AND MEMBER

Landslide deposits

Terrace deposits

Brecciated sandstone

Paragon Formation

Bangor Formation

Hartselle Formation

Kidder Limestone Member

Ste. Genevieve

St. Louis Limestone

Salem and Warsaw

Cumberland Formation

Catheys Formation

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Limestone Member

UNIVERSITY OF KENTUCKY, LEXINGTON

DESCRIPTION OF MAPPED UNITS

ALLUVIUM—Clay, silt, sand, gravel, cobbles, and boulders in poorly sorted

vith sand and gravel. Gravel, pebble to boulder size, as thin lenses an

scattered pockets in silt and sand; composed of two distinct types of rock: wel

rounded pebbles of quartz and angular pebbles, cobbles, and boulders of

ert, limestone, and sandstone. Sand, very fine, silty, composed mainly of

LANDSLIDE DEPOSITS—Hillside slumping and collapse of overlying units

TERRACE DEPOSITS—Sand and silt, fine, commonly contains small pebbles

Clay films common on faces of crude coarse prismatic soil structures. Terraces

of limestone, sandstone, chert, and quartzite. At places upper soil leached of

calcium carbonate and eroded, forming rounded slopes and dissected surfaces

BRECCIATED SANDSTONE—Sandstone, randomly oriented angular boulders

cobbles, and smaller sandstone fragments in a matrix of clavey silt and sand

across, although large angular boulders and cobbles are widespread. Boulders

as large as 2 ft on a side are common; a few are as much as 3 ft long

andstone, chiefly of fine angular quartz grains, very well sorted; very friable

n the St. Louis Limestone; no fossils were found and the age of the deposit

s unknown. It may be a remnant of Mississippian sandstone that has been le

own and repeatedly brecciated through solution of the underlying Ste

OCKCASTLE SANDSTONE MEMBER OF BEE ROCK FORMATION—

ssbedded, quartzose, commonly iron-stained. Conglomerate, well-rounded

uartz pebbles in a silica-cemented sand matrix; in irregular pods and lense

ower 15 to 20 ft of member. Sandstone and conglomerate weather to for

arly vertical cliffs with rough surfaces at some places caused by resista

f finely disseminated carbonaceous material. Sandstone, quartzose, partly

conglomeratic; grains fine to medium, subangular to well rounded; crossbedded,

pods, stringers, and joint fillings of sandstone impregnated with iron oxide

stone, medium- to coarse-grained, medium- to massive-bedded, commonly

CREEK FORMATION—Shale, in part carbonaceous, plastic

Contains scattered fragments of plant debris and very dark gray layer

RAGON FORMATION—Shale, clayey, plastic, fissile; in even horizontal

ds. Sandstone, quartzose, micaceous, somewhat calcareous, fine- to medium-

ned, thin- to medium-bedded, ripple-marked, commonly as a single be

icrograined to medium-grained, partly oolitic; locally contains abundan

ragments of crinoids, blastoids, bryozoans, and brachiopods. Several species

nedium-bedded, forms resistant ledges. Unit consists of rocks assigned t

BANGOR LIMESTONE—Limestone, fine- to medium-grained; in part argillaceous

nd arenaceous calcarenite. Commonly interbedded with some calcareous

iltstone, particularly near top. Large aggregates of white or clear calcite crystals

