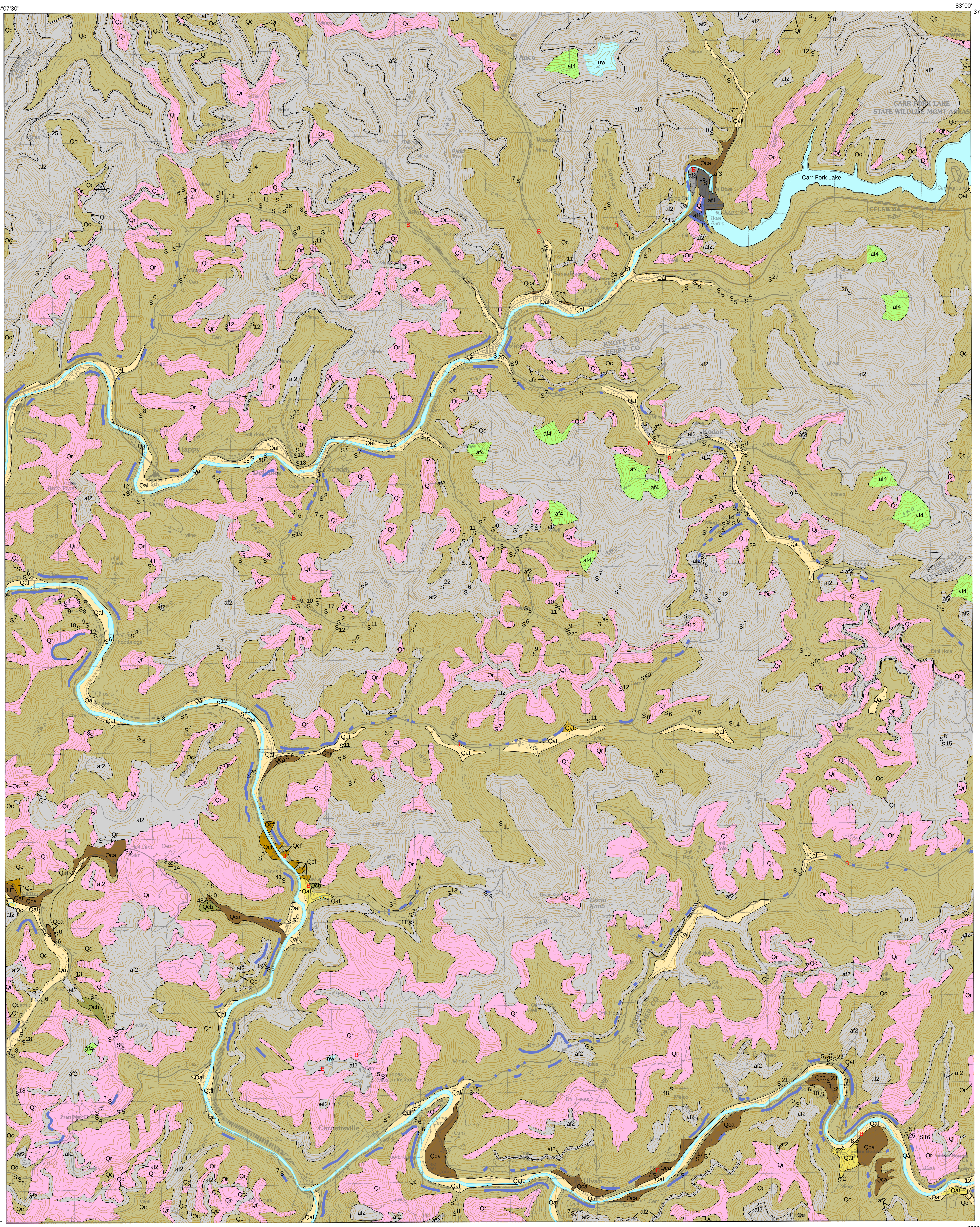
GEOLOGIC QUADRANGLE
VICCO QUADRANGLE, KY.
Series XII, 200 8
GQ-418
Version 1.0
Contract Report 30



