WEB-BASED GEOLOGIC MAPS, DATABASES, & HTML PAGES FOR MARION COUNTY, INDIANA

Rupp, R. F.[1], Hasenmueller, N. R.[1], Walls, A. C.[2], Karaffa, M. D.[1], Brown, S. E.[3], Fleming, A. H.[1], Ferguson, V. R.[4], Hasenmueller, W. A.[1], Daniels, M. S.[1], and Rohwer, P. D.[1]
[1] Indiana Geological Survey, Indiana University, 611 North Walnut Grove Ave., Bloomington, IN 47405, [2] 39 Degrees North, P.O. Box 1937, Bloomington, IN 47404,
[3] Illinois State Geological Survey, 615 E. Peabody Dr., Champaign, IL 61820, [4] 2275 E. 300 S., Albion, IN 46701

Abstract

The Indiana Geological Survey (IGS) has created an Internet map server for Marion County in central Indiana. The Web site provides detailed geologic information needed to address environmental issues, resource management issues, and land-use conflicts related to a growing population. Marion County is the location of Indianapolis, the state capital and largest city. The IGS anticipates that the Web site will be widely used by the general public, industry, and government entities concerned about the geology, groundwater, and other natural resources.

The Marion County Web site links an Internet map server (IMS) and database to provide a portal to the IGS's enterprise geodatabases, which allow users to efficiently create, manage, update, and distribute maps and data. The IMS site retrieves maps of bedrock and surficial geology completed during earlier IGS mapping projects. Hydrogeology, infrastructure, and imagery map layers are also included. Database information includes lithologic information (iLITH) compiled from water-well records stored in the Indiana Department of Natural Resources, Division of Water archives and natural gamma-ray geophysical log data, stratigraphic test hole data, and petroleum well-record data from the IGS.

Currently, the following products are being prepared: (1) illustrated Web pages discussing the surficial geology, bedrock geology, and bedrock topography; (2) illustrated Web pages discussing digital elevation model terrain, gamma-ray log, iLITH, and clay thickness data sets; (3) online glossary; and (4) metadata for the map layers. The development of the Web site is funded by the IGS and the Great Lakes Geologic Mapping Coalition.

Introduction

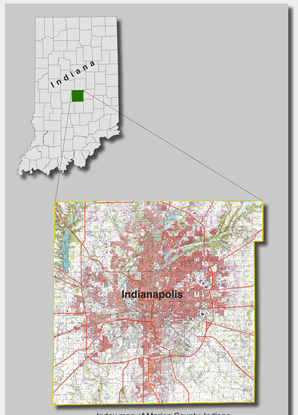
The Marion County Web site provides basic information on the geology of the area in an easy-to-view format and provides access to various maps and photos. The Web site includes an Internet map server (IMS) and a data download site. Illustrations and educational summaries and discussions of geologic maps, terrain images, and databases that complement the IMS are being added in 2011. 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 reference 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.

Underground limestone mine

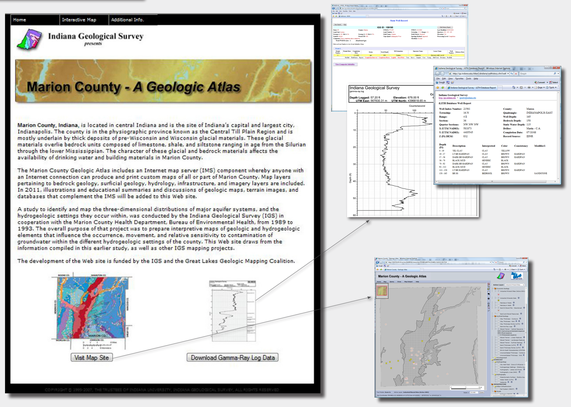
96th Street Quarry - Indianapolis

Exploratory drilling for "Deep Rock Tunnel"



Index map of Marion County, Indiana

Homepage



Acknowledgments

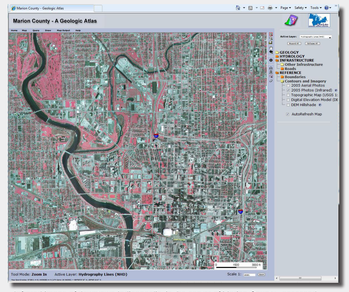
Previous work featured in this Web site was funded by the Marion County Health Department and the STATEMAP component of the National Cooperative Geologic Mapping Program (USGS).

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

Funding for the Web site was provided in part by the Great Lakes Geologic Mapping Coalition (USGS) (<http://igs.indiana.edu/GreatLakesGeology/index.html>).

INTERACTIVE MAPS
providing geologic interpretation

Infrared Photos

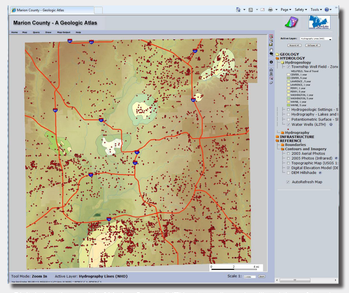


Infrared image of downtown Indianapolis, in the center of Marion County, accessed through the *IndianaMap* Web site (<http://www.indianamap.org/>)

These 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, where data for the entire state is updated regularly.

