High-level fluvial deposits ONGLOMERATE AND SANDSTONE—Friable conglomerate and conglomeratic sandstone, composed of quartz gravel in matrix of sand, etdown deposits derived from Pennsylvanian rocks (Rice, 1984). Mappe Conglomerate and sandstone ocally in Halls Gap 7.5-minute quadrangle. BREATHITT GROUP—Shale, siltstone, sandstone, conglomerate, coal, and limestone. Unit mapped as a formation on 7.5-minute geologic maps but elevated to group status by Chesnut (1992); now contains unit originally mapped as Breathitt and Lee Formations. Detailed litholog escription and explanation provided by Sparks and others (2008) adjacent Hazard 30 x 60 minute quadrangle to the east. PIKEVILLE FORMATION—Shale, siltstone, sandstone, and coal, Shale, ly to clavey. Base of lower shale member is fossiliferous. Siltstone Corbin Sandstone dy, thin-bedded. Sandstones, arkosic to sublitharenitic, micaceou dded, and commonly argillaceous. Unit named by Chesnut (1992) fo ata between the base of the Betsie Shale Member (Rice and others Grundy Formation 987) and the base of the Kendrick Shale Member, which is eroded in the quadrangle. The base of the Betsie Shale (not mapped) is just above als include, in descending order, the Jellico, Blue Gem, and Little Blu Rockcastle Sandstone Membe GRUNDY FORMATION—Shale, siltstone, sandstone, and coal. Litholog Bee Rock Formation naps. Unit as mapped contains three thick informally named sandstones The Corbin Sandstone Member occurs in the upper half of the formation Livingston coal and is mapped separately. Sandstone in lower to middle part mappe Livingston Conglomerate n some geologic maps as Sandstone G. and informally called the Haze h sandstone (Kilburn, 1956; Greb and Chesnut, 1989), is quartzose, eous, bedded to massive, and may be bioturbated. On this ma e Pine Creek sandstone is quartzose, lentins sparse quartz pebbles at the base, and is as much as 36 r 20 ft) thick. Each of the sandstone units is cliff forming. Upper parts of sandstones grade laterally into sandy siltstone and shale. Upper part of Bangor Limestone unit as mapped may contain Corbin Sandstone Member, where it was or not mapped separately. Unit as mapped contains four na in descending order, the Lily/Colony, Gray Hawk, Halsey Rough Hartselle Formation BIN SANDSTONE MEMBER, GRUNDY FORMATION—Sandstone rate, and minor shale. Sandstone, quartzose, fine- to medium locally coarse-grained, medium- to thick-bedded, massive, a ninently crossbedded; contains scattered, rounded quartz pebbl as much as 1.3 cm (0.5 in.) in diameter. Pebbles most common towar Kidder Limestone base. Unit generally fines úpward. Locally forms steep cliffs. Weathered e of top creates broad upland plateau in the southeastern part of ne quadrangle. Base of unit is unconformable. Unit was mapped as a member of the Lee Formation on 7.5-minute geologic maps reclassified as a member of the Grundy Formation by Chesnut (1992). OCKCASTLE SANDSTONE MEMBER, BEE ROCK FORMATION— Limestone Member , conglomerate, and minor shale. Sandstone, quartzose, fine ebbles as much as 5 cm (2 in.) in diameter, thin- to thick-bedded, loc assive, prominently crossbedded, with sparse giant crossbeds. Unit nerally fines upward. Forms steep cliffs, especially in the Rockcastle Burnside Member ver Valley. Unit was mapped as a member of the Lee Formation on Bronston Member minute geologic maps, and was made part of the Bee Rock Formatio by Chesnut (1992). Base of unit is unconformable with underlying strata. REEK FORMATION—Shale, siltstone, sandstone, and coal. Salem and Warsaw e Stearns No. 2 coal is informally called the Coal Cliff member ying Paragon Formation as much as 30 m (100 ft) deep (Stag Unit was mapped as part of the Lee Formation on most 7.5-minutes. geologic maps, the Beattyville Shale on the Ano 7.5-minute map (Stag and was renamed Alvy Creek by Chesnut (1992). In this guadrang is equivalent to strata between the top of the Mississippian of the Rockcastle Sandstone. Where units equivalent t astle Sandstone were not mapped, the Alvy Creek and ov dy Formation are undifferentiated (see below). Coals include, i descending order, the Beaver Creek, New Livingston, Stearns zone (No. 2 and No. 1 coals), and Livingston/Lee No.1. GRUNDY AND ALVY CREEK FORMATIONS UNDIFFERENTIATED Wildie Member Unit mapped north of Mount Vernon Fault. See descriptions of Grundy rmation and Alvy Creek Formation