INDIANA UNIVERSITY
INDIANA GEOLOGICAL SURVEY

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Open-File Study 03-10

EXPLANATION

This map presents basic bedrock geologic information that contributes to the characterization of potential aggregate resources, characterization of bedrock aquifer systems, and analysis of the overlying predominantly glacial deposits. This map is based on data obtained from several thousand records including petroleum well drillers' logs, geophysical logs, water well drillers' logs, descriptions of cores recovered by the Indiana Geological Survey, seismic refraction records collected by the Indiana Geological Survey, natural exposures in and near the map area, and exposures in active and abandoned quarries. The map was created by modeling the bounding surfaces of mapped units using a computer gridding and contouring software. Each of the computer-modeled boundary surfaces is a 60-meter grid aligned with the U.S.Geological Survey (USGS) 30-meter, 1:24,000-scale, digital elevation model grid to facilitate the development of derivative map products, such as overburden maps. The techniques used to model stratigraphic boundaries are adaptations of techniques described by Hasenmueller (1995, 1998). Subcrop lines shown on the map are computed intersections between stratigraphic unit boundaries and the bedrock surface mapped by Hasenmueller and James (2003). The Trenton Limestone (Ordovician) underlies the entire map area but does not outcrop or subcrop within the map area. The contact between the Trenton and overlying Maquoketa Group (Ordovician) is well documented in the eastern part of the map area and, thus, plays a key role in the analysis of regional and local structures. Structural trends and minor features revealed by Hasenmueller and James's (2002) map showing the approximate top of the Trenton were transferred to mapped boundary surfaces by adding isochore intervals.

The map shows the distribution of gently dipping Paleozoic sedimentary rocks subcropping and outcropping on the crest and western flank of the Cincinnati Arch. The simplicity of the regional structure suggests that the map can be used to make precise predictions of rock unit distribution. The remoteness of the mapped units -- subcrops are well over 400 feet below the topographic surface in some places -- presence of minor structural features that disrupt the regional trend, unconformities within the Paleozoic rock sequence that complicate boundary surfaces, and imprecision inherent to some of the data used to construct the map make it inadvisable to regard this map product as the final authority on geologic conditions at specific sites within the map area. The map is a summary and interpretation of geologic information available in the public domain and is intended to serve as a guide to planning cost-effective site-specific evaluations of geologic conditions.

Two stratigraphic revisions have been incorporated into the map. The base of the Pleasant Mills Formation and Salina Group has been moved from the base of the Limberlost Dolomite to the base of the Waldron Shale Member of the Pleasant Mills Formation and the use of the terms Pleasant Mills Formation and Salina Group have been extended throughout the map area (see explanation of map symbols). These revisions simplify Silurian nomenclature in the map area and greatly increases control on the top of the Salamonie Dolomite because Waldron shale is a distinct lithology that is more frequently and reliably recorded ity the records used in the construction of this map. Placing the Pleasant Mills-Salamonie boundary at the base of the Waldron is likely to facilitate subsequent hydrologic and resource assessment studies because Waldron shale most likely is an aquitard throughout the map area and is a convenient stratigraphic position for quarry benching.

The trace of the Fortville Fault, shown near the northwest corner of the map, has been slightly modified from previously published maps of the area (Gray, Ault, and Keller, 1987; Hasenmueller and James, 2002).

This map is the result of a cooperative mapping agreement between the USGS and the Indiana Geological Survey. The mapping was supported with USGS National Mapping Program STATEMAP funds and matching funds from the Indiana Geological Survey.