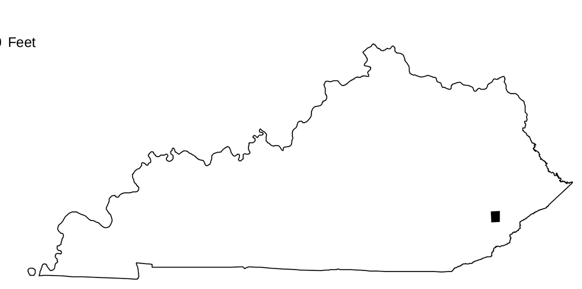
SCALE 1:24,000

5,000 2,500 0 5,000 10,000 Feet
0.5 0.25 0 0.5 1 Miles
0.5 0.25 0 0.5 1 Kilometers

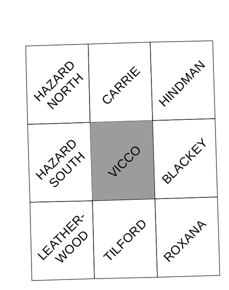
CONTOUR INTERVAL 20 FEET

Kentucky Single Zone State Plane projection

Topographic base and cultural features are from Kentucky Raster Graphics from Kymartian.ky.gov/krgmaps/KRG of VICCO



MAP LOCATION



7.5 MIN QUADRANGLE INDEX

CORRELATION OF MAP UNITS

Qal | Qaf | Qat | Qc | Qca | Qcb | Qcf | Qls | Qr — Holocene — QUATERNARY

UNCONFORMITY

Pz — Pennsylvanian — PALEOZOIC

CORRELATION OF MAP UNITS chart and DESCRIPTION OF MAP UNITS
Includes map units from adjacent quadrangles. Only map units within this quadrangle are shown with color fill.

DESCRIPTION OF MAP UNITS

Qal — **Alluvium modern (Holocene)**
Unconsolidated sand, silt, gravel, and clay. Mainly occupies modern river channels, narrow stream valley bottoms, and floodplains. Local sand and gravel bars containing cobbles and boulders present. Unit typically generated from weathered colluvium and debris flows near valley bottoms and often flooded, eroded, and re-deposited. Contact between adjacent colluvium and alluvial fans varies from sharp to poorly defined. Thickness ranges from 0 to 30 feet.

Qaf — **Alluvium, alluvial fans (Holocene)**
Broad, fan-shaped deposits of unconsolidated material at the mouths of small valleys and ravines. Confined to coalescing tributary valleys, unit probably contains a mixture of flood-plain alluvium and hill slope colluvium. Fluvial origin varies from recent to old.

Qat — **Alluvium, low terrace (Holocene)**
Silt, sand, and clay deposited by rivers; forms terrace above adjacent floodplain; contact with adjacent units varies from sharp to poorly defined; locally inferred on the basis of topographic expression; distinguished by topographic expression from lower floodplain.

Qc — **Colluvium , modern (Holocene)**
Unconsolidated sand, gravel, silt, clay, cobbles, and boulders; gravity driven material mantling steep slopes, generated from weathering of underlying bedrock. Thickness ranges from 0 to 40(?) feet and varies depending on landscape position and underlying bedrock lithology. Typically colluvial slopes are thickest at the base (toe slopes) and thin and discontinuous toward the shoulder (side slopes). Thick colluvium troughs or wedges often surround bedrock outcrops or ledges on steep slopes.

Qca — **Colluvium, accumulation zones (Holocene)**
Thick accumulation zones of colluvial material generally deposited on gently sloping toe slopes. Unit also may be small, fan-shaped deposits near base of steep slopes or occur downslope of gaps in bedrock ledges, on concave slopes, and in toe slopes. Gravity driven.

