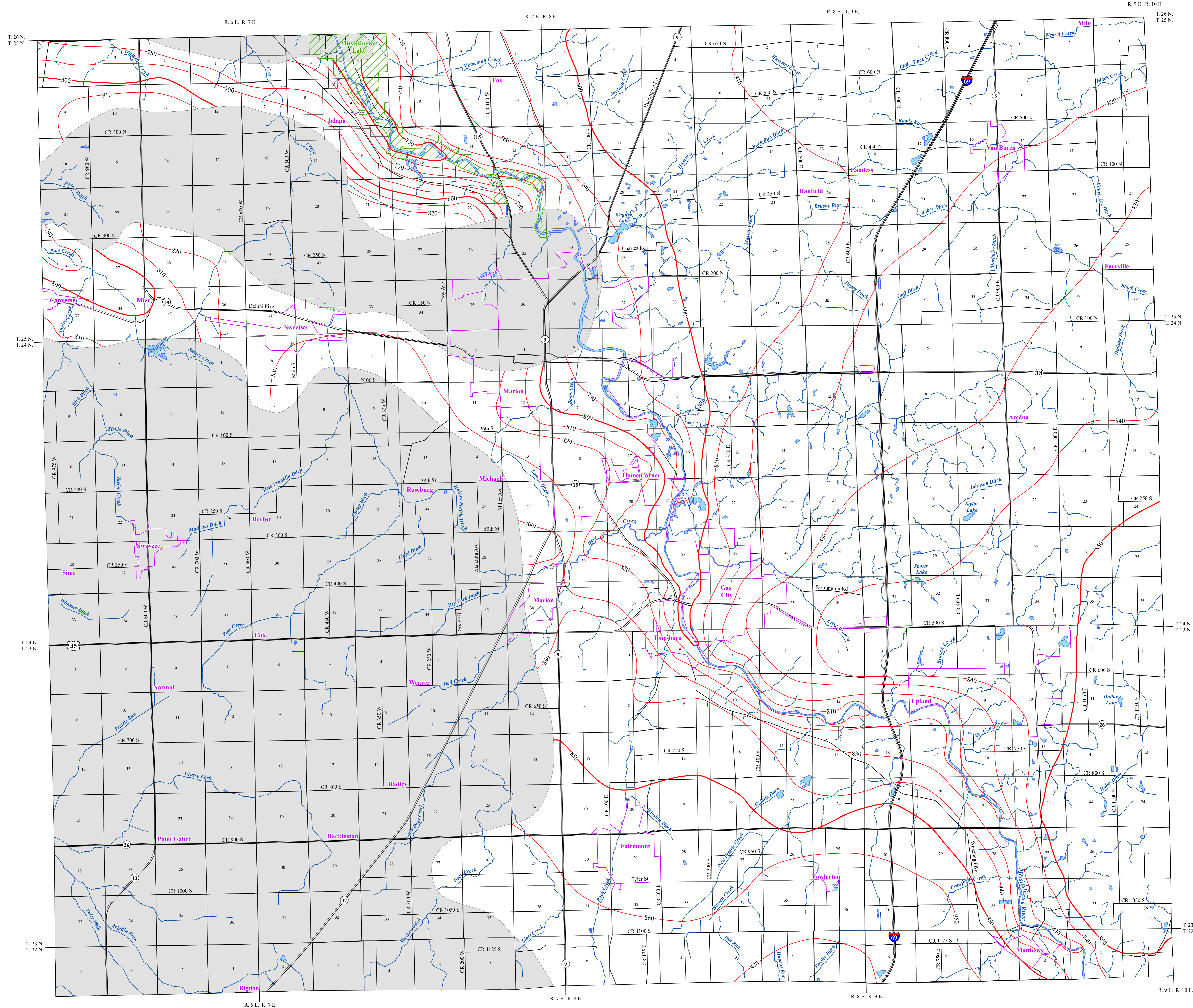
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Potentiometric Surface Map of the
Bedrock Aquifers of Grant County, Indiana
by
Glenn Grove
Division of Water, Resource Assessment Section
October 2013

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



Grant County, Indiana is located in the north-central section of the state. The entire county lies within the Upper Wabash River Basin. The Potentiometric Surface Map (PSM) of the unconsolidated aquifers of Grant County was mapped by contouring the elevations of approximately 890 static water-levels reported on well records received primarily over a 50 year period. These wells are completed in aquifers at various depths, and typically, under confined conditions (bounded by impermeable layers above and below the water bearing formation). However, some wells were completed under unconfined (not bounded by impermeable layers) settings. The potentiometric surface is a measure of the pressure on water in a water bearing formation. Water in an unconfined aquifer is at atmospheric pressure and will not rise in a well above the top of the water bearing formation, in contrast to water in a confined aquifer which is under hydrostatic pressure and will rise in a well above the top of the water bearing formation.