above. Westward thinning of b Halls Gap Member Member units onto the Cincinnati Arch and truncation by sandstone members of the Bee Rock Formation locally complicates differentiation of the units. LIVINGSTON CONGLOMERATE MEMBER, ALVY CREEK FORMATION— Sandstone, conglomerate, and minor shale. Sandstone, quartzose, thir Cowbell Member ium-bedded, fine- to coarse-grained, with lenses of quartz-pebbl omerate, locally massive, prominently crossbedded. Unit partia nderlying strata. Unit locally overlain by the Livingston coal or dark Nancy Member arbonaceous shale. Unit mapped as part of the Lee Formation on 7. minute geologic maps, and made part of the Bee Rock Formation by ut (1992), but should be a member of the Alvy Creek Formation Shale Member Stearns coal zone, within the Alvy Creek Formation (Eble and others, SANDSTONE—Unnamed or informal correlative sandstones mapped in of the easternmost 7.5-minute quadrangles. Unnamed units range ous, arkosic to sublitharenitic) to Mississippian Paragon sandston ne-grained, well-sorted); crossbedded; resting on scour surfaces Informally named quartzose, argillaceous, bedded to massive, bioturbat sandstones are Hazel Patch sandstone (sandstone G) and Pine Cro andstone (sandstone K). Also includes unnamed Sandstones L, N, X. Mapped units range from ridgetop, cliff-forming outcrops to valley-GON FORMATION—Unit consists of rocks assigned to Pennington Boyle Dolomite erative mapping project, 1960–78 (Ettensohn and others, 1984) e, sandstone, siltstone, limestone, and dolomite. Shale, clayey, par lty and sandy, partly calcareous, sparsely fossiliferous. Sandstone, ver fine- to medium-grained, partly calcareous, partly argillaceous, partl fossiliferous; locally as much as 12 m (40 ft) thick at base. Siltstone ned, commonly fossiliferous. Dolomite, very finely to finely crystalling v argillaceous: local mineral-lined yugs. Common erosional thin and local removal of Paragon by post-Mississippian Paleozoic erosic BANGOR LIMESTONE AND HARTSELLE FORMATION, UNDIVIDED— Combined unit, descriptions below. BANGOR LIMESTONE—Limestone, shale, and siltstone. Limeston ry fine- to very coarse-grained, bioclastic, fossiliferous, commonly silt argillaceous, partly sandy. Shale, clayey, calcareous. osion. Combined unit mapped along southern margin of quadrang Brassfield Dolomite mapped locally on Bobtown 7.5-minute geologic map (Lewis and others 1973); not mapped separately for this map. Correlative rocks originally mapped with Newman Limestone (Slade Formation) in northeastern part Preachersville Member HARTSELLE FORMATION—Shale, sandstone, and limestone, Shale, clavev. partly calcareous. sparsely fossiliferous. Sandstone, very fine 1 along southern margin of quadrangle; unit mapped loc ນ 7.5-minute geologic map (Lewis and others, 1973); not ma separately for this map. Correlative rocks originally mapped with Newman Rowland Member Limestone (Slade Formation) in northeastern part of quadrangle. SLADE FORMATION/MONTEAGLE LIMESTONE—Correlative. laterally equivalent sequence of Mississippian rocks: limestone, dolomite, shale, and siltstone. Limestone, micrograined to very coarse-grained, bioclastic, politic, peloidal; sparsely to abundantly fossiliferous; partly argillaceous Reba Member andy, cherty, and brecciated; commonly conglomeratic in basal pan olomite, microcrystalline to very finely crystalline. Shale, clayev, partly alcareous, mainly in partings and interbeds; forms distinct unit, as mu Terrill Member ft) thick, in upper part of formation in northeastern part of angle. Siltstone, calcareous. Local erosional thinning by post-Stingy Creek Member SLADE FORMATION—Unit in northeastern part of quadrangle includes ocks assigned to upper member of Newman Limestone, Ste. Geneviev Gilbert Member Limestone Member, St. Louis Limestone Member, and Renfro Membe of the Borden Formation (mapped separately) during the USGS–K0 cooperative mapping project. Renamed Slade Formation by Ettenso Tate Member and others (1984). Limestone, dolomite, and shale (see description PPER PART OF SLADE FORMATION—Unit in northeastern part of gle includes rocks assigned to upper member of Newman estone; limestone, dolomite, and shale. Calloway Creek Limestone E. GENEVIEVE LIMESTONE MEMBER OF SLADE FORMATION-Limestone, light gray, oolitic, commonly crossbedded to planar-bedded Mapped as member of Newman Limestone on earlier maps, reassigne

