KENTUCKY GEOLOGICAL SURVEY
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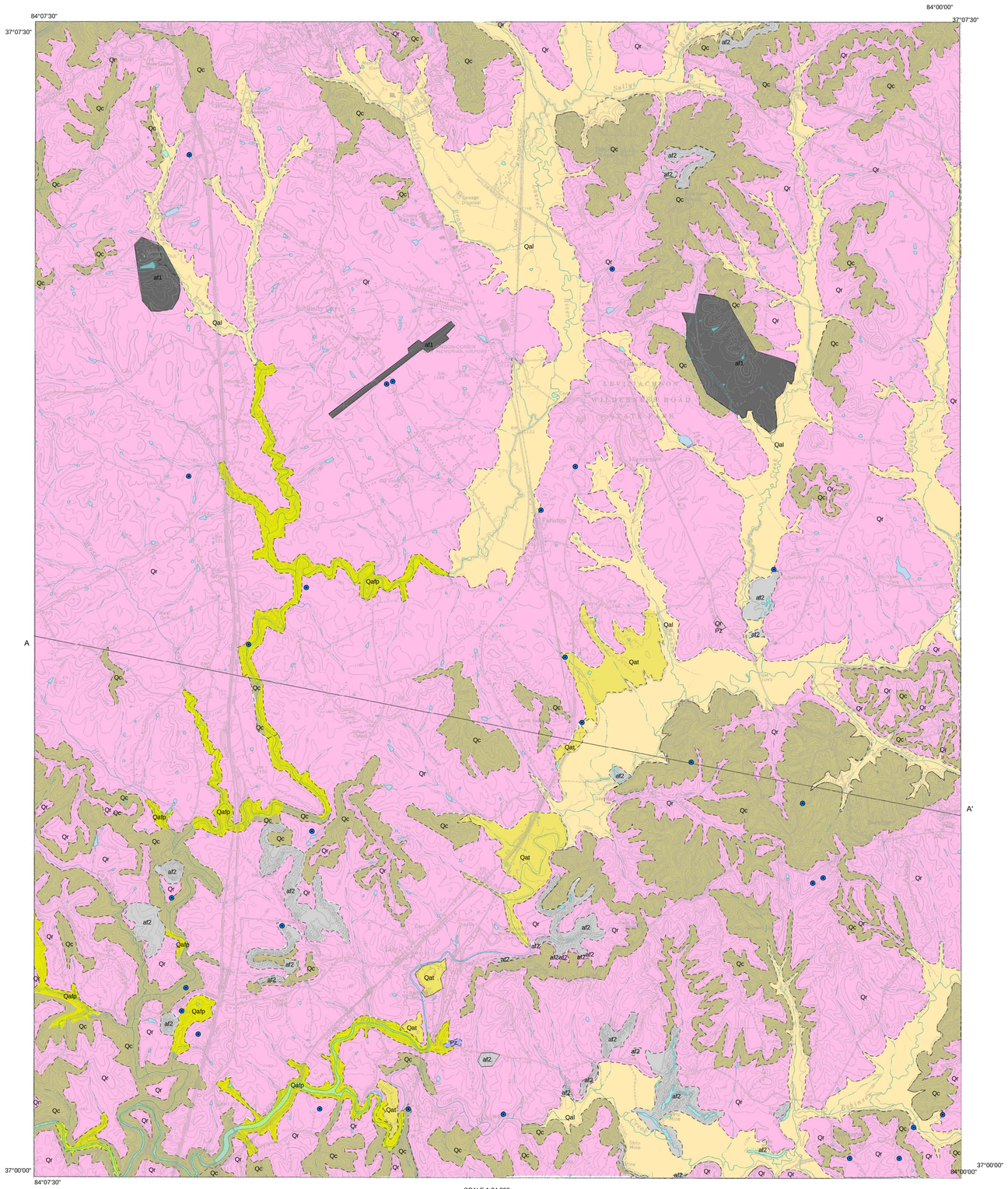
GEOLOGIC QUADRANGLE
LILY QUADRANGLE, KY.
Series XII, 2012
GQ-218
Version 1.0
Contract Report 49