Qcb — **Colluvium, accumulation zones, boulder dominated (Holocene)**
Thick accumulation zones of boulder dominated material. Small, fan-shaped deposits near base of steep slopes. Down slope of gaps in bedrock ledges, concave slopes, and toe slopes. Gravity driven.

Qcf — **Colluvium, colluvial fans (Holocene)**
Thick accumulation zones of colluvial material. Small, fan-shaped deposits near base of steep slopes. Gravity driven.

Qr — **Residuum (Holocene)**
Highly weathered bedrock regolith found along ridge tops, gently sloping hills, and convex upward slopes. Unit is typically interbedded fine-grained rock and silty soil, few large angular rock pieces; maintains sedimentary rock structure. Underlain by interbedded sandstone, shale, siltstone, and coal which determines rate of weathering and residual accumulation.

Pz — **Bedrock and residuum (Paleozoic)**
Consolidated layers of sandstone, shale, siltstone, and coal, minor amounts of limestone. Except where exposed as a roadcut or natural rock face, unit is primarily underlying the surficial geology and comprises the core of the steep hills.

Qls — **Landslide deposits, modern (Holocene)**
Complex accumulations of slumps, earthflows, debris flows, and hummocky ground within colluvial slopes. Unit derived from thick colluvial slopes or boulder dominated areas. Commonly consists of cobbles and boulders with sand, silt, and clay matrix. Slides range from active to historic non-active slides. Widespread in steep narrow gullies. Generally small in size, most too small to map at this scale, and difficult to delineate contacts with other units.

af1 — **Artificial fill, engineered fill (Modern)**
Unconsolidated material used as fill for the construction of roads, railroads, buildings, floodwalls, and other engineered structures.

af2 — **Artificial fill, mine spoil (Modern)**
Unconsolidated overburden and fill material generated from surface and underground coal mining processes. This includes material mined and restored from contour mining, excess mine spoil placed in hollow fills, dry refuse, slurry ponds, and mountain top removal sites. Unit delineated by soil map analysis, modern aerial photography, current mine maps, and historical topographic maps.

af3 — **Artificial fill, other fill (Modern)**
Chaotic, unconsolidated fill material; includes materials cleared during maintenance of roads and water ways and graded recreational areas.

af4 — **Artificial fill, hollow fill (Modern)**
Excess overburden placed in narrow valleys after coal removal. Volume of material swells by approximately 20%-25% as unconsolidated spoil after bedrock is broken up. Material is typically graded and benched.

nw — **New water**
Areas of former land which have been removed by active erosion or dredging since the completion of original topographic mapping.

*Map units **Qc**, **Qr**, and **Qa**l are primarily derived from the parent materials of the USDA soil series units. Delineation of these units was completed by field observations, slope percentage analysis, and mining data.

*Map units **Qaf**, **Qat**, **Qca**, **Qcb**, and **Qls** are derived from field observation.

*Map unit **af2** and **af4** were derived from soil series maps, known mined areas, mine permit maps, and aerial photography

EXPLANATION

- Contact
- Inferred contact
- Terrace scarp
- Contour strip
- Bedrock face
- S 23 KGS database, number indicates depth to bedrock in feet
- " KGS drilling
- $ Landform observation and soil probe
- B Landform observation

