Kentucky Geological Survey
James C. Cobb, State Geologist and Director
UNIVERSITY OF KENTUCKY, LEXINGTON

Generalized Geologic Map for Land-Use Planning: Henry County, Kentucky

Daniel I. Carey

MAP AND CHART 115

Series XII, 2005

Pond Construction

Successful pond construction must prevent water from seeping through structured soils into limestone solution channels below. A compacted clay liner, or artificial liner, may prevent pond failure. Getting the basin filled with water as soon as possible after construction prevents drying and cracking, and possible leakage, of the clayey soil liner. Ponds constructed in dry weather are more apt to leak than ponds constructed in wet weather. A geotechnical engineer or geologist should be consulted regarding the requirements of a specific site. Other leakage prevention measures include synthetic liners, bentonite, and asphaltic emulsions. The U.S. Department of Agriculture--Natural Resources Conservation Service can provide guidance on the application of these liners to new construction, and for treatment of existing leaking ponds.

Dams should be constructed of compacted clayey soils at slopes flatter than 3 units horizontal to 1 unit vertical. Ponds with dam heights exceeding 25 feet, or pond volumes exceeding 50 acre-feet, require permits. Contact the Kentucky Division of Water, 14 Reilly Rd., Frankfort, KY 40601, telephone: 502.564.3410. Illustration by Paul Howell, U.S. Department of Agriculture--Natural Resources Conservation Service.

Lake Jericho

Lake Jericho, on the Little Kentucky River east of Ky. 153, provides for boating and fishing recreation. Photo by Dan Carey, Kentucky Geological Survey.

River Transport

Lock and Dam 2 near Lockport. Photo by Dan Carey, Kentucky Geological Survey.

Henry County Courthouse

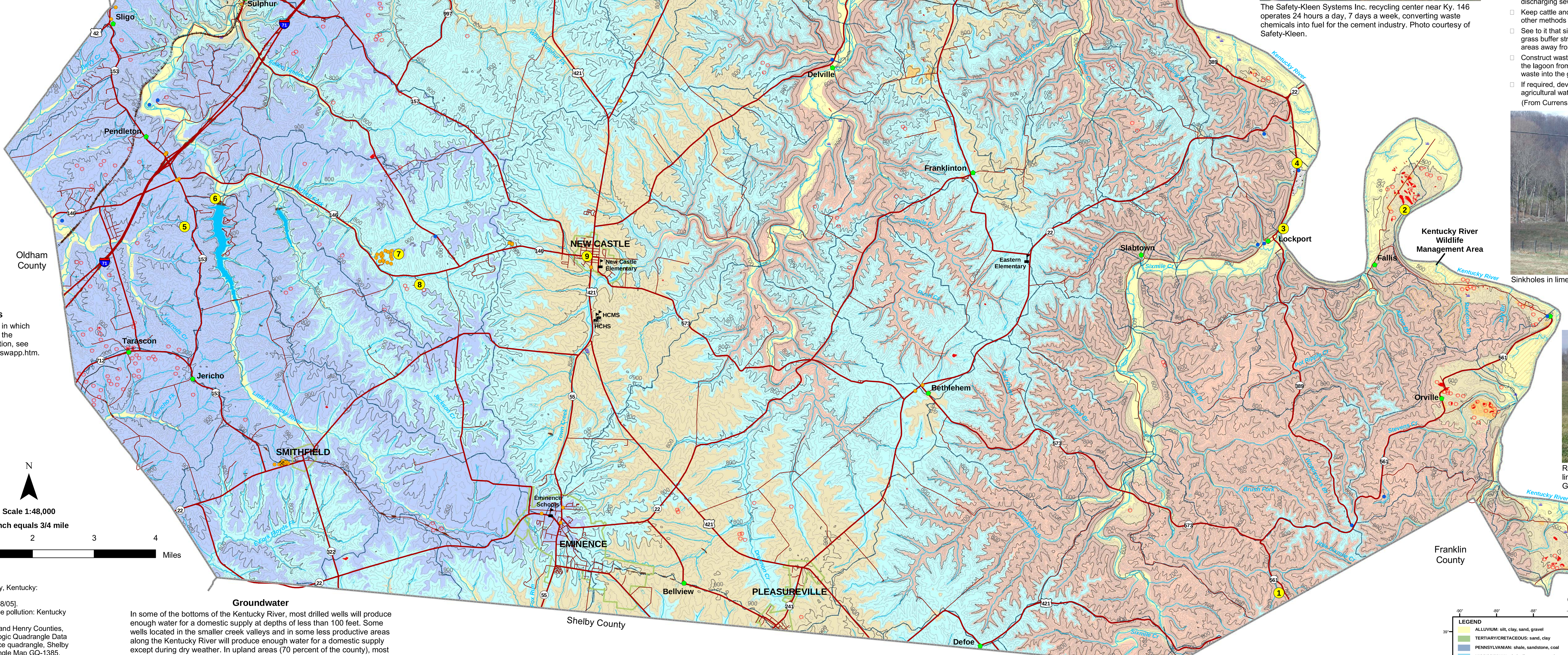
New Castle, the county seat, was founded in 1798. Henry County, 289 square miles in the Outer Bluegrass Region, was formed in 1799. The terrain is rolling to hilly. The highest elevation, 950 feet, is on a ridge about 3/4 mile east of Franklinton. The 2006 population, 16,025, was 6.4 percent greater than that of 2000. Photo by Dan Carey, Kentucky Geological Survey.