Clays Ferry Formation ACKNOWLEDGMENTS: This map was digitally DISCLAIMER: Although this map was compiled generated from 1:24,000-scale geologic maps and from digital data that were successfully processed was funded in part by a grant from the Kentucky ransportation Cabinet to assist with the planning and development of the proposed Interstate 66 We would like to thank the following for their assistance: Gerald A. Weisenfluh, Michael L. Murphy, Christopher P. Hettinger, Qinhua Zhang, Elizabeth A. Ciszak, Michael P. Solis, Garland R. Dever Jr., Stephen F. Greb, Donald R. Chesnut Jr., James A. Drahovzal, Margaret L. Smath, Brandon C. Nuttall, James M. McElhone, Jason A. Patton, R. Shawn ment are those of the authors and should not be Duncan, Donna J. Webb, Mike Stidham, and Clar-interpreted as necessarily representing the official

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Garrard Siltstone

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Shale, clayey, partly silty, partly calcareous. Siltstone, calcareous, dolomitic. Jnit assigned to Borden Formation during USGS-KGS cooperative napping project. Reassigned to basal member of the Slade Formation Ettensohn and others, 1984). Unit mapped in east-central part of uadrangle; merges with rocks assigned to the Muldraugh Member, alem and Warsaw Limestones, and lower and middle St. Louis Limestone in south-central part of quadrangle.

SALEM AND WARSAW LIMESTONES—Limestone, siltstone, shale, and sandstone. Limestone, fine- to very coarse-grained, bioclastic, sandy, fossiliferous, partly cherty, partly argillaceous, partly geodiferous. Siltstone, calcareous, fossiliferous, geodiferous, partly dolomitic. Shale, calcareous, fossiliferous, silty. Sandstone, fine- to coarse-grained, calcareous, partly conglomeratic, partly geodiferous, sparsely fossiliferous; includes Science Hill Sandstone Member. Mapped in southwestern part of quadrangle; correlative to rocks in the Renfro Member in east-central part of quadrangle. MULDRAUGH MEMBER OF BORDEN FORMATION—Siltstone, dolomite, chert, limestone, and shale. Siltstone, siliceous, partly dolomitic, locally eodiferous, sparsely fossiliferous; intergradational with silty dolomit hert, dense, bedded; interbedded and intergradational with siltstor and dolomite. Limestone, fine- to coarse-grained, bioclastic, fossiliferous, commonly lenticular in upper part. Shale partings interlayered with chert, vith rocks in middle and lower part of the Renfro Member in eastern part of quadrangle; thickens rapidly to the south and southwest as it grades nto the Fort Payne Formation.

FORT PAYNE FORMATION—Shale, limestone, chert, and sandstone. le, commonly silty and calcareous, partly dolomitic, commonly Chert, locally as much as 12 m (40 ft) thick. Sandstone, very fine-grained. y, partly calcareous in upper part. Mapped in southwestern part of REEF LIMESTONES—Discrete coarsely crystalline, crinoidal, crossbedded estone bodies mapped separately in Fort Payne Formation as "ree estone" (rl), in basal Muldraugh Member, and upper part of Borden Formation as 'limestone' (Is), dip steeply to the south. BORDEN FORMATION—Mapped unit consists of six members, in ascending order, the New Providence Shale, Nancy, Cowbell, Halls Gap, die, and Nada Members, Uppermost carbonate-rich Muldraugh and Renfro Members of the siliciclastic-dominated Borden are mapped separately (Renfro now part of Slade Formation). Shale, siltstone, to silty shale and siltstone in middle and upper part; locally fossiliferou

> lauconitic siltstone and shale at top of unit. Siltstone in part in southwestplunging beds. Limestone, fossiliferous, commonly fine- to coarse-grained. tly argillaceous, commonly lenticular; locally grades into calcareous siltstone. Sandstone, very fine-grained locally in upper part. NEW ALBANY SHALE/CHATTANOOGA SHALE—Shale, dark brownish ck to black. carbon-rich, silty, fissile, laminated, pyritic; phosphatic Boyle Dolomite, but unconformable with underlying rocks of Silurian and Ordovician age where Boyle is absent. In northeastern part of quadrangle, unit designated New Albany Shale, in southern part designated Chattanooga Shale during USGS-KGS cooperative mapping project. BOYLE DOLOMITE—Dolomite, limestone, and sandstone. Dolomite, ery finely to moderately crystalline, partly cherty, partly sandy, sparsely o abundantly fossiliferous. Limestone, fine- to very coarse-grained, partly

nstone concretions and phosphatic nodules in lower part. Siltston

artly shaly, partly dolomitic or calcareous, irregularly silicified, partly

eodiferous and cherty, locally grading into chert; sparsely fossiliferous;