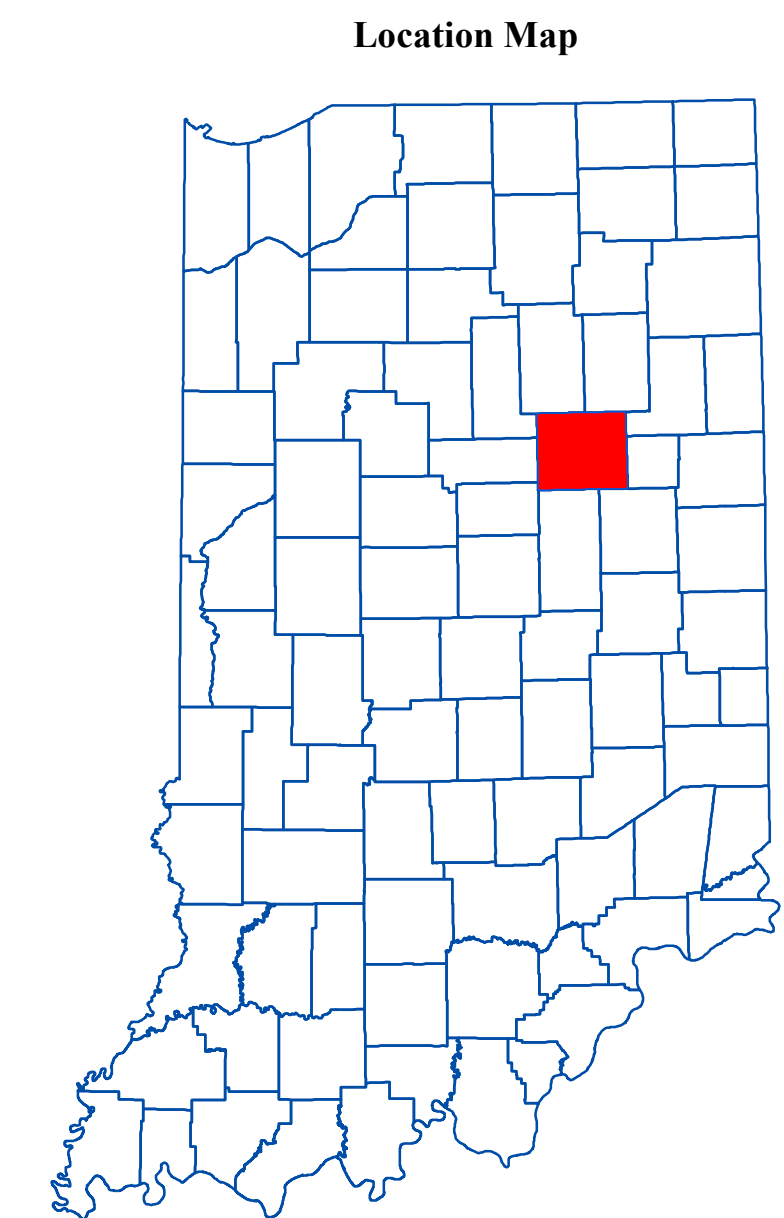
The mapped potentiometric surface contours primarily utilized data obtained from wells 100 feet or less in depth. If the shallow data was sparse or unavailable in an area, deeper wells were used to complement the mapping. There are large portions in western Grant County where unconsolidated well data is lacking and/or covered by thin or unproductive deposits; therefore, the potentiometric surface elevation contours have not been extended through these areas.

Static water-level measurements in individual wells used to construct county PSM's are indicative of the water-level at the time of well completion. The groundwater level within an aquifer constantly fluctuates in response to rainfall, evapotranspiration, groundwater movement and pumping. Therefore, measured static water-levels in an area may differ due to local or seasonal variations. Because fluctuations in groundwater are typically small, static water-levels can be used to construct a generalized PSM. As a general rule, but certainly not always, groundwater flow approximates the overlying topography and intersects the land surface at major streams.

Universal Transverse Mercator (UTM) coordinates for the water wells were obtained in the field, determined through address geocoding, or reported on water well records by the drillers. However, the location of the majority of the water well records used to make the PSM were field verified. Elevation data were obtained from a digital elevation model. Quality control/quality assurance procedures were utilized to refine or remove data where errors were readily apparent.

Unconsolidated potentiometric surface elevations in Grant County range from a southerly high of 870 feet mean sea level (msl) south of the Town of Fowlerton, to a low of 750 feet msl in the north-central part just above the headwaters of Mississippi Lake. Groundwater flow direction is generally to the west and northwest, and towards major streams in the county, the Mississippi River and its tributaries, and Pipe Creek.