For Planning Use Only

This map is not intended to be used for selecting individual sites. Its purpose is to inform land-use planners, government officials, and the public in a general way about geologic bedrock conditions that affect the selection of sites for various purposes. The properties of thick soils may supersede those of the underlying bedrock and should be considered on a site-to-site basis. At any site, it is important to understand the characteristics of both the soils and the underlying rock. For further assistance, contact the Kentucky Geological Survey, 859.257.5500. For more information, and to make custom maps of your area, visit the KGS Land-Use Planning Internet Mapping Web Site at kgsmap.uky.edu/website/kyluplan/viewer.htm.

Acknowledgments

Geology adapted from Davidson (2002), Mullins (2002), Nelson (2001, 2002a-c), Thompson (2001a, b, 2002), Tyra (2002a, b), Zhang (2002a, b), Sinkhole data from Paylor and others (2004). Thanks to Paul Howell, U.S. Department of Agriculture, Natural Resources Conservation Service, for pond construction illustration.



Agriculture

Upland limestones provide soils for a strong agricultural economy. Photo by Dan Carey, Kentucky Geological Survey.

Mapped Surface Faults

Faults are common geologic structures across Kentucky, and have been mapped in many of the Commonwealth's counties. The faults shown on this map represent seismic activity that occurred several million years ago at the latest. There has been no activity along these faults in recorded history. Seismic risk associated with these faults is very low. Faults may be associated with increased fracturing of bedrock in the immediately adjacent area. This fracturing may influence slope stability and groundwater flow in these limited areas.

Mineral Resources

Liter's Quarry Inc. uses room-and-pillar mining techniques to produce 750,000 to 1 million tons of aggregate per year from their drift mine in limestone just north of Lockport. Photo by Dan Carey, Kentucky Geological Survey.