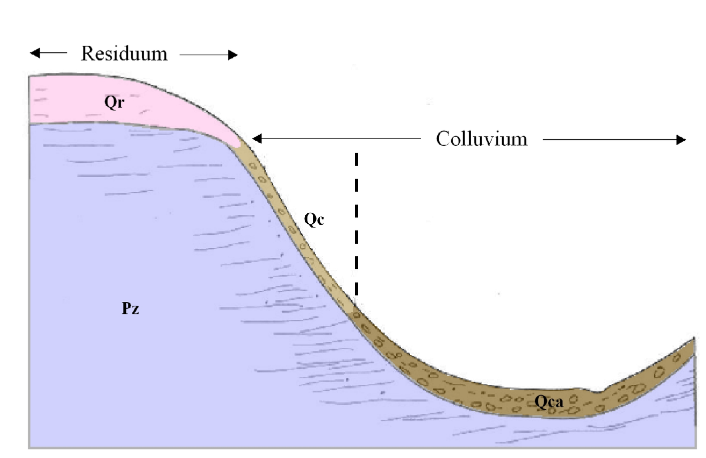


Figure A. Idealized cross-section of hillslope and surficial units formed on siltstone and shale. Note difference in thickness between colluvium (**Qc**) and the colluvial accumulation zones (**Qca**). The absence of Alluvium (**Qal**) is common as there are places wh ere the steep colluvial slopes dominate and intersect the valley bottom without **Qal** depositional influence. **(**Modified from Newell, 1978).

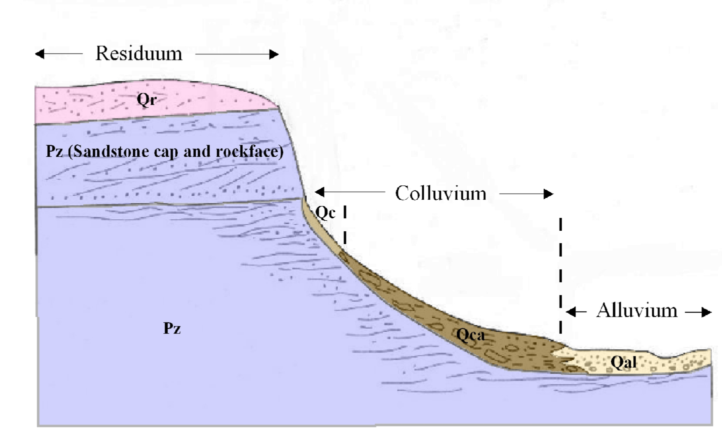


Figure B. Idealized cross-section of hillslope and suficial units formed on bedrock with a sandstone cap and vertical sandstone rock face. Note the difference in colluvium (**Qc**) and the colluvial accumulation zones (**Qca**). Here the **Qca** intersects a broader c hannel occupied by **Qal.** (Modified from Newell, 1978).

GEOLOGIC SUMMARY

GEOLOGIC SETTING AND ECONOMIC GEOLOGY

The Vicco 7.5-minute quadrangle is located in Perry, Knott, and Letcher counties of Kentucky and lies in the larger Eastern Kentucky Coal Field of the Appalachian Basin. The geology consists of gently dipping sedimentary rocks of Pennsylvanian age and unconsolidated sediments of Quaternary age. These rocks are dominantly sandstone, siltstone, shale, coal, and limestone of the Breathitt Group that occur in the Eastern Kentucky Coal Field.

Coal, oil, and natural gas are the principal mineral resources of the Vicco 7.5-minute quadrangle. Limestone, sand, gravel, clay, and shale are also available as mineral resources for general construction purposes and for use in the coal industry. Coal mining has a history of more than 100 years. Perry County alone has produced approximately 593 million tons from a variety of surface and underground mining methods. In 2004, Perry County produced approximately 12 million tons and has estimated remaining reserves of 2,500 million tons.

The distribution of surficial materials is related to specific bedrock lithology, weathering rates, and the influence of mining and other types of development. The units described on this map reflect natural processes collectively operating as a dynamic geomorphic system (Newell, 1978). They are the result of the relationship between processes and landforms. Chemical and mechanical weathering, mass wasting, and streamflow are the main agents creating and transporting the surficial materials that become the residual, alluvial, and colluvial units.

GEOTECHNICAL BEHAVIOR

The Quaternary deposits identified in the map area exhibit a wide range of grain size and geotechnical behaviors. Grain-size distribution, soil thickness, plasticity index, clay content, and soil saturation are the primary factors affecting the behavior of soils for geotechnical, hydrogeologic, and agricultural applications. The grain-size distribution of unconsolidated sediments is dominantly controlled by the conditions under which the material was deposited. Fluvial processes produce moderate sorting; colluvial processes produce poorly sorted deposits. Low-energy environments allow the deposition of fine-grained materials. High-energy deposits limit deposition to only coarser-grained materials.