EXPLANATION OF MAP SYMBOLS

DMnar Rockford Limestone and New Albany Shale undifferentiated -- Organic-rich shale and minor amounts of impure limestone. The Rockford Limestone is a thin, persistent, impure limestone that rests conformably on the New Albany Shale. The Rockford and New Albany are not differentiated because the Rockford, which is rarely more than 10 feet thick, is too thin to map as a separate unit. The New Albany consists of brownish-black, carbon-rich shale, greenish-gray shale, and minor amounts of carbonate and quartz sandstone. The New Albany is divided into six irregularly developed members, in descending order these are the Ellsworth, Cleg Creek, Camp Run, Morgan Trail, Selmier, and Blocher Members. The full thickness of the undifferentiated Rockford/New Albany is not present in the map area.

Dm Muscatatuck Group -- Limestone and dolomite. The Muscatatuck Group consists of two formations; these are, in descending order, the North Vernon Limestone and Jeffersonville Limestone. Muscatatuck formations were not mapped because they are thin and not well documented in the map area. Drillers' logs, especially older drillers' logs in the map area, refer to the Muscatatuck as the "Corniferous Limestone" and do not differentiate units within the Muscatatuck. The contact between the Muscatatuck and overlying New Albany Shale is an abrupt and possibly unconformable transition from limestone to black, organic-rich shale (Droste and Shaver, in Shaver and others, 1986, p. 99) that is well documented in drilling records in the map area. The contact between the Muscatatuck and underlying Silurian rocks is a diachronous regional unconformity. The Muscatatuck rests on the Wabash Formation in all but the southeastern part of the map area where the Muscatatuck rests on the Salamonie Dolomite.

Sw Wabash Formation -- Limestone, dolomite, and argillaceous or silty dolomite. The Wabash Formation is subdivided into two irregularly developed named members in the map area; these are, in descending order, the Liston Creek Limestone and Mississinewa Shale Members. The upper contact of the Wabash Formation is a regional unconformity between Devonian and Silurian rocks. The Wabash thickens northwestward in the map area and is absent in the southeastern part of the map area. Recorded thickness of the Wabash Formation ranges from 5 to 81 feet and averages 29 feet in the map area. The contact between the Wabash Formation and underlying Pleasant Mills Formation is conformable and gradational. The gradation from the Mississinewa Shale Member of the Wabash Formation to the Louisville Limestone Member of the Pleasant Mills Formation is generally an interval of several feet. Wabash boundaries are extrapolations where reef facies replace the above-mentioned members.

Spm Pleasant Mills Formation -- Dolomite, limestone, and argillaceous dolomite. The Pleasant Mills Formation was proposed by Droste and Shaver (1982, p. 11-17) to include, in descending order, the Louisville Limestone, Waldron Shale, and Limberlost Dolomite Members. It rarely is possible to differentiate the Limberlost Dolomite and underlying Salamonie Dolomite carbonates in the map area. The lithologic change that marks the base of the Waldron Shale Member of the Pleasant Mills Formation is distinct and commonly noted in drillers' logs and other geologic records from the map area; therefore, the Pleasant Mills Formation is herein restricted to the rocks from the top of the Louisville Limestone Member to the base of the Waldron Shale Member and the Limberlost Dolomite is assigned to the Salamonie Dolomite. Both the upper and lower contacts of the Pleasant Mills Formation, as herein defined, are conformable. The Pleasant Mills thickens northward in the map area. Recorded thickness of the Pleasant Mills ranges from 10 to 85 feet and averages 56 feet in the map area. Pleasant Mills boundaries are extrapolations where reef facies replace the above-mentioned members.

Ss Salamonie Dolomite -- Dolomite and argillaceous limestone and dolomite. The Salamonie Dolomite was named by Pinsak and Shaver (1964, p. 24) for the rocks extending from the base of the Waldron Formation to the top of the Brassfield Limestone. The Salamonie Dolomite is herein amended to include the rocks from the unconformity at the top of the Sexton Creek Limestone (Rexroad and Droste, 1982) to the base of the Waldron Shale Member of the Pleasant Mills Formation. The amended Salamonie thickens northward in the map area. Recorded thickness of the Salamonie ranges from 6 to 93 feet and averages 52 feet in the map area. Impure carbonates and thin shales are most prominent in the lower Salamonie. The upper Salamonie, which includes the Limberlost Dolomite Member, consists of relatively pure carbonates.