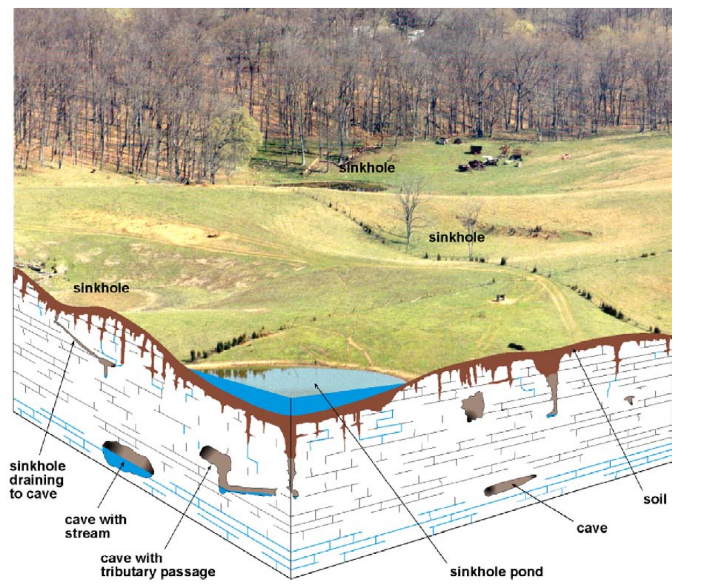
Industry

The Safety-Kleen Systems Inc. recycling center near Ky. 146 operates 24 hours a day, 7 days a week, converting waste chemicals into fuel for the cement industry. Photo courtesy of Safety-Kleen.

Karst Geology

The term "karst" refers to a landscape characterized by sinkholes, springs, sinking streams (streams that disappear underground), and underground drainage through solution-enlarged conduits or caves. Karst landscapes form when slightly acidic water from rain and snowmelt seeps through soil cover into fractured and soluble bedrock (usually limestone, dolomite, or gypsum). Sinkholes are depressions on the land surface into which water drains underground. Usually circular and often funnel-shaped, they range in size from a few feet to hundreds of feet in diameter. Springs occur when water emerges from underground to become surface water. Caves are solution-enlarged fractures or conduits large enough for a person to enter.

Environmental Protection



- Never use sinkholes as dumps. All waste, but especially pesticides, paints, household chemicals, automobile batteries, and used motor oil should be taken to an appropriate recycling center or landfill.
- Make sure runoff from parking lots, streets, and other urban areas is routed through a detention basin and sediment trap to filter it before it flows into a sinkhole.
- Make sure your home septic system is working properly and that it's not discharging sewage into a crevice or sinkhole.
- Keep cattle and other livestock out of sinkholes and sinking streams. There are other methods of providing water to livestock.
- See to it that sinkholes near or in crop fields are bordered with trees, shrubs, or grass buffer strips. This will filter runoff flowing into sinkholes and also keep tilled areas away from sinkholes.
- Construct waste-holding lagoons in karst areas carefully, to prevent the bottom of the lagoon from collapsing, which would result in a catastrophic emptying of waste into the groundwater.
- If required, develop a groundwater protection plan (410KAR5:037) or an agricultural water-quality plan (KRS224.71) for your land use.

(From Currens, 2001)

Sinkholes in limestone (unit 3). Photo by Dan Carey, Kentucky Geological Survey.

Topography

Rounded, knobby hills in southeastern Henry county typify shaly limestone (unit 2) topography. Photo by Dan Carey, Kentucky Geological Survey.

EXPLANATION

- School
- Severely eroded area
- Rock outcrop
- Sinkhole
- Wet area
- Mine or quarry
- Water wells
  - Domestic
  - Monitoring
- Fault
- Railroad
- Wetlands > 1 acre (U.S. Fish & Wildlife Service, 2003)
- Watershed divide
- Wildlife management areas
- Source-water protection areas, zone 1
- Quarry
- Artificial fill
- Mapped sinkholes
- 20-foot contour interval
- Photograph location

Source-Water Protection Areas

Source-water protection areas are those in which activities are likely to affect the quality of the drinking-water source. For more information, see kgsweb.uky.edu/download/water/swapp/swapp.htm.

N

Scale 1:48,000

1 inch equals 3/4 mile

0 0.5 1 2 3 4 Miles

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Groundwater

In some of the bottoms of the Kentucky River, most drilled wells will produce enough water for a domestic supply at depths of less than 100 feet. Some wells located in the smaller creek valleys and in some less productive areas along the Kentucky River will produce enough water for a domestic supply except during dry weather. In upland areas (70 percent of the county), most drilled wells will not produce enough water for a dependable domestic supply, unless they are drilled along drainage lines, in which case they may produce enough water except during dry weather. Groundwater in these areas is hard or very hard and may contain salt or hydrogen sulfide, especially at depths greater than 100 feet.