Digital Elevation Model (DEM)

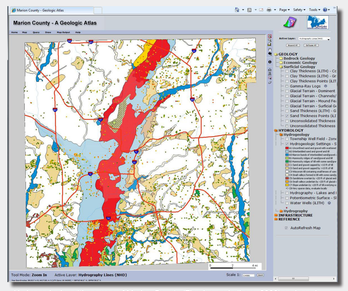


Digital elevation model of Marion County, iLITH water wells, and wellhead time-of-travel zones surrounding the city wellfields (Brown and Fleming, 2000)

This is the 2005 Digital Elevation Model (DEM) 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 (IDNR), 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.

Hydrogeologic Settings

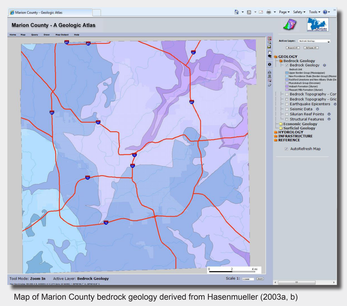


Hydrogeologic settings map of Marion County (Fleming and others, 2000) and sand thickness data

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, which contains similar data for all of Indiana.

Bedrock Geology



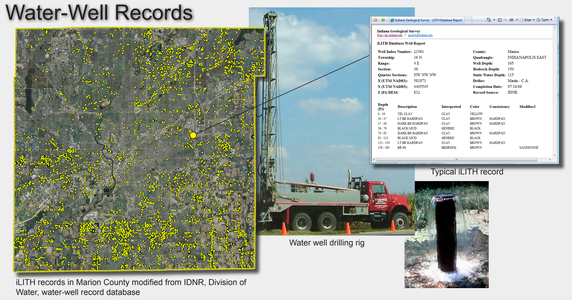
Map of Marion County bedrock geology derived from Hasenmueller (2003a, b)

The bedrock strata underlying 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.

The county is located between the Cincinnati Arch to the northeast and the Illinois Basin to the southwest. The bedrock units dip in a southwesterly direction at 30 to 50 feet per mile. Thus, the oldest units are at the bedrock surface in the northeastern part of the county while the youngest units form buried bedrock uplands in the southwestern part of the county.

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

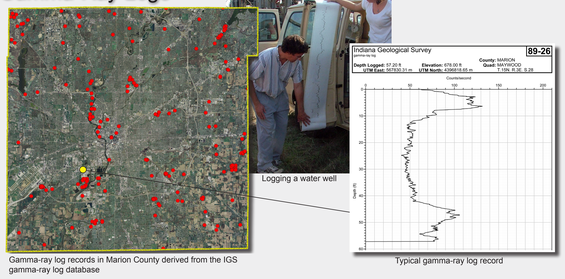
Water well drilling rig

Typical iLITH record

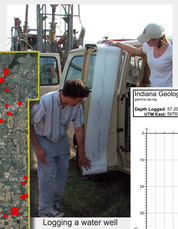
iLITH is a database containing water-well records from the Indiana Department of Natural Resources (IDNR). These records were edited by the Indiana Geological Survey for locational accuracy and the lithologic data were standardized in a series of tables (Brown and others, 2000).

This Web site displays the 4,719 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



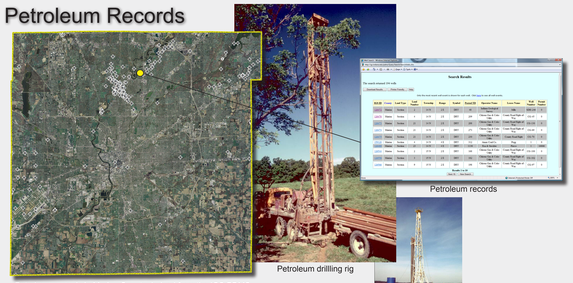
Logging a water well

Typical gamma-ray log record

The gamma-ray records data set for Marion County 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

Petroleum drilling rig

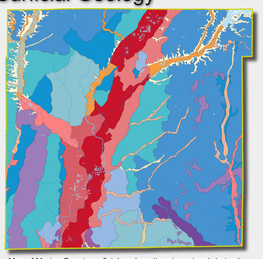
Petroleum records

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 the entire state of 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 and east-central Indiana, and was largely depleted many years ago. However, it still produces noncommercial residential gas wells.

HTML PAGES
providing educational information

Surficial Geology



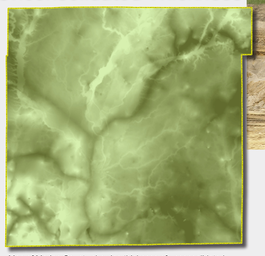
Map of Marion County surficial geology (terrain regions) derived from Brown and Fleming (2000)

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

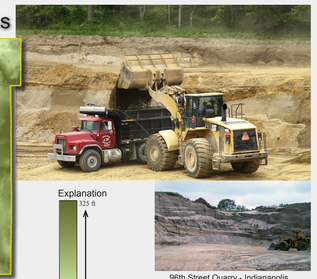
The surficial geology map of Marion County depicts local glacial terrains. These terrains characterize regions of distinct landscapes whose morphologies reflect a series of glacial and postglacial events and processes, and which are underlain by a sequence of near-surface sediments that are distinctly 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



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



96th Street Quarry - Indianapolis

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.

The isopach color ramp emphasizes the end members of thick (dark green) grading to thin (light green) 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 northeast and southeast quadrants, where elevated glacial uplands are superposed over bedrock valleys.

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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.