



Abstract

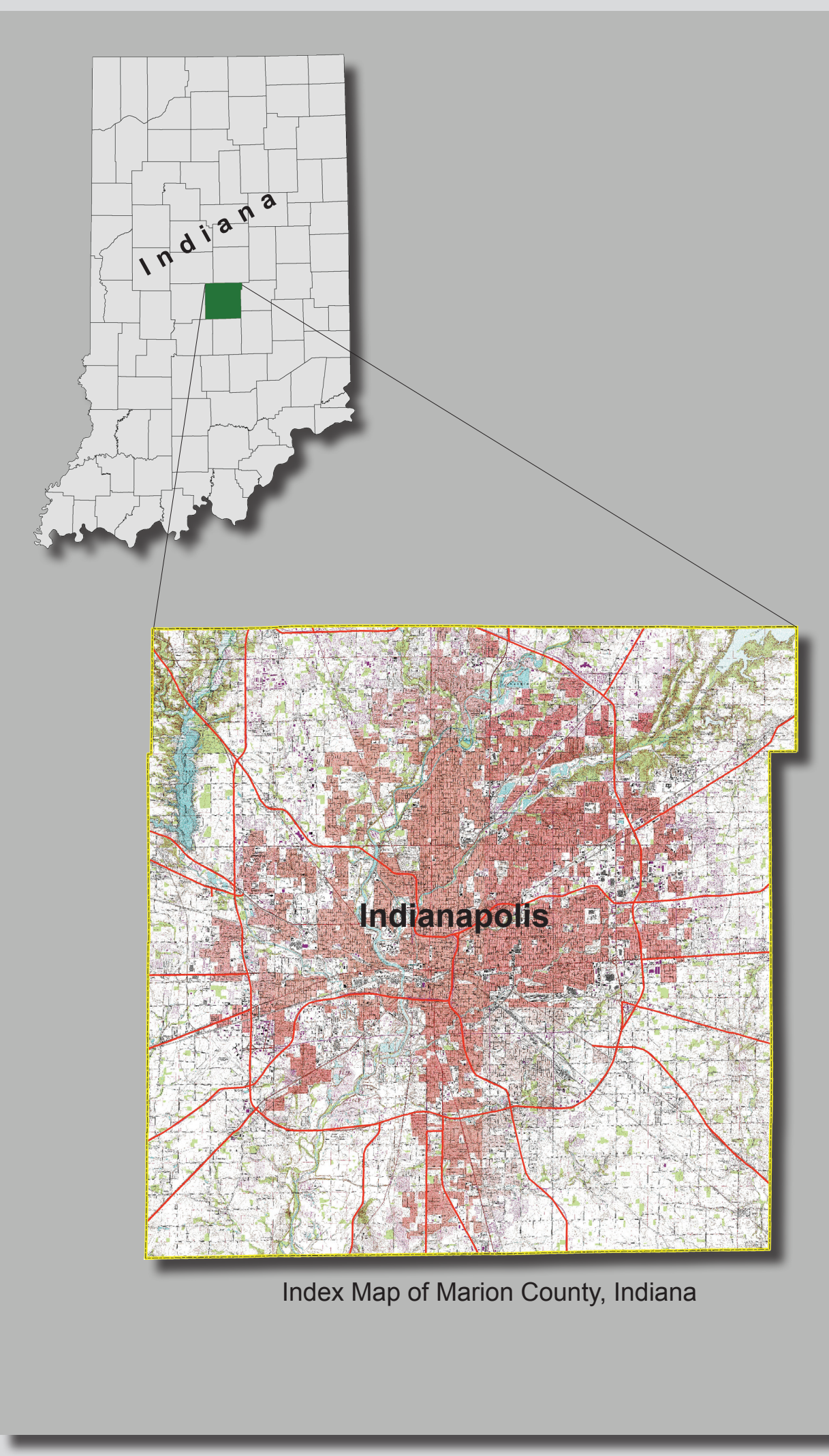
The Internet has become a medium of choice for delivering geologic information to both technical users and the general public. The Indiana Geological Survey (IGS) is creating a Web-based glacial and bedrock geologic map site for Marion County in central Indiana to provide detailed geologic information needed to address environmental and resource management issues related to a growing population and land-use conflicts. Marion County is the location of Indianapolis, the state capital and largest city. The IGS anticipates that the information available via the Web site will be widely used by the general public, industry, and government entities concerned about the geology, groundwater, and other natural resources in this county.

The Marion County Web site links an Internet map server (IMS) and databases to provide a portal to the IGS's enterprise geodatabases that allows users to efficiently create, manage, update, and distribute maps and data. The IMS site retrieves maps and cross sections of Marion County completed during earlier IGS mapping projects. Map layers pertaining to bedrock geology, surficial geology, hydrology, infrastructure, and imagery are included. Database information includes (1) lithologic information compiled from water-well records stored in the Indiana Department of Natural Resources, Division of Water archives, (2) natural gamma-ray geophysical log data, (3) stratigraphic test hole data, and (4) petroleum-well record data. The development of the Web site is funded by the IGS and the Great Lakes Geologic Mapping Coalition.

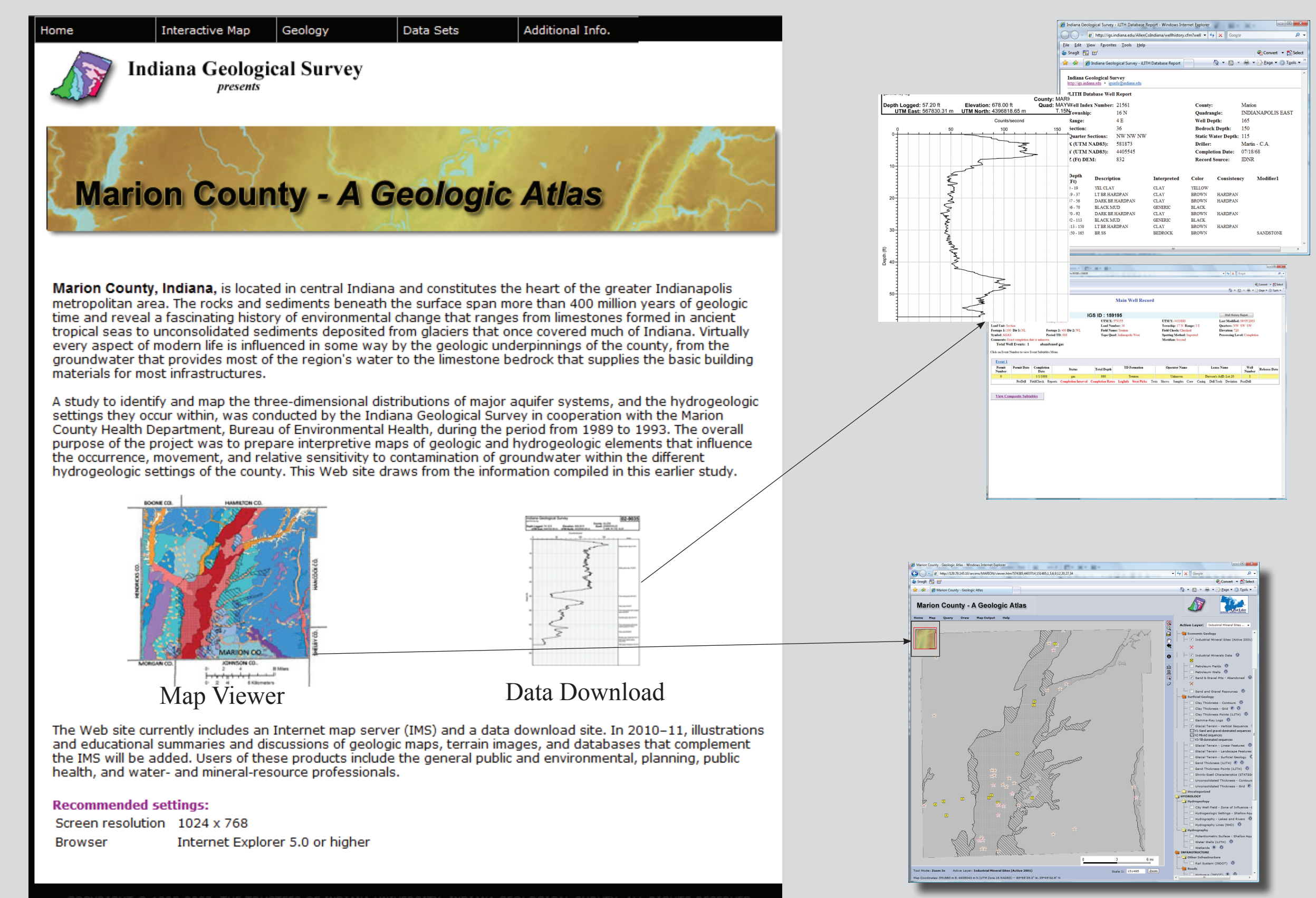
Introduction

The Marion County Web site provides basic information on the geology of the area in an easy-to-view format and provides access to various maps and photos. The Web site includes an Internet map server (IMS) and a data download site. Illustrations and educational summaries and discussions of geologic maps, terrain images, and databases that complement the IMS will be added in 2010-11. Users of these products include the general public and environmental, planning, public health, and water- and mineral-resource professionals.