For more information on groundwater in the county, see Carey and Stickney (2005).

PLANNING GUIDANCE TABLE DEFINITIONS

FOUNDATION AND EXCAVATION

The terms "earth" and "rock" excavation are used in the engineering sense; earth can be excavated by hand tools, whereas rock requires heavy equipment or blasting to remove.

LIMITATIONS

Slight--A slight limitation is one that commonly requires some corrective measure but can be overcome without a great deal of difficulty or expense.

Moderate--A moderate limitation is one that can normally be overcome but the difficulty and expense are great enough that completing the project is commonly a question of feasibility.

Severe--A severe limitation is one that is difficult to overcome and commonly is not feasible because of the expense involved.

LAND USES

Septic tank disposal system--A septic tank disposal system consists of a septic tank and a filter field. The filter field is a subsurface tile system laid in such a way that effluent from the septic tank is distributed with reasonable uniformity into the natural soil.

Residences--Ratings are made for residences with and without basements because the degree of limitation is dependent upon ease and required depth of excavation. For example, excavation in limestone has greater limitation than excavation in shale for a house with a basement.

Highways and streets--Refers to paved roads in which cuts and fills are made in hilly topography, and considerable work is done preparing subgrades and bases before the surface is applied.

Access roads--These are low-cost roads, driveways, etc., usually surfaced with crushed stone or a thin layer of blacktop. A minimum of cuts and fills are made, little work is done preparing a subgrade, and generally only a thin base is used. The degree of limitation is based on year-around use and would be less severe if not used during the winter and early spring. Some types of recreation areas would not be used during these seasons.

Light industry and malls--Ratings are based on developments having structures or equivalent load limit requirements of three stories or less, and large paved areas for parking lots. Structures with greater load limit requirements would normally need footings in solid rock, and the rock would need to be core drilled to determine presence of caverns, cracks, etc.

Intensive recreation--Athletic fields, stadiums, etc.

Extensive recreation--Camp sites, picnic areas, parks, etc.

Reservoir areas--The floor of the area where the water is impounded. Ratings are based on the permeability of the rock.

Reservoir embankments--The rocks are rated on limitations for embankment material.

Underground utilities--Included in this group are sanitary sewers, storm sewers, water mains, and other pipes that require fairly deep trenches.

Additional Planning Resources

Listed below are Web sites for several agencies and organizations that may be of assistance with land-use planning issues in Henry County:

ces.ca.uky.edu/Henry/ University of Kentucky Cooperative Extension Service
www.kipda.org/ Kentuckiana Regional Planning and Development Agency
www.thinkkentucky.com/edis/cmnty/cmntyin dex.htm Economic Development Information System
www.uky.edu/KentuckyAtlas/21103.html Kentucky Atlas and Gazetteer
http://quickfacts.census.gov/qfd/states/21/21103.html U.S. census data
www.uky.edu/KGS/ Kentucky Geological Survey

Earthquake Hazard

Ground shaking (peak-particle accelerations) due to an earthquake in or near the county is minimal for structures situated on or tied into the bedrock foundation. In areas underlain by poorly consolidated soils, site-specific investigations should be conducted to assure that the building codes will conform to any ground deformation such as liquefication, landslides, or surface fault ruptures. For more information, see www.uky.edu/KGS/geologichazards/eqhazards.htm.

Residential Development

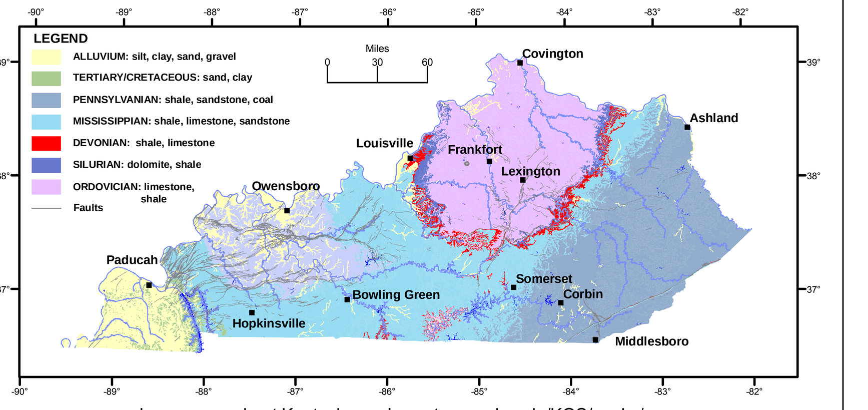
New housing development in rural Henry County. Photo by Dan Carey, Kentucky Geological Survey.