are common in the limestone. Brachiopods and bryozoans abundant in some

quartz grains with minor amounts of dark minerals and mica. Commonly

ontains small green clay galls and thin clay partings, and a few molds and

asts of brachiopods. Commonly thin, partly calcareous, clay shale bed or

KIDDER LIMESTONE MEMBER OF MONTEAGLE LIMESTONE—Limestone,

assive, in part silty. Interbedded with calcareous siltstone and thin clay shall

Contains abundant small brachiopods, blastoids, and crinoids. Basal an

lateral plates of crinoid Talarocrinus are abundant in lower 75 ft of member

In some areas, plates of crinoid *Agassizocrinus* are common in upper part of

f an unidentified genus are common in a zone 30 to 50 ft below overlying

andstone and above a limestone unit composed almost entirely of blastoids

E. GENEVIEVE LIMESTONE MEMBER OF MONTEAGLE LIMESTONE

and green limestone "sand" zones. Commonly a zone of black chert nodule

stone, lithographic to medium-grained, thin- to thick-bedded; in large part

plitic: in part crossbedded and silty. Contains one or more thin breccia zones

to 6 in. in diameter, occurs about 20 ft below top of member; and a thin zone

of porous, massive replacement chert is present at base. Fossiliferous, contains

mall brachiopods, an extensive microfossil fauna, and fragments of megafossils

and black limestone and chert breccia, the Lost River Chert of Elrod (1899

LOUIS LIMESTONE—Limestone, sublithographic to medium-grained, thin-

s, nodules, and pods of dark gray to black chert. Bryozoans, brachiopod:

inoids, and corals are abundant; colonial lithostrotionoid corals ar

ithostrotion" proliferum Hall and *Lithostrotionella castelnaui* Havasaka an

asal few feet is commonly interbedded with calcareous siltstone, sandstone

re commonly silicified. Upper part mostly poorly laminated or structureless

nedium-bedded, interbedded and gradational with limestone. Sandstone

quartzose, friable; sand grains fine to medium, subspherical, and angular.

SALEM AND WARSAW FORMATIONS—Limestone, fine- to very coarse-

rained, detrital; medium- to thick-bedded, mostly crossbedded, faintly t

ically present. Small fragments of cystoid, blastoid, bivalve shell fragmen

vith silty limestone, sandy limestone, and calcareous siltstone. Siltstone

aminae; contains quartz geodes and a few irregular nodules of chert. Sandstone

uartz grains, minor amounts of mica, and some well-rounded, granule-siz

common in lower part of unit. Dolomite, argillaceous, variably cherty, is preser

locally in beds as much as 10 ft thick in all parts of unit. The Salem-Warsaw sequence and the Fort Payne Formation interfinger in some localities.

dark rock fragments. Shale, lenticular, dolomitic; fossil Spirifer lateralis Hall is

ORT PAYNE FORMATION—Siltstone, thin- to very thick-bedded; commonly

se glauconite. In some areas siltstone grades upward into silty, very fir

eous lenses; geodes common. Sparsely fossiliferous except near limestone

ained sandstone or shale. Shale, silty, calcareous and sandy in part: contain

lenses. Dolomite, largely silicified, very fine- to medium-grained, medium-bedded to massive; relatively unfossiliferous except for a minor amount of

ilicified crinoid stems; cherty. Limestone, thin-bedded to massive, in par

tem fragments and bryozoan and brachiopod debris in a crystalline calcite

EF LIMESTONES. FORT PAYNE FORMATION—Limestone, thin-bedded

sive, medium- to very coarse-grained, crossbedded, very fossiliferous

one is composed almost entirely of large crinoid stem segments, bryozoa

d brachiopod debris. Irregular fossiliferous chert nodules and lenses are lisseminated in the reefs and in the red residual soil derived from the reefs

nickness varies from a few inches to 270 ft. In part contains Cane Valley

HATTANOOGA SHALE—Shale and sandstone. Shale, fissile to slabby, silt minous, well jointed, slightly uraniferous, thin- to thick-bedded, thinl nated, slightly petroliferous, Typically carbonaceous, Where scratche

wder is dark brown, whereas powder of shale in other formations is gr Pyrite and marcasite abundant throughout. Small brachiopods, fish scales and

teeth, worm trails, and conodonts are abundant to scarce. Basal conglomerates

and thin, well-rounded, fine- to coarse-grained quartzose sandstone lenses

LAUREL DOLOMITE AND OSGOOD FORMATION—Dolomite, mottled

ellowish gray to grayish yellow-green, fine- to medium-grained; weathers

rown; weathered surfaces appear nodular; fossils rare. Shale, green, weathers

BRASSFIELD DOLOMITE—Dolomite, reddish to grayish brown and brownish

n, discontinuous lenses and nodules of dark gray, brown, and black che

parallel to bedding planes. Unit is sparsely fossiliferous; contains some

onodonts, brachiopods, and crinoid stem fragments. Unit is exposed alon

upper parts of Marrowbone Creek and Mud Camp Creek. Basal contact

CUMBERLAND FORMATION—Dolomite, siltstone, and limestone. Dolomite

nick-bedded, chert nodules common. Glauconitic in some areas. Siltstor

Limestone, fine-grained to sublithographic; in part dolomitic. Dense, contair irregularly scattered chert; thin- to thick bedded. Silicified fossils in the che

are Hebertella sp., Platystrophia sp., and Zygospira sp.

ncluding the brachiopod *Platystrophia ponderosa* Foerste.