More information may be found within the references list. Reference layers and metadata for the entire state can be downloaded from the *IndianaMap* site (<http://www.indianamap.org/>). The *IndianaMap* together with the other IGS sites had over one million visitors during 2009, and the number of visits to these sites continues to increase.



Homepage



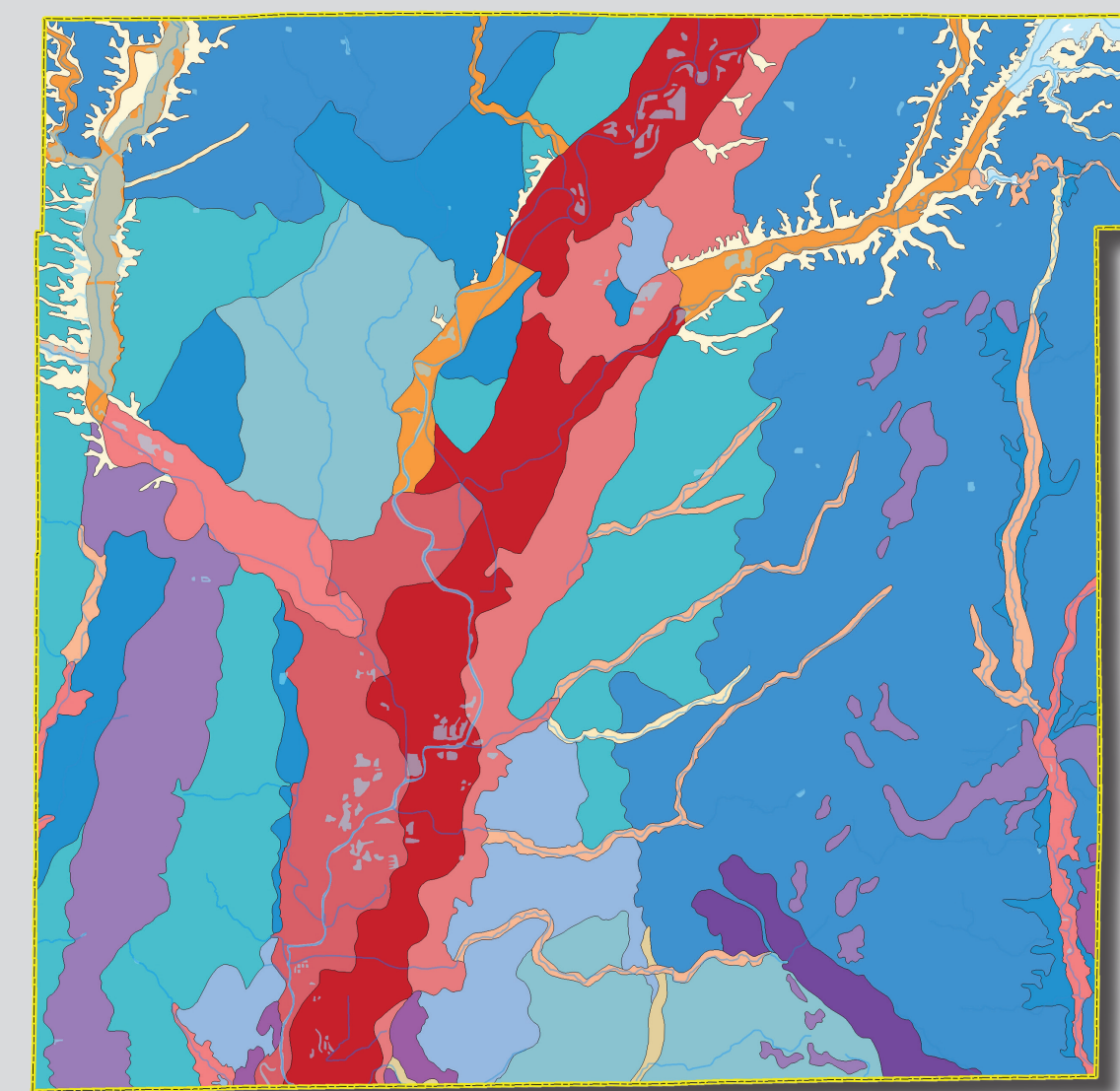
Acknowledgments

Previous work featured in this Web site was funded by the Marion County Health Department and the Statemap Program (U.S. Geological Survey). Funding for the Web site was provided by the Great Lakes Geologic Mapping Coalition (<http://igs.indiana.edu/GreatLakesGeology/index.html>).

Photography by John M. Day, Barbara T. Hill, and John Rupp.

GEOLOGY providing geologic interpretation

Surficial Geology



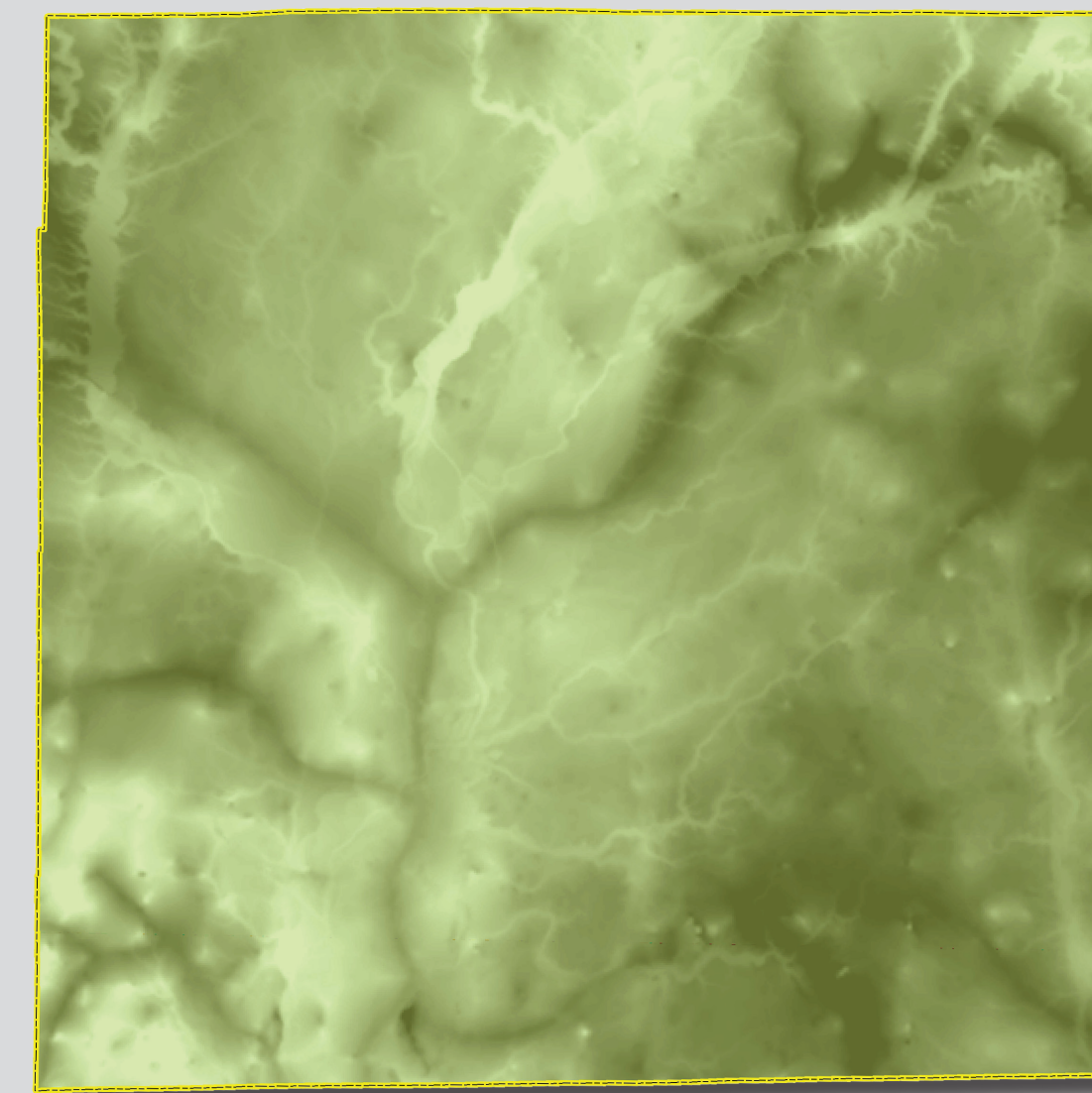
- Explanation**
- Sluiceway axis
 - Sluiceway fringe, west side
 - Sluiceway fringe, east side
 - Deep locally gorge like stream valleys
 - Medium to large entrenched sluiceways
 - High-level valleys with some outwash
 - High-level valleys with little outwash
 - Small valleys or valley complexes
 - Valley segments
 - Low areas
 - Gently rolling landscape
 - Streamlined till landscape
 - Small fringing zones along sluiceways
 - Dissected till surfaces
 - Ridges, formed as end moraines
 - Moderate relief hummocks
 - Large ridges, formed as end moraines
 - Large ridges, formed as ice-contact fans