Planning Guidance by Rock Unit Type

Rock Unit	Karst Potential Rating	Foundation and Excavation	Septic System	Residence with Basement	Highways and Streets	Access Roads	Light Industry and Malls	Intensive Recreation	Extensive Recreation	Reservoir Areas	Reservoir Embankments	Underground Utilities
1. Silt, clay, sand, and gravel	None, but on-site karst investigation recommended where less than 25 feet thick over soluble rock.	Fair foundation material; easy to excavate.	Severe limitations. Failed septic systems can contaminate groundwater. Refer to soil report (Whitaker and Eigel, 1992).	Water in alluvium may be in direct contact with basements. Refer to soil report (Whitaker and Eigel, 1992).	Slight limitations. Refer to soil report (Whitaker and Eigel, 1992).	Slight to moderate limitations. Refer to soil report (Whitaker and Eigel, 1992).	Slight to moderate limitations. Avoid construction in floodplain. Refer to soil report (Whitaker and Eigel, 1992).	Refer to soil report (Whitaker and Eigel, 1992).	Refer to soil report (Whitaker and Eigel, 1992).	Refer to soil report (Whitaker and Eigel, 1992).	Not recommended. Refer to soil report (Whitaker and Eigel, 1992).	Not recommended. Refer to soil report (Whitaker and Eigel, 1992).
2. Limestone, dolomite, and shale*	High.	Fair to excellent foundation material; difficult excavation.	Severe to moderate limitations. Impermeable rock. Locally fast drainage through fractures and sinks. Danger of groundwater contamination.	Severe to moderate limitations. Rock excavation may be required.	Moderate limitations. Rock excavation possible. Local drainage problems, especially on shale. Sinks possible.	Moderate limitations. Rock excavation. Local drainage problems. Sinks common.	Slight to severe limitations, depending on topography. Rock excavation. Sinks possible. Local drainage problems. Groundwater contamination possible.	Slight to moderate limitations, depending on activity and topography. Possible steep wooded slopes.	Slight to severe limitations, depending on activity and topography. Possible steep wooded slopes. Slight limitations for forest or nature preserve.	Severe to moderate limitations. Reservoir may leak where rocks are fractured. Sinks possible.	Severe to moderate limitations. Reservoir may leak where rocks are fractured. Sinks possible.	Severe to moderate limitations. Possible rock excavation.
3. Limestone	High.	Good to excellent foundation material; difficult to excavate.	Severe limitations. Impermeable rock. Locally fast drainage through fractures and sinks to water table, with possible contamination.	Severe to moderate limitations. Rock excavation may be required. Local seepage problems.	Slight to moderate limitations. Rock excavation; locally, upper few feet may be rippable. Local drainage problems.	Slight limitations. Rock excavation likely. Local drainage problems. Sinks possible.	Slight to moderate limitations. Rock excavation; locally, upper few feet may be rippable. Sinks possible. Local drainage problems.	No limitations.	No limitations.	Moderate to severe limitations. Reservoir may leak where rocks are fractured. Sinks possible. Locally, conditions may be favorable.	Severe limitations. Reservoir may leak where rocks are fractured. Solution channels possible.	Severe limitations. Rock excavation.
4. Limestone and shale*	High to medium.	Good to excellent foundation material; difficult to excavate.	Moderate to severe limitations. Impermeable rock. Locally fast drainage through fractures and sinks to water table, with possible contamination.	Moderate to severe limitations. Rock excavation may be required. Poor drainage when shale present.	Moderate limitations. Rock excavation possible. Local drainage problems, especially on shale. Sinks possible.	Moderate limitations. Rock excavation likely. Local seeps.	Severe to slight limitations. Rock excavation. Local drainage problems. Groundwater contamination possible.	Moderate to slight limitations, depending on activity and topography.	Moderate to slight limitations, depending on activity and topography.	Moderate to severe limitations. Reservoir may leak where rocks are fractured. Sinks possible.	Moderate to severe limitations. Reservoir may leak where rocks are fractured. Sinks possible.	Moderate to severe limitations. Possible rock excavation.
5. Shale* and limestone	Low.	Fair to poor foundation material; moderately difficult to excavate.	Slight to severe limitations, depending on depth to impermeable rock. Possible thin soils.	Moderate to severe limitations. Rock excavation; locally, upper few feet may be rippable.	Severe limitations. Rock excavation; locally, upper few feet may be rippable. Steep slopes. Possible expansion of shales.	Moderate limitations. Rock excavation. Steep slopes. Local drainage problems.	Severe limitations. Rock excavation; locally, upper few feet may be rippable. Steep slopes. Possible expansion of shales.	Severe limitations. Steep slopes.	Slight to moderate limitations, depend- on topography and activity.	Slight limitations. Reservoir may leak where rocks are fractured.	Moderate limitations. Reservoir may leak where rocks are fractured.	Severe to moderate limitations. Possible rock excavation.
6. Silt, clay, sand, and gravel (high-level deposits)	High, when overlying unit 3. Otherwise, on-site karst investigation recommended where less than 25 feet thick over soluble rock.	Fair foundation material; easy to excavate.	Severe to slight limitations, depending on amount of soil cover. See guidance for underlying unit 3.	Moderate to slight limitations. See guidance for underlying unit 3.	See guidance for underlying unit 3.	See guidance for underlying unit 3.	See guidance for underlying unit 3.	See guidance for underlying unit 3.	See guidance for underlying unit 3.	Not recommended. Pervious material.	See guidance for underlying unit 3.	Slight limitations.