eous, partly conglomeratic. Unit pinches out locally. Base CHATTANOOGA SHALE AND BOYLE DOLOMITE—Units mapped together locally in southwestern part of quadrangle (Fli and Fault conglomeratic, interbedded with basal part of Chattanooga Shale. Dolomite, andy, slightly calcareous, includes lenses of dolomitic silty claystone similar to Chattanooga. CRAB ORCHARD FORMATION AND BRASSFIELD DOLOMITE— Combined mapping unit (Scb) is composed of two thick formations, in ascending order, Brassfield Dolomite and Crab Orchard Formation, Crab rchard (Sco) is mainly shale, with few dolomite beds in lower part

assfield (Sb) is dominantly dolomite, with few interbedded shales

ale and dolomite. Shale, clayey. Dolomite, finely to moderately crystalline,

silty, slightly argillaceous, sparsely sandy, partly conglomeratic, locally cherty, commonly fossiliferous. Common erosional thinning and local removal of unit by post-Silurian Paleozoic erosion. CUMBERLAND FORMATION—Dolomite, siltstone, and mudstone. Dolomite, very finely to moderately crystalline, silty, rarely fossiliferous; interbedded and gradational with dolomitic siltstone and dolomitic mudstone. Possibly equivalent to Preachersville Member of the Drakes Formation. Thinning of Cumberland by post-Ordovician Paleozoic erosion. DRAKES FORMATION—Unit consists of two members, in ascending order, the Rowland and Preachersville Members. Mudstone, dolomite, nd limestone. Mudstone, silty, dolomitic, calcareous. Dolomite, very finely to finely crystalline, silty, calcareous, rarely fossiliferous. Limestone, Ellisburg 7.5-minute quadrangle. Siltstone and minor shale.

argillaceous, in irregular thin beds; contains abundant brachipod bryozoans, pelecypods, and gastropods. Shale, in partings and beds 1 to 3 cm (2 to 8 in.) thick. Mapped in Ellisburg 7.5-minute quadrangle correlates to Stingy Creek Member of Ashlock Formation to the east. ASHLOCK FORMATION—Unit consists of five members, in ascending order, Tate, Gilbert, Stingy Creek, Terrill, and Reba Members. Mudstone, limestone, siltstone, dolomite, and shale, Mudstone, micrograined dolomitic, calcareous, clavey, silty, sparsely fossiliferous; intergrades with mestone. Limestone, micrograined to coarse-grained, partly silty and rgillaceous, rarely cherty, sparsely to abundantly fossiliferous; intergrades with siltstone. Siltstone, calcareous; intergrades with limestone. Dolomite, very finely crystalline, sparsely to locally fossiliferous. Shale, calcareous, mainly in partings. REBA MEMBER (not mapped separately on this map)—Limestone, commonly clean, dense, even-bedded, grading up to silty, argillaceous rregular-bedded limestone formed in pods; contains scattered fossil TERRILL MEMBER (not mapped separately on this map)—Mudstone, dolomitic and limy, thin-bedded to finely laminated; ripple marks and mud cracks common; glauconitic mudstone bed near base.

STINGY CREEK MEMBER (not mapped separately)—Limestone, fineto medium-grained, silty, argillaceous, fossiliferous, interbedded with gray GILBERT MEMBER (not mapped separately on this map)—Limestone, fine- to medium-grained, irregularly bedded; micrograined, thicker-bedded near base; contains abundant brachiopods, bryozoans, and gastropods. TATE MEMBER (not mapped separately on this map)—Mudstone, limy and dolomitic, thin- to medium-bedded, regularly bedded, sparsely glauconitic; sparse fossils. CALLOWAY CREEK LIMESTONE—Limestone, shale, and siltstone. estone, fine- to coarse-grained, bioclastic, fossiliferous; with partings nd seams of calcareous shale. Siltstone, calcareous, mainly in t part. Unit mapped in Ellisburg, Halls Gap, and Hustonville 7.5-minute GARRARD SILTSTONE—Siltstone, shale, and limestone. Siltstone,

calcareous, in planar to contorted beds, with thin, irregular interlayers of ilty to clayey, calcareous shale. Limestone, medium- to coarse-grained, bioclastic, silty, in thin discontinuous lenses. Unit mapped in Halls Gap and Hustonville 7.5-minute quadrangles. CLAYS FERRY FORMATION—Limestone and shale. Limestone, fineto medium-grained, fossiliferous; with partings of calcareous, clayey shale. Unit mapped in Hustonville 7.5-minute quadrangle. ARTIFICIAL FILL—Compacted rock debris from highway or railroad

····· City boundary

····· Concealed fault

Contact

Normal fault (U, upthrown side;

D, downthrown side)

Concealed contact

Inferred contact

------ Railroad

to Slade Formation by Ettensohn and others (1984).

Slade Formation described above.

Limestone Member of the Slade Formation.

