INDIANA UNIVERSITY
INDIANA GEOLOGICAL SURVEY

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Open-File Study 03-03

EXPLANATION

The bedrock surface in the Indianapolis 30 x 60 minute quadrangle is a complex surface representing the accumulated effects of numerous erosional events, ranging from modern stream erosion to deeply incised paleovalley systems filled with thick deposits of unconsolidated sediments. This map is an interpretation of this complex surface based upon bedrock-surface information obtained from several thousand records, including drilling records, natural exposures, excavations, and seismic refraction records. The data are sufficient to identify major morphologic features on the buried bedrock surface (for example, paleovalleys) and to construct an interpretation that emphasizes the continuity and importance of these features. The data are not sufficient, however, to document the exact shape and location of the identified bedrock surface features everywhere in the map area.

The map was created by modeling the bedrock surface using computer gridding and contouring software and the bedrock-surface-modeling concepts described by Hasenmueller (2003, 2000). Most of the map area was modeled using Hasenmueller's (2003) independent bedrock-surface model, which assumes that the bedrock surface and topographic surface are unrelated. A best fit computer-generated bedrock-surface model was achieved by first contouring only the data that documents the geospatial position of the bedrock surface. Drill holes that did not reach the bedrock surface were compared to this preliminary bedrock-surface model; if the well penetrated the preliminary bedrock surface, the total depth (T.D.) of the well was added to the bedrock-surface data set as a minimum depth data point. A second bedrock-surface model was produced using this combined data set; the resultant surface was compared to the remaining minimum depth data to identify additional minimum depth data points. The modeling process was repeated until no new minimum depth data joined the bedrock-mapping data set. The best fit computer-generated bedrock-surface model that resulted from this procedure was the basis for interpreting the paleovalley networks shown on the map. Linear lows and deep pits on the computer-generated bedrock-surface model suggest the location, trend, and connectivity of paleovalleys. Interpretations of paleovalley thalwegs were added to the model by assuming that the lows and pits on the computer-generated bedrock surface lie on or close to paleovalley thalwegs. Strings of closely spaced thalweg control points representing the interpretation of paleovalley thalwegs were positioned to force the connection of nearby troughs and pits in the computer-generated bedrock surface via the shortest path consistent with the data. Elevations for these thalweg control points are based on the lowest upstream and downstream bedrock-surface values. The independent bedrock-surface model was completed by gridding a data set consisting of the bedrock-surface data, minimum-depth data, and thalweg control points on a 120-meter grid. The natural neighbor gridding algorithm was employed throughout the independent bedrock-surface modeling process to incorporate as much detail as possible in the map and to limit the range of the resultant bedrock-surface model to the range of the data.

Hasenmueller's (2003) independent bedrock-surface model, which assumes that the bedrock surface and topographic surface are sub-parallel trend surfaces, was employed in the southwestern part of the map area where unconsolidated deposits are thin and the topographic surface is undulating. The trend of the topographic surface was computed by applying two iterations of a Gaussian low-pass filter to a 120-meter topographic digital elevation model in the selected areas. The resultant damped surface established the trend of the topographic surface by filtering out minor topographic features such as ravines. Bedrock-surface depths were recomputed relative to this topographic trend; a thickness of this interval was computed using natural neighbor gridding (120-meter grid spacing). The adjusted depth interval was subtracted from the topographic trend surface to obtain a 120-meter bedrock-surface grid for the independent bedrock-surface model areas.

The 120-meter independent and dependent bedrock-surface models were combined and extended to the 60-meter grid that underlies this map using cubic spline grid interpolation. This 60-meter grid is aligned with the U.S. Geological Survey (USGS) 1:24,000-scale 30-meter grid system to facilitate computating depth to the bedrock surface at any point on the map.

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.

REFERENCES CITED

Hasenmueller, W. A., 2000, Map showing elevation of the bedrock surface in the western quarter of the Muncie and eastern quarter of the Lafayette 1:100,000-scale quadrangles, central Indiana: Indiana Geological Survey Open-File Study 00-15.

Hasenmueller, W. A., 2003, Mapping the bedrock surface in central Indiana with contouring software: Indiana Academy of Science, 119th Annual Meeting Programs and Abstracts, October 16-17, Anderson University, Anderson, Indiana, p. 77-78.

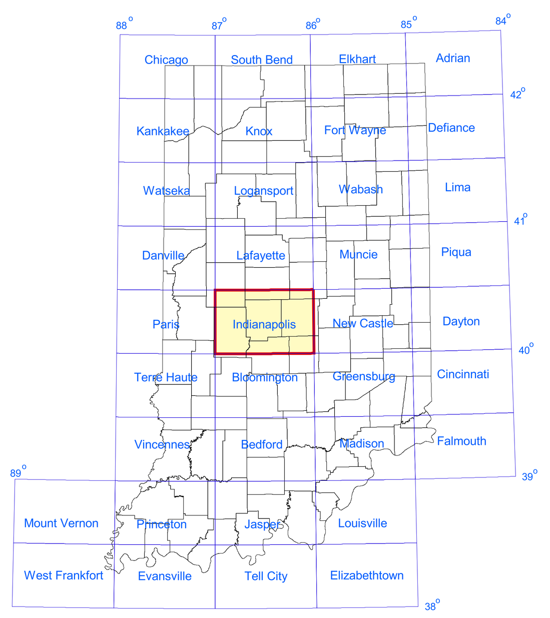
EXPLANATION OF MAP SYMBOLS

- Data point that documents the elevation of the bedrock surface
- Data point that documents the elevation of the minimum depth to the bedrock surface