Map of Marion County surficial geology (terrain regions) derived from Brown and Fleming (2000)

The surficial geology map of Marion County depicts local glacial terrains. These terrains characterize regions of distinct landscapes whose morphologies reflect a series of glacial and postglacial events and processes, and which are underlain by a sequence of near-surface sediments that are distinctly related to those processes. These landscapes include various types of till-capped uplands and stream channels of different origins and morphologies.

The glacial terrains of Marion County represent processes that occurred during the most recent glacial period, the late Wisconsin. These terrains include silt- and clay-rich lake plains, silty-clay to clay loam till plains and end moraines, and stratified sand and gravel meltwater channels.

Unconsolidated Thickness



- Explanation**
- 325 ft
 - 5 ft

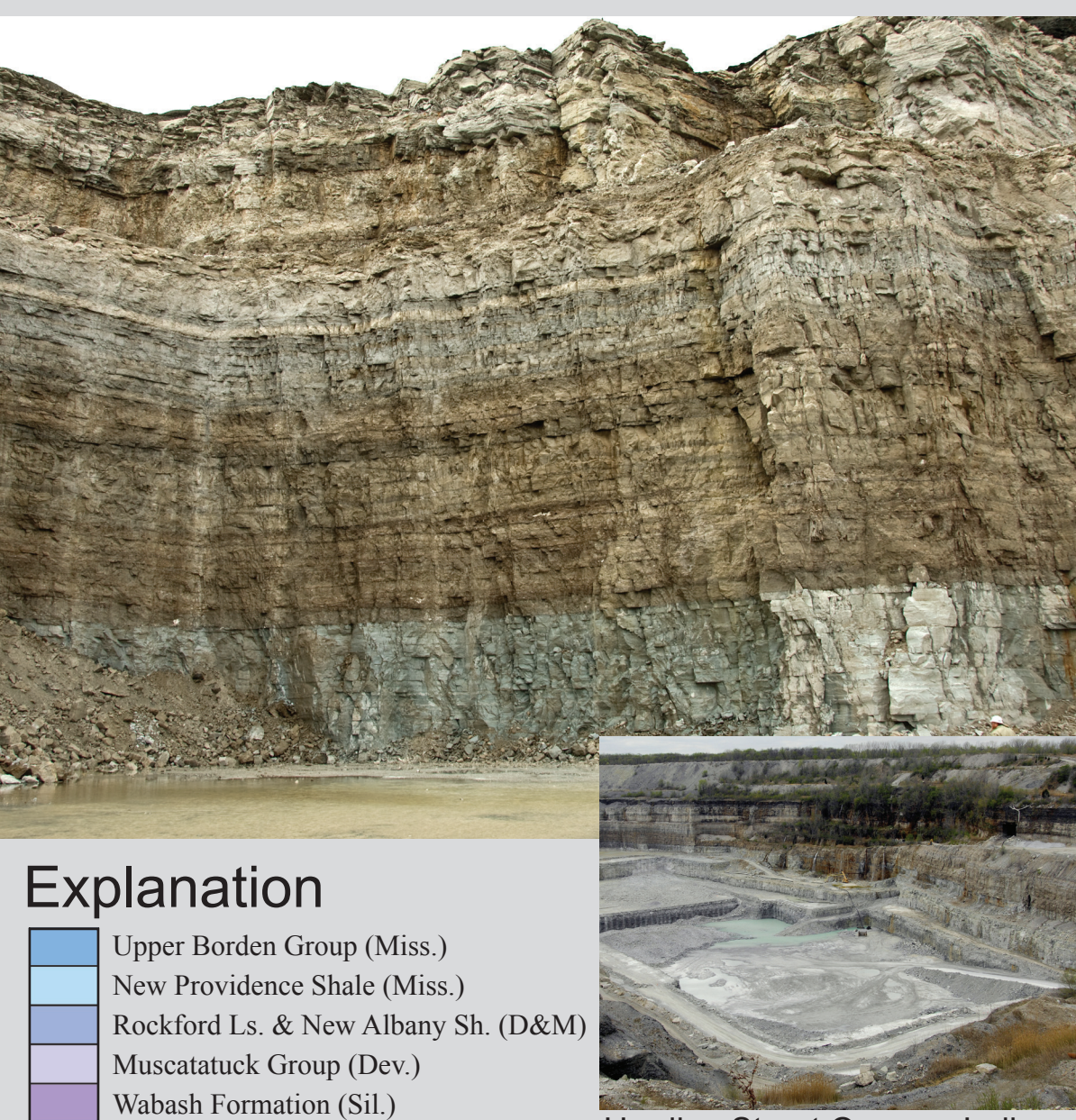
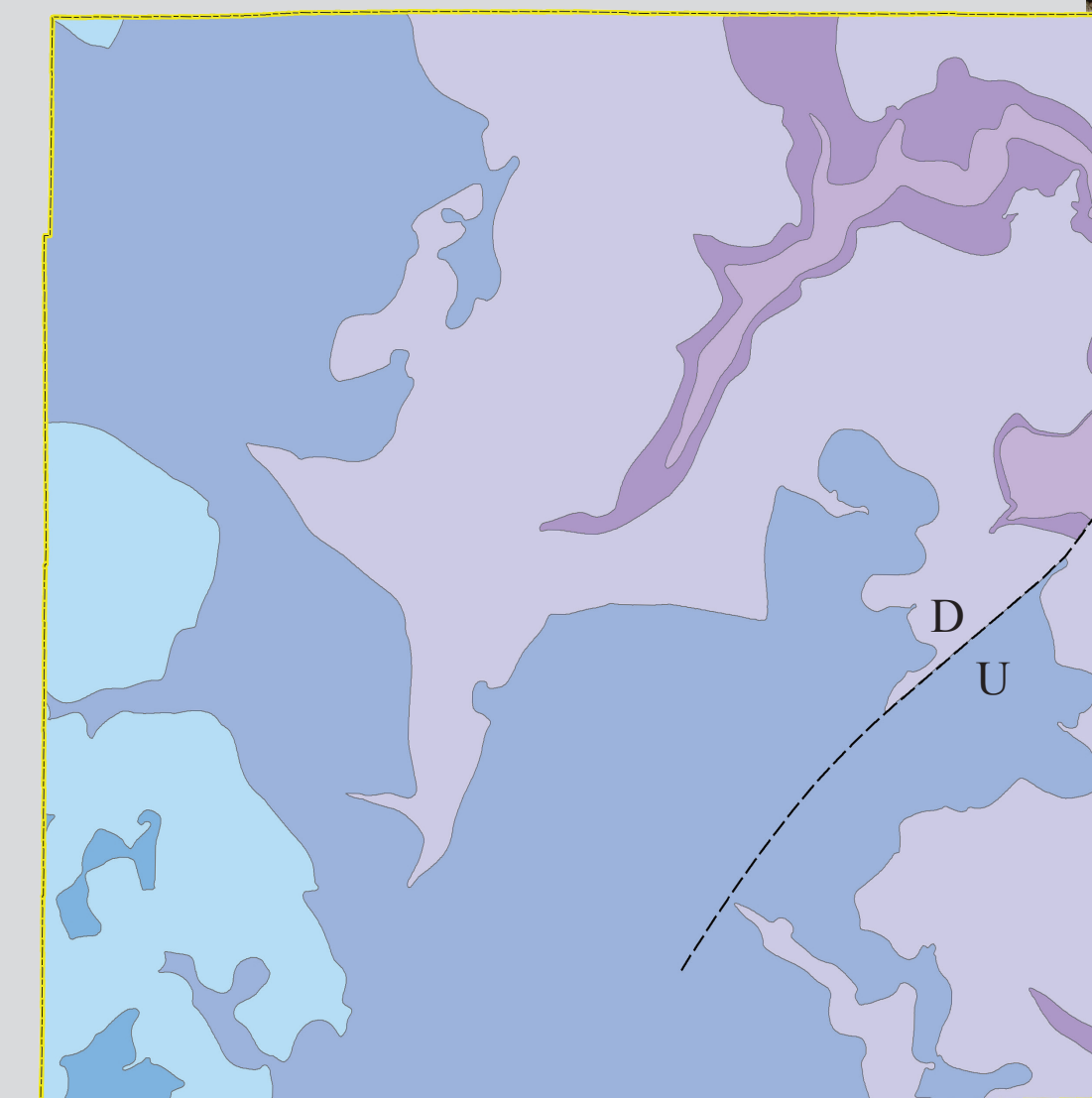
Map of Marion County unconsolidated thickness derived from James and Hasenmueller (2003a, b)