MONTEAGLE LIMESTONE—Unit in southern part of quadrangle. Consists

of two members, in ascending order, the Ste. Genevieve Limeston Member and Kidder Limestone Member. See descriptions below.

KIDDER LIMESTONE MEMBER, MONTEAGLE LIMESTONE—Unit in

southern part of quadrangle. Laterally equivalent to upper part of the

STE. GENEVIEVE LIMESTONE MEMBER, MONTEAGLE LIMESTONE-

t in southern part of quadrangle. Laterally equivalent to Ste. Genevieve

**NOTE:** cross section is diagrammatic

vertical exaggeration 6x

Interstate highway or parkway 400 Structure contour, fee

Concealed coal bed

or mine

Strip mine

Active stone quarry or mine

Inclined mine shaft; coal

Abandoned or inactive stone quarry

Madison Falmouth Maysville Ironton Jasper Louisville Lexington Morehead

Locations of the 30 x 60 minute quadrangles covering Kentucky. The location of the Somerset

Beekmantown Dolomite of Knox Group

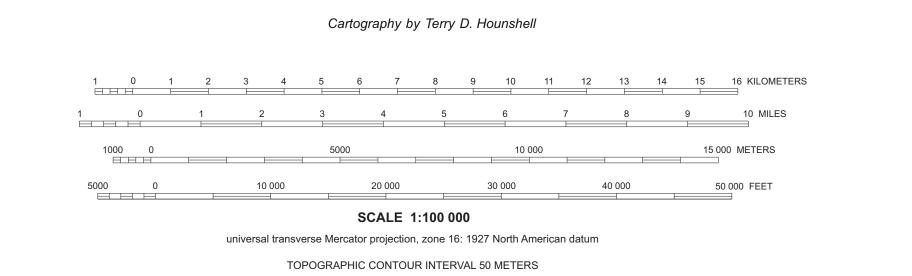
Clays Ferry Formation

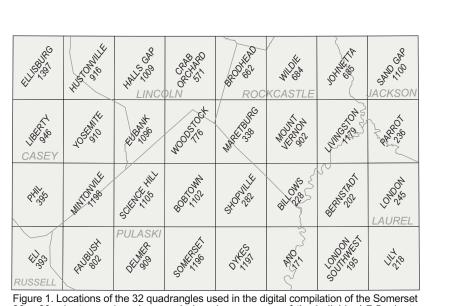
basement fault based on seismic data

quadrangle is highlighted in blue.

Ashlock Fm. Lexington Limestone

homas N. Sparks, Warren H. Anderson, and Xin-Yue Yang Cartography by Terry D. Hounshell





/ Limestone Sandstone // Corbin Sandstone qure 2. Location of structure contours in the Somerset 30 x 60 minute quadrangle. Index gives imes of each mapped datum horizon. The horizon boundaries are shown on the geologic mai as thin red dashed lines or faults. Contour interval is 40 ft with index contours at every 200 ft

upper Meramecian and lower Chesterian (Mississippian) rocks of south-central and east-central Kentucky: Kentucky Geological Survey, ser. 11, Bulletin 5, 76 p. Dever, G.R., Jr., Greb, S.F., Moody, J.R., Chesnut, D.R., Jr., Kepferle, R.C., and Sergeant, R.E., 1990, Tectonic implications of depositional and erosional features Geological Society of Kentucky 1990 field conference): Kentucky Geological Dever, G. R. Jr. and Moody, J. R., 2002, Bronston and Burnside Members: Subdivision of the St. Louis Limestone in south-central Kentucky: Kentucky Geological Survey, ser. 12, Report of Investigations 9, 25 p.

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Ettensohn, F.R., Rice, C.L., Dever, G.R., Jr., and Chesnut, D.R., 1984, Slade and

Rice, C.L., Currens, J.C., Henderson, J.A., Jr., and Nolde, J.E., 1987, The Betsie Kansas Geological Survey Open-file report 9321, p. 15.1-15.6. Greb, S.F., and Chesnut, D.R., Jr., 1989, Geology of Lower Pennsylvanian strata along Gualtieri, J.L., 1967, Geologic map of the Crab Orchard quadrangle, Lincoln County, Kentucky: U.S. Geological Survey Geologic Quadrangle Map GQ-571, scale Sparks, T.N., and Stidham, M., 2006, Spatial database of the Lily quadrangle, Kentucky J.B., and Walker, B.J., eds., The atlas of major Appalachian gas plays: West Virginia Geological and Economic Survey, Publication V-25, p. 188–192.