Volf Creek Dam (Lake Cumberland).

olomitic, thin-bedded, lenticular, interbedded and gradational with silty dolomite

AUREL DOLOMITE, OSGOOD, AND CUMBERLAND FORMATIONS RENTIATED—Consists of Laurel Dolomite, Osgood Formation, an

LEIPERS LIMESTONE—Limestone, argillaceous and silty, fine- to coarse-

grained, irregular limestone layers and light gray shale partings within beds weather to give appearance of thin wavy beds, thin- to thick-bedded, very silty

enses of bluish gray very fine-grained, relatively pure limestone. Ver

CATHEYS FORMATION—Limestone and dolomitic limestone, medium gray,

locally pale bluish or greenish gray, fine- to medium-grained, silty; contains

rachiopods. In even beds 2 in, to 2 ft thick; weathered surfaces show th

even laminae parallel to bedding: thicker beds locally have low-angle

rossbedding. Includes blue nodular limestone in small isolated exposures a

evel of Cumberland River. Upper contact gradational in places; relation to

TIFICIAL FILL—Compacted rock debris from earthen dam construction at

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

shale beds; in part fossiliferous with small fragments of bryozoans a

ntains some thin lenses of bluish gray calcareous shale and some thin

ssiliferous; large brachiopods and bryozoans are particularly abundant,

nberland Formation, undifferentiated. Mapped only in the Fountain Run

estone include brachiopods, bryozoans, and pelecypods. The brachiopods

argillaceous, very fine- to medium-grained, commonly saccharoidal, thin- to

ine- to medium-grained, commonly saccharoidal, thin- to medium-bedded

y intertongued with thin dolomitic siltstone lenses; contains abunda

nin lenses and tongues of glauconitic(?) calcareous green shale and cl

units are associated with the reefs. Reefs may occur in any part of the formation

rossbedded, fine- to verv coarse-grained, commonly composed of large crinol

matrix. Limestone interbedded and gradational with thin lenses of shale.

ous, in part dolomitic and arenaceous, geodiferous, fossiliferous, contains

orn corals such as *Hapsiphyllum* sp. common. Interbedded and gradationa

alcareous, thin- to massive-bedded, banded by light to medium dark gray

in- to medium-bedded, silica-cemented and in part cemented with calcium

nently laminated; argillaceous and arenaceous, in part cherty, geode

k-bedded, and contains a few quartz geodes. Contains thin irregular

Stem fragments of crinoid *Platycrinites* are common in some localities. A c

member. Large crinoid stem segments, commonly 1 in, or more in diamete

ographic to medium-grained, commonly oolitic, thin- to thick-bedded to

HARTSELLE FORMATION—Sandstone, fine- to medium-grained, thin- to

Mha thick-bedded, quartzose, iron-stained. Composed of angular to well-rounded

to 4 in. of clay pellet conglomerate at base.

e crinoid Pterotocrinus occur in lowermost unit. Siltstone, calcareous, thin-

on Formation during USGS-KGS cooperative mapping project, 1960-

set within a shale sequence in upper part of unit. Limestone, in part dolor

ed/crossbedded with lenses of sandstone and calcareous siltstone

Grains weakly cemented with iron oxide and some silica. Unit rests unconformable

y poorly sorted. Breccia, predominantly of angular fragments 1/4 to

deposits. Silt, sandy, irregularly bedded, in part crossbedded and interlens

due to instability and plastic flow of shale beds.

issected to rounded remnants adjacent to rock ridges.

enevieve and St. Louis Limestones. Contacts indefinite.

guadrangle are shown in the index map (Fig. 1).