Ssc Sexton Creek Limestone -- Cherty and argillaceous limestone. The name Sexton Creek Limestone is herein applied to the rocks from the unconformity at the base of the Silurian to the unconformity at the base of the Salamonie Dolomite. This usage is adopted in order to map a single thin basal Silurian formation bounded at its base and top by regional unconformities. Rexroad and Droste (1982, p. 3) recognized that the Sexton Creek Limestone of western and central Indiana terminology and the Brassfield Limestone of southeastern Indiana terminology are part of a single Early Silurian blanket carbonate. The name Sexton Creek, which postdates the name Brassfield Limestone, is preferred here because these basal Silurian rocks are dominated by cherty limestones throughout most of central Indiana. A thin limestone which underlies the cherty limestones or the Salamonie is probably the equivalent of the Brassfield Limestone in parts of the map area. The Sexton Creek thickens westward in the map area. Recorded thickness of the Sexton Creek ranges from 2 to 36 feet and averages 17 feet in the map area.

Om Maquoketa Group -- Shale and limestone. The Maquoketa Group consists of three formations: the Whitewater Limestone, Dillsboro Formation, and Kope Formation, in descending order (Gray and Shaver, in Shaver, and others, 1986, p. 88-89). The Maquoketa is bounded by unconformities at its base and top (Gray and Shaver, in Shaver and others, 1986, p. 88-89). The Whitewater Formation is present at the top of the Maquoketa throughout most of the map area. West of the map area, where the Maquoketa is thin, Silurian carbonates rest directly on the Dillsboro Formation. Many oil and gas drillers were apparently unaware of this relationship and included the Whitewater Limestone in the dominantly carbonate sequence described as "Silurian." The Maquoketa thins westward in the map area. Recorded thickness of the Maquoketa ranges from 519 to 765 feet and averages 678 feet in the map area.

Correlation of Map Units

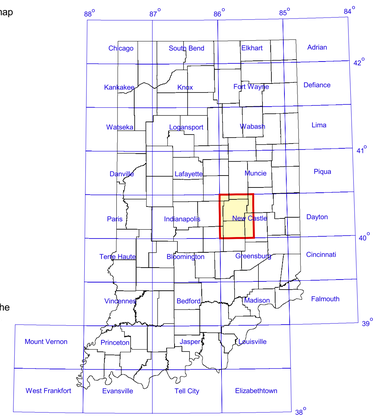
MAP UNIT	SERIES	SYSTEM
DMnar	Chautauquan Senecan	Devonian
Dm	Erian	
unconformity		
Sw	Ulsterian Cayugan	
Spm	Niagaran	Silurian
Ss		
unconformity		
Ssc	Alexandrian	
unconformity		
Om	Cincinnatian	Ordovician

Explanation of Map Line Symbols

Contact -- Approximately located.

Fault -- Approximately located. Bar and ball on downthrown side. Polyline representing fault trace was treated as a breakline when computing structure.

600 Structure contour -- Approximately located. Drawn on the top of the Salamonie Dolomite using computer gridding and contouring software to add the interval from the top of the Salamonie to structure on the approximate top of the Trenton Limestone. Contour interval is 50 feet (about 16 meters). The computations were carried out on 60-meter grids that extend more than one mile beyond the map area on all sides.



Index map of Indiana counties showing the location of the study area; red line indicates the extent of the west half of the New Castle 30 x 60 minute quadrangle.