The data files resulting from the digitization of the GQ's are part of resources, including limestone and other mined resources, were After 1968, three deep stratigraphic tests were drilled in the a comprehensive relational and spatial data set, being released as mapped and described by Anderson and Dever (2001) and Knowles quadrangle. Amerada-Hess Petroleum Corp. drilled two wells, one Digitally Vectorized Geologic Quadrangles (DVGQ's) by the Kentucky and Malone (2008). Geological Survey (Anderson and others, 1999). These DVGQ's are available on CD-ROM, and can be purchased via the Internet. Users of the DVGQ data can prepare custom geologic maps by overlaying data using their own GIS or CAD software. KGS has also developed being mined and quarried from the Monteagle Limestone and the at about 8,186 ft (-6,928 ft subsea) near Mintonville in Casev County. an Internet map server where users can prepare similar maps, without correlative upper part of the Slade Formation in Casey, Jackson,

All three wells were drilled through the Cambrian, but only the Cities purchasing DVGQ's, via an interactive geologic map information

Pulaski, and Rockcastle Counties. High-purity limestone in the

Service well had a show of gas in the Cambrian; it was plugged as service (Weisenfluh and others, 2005).

The 7.5-minute quadrangle maps were digitally compiled using a also have been quarried for construction aggregate and agricultural The area underlain by the Silurian Crab Orchard, Devonian black semi-automated data-capture technique to convert hard-copy geologic products. The St. Louis Limestone is less suitable for concrete shale (Chattanooga/New Albany Shale), and Mississippian Paragon maps into digital format. Compiling 7.5-minute maps into a 30 x 60 aggregate because it contains substantial chert. Several companies and Borden Formations presents potential construction and engineering minute map required the resolution of significant problems, such as operate underground mines and quarries in Rockcastle, Jackson, problems. The Crab Orchard and Paragon are dominantly varicolored 1) correlating geologic and cartographic quadrangle boundaries, (2) Casey, and Pulaski Counties. Total production from all these quarries plastic clay shales that are unstable even on very low slopes. Surfaces, resolving nonuniform structure-contour datums or intervals, (3) resolving is approximately 4 million tons annually. discrepancies in Quaternary alluvium boundaries and inferred contacts, The Livingston Conglomerate was previously quarried for aggregate disturbed; landslides, slump, and soil creep are common. Shales and (4) determining necessary formation data for topological analysis in Rockcastle County. Sandstone, sand, and gravel were also mined slump readily when wet, and any construction on them should be in a GIS environment, which was omitted during 7.5-minute quadrangle from the eastern part of the quadrangle, but most operations are provided with adequate drainage. In addition, swelling clays of the mapping. The metadata portion of the DVGQ file provides detailed currently inactive. Flat, thin-bedded or laminated, fine-grained Crab Orchard have caused pavement and heaving problems in sources of data and information about the conversion process. sandstone, used locally as dimension stone, has been quarried in highway construction projects in adjacent Estill County (Beckham and ormation codes were assigned using the American Association of Jackson County. Pink sandstone of the Corbin Sandstone has been Hopkins, 2005; Anderson, 2008). Petroleum Geologists' standard stratigraphic code (Cohee, 1967), mined in the eastern part of the quadrangle for landscaping stone, Significant foundation and structural problems can develop at which was modified by KGS for state-specific use. Formations and for use in concrete walks, walls, and foundations, and as a decorative building sites located on the Devonian black shale. Structural failures, formation boundaries were not mapped consistently on each of the paving material. 5-minute maps as they were compiled between 1960 and 1978 for topological analysis in a GIS environment. In addition, numerous GIS standards appropriate for the scale of the map. work was attempted. When there were problems in stratigraphic correlation between quadrangles, the best current data available were **Coal production and reserves** used to resolve these differences.

GEOLOGIC SETTING AND STRUCTURAL GEOLOGY The geology of the Somerset 30 x 60 minute quadrangle consists Eastern Kentucky Coal Field of the central Appalachian Basin. The the four counties in the quadrangle is summarized in Table 1. construction projects, including highways. dominant rock types for the mapped area are limestone, siltstone, and shale in the Ordovician and Mississippian units; clay shale and Table 1. Cumulative coal production (million tons) by county and KARST FEATURES AND HYDROGEOLOGY dolomite in the Silurian section; dark, organic-rich shale and dolomite mining method (1838–2009). in the Devonian: interbedded cyclic sandstone, siltstone, shale, coal. deposits in the Tertiary and Quaternary strata. The Tertiary and and contain clay, silt, sand, and gravel deposits, some of which may be locally cemented. along the north-central part of the quadrangle. The Rome Trough, a and extends across eastern Kentucky northeastward through West [accessed 07/05/11]. Virginia and Pennsylvania and into southern New York (Drahovzal gas (Harris and Baranoski, 1996; Harris and Drahovzal, 1996). Somerset quadrangle are shown in Table 2. Proprietary seismic data indicate subsurface northeast-trending an offset of several thousand feet in the Precambrian basement District.

anomaly was not mapped on the original geologic quadrangle maps,

Rockcastle 145 but is mentioned here because of its geologic importance. Major geologic changes are reflected by the differences in Missis- Source: Keystone Coal Industry Manual (2009) sippian nomenclature between the northeastern and southwestern parts of the Somerset quadrangle. The Monteagle Limestone, the Industrial minerals and associated rocks underlying St. Louis Limestone, the Salem and Warsaw Limestones.