Major properties of surficial materials recorded during mapping include (1) texture, using standard U.S. Department of Agriculture (USDA) terms defined by percentages of sand, silt, and clay and (2) classification, determined by the Unified Soil Classification System, which classifies soil properties that affect construction development.

HAZARDS

The highly dissected topography in the Hazard area has a history of mass wasting and has the potential to cause engineering and maintenance problems. The thick sequences of interbedded sandstone, siltstone, and shale in the Breathitt Group that is covered by varying thicknesses of surficial materials contributes to failure by landslide, creep, slumps, and debris flows, adversely affecting construction projects. Heavy precipitation, stream erosion, new roads, logging, clear-cutting, and removal of vegetation for construction can destabilize slopes. Coal-mining activities can also precipitate landslides. Landslides of colluvium from hillsides pose engineering hazards and have damaged roads, railroads, and housing development. Within the colluvial units, much of the housing developments are benched into the toe of slopes along narrow valleys, often tiered a few hundred feet up the slope. A sandy matrix of colluvium (sandstone makes up greater than 50 percent of the bedrock) typically has higher porosity and is well drained, making it more stable than colluvium derived from clay-rich rocks (Newell, 1978). A colluvium whose matrix is rich in clay and silt (sandstone is less than 33 percent of the bedrock) is poorly drained and easily saturated and mobilized (Newell, 1978).

Flooding is a common occurrence, particularly in late winter or early spring, in areas underlain by alluvium. Both modern channel deposits and floodplain alluvium occupying narrow stream valleys between steep slopes have flood potential. Floodplain alluvium will vary from sandy, well-drained sediment to predominantly silt and clay that may drain poorly following floods. Low terraces correspond to high-magnitude, low-frequency flood stages.

LANDUSE

The topography in the Hazard area severely limits developable sites. Housing developments and transportation corridors are most often located on relatively flat alluvium and colluvium deposits near valley bottoms. These deposits are marginally stable materials that were moved into place by catastrophic events. Though these landforms appear stable, loading a deposit with structures, truncating the toe of a deposit for transportation routes and/or saturating the materials with septic systems or development drainage may destabilize and activate mass movement events. Other possible sites for development and transportation corridors are former mining benches, hollowfill deposits, and mined out areas. Care must be taken to understand the distribution and compaction of the mine spoil and location of buried highwalls and undisturbed bedrock relative to planned construction.

DISCLAIMER

ACKNOWLEDGMENTS

This map was generated using new field mapping and compilation of unpublished and previously published data and was funded in part by the U.S. Geological Survey National Cooperative Mapping Program under the STATEMAP Program authorized by the National Geologic Mapping Act of 1992, Grant No. 07HQAG0062, and by the Kentucky Geological Survey.

Field mapping was completed by Michael L. Murphy from May 2007 to May 2008, with assistance from M. Crawford, W. Andrews, and M. Rivers (KGS).

Subsurface information was compiled from data on file at the Kentucky Geological Survey as well as data contributed by the Kentucky Transportation Cabinet and the U.S. Geological Survey.

Areas within the map area that were inaccessible for various reasons, were interpreted from secondary data from Kentucky Division of Mines Permits, Kentucky Transportation Cabinet, Kentucky Raster Graphics (KRG) Dataset at http://kymartian.ky.gov/krgmaps/index.htm, FSA NAIP Digital Ortho Photo Imagery for Kentucky (2004) ftp://ftp.kymartian.ky.gov/fsa/ USDA Soils Maps and data base,

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QUATERNARY GEOLOGIC MAP OF THE VICCO 7.5–MINUTE QUADRANGLE, EASTERN KENTUCKY

By Michael L. Murphy and Mathew M. Crawford

2008