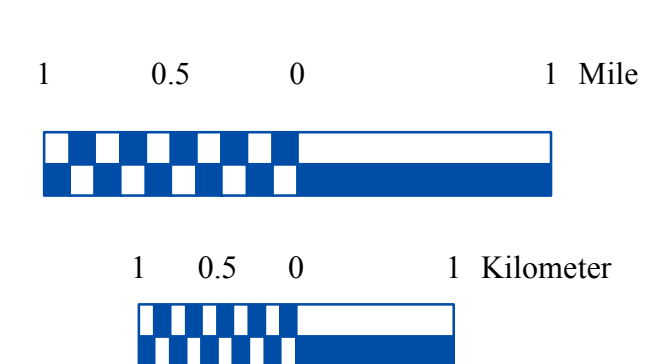
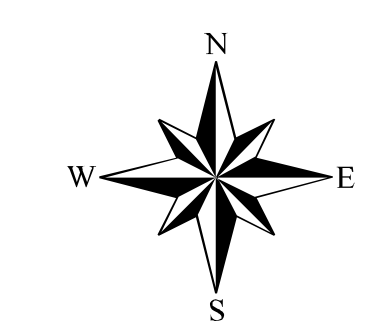
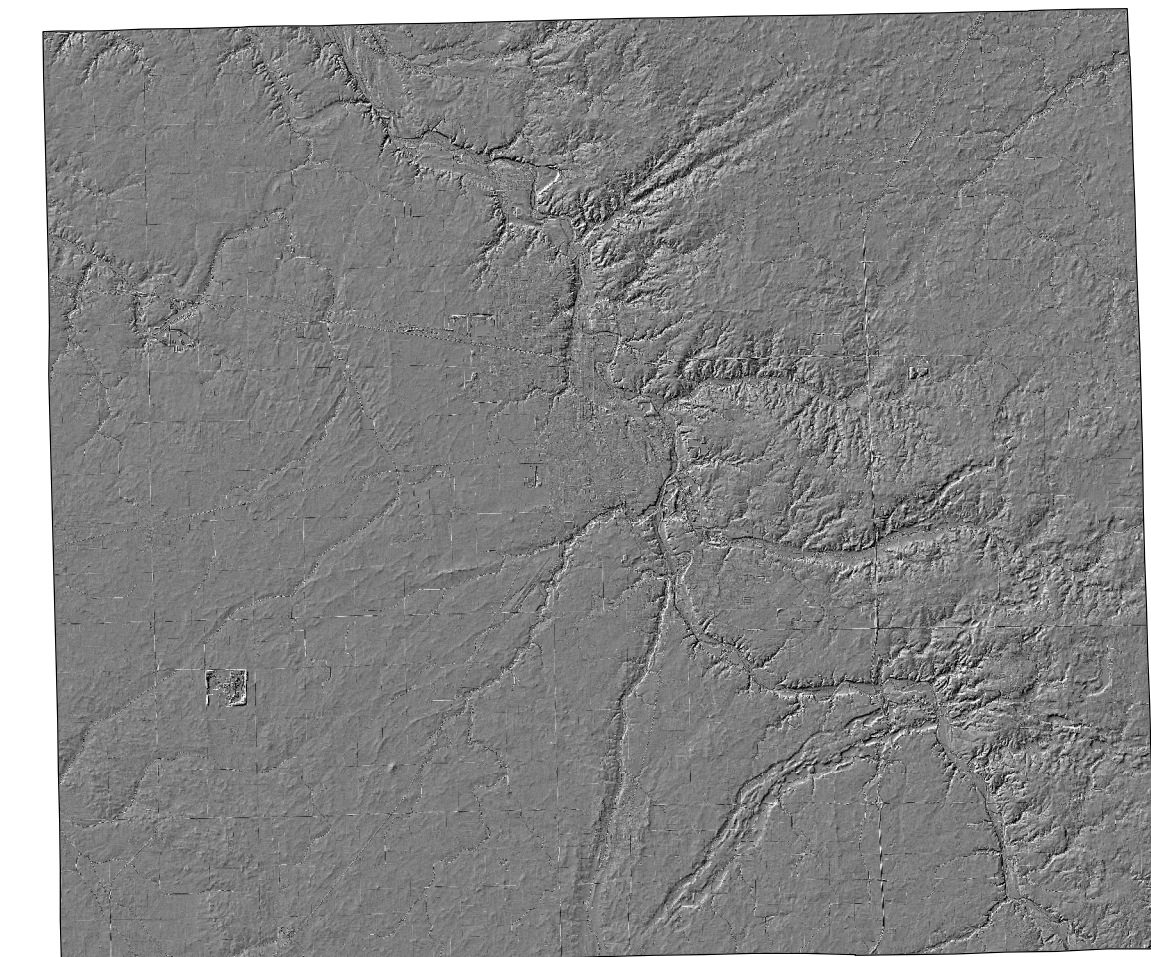
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EXPLANATION

- 800 — Line of equal elevation, in feet above mean sea level
- Potentiometric Contour interval 10 feet
- Stream
- County Road
- State Road
- US Highway
- Interstate
- Municipal Boundary
- State Managed Property
- Lake & River
- No Aquifer Material or Limited Data

Hillshade Map of Grant County, Indiana



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Potentiometric Surface Map of the Unconsolidated Aquifers of Grant County, Indiana
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October 2013

Grant County