Traces of calcite, barite, galena, and sphalerite mineralization have and the Muldraugh Member of the Borden Formation to the southwest been noted at depth in the Knox Group. Chert nodules and geodes have a complex carbonate facies boundary in northern Pulaski County occur in the upper part of the Borden Formation along U.S. 27. These with the correlative rocks of the Slade Formation in the area to the geodes contain millerite, pyrite, chalcopyrite, and other minor minerals. northeast (Dever and others, 1990). A stratigraphic anomaly along Barite occurs as nodules or lenticular bodies in the Brassfield Dolomite Mineral water, high in epsom salts and valued for its medicinal this boundary separates the accepted nomenclature in south-central in a graben near Crab Orchard (Gualtieri, 1967). Very small replacement qualities, was formerly obtained in the Crab Orchard area by Kentucky (to the southwest) from the nomenclature of east-central nodules of galena and sphalerite have been found locally in Ordovician concentrating groundwater seepage in pits dug into the Crab Orchard

ne Greenwood Anomaly, a major gravity anomaly that coincides with

Limestone, sandstone, sand, gravel, and clay

Limestone for construction aggregate and agricultural products is subsea). Cities Service drilled a basement test and intersected granite Monteagle Limestone crops out over large areas near Somerset and dry and abandoned. Bobtown, and is a potential source of chemical-grade limestone (McGrain and Dever, 1967). The Bangor and St. Louis Limestones Engineering geology

This map is a compilation of existing maps, and no additional field

The shale is easily quarried, but weathers readily to clay.

and limestone in the Pennsylvanian strata; and terrace and alluvial | County | Undifferentiated | Underground | Surface | Total Quaternary sediments are mainly unconsolidated or semiconsolidated,

Jackson 0.028 5.962 5.626 11.616 The northwestern part of the quadrangle contains the Lexington Fault System and the Middleburg Graben (see structure contour map, Figure 2). The east–west-trending Mount Vernon Fault System extends mbrian extensional feature, is a dominant basement structure in Source: Kentucky Geological Survey coal production database, the quadrangle (though not directly apparent in the surface geology), kgsweb.uky.edu/DataSearching/Coal/Production/prodsearch.asp

Drahovzal and Noger, 1995). This basement faulting may have northeast-trending near-surface expression from the Delmer Fault, County Original Mined and Lost Remaining Reserves which is exposed in the southern part of the Somerset quadrangle.

the Grenville Front (Dever and others, 1990; Dever, 1999), is in the eastern part of the quadrangle in the same area as the faulting. This Pulaski 153 Estimated remaining coal resources in Somerset area: 937

Quadrangle Map GQ-195, scale 1:24,000.

Quadrangle Map GQ-910, scale 1:24,000.

Hettinger, C.P., and Stidham, M., 2006, Spatial database of the Shopville quadrangle,

utucky: Kentucky Geological Survey, ser. 12, Digitally Vectorized Geological Geological Pata DVGQ-282. Adapted from Hatch, N.L., Jr., 1964, Geology o

uadrangle, Casey and Lincoln Counties, Kentucky: Kentucky Geological Surve

Shopville quadrangle, Kentucky: U.S. Geological Survey Geologic Quadrangle

12, Digitally Vectorized Geologic Quadrangle Data DVGQ-910. Adapted from lor, A.R., and Lewis, R.Q., Sr., 1971, Geologic map of the Yosemite quadrangle, sey and Lincoln Counties, Kentucky: U.S. Geological Survey Geologic

Analysis of clay samples from the Nancy Member and New sidewalks, have been known to occur. The shale contains various Resolution of the differences between quadrangles was necessary