SCALE 1:24,000

Kentucky Single Zone State Plane projection

Topographic base and cultural features are from Kentucky Raster Graphics from Kymaritime.ky.gov/kygisapps/KRG of LILY

5,000 2,500 0 5,000 10,000 Feet

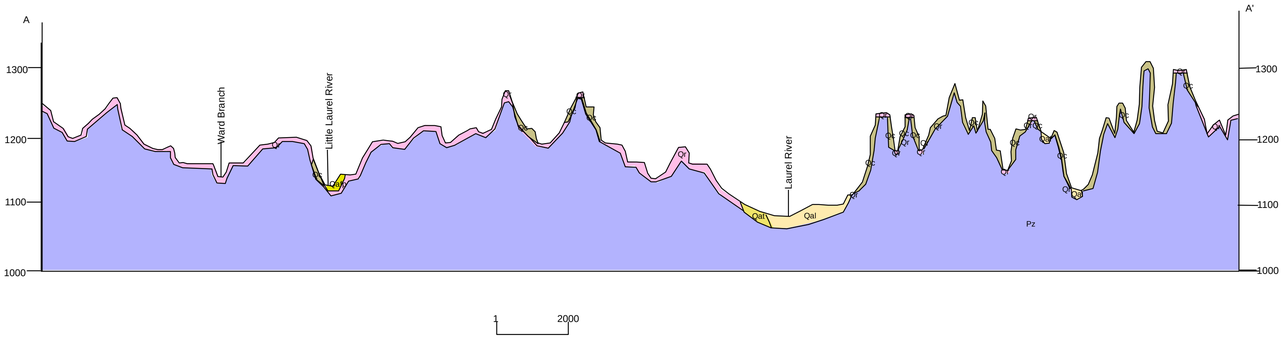
0.5 0.25 0 0.5 1 Miles

0.5 0.25 0 0.5 1 Kilometers

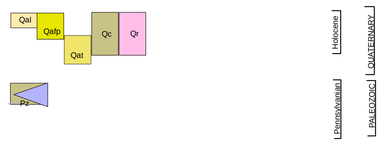
CONTOUR INTERVAL 20 FEET

MAP LOCATION

7.5 MIN QUADRANGLE INDEX



Vertical Exaggeration X 25



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.

Qal **Alluvium modern (Holocene)**
Unconsolidated sand, silt, gravel, and clay. Mainly occupies modern stream channels, narrow stream valley bottoms, and floodplains. Sand and gravel bars containing cobbles locally 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 larger 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.

Qafp **Alluvium, floodplain (Holocene)**
Silt, sand, and clay deposited by rivers; forms low-lying plain next to rivers; contact with adjacent units varies from sharp to poorly defined; locally inferred on the basis of topographic expression and field observation.

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 **Colluvial accumulation zones (Holocene)**
Thick accumulation zones of colluvial material generally deposited on gently steeping 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 **Colluvial 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, golf courses, 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 replaced 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 unit **Qc** and **Qr** 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 **Qat, Qal**, and **Pz** are derived from field observation.

*Map units **af1** and **af2** were derived from soil series maps, known mined areas, mine permit maps, aerial photography, and field observation.

EXPLANATION

Contact
Approximate contact
Inferred contact
Concealed contact
Fault
Approximate fault
Inferred fault
Landform observation and soil probe
Bedrock outcrop
Water well

GEOLOGIC SUMMARY

GEOLOGIC SETTING AND ECONOMIC GEOLOGY

The Lily 7.5-minute quadrangle is located in Laurel County, Kentucky and lies in the 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 is the principal mineral resources of the Lily 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 in Laurel County started in 1750 and still continues today on strip mines that can be seen dotting the landscape.

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 stream flow 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 wetness 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

Laurel County has a wide history of mass wasting which has the potential to cause engineering and maintenance problems. The thick sequences of interbedded sandstone, siltstone, and shale in the Breathitt Group are covered by varying thicknesses of surficial materials. The siltstones and the shales of the Breathitt Group contribute to slope failures such as landslides, creeps, slumps, and debris flows. These slope failures adversely affect construction projects, homes farming, and transportation. Heavy precipitation, stream erosion, new roads, and removal of vegetation for construction can destabilize these slopes.