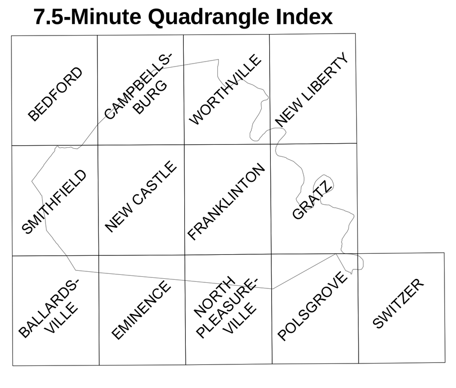
*Some of these shales can shrink during dry periods and swell during wet periods, and cause cracking of foundations. Shale units on hillsides, especially where springs are present, are susceptible to landslides.

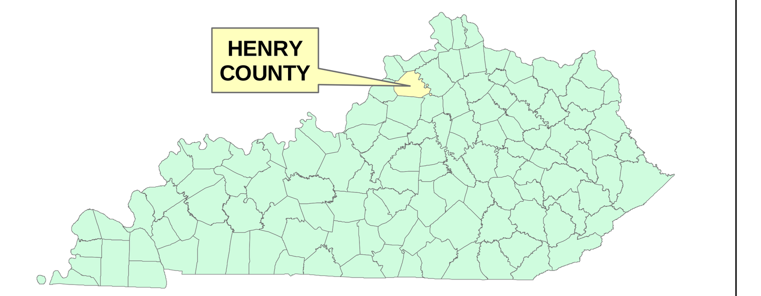
Geology of Kentucky



Learn more about Kentucky geology at www.uky.edu/KGS/geoky/

7.5-Minute Quadrangle Index





For information on obtaining copies of this map and other Kentucky Geological Survey maps and publications call our Public Information Center at 859.257.3896 or 877.778.7827 (toll free).

View the KGS World Wide Web site at www.uky.edu/kgs.