Providence Shale Member of the Borden Formation in the southern

Clay and iron sulfide minerals (pyrite) that react with water to form part of the quadrangle indicates potential for industrial uses in the sulfates and a mild sulfuric acid. This formation of sulfates and creation small members mapped on individual 7.5-minute maps are too small to be mapped at a scale of 1:100,000 on a 30 x 60 minute map. These to be mapped at a scale of 1:100,000 on a 30 x 60 minute map. These controlled by adhering to problems were resolved by adhering to geologic, cartographic, and use as flagstone and aggregate. The New Albany Shale has been oxidation or pyrite swelling. These mineralogic changes make unstable use as flagstone and aggregate. quarried on a small scale for use as fill and for surfacing of farm roads. foundation material, and adequate preconstruction geologic and engineering investigations should be conducted prior to construction in this area (Anderson, 2008). High-slope areas should be given careful engineering consideration. The Somerset quadrangle encompasses the northwestern margin Prior to road excavation and foundation construction, detailed on-site and central part of the Southwestern Coal Reserve District. Coal has engineering studies should be made to define problems and to been mined in that area since the mid 1800's by surface and determine remedial actions. Slope instability in thick sequences of underground methods. The most important resource is the Manchester shales of the Borden Formation also affects construction and of southeast-dipping sedimentary rocks of Ordovician through coal bed (also known locally as the Lily, River Gem, or Colony). This engineering projects. Landslides or slumps could occur when developed Pennsylvanian age and unconsolidated sediments of Tertiary and coal has been mined primarily along the eastern margin of this slopes in the Borden are saturated with water. Oversteepening of Quaternary age; it is transected by a major northeast-trending basement quadrangle in Laurel and Jackson Counties. Along the western margin slopes by artificial cuts is likely to result in the clay shale flowing or ault system, the Rome Trough. These rocks extend across the eastern of the district, coals below the Corbin Sandstone have been mined sliding, particularly when saturated with water. Hummocky terrain, flank of the Cincinnati Arch, a structural feature that crosses Ohio in Pulaski and Rockcastle Counties, the most important beds being probably resulting from small landslides, is characteristic of the outcrop rough Kentucky to Tennessee, and along the western margin of the the Halsey Rough and Beaver Creek coals. Total coal production from belt of the lower part of the Borden Formation, and can affect This area contains some of the largest cave systems in the state; more than 12 cave systems have a length of 1 mi or more (James C. Currens, KGS, personal communication, 1999). Two of these cave systems, Popular Cave and Wells Cave, are each longer than 10 mi,

located east of Somerset, which reached Precambrian basement at

including those covered with vegetation, become unstable when

such as cracked and heaving floors, and cracked walls, ceilings, and

a measured depth of 8,843 ft (-7,875 ft subsea), and the other

northwest of Somerset, encountering basement at 6,670 ft (-5,605 ft

and several other cave systems are 5 to 7 mi long. There may be other large cave systems beneath the limestone plateau in the western part of the Somerset quadrangle. Because of the extensive development of karst, cave systems, and solution of limestone bodies, pruden engineering evaluation must be completed before any type of construction or excavation begins to avoid problems such as failure of structures or highways and intersection of high-volume karst aquifers. in Carey and Stickney (2004a-c, 2005a-d) and Currens and Ray 1998). Most groundwater is obtained from wells between 30 and 00 ft deep in shallow alluvial or bedrock regolith, but many produce and Noger, 1995; Harris and Drahovzal, 1996). Several small oil fields Studies by Brant (1983) calculated total remaining resources of insufficient yields for domestic supply. Wells in alluvium near major have been discovered along these near-surface faults and anticlines, more than 6.85 billion tons for the district, of which the four counties streams may provide adequate water for farms or commercial and other (deeper?) anticlinal structures may play an important role in the Somerset quadrangle accounted for about one-quarter of the operations. Shallow carbonate aquifers in the St. Louis Limestone in in the accumulation of petroleum resources, particularly Cambrian total. Remaining coal reserves for the coal-producing counties in the this region are karstic. Groundwater in karst aquifers occurs in solutionenlarged joints, bedding planes, and caves. These features provide

basement faulting in the central part of the quadrangle (see cross section) associated with the Rome Trough. The seismic data show supply. Water from all wells and springs in karst aquifers should be sanitized before human consumption. Water in the Pennsylvanian rocks, which underlie the eastern part of the quadrangle, generally contains undesirable amounts of iron, and some deeper Ordovician ocks may have a sulfurous odor or taste. The Livingston Conglomerate Member, where below stream level. may contain large quantities of groundwater, and many springs and seeps flow from the contact between thick sandstone beds and

underlying impervious shale in Pennsylvanian rocks. Rocks of Mississippian age with sufficient porosity should be able to supply water for most farm and home needs. There is a shallow aguifer in e sandstone strata (Science Hill Sandstone?) in the lower part of ne Salem and Warsaw Formations. Some water can be obtained rom fractured chert beds within the Muldraugh Member of the Borden. Weathered joints and a siltstone facies in the Borden act as an aquifer and produce water (James C. Currens, KGS, personal communication,

Kentucky (to the northeast). Mappers in the southwestern part of the rocks. Geodes and nodules in the Borden Formation commonly are Formation. The natural concentration of salts in the groundwater is quadrangle and southward used Monteagle and in the northeastern filled with crystals of quartz and rarely with sphalerite. Geodes also thought to be too low for commercial production (Gualtieri, 1967).

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