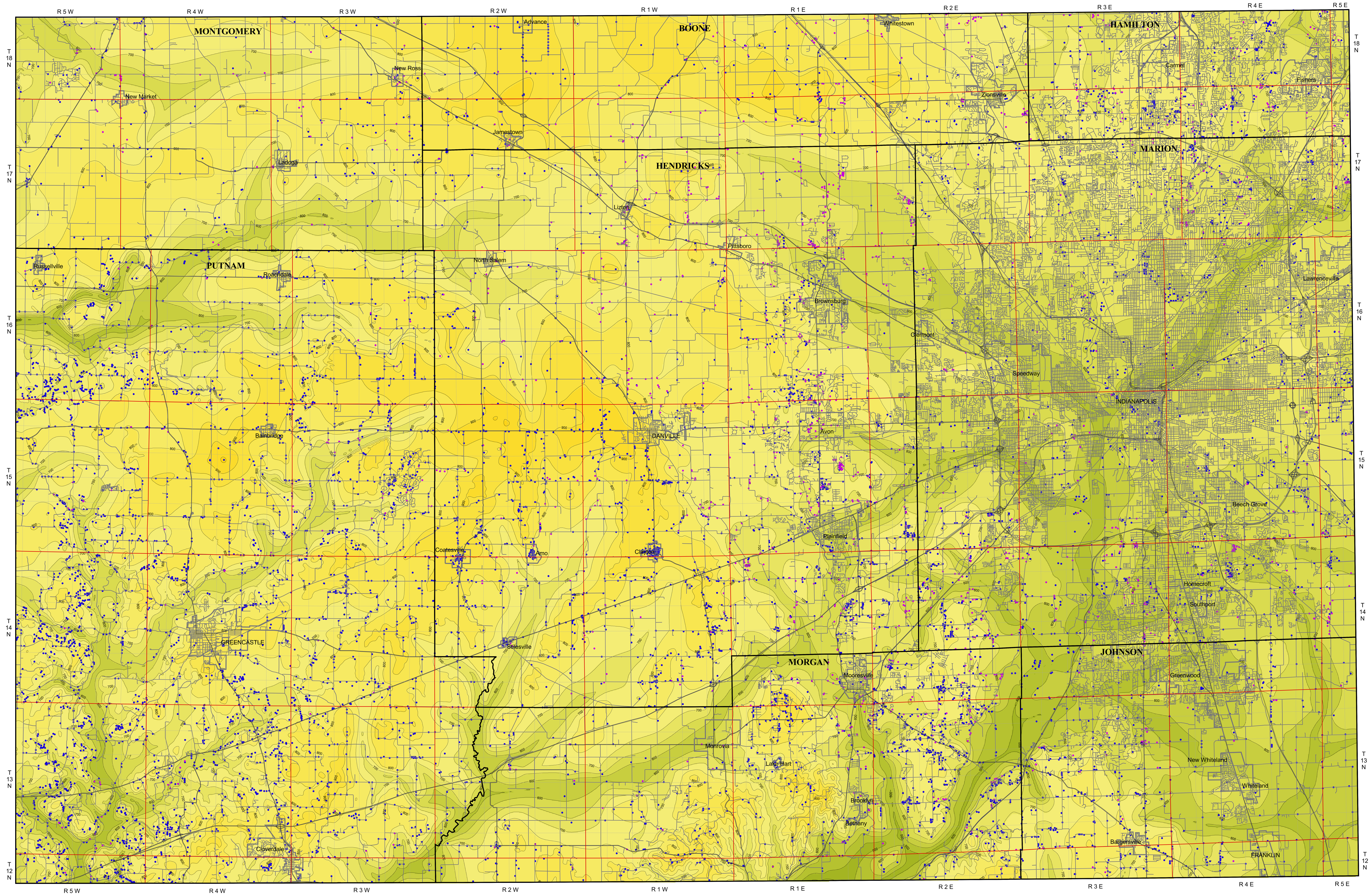
—600— Bedrock surface contour; approximately located; drawn on the computed difference between a 60-meter digital elevation model (DEM) and the bedrock-surface DEM using computer gridding and contouring software; contour interval is 50 feet (about 16 meters)

Elevation of Bedrock Surface (ft)

1000 - 1050
950 - 1000
900 - 950
850 - 900
800 - 850
750 - 800
700 - 750
650 - 700
600 - 650
550 - 600
500 - 550
450 - 500



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



Scale 1:100,000

5 0 5 10 Miles

5 0 5 10 15 Kilometers

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Base map taken from
Indiana Geological Survey
Computer Database 3, 2002

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Map Showing Elevation of the Bedrock Surface in the Indianapolis 30 x 60 Minute Quadrangle, Central Indiana

by
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2003