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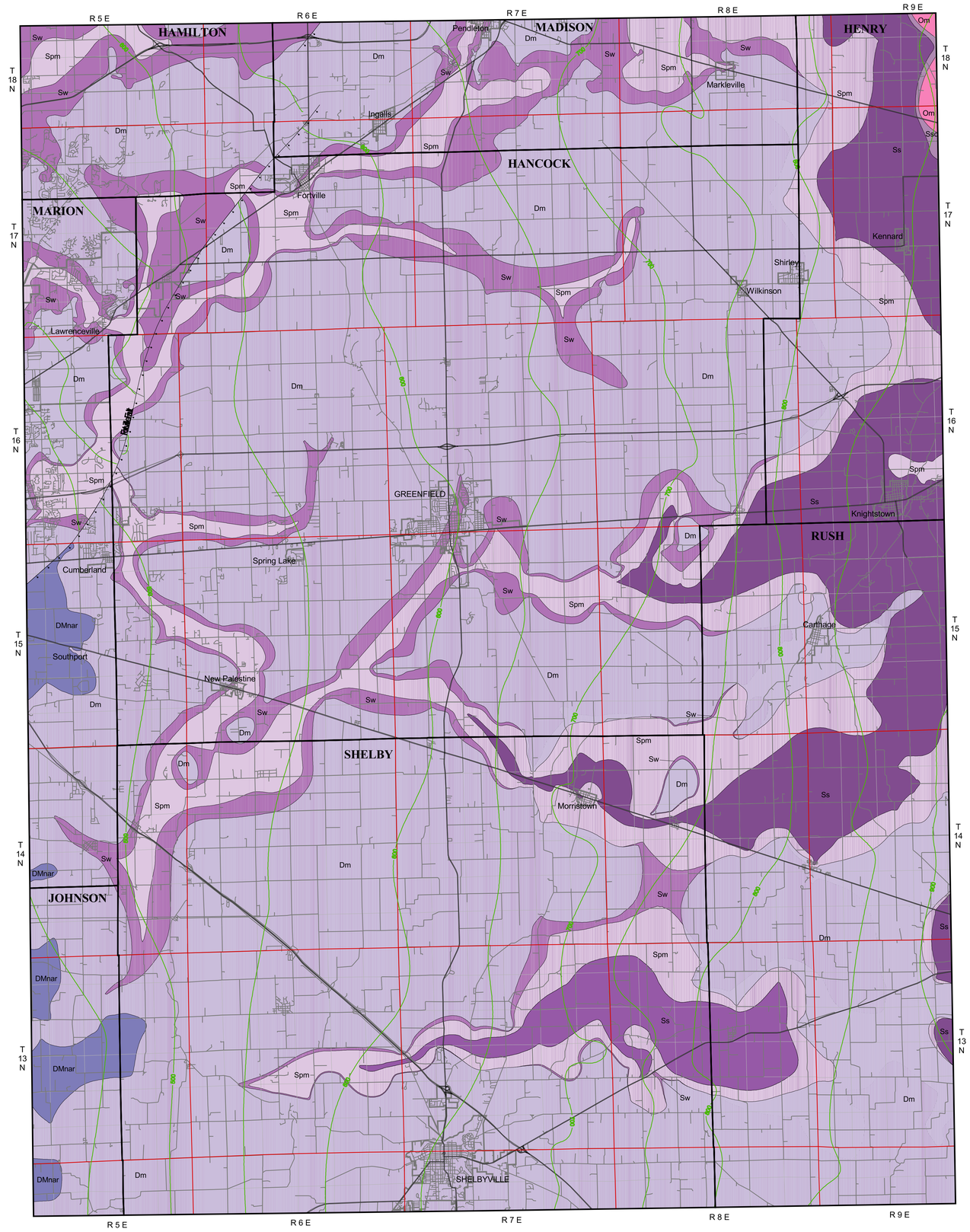

Scale 1:100,000

5 0 5 10 Miles

5 0 5 10 15 Kilometers

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Base map taken from
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Digital compilation and cartography
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Bedrock Geologic Map of the West Half of the New Castle 30 x 60 Minute Quadrangle, Central Indiana

by
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2003