The unconsolidated thickness map depicts the total thickness of unconsolidated or Quaternary sediments above the bedrock surface in Marion County. It was created by using a grid subtraction routine in Surfer® (Golden Software) using the newest bedrock topographic surface map.

unconsolidated sediments. The thinnest unconsolidated sediments lie over bedrock highs in the northern part of the White River Valley and in the southwestern quadrant of the county, where glaciers surmounted the buried Knobstone escarpment. The thickest unconsolidated sections occur in the NE and SE quadrants, where elevated glacial uplands are superposed over bedrock valleys.

The isopach color ramp emphasizes the end members of thickness (dark green) grading to thin (light green).

Bedrock Geology



- Explanation**
- Upper Borden Group (Miss.)
 - New Providence Shale (Miss.)
 - Rockford L. & New Albany Sh. (D&M)
 - Miscountank Group (Dev.)
 - Wabash Formation (Sil.)
 - Pleasant Mills Formation (Sil.)
 - Fault (inferred)

Map of Marion County bedrock geology derived from Hasenmueller (2003a, b)

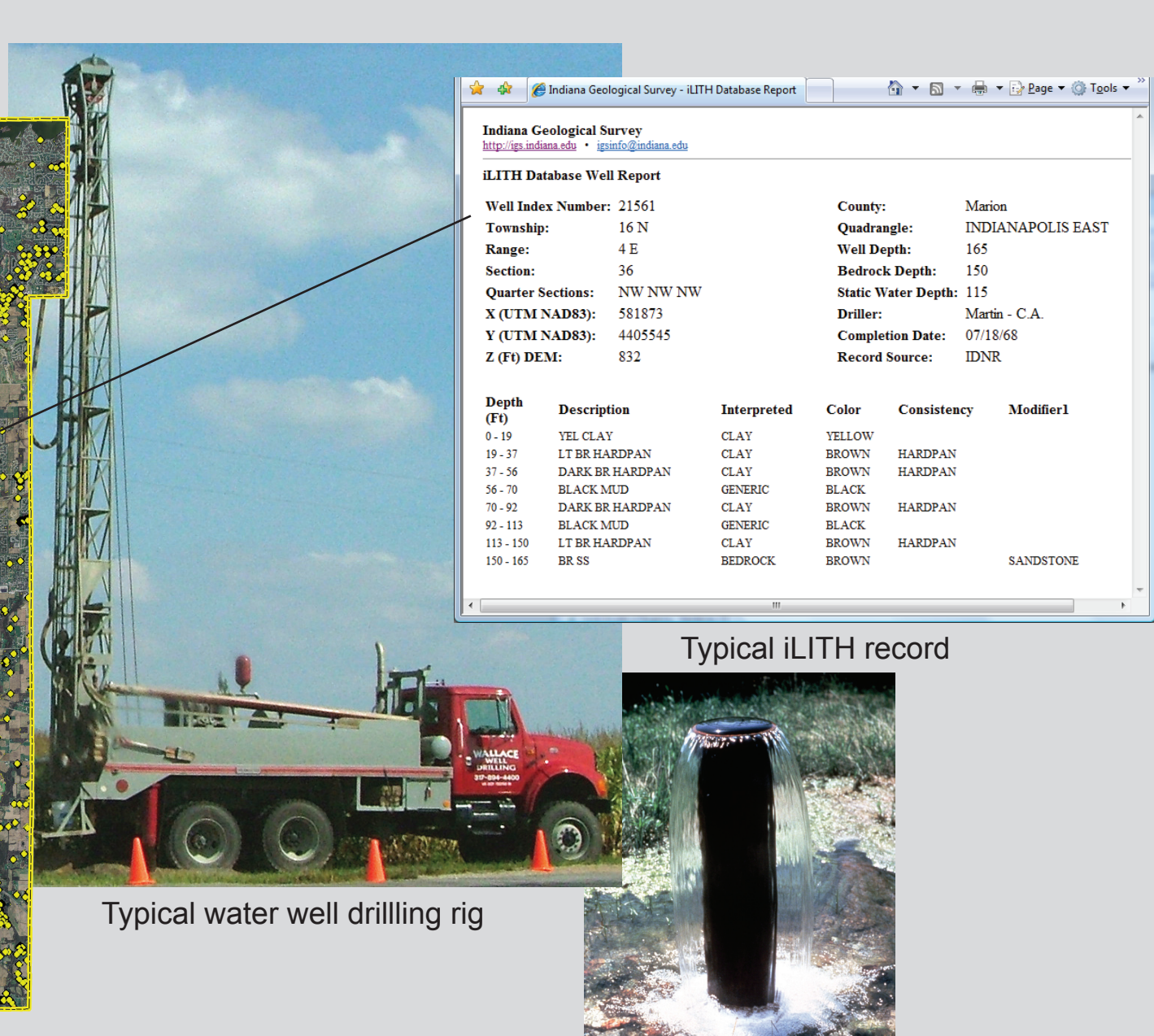
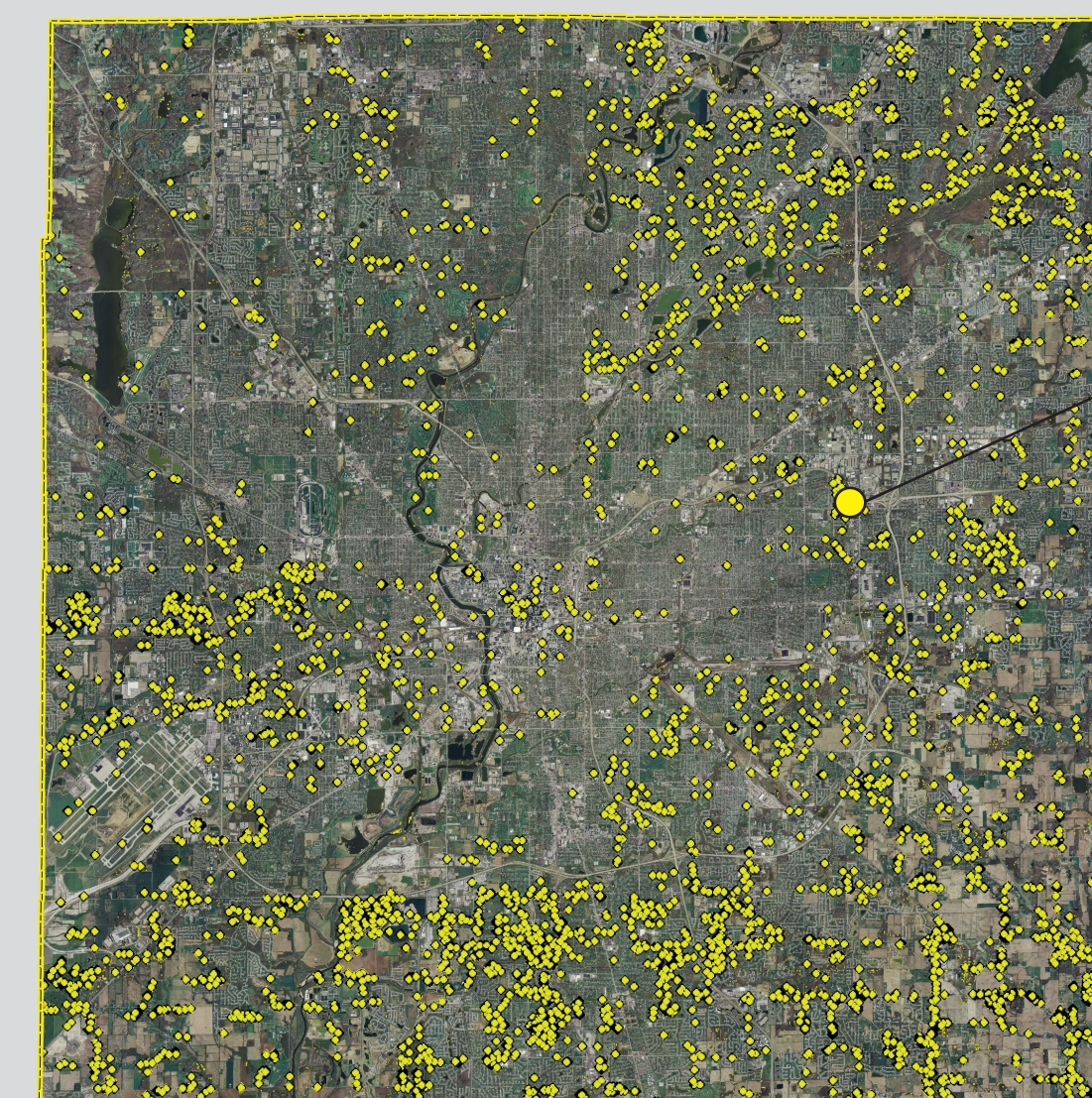
The bedrock units in Marion County are composed of Paleozoic limestone, dolomite, shale, siltstone, and fine-grained sandstone ranging in age from Silurian to Mississippian. Throughout most of the county, natural bedrock outcrops are sparse, and the bedrock surface is covered by unconsolidated deposits that range in thickness from a few feet to more than 300 feet.