Flooding is a common occurrence, from late winter and into early summer, in areas underlain by alluvium. The modern alluvium created by the Laurel River and the Little Laurel River have only been sparsely developed and still flood quite easily due to the flat land and waterlogged soil. This modern alluvium will vary from sandy, well-drained sediment to predominantly silt and clay that may drain poorly following floods.

LANDUSE

Housing developments and transportation corridors are most often located on relatively flat alluvium and residuum while farms are mainly seen in the slightly steeper slopes of residuum and colluvium. Strip mining o perations still continue in the southern part of Lily. Much of the gently sloped residuum is overlain by commercial development and even the floodplains are starting to be developed by residential/commercial building. Modern stream channels h ave also been altered to help lessen flooding so that residential development can occur near them.

DISCLAIMER

Although these data have been processed successfully on a computer system at the Kentucky Geological Survey (KGS), no warranty, expressed or implied, is made by KGS regarding the utility of the data on any other system, nor shall the act of distribution constitute any such warranty.

KGS does not guarantee this map or digital data to be free of errors or inaccuracies. Some cultural features originate from data sources other than KGS, and may not align with geologic features on this map. KGS disclaims any responsibility or liability for interpretations from this map or digital data, or decisions based thereon.

The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government.

ACKNOWLEDGMENTS

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Field mapping was completed by Antonia E. Hansen from August 2011 to June 2012.

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.

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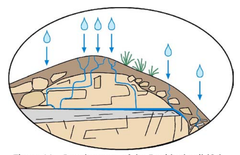


Figure 1A. Development of the Residual soil (Qr). Influence of water on weathering of Bedrock, soil development, and transport of Colluvium (Qc) by infiltration.

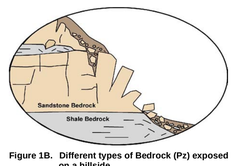


Figure 1B. Different types of Bedrock (Pz) exposed on a hillside.

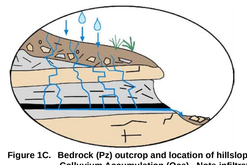
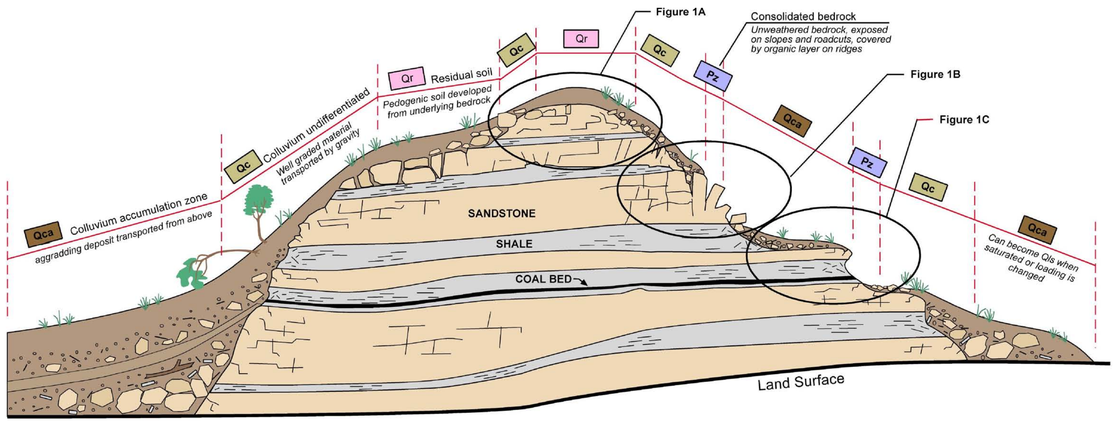


Figure 1C. Bedrock (Pz) outcrop and location of hillslope Colluvium Accumulation (Qca). Note infiltration of water with seep at impervious coal seam



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

By Antonia E. Hansen

2012