The St. Louis, Fort Payne, and Leipers Limestones are similar to the Salem and The data files resulting from the digitization of the GQ's are part of a comprehensive Warsaw Limestones in that their quality is highly variable. The quality of the St. Louis. relational and spatial data set, released as Digitally Vectorized Geologic Quadrangles Fort Payne, and Leipers Limestones ranges from subchemical grade to being interbedded DVGQ's) by KGS (Anderson and others, 1999). These DVGQ's are available on CD- with siltstone and chert. These limestones also are a potential source of stone for ROM, and are available on an Internet map service on the KGS Web site. Users of the agricultural use and road material.

prepare similar maps without purchasing DVGQ's via an interactive Geologic Map

the Cumberland Formation and from parts of the St. Louis, Warsaw, and reef deposits nformation Service (kgs.uky.edu/kgsmap/KGSGeology) (Weisenfluh and others, 2005). in the Fort Payne, and has been used locally for construction. Three limestone quarries are operating in this quadrangle (Broyles and Malone, 2009). Total production from these quarries is estimated to be less than 1 million tons per year (W.H. Anderson, KGS, personal communication, 2003). The quarry northwest of Burksville in the Waterview 7.5-minute guadrangle, is in the Leipers Limestone, the guarry in the Tompkinsville 7.5-minute guadrangle is in the Salem and Warsaw Limestones, and the quarry at the south end of Grider Mountain in the Albany 7.5-minute quadrangle is in the Ste. Genevieve Limestone and Kidder Limestone Members of the Monteagle Limestone. These quarries primarily produce construction aggregate.

such as (1) correlating geologic formations across quadrangle boundaries, (2) resolving nonuniform structure-contour datums or intervals, and (3) resolving discrepancies in Quaternary alluvium boundaries and inferred contacts. The metadata portion of the digital file provides detailed information about the conversion process. Formation codes were assigned using the American Association of Petroleum Geologists' standard Sandstone stratigraphic code (Cohee, 1967), which was modified by the Kentucky Geological Survey or state-specific use. Formations and formation boundaries were not mapped the same on Huddleston and Grider Mountains and from the upper parts of the Salem and Warsaw way on each of the 7.5-minute maps, since they were compiled by various authors

Formations in the southeastern part of the Albany 7.5-minute quadrangle. These sandstone between 1960 and 1978. Resolution of the differences between quadrangles was units are commonly well cemented, fine- to medium-grained, and thin- to thick-bedded. necessary for efficient topological analysis in a GIS environment. In addition, numerous Both have been used locally for building stone. small lithologic members mapped on individual 7.5-minute quadrangle maps are too

Porous sandstone derived from weathered, sandy Warsaw Limestone in the northern small to be displayed at a scale of 1:100,000 on a 30 x 60 minute quadrangle map.

part of the Jamestown 7.5-minute quadrangle is reported to have been used for at least hese problems were resolved by adhering to the geologic, cartographic, and GIS

standards appropriate for the scale of this map. but "case hardens" upon drying. This map is a compilation of existing maps, and no additional field work took place. When there were problems in stratigraphic correlation between quadrangles, the best Sand and Gravel current data available were used to resolve these differences.

The 7.5-minute quadrangle maps were digitally compiled using a semi-automated

data-capture technique to convert hard-copy geologic maps into digital format. Compiling

.5-minute maps into a 30 x 60 minute map required the resolution of significant problems,

GEOLOGIC SETTING, STRATIGRAPHY, AND STRUCTURAL GEOLOGY and the Jessamine Dome of central Kentucky. The quadrangle is located in the source of sand for mortar or allied purposes. southeasterrn part of the Illinois Basin and contains flat-lying sedimentary rocks. The quadrangle is located in the Mississippian Plateau physiographic region and extends across south-central Kentucky. The region is subdivided into two major plateau areas, sand is perhaps too fine-grained for some uses and also might require the removal of which are separated by the Dripping Springs Escarpment: the Mammoth Cave Plateau lies north of the escarpment, and the Pennyroyal Plateau lies south of the escarpment. Wolf Creek Dam and part of Lake Cumberland are located in the northeastern section of the quadrangle.

Mississippian rocks are exposed over a wide area in the quadrangle, whereas Ordovician and Devonian