Much of the bedrock surface in Marion County is composed of limestone and dolomite of Silurian and Devonian age. These rocks range in thickness from less than 200 feet to more than 350 feet, and commonly are well fractured. The carbonate rocks are overlain by 100 to 130 feet of greenish-gray and brownish-black shales of the New Albany Shale (Devonian and Mississippian).

The Borden Group (lower Mississippian) is composed primarily of greenish-gray shale, siltstone, and lesser sandstone. The base of this group is marked by the underlying Rockford Limestone, which is rarely more than 10 feet thick. The Borden Group forms the bedrock surface in the southwestern part of the county where it is as much as 250 to 300 feet thick.

IGS DATA SETS providing access to primary data

Water Well Records

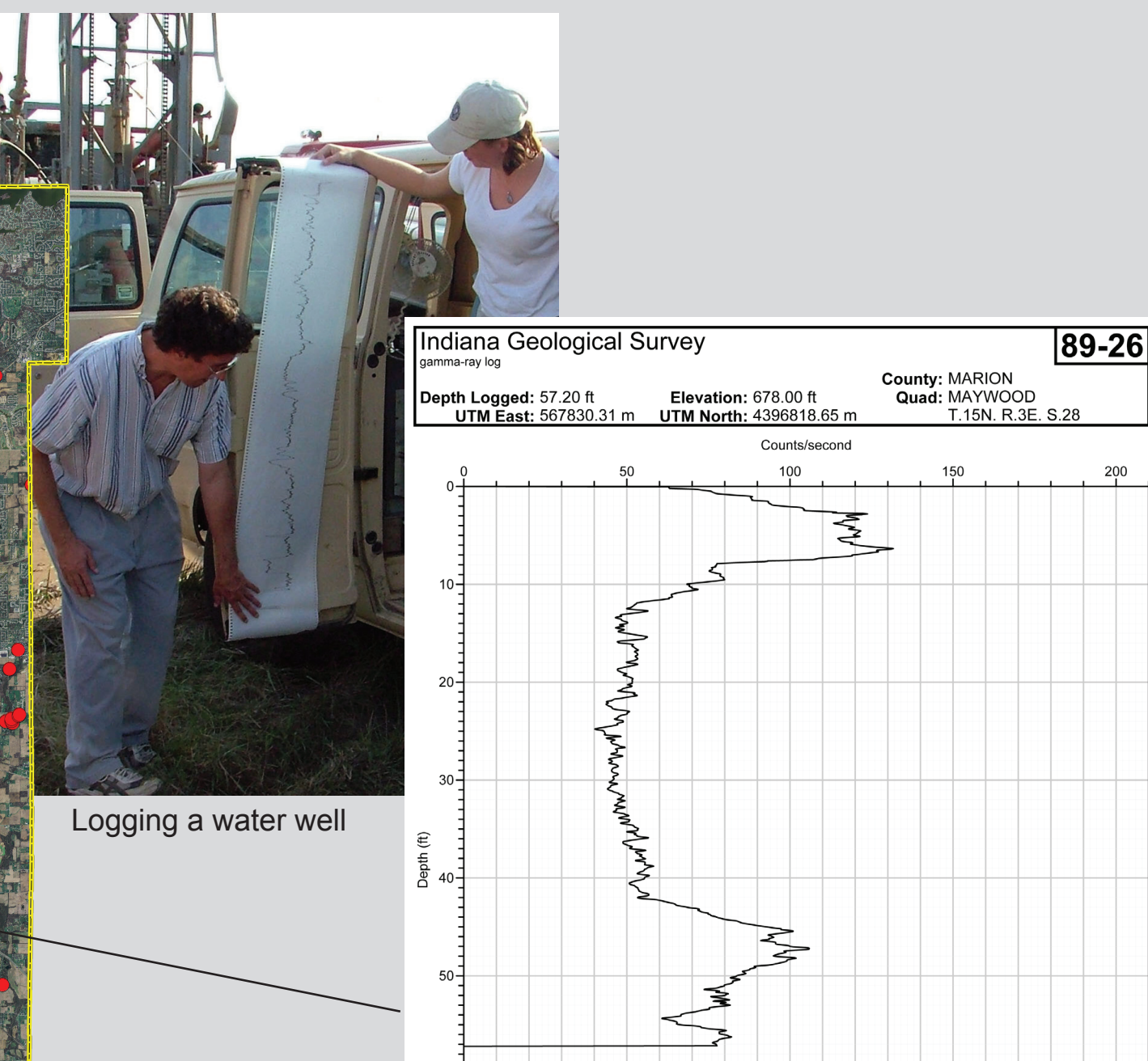
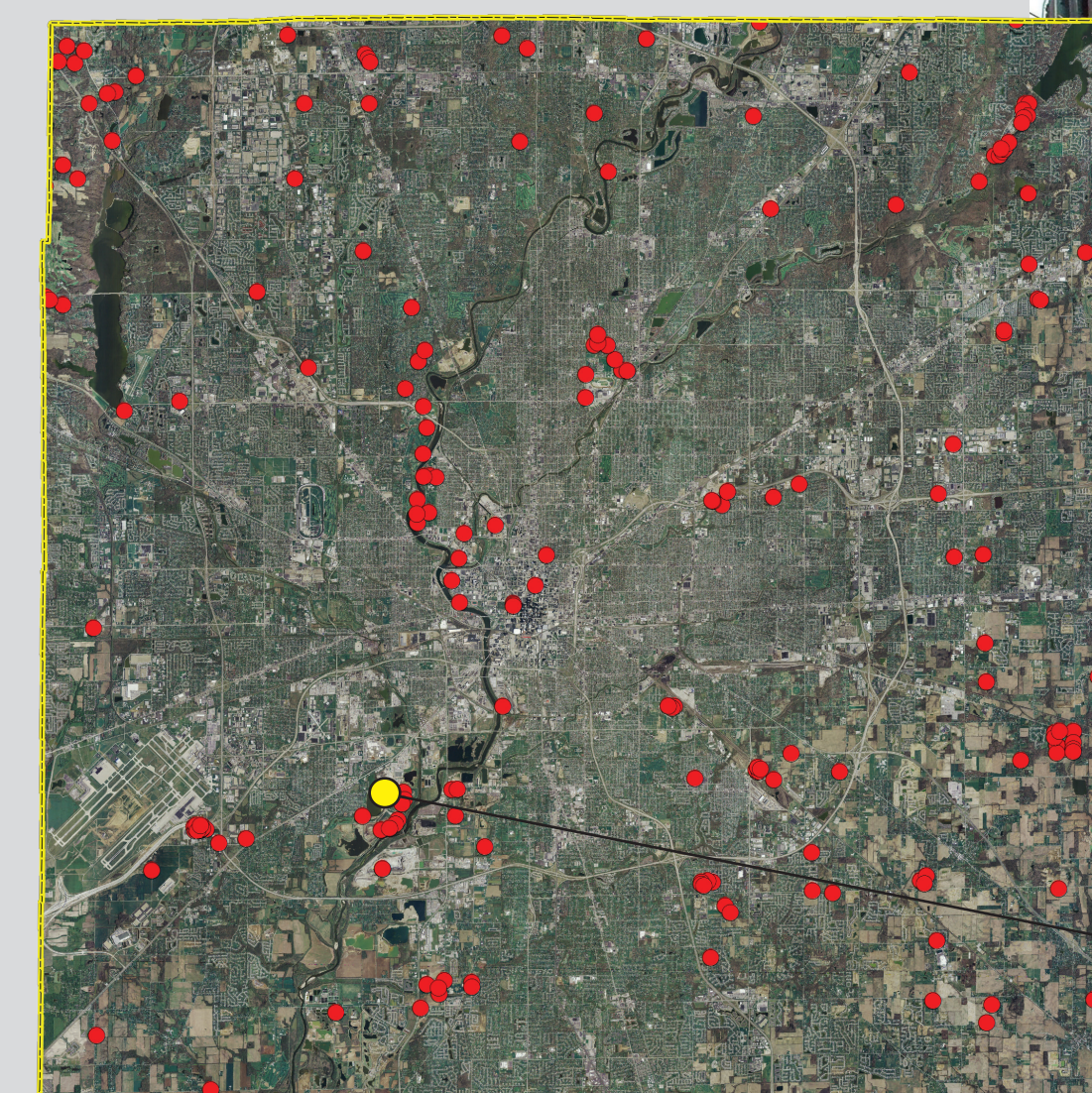


iLITH records in Marion County modified from IDNR, Division of Water, water-well record database

iLITH is a database containing water well records from the Indiana Department of Natural Resources. These records were edited by the Indiana Geological Survey for locational accuracy and the lithologic data were standardized in a series of tables (Brown and others, 2000).

This Web site displays the water wells in Marion County that are contained in the iLITH database. It is possible to view these records in report form. The locational data and the lithology data are made available for each record by clicking on any water-well point in the Web viewer.

Gamma-Ray Logs

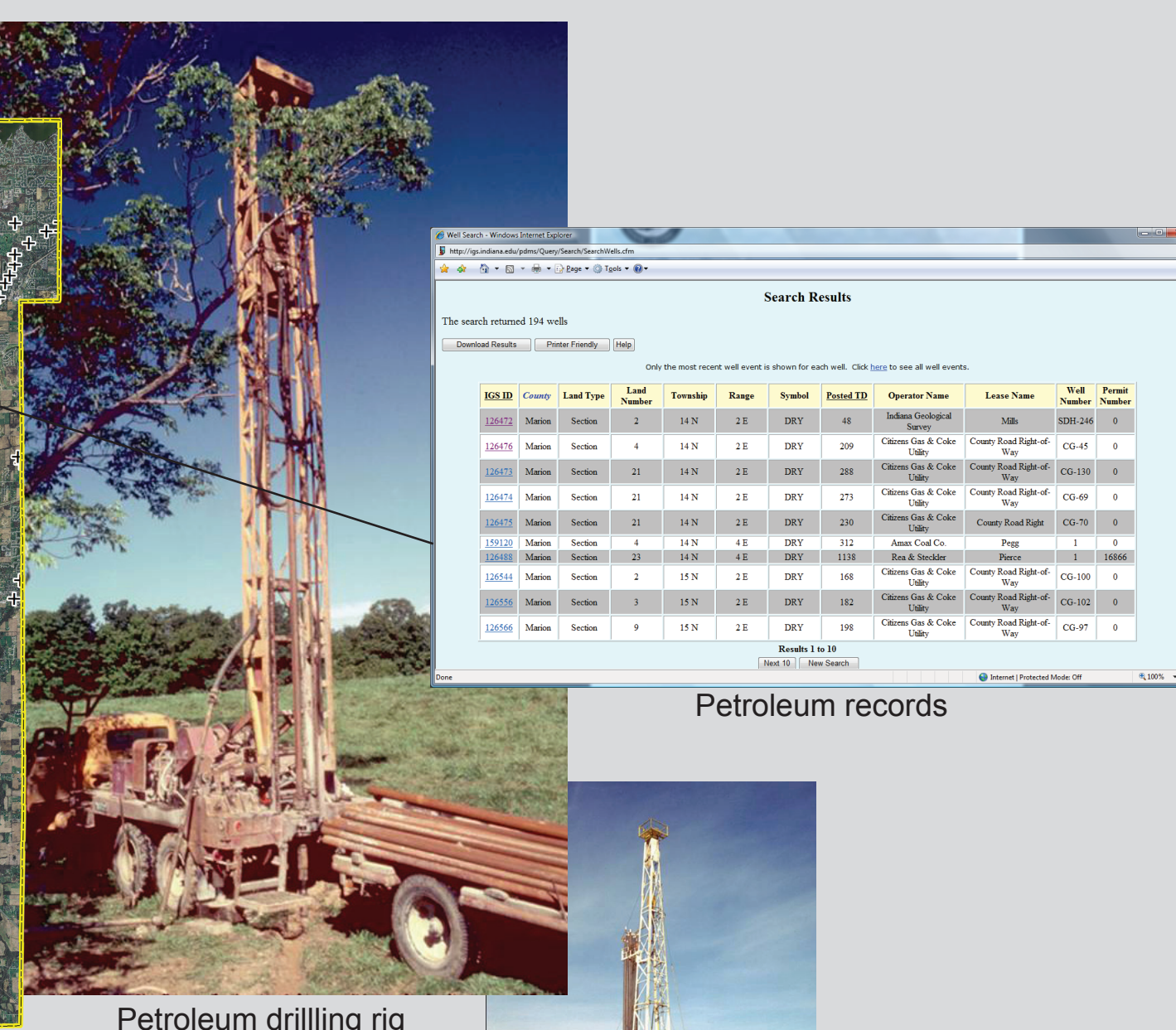
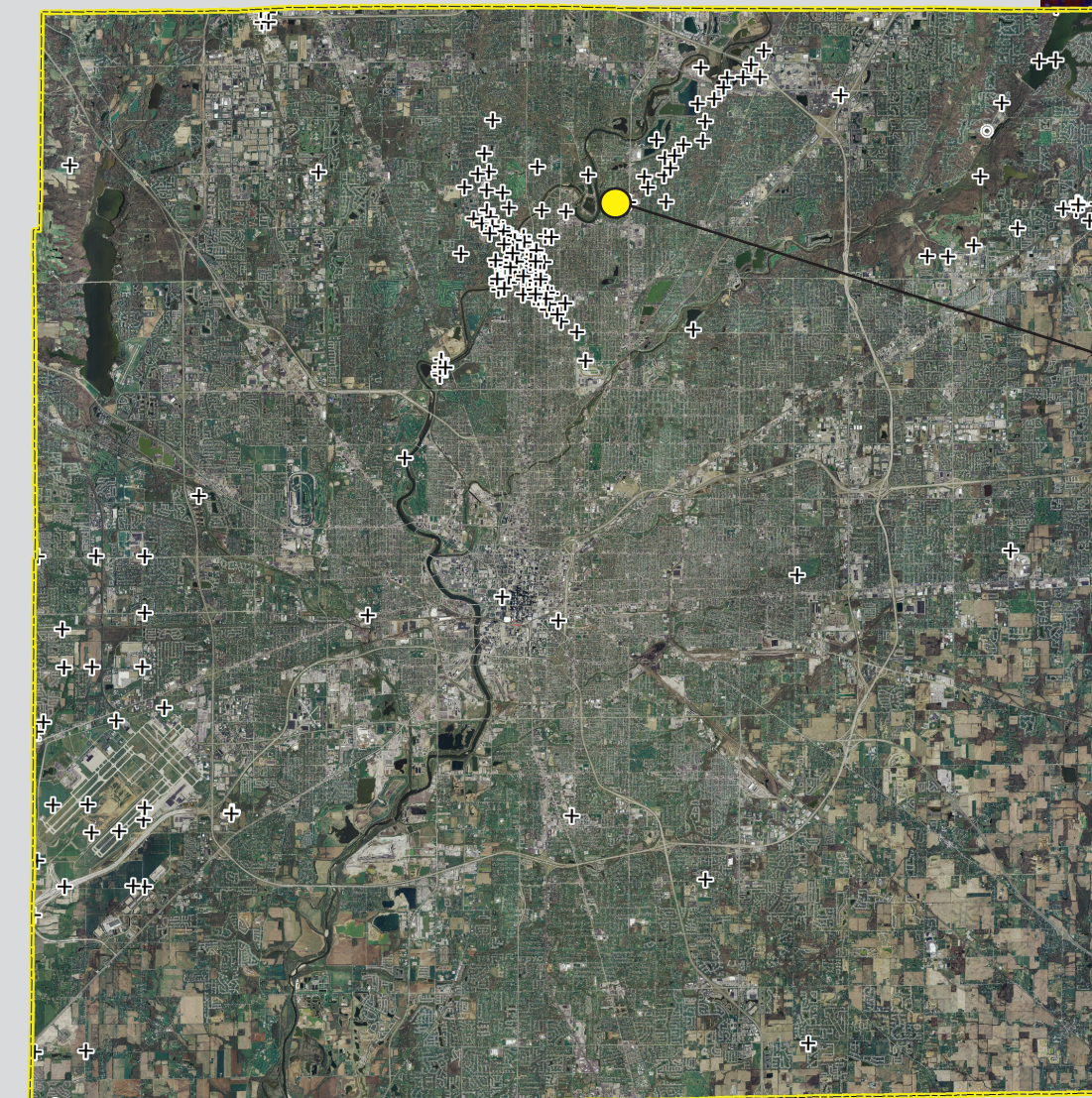


Gamma-ray log records in Marion County derived from the IGS gamma-ray log database

The gamma-ray records data set for Marion County, Indiana, contains records collected from water wells within the county. These records are geophysical logs, which provide reliable lithologic information (Bleuer, 2004). The locations of these data are shown in point form on the map.

The Web site allows one to click on each point and bring up the plotted digital data in PDF format. These PDFs can be printed or downloaded from the site. LAS files of the log information are also available for download.

Petroleum Records

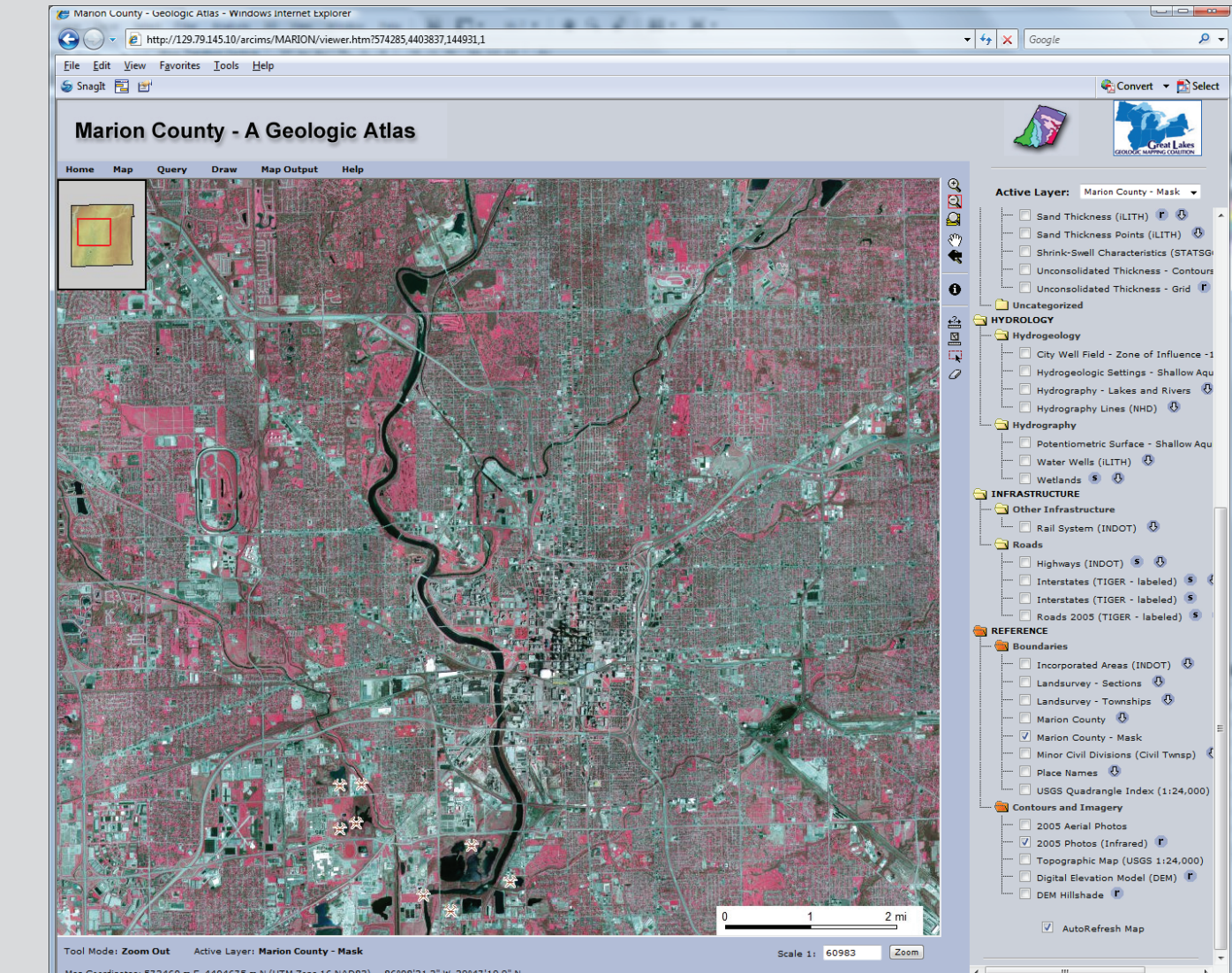


Petroleum records in Marion County derived from the IGS PDMS

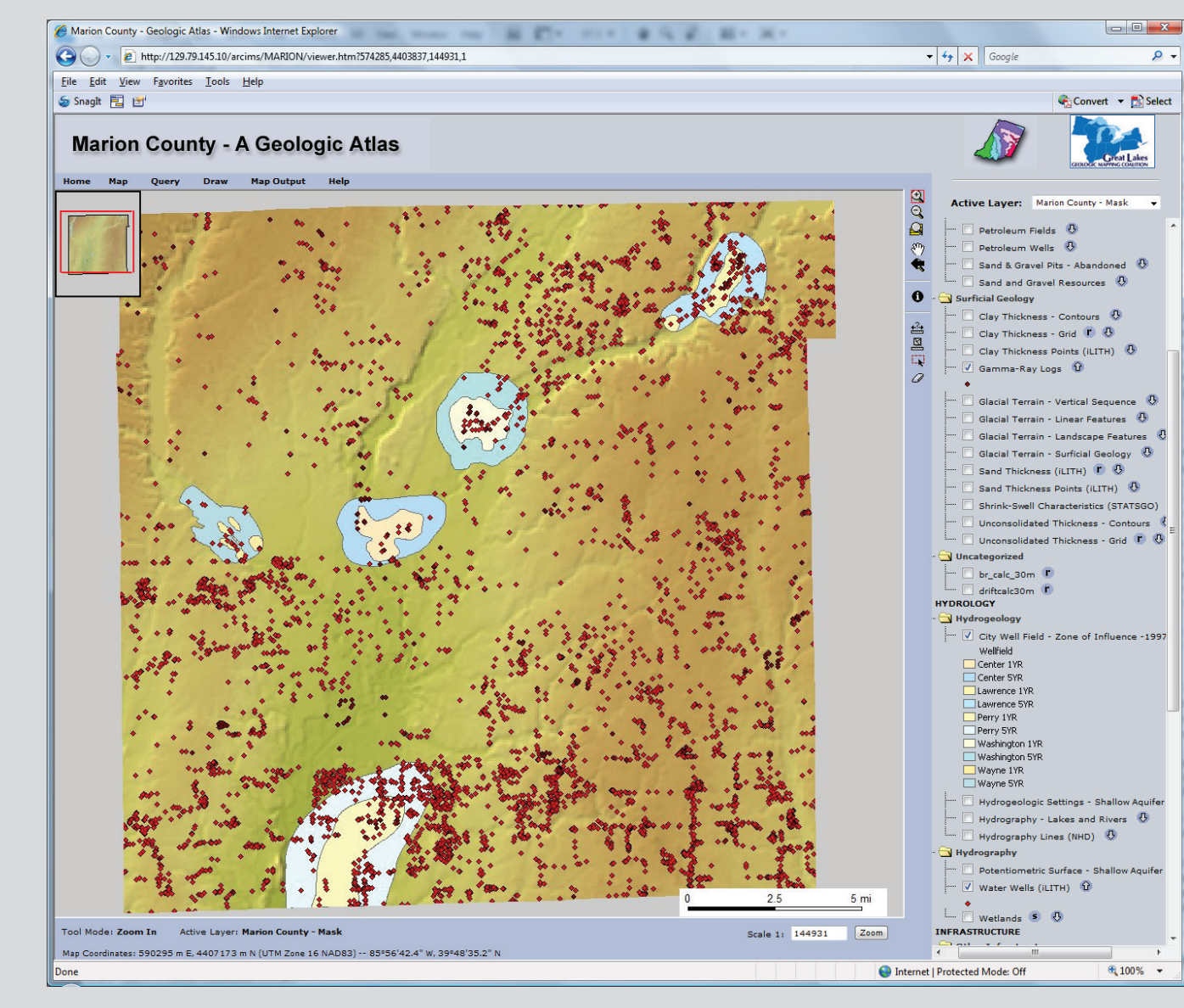
The Petroleum Database Management System (PDMS) is a Web application designed to distribute petroleum-related information from the Indiana Geological Survey. The database contains information on more than 70,000 petroleum-related wells drilled in Indiana. The PDMS Map Viewer is an interface that displays interactive maps of petroleum well data (<http://igs.indiana.edu/pdms/index.cfm>).

The PDMS database contains 194 records in Marion County, and these can be viewed from the Marion County Web site. Many of these records date back to the late 1890s when the Trenton Field was one of the largest oil and gas fields at the time. This field extended through a large portion of north-central Indiana, and was largely depleted many years ago.

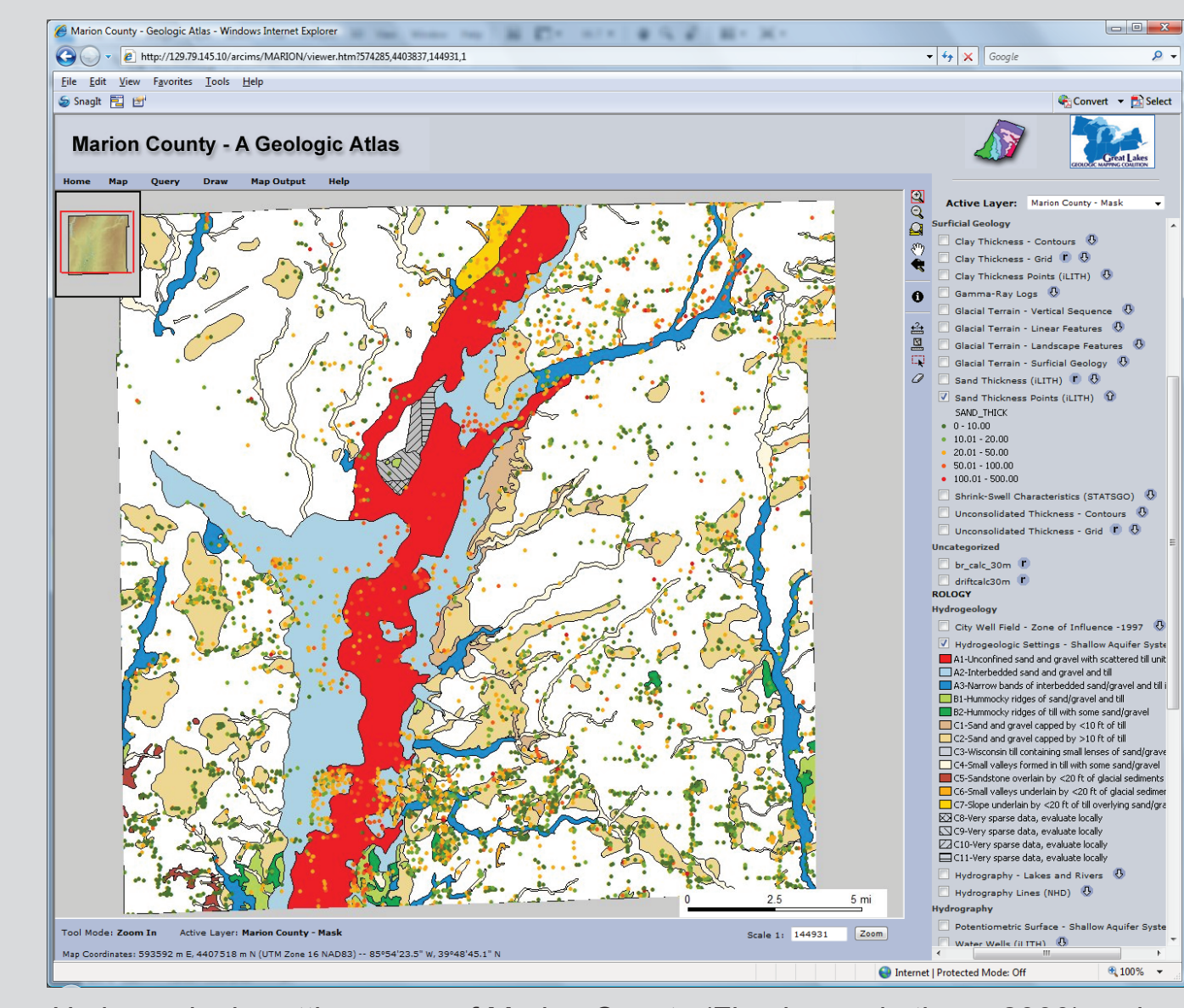
Interactive Map Viewer



Infrared image of downtown Indianapolis, in the center of Marion County, accessed through the *IndianaMap* Web site (<http://www.indianamap.org/>)



Digital elevation model of Marion County, iLITH water wells, and wellhead time-of-travel zones surrounding the city wellfields (Brown and Fleming, 2000)



Hydrogeologic settings map of Marion County (Fleming and others, 2000) and sand thickness data

This infrared images of Marion County are from Landsat satellites that have been collecting images of the Earth's surface since 1972. These images can be useful in mapping sediments of various textures, which may have different moisture contents and thereby display as different colors. Clear water reflects little radiation, so it looks black. Pavement and bare ground reflect a lot of radiation, so they look bright. Urban areas usually look light blue-gray. Vegetation absorbs visible light but reflects infrared, making it red in the image.

This layer is viewed on the Marion County Web site and accessed from the *IndianaMap* database, which refreshes data for the entire state regularly.

This digital elevation model (DEM) is the 2005 Digital Elevation Model created from the 2005 aerial images for Indiana. This Web view also shows the locations of the iLITH water wells (from the Indiana Department Natural Resources, Division of Water) and the 5- and 10-year wellhead time-of-travel zones for the groundwater surrounding the Indianapolis city wellfields.

Layers contained in the site can be turned on using the Map Layers palette to the right of the view. Legends for each layer can be viewed by clicking the Map dialog box in the top left corner of the map view.

The hydrogeologic settings map of Marion County shows values of "Sensitivity to Contamination" based upon the surficial geology of the area, the water table, position in the groundwater flow system, and recharge-discharge relations of the area.

The "Thickness of Sand" layer, which appears as point data in this image, uses colored dots to display the thickness of the sand in water wells drilled within the county. This layer is also available from the *IndianaMap* Web site with similar data for all Indiana.

References

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Hasenmueller, W. A., 2003b. Bedrock geologic map of the west half of the New Castle 30 x 60 minute quadrangle, central Indiana: Indiana Geological Survey Open-File Study 03-10, scale 1:100,000.

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James, C. L., and Hasenmueller, W. A., 2003b. Map showing thickness of the unconsolidated deposits in the west half of the New Castle 30 x 60 minute quadrangle, central Indiana: Indiana Geological Survey Open-File Study 03-14, scale 1:100,000.

Great Lakes Geologic Mapping Coalition, 2009. Great Lakes Geologic Mapping Coalition Web site: <http://igs.indiana.edu/GreatLakesGeology/index.html>, date accessed, March 11, 2010.

Hasenmueller, W. A., 2003a. Bedrock geologic map of the Indianapolis 30 x 60 minute quadrangle, central Indiana: Indiana Geological Survey Open-File Study 03-07, scale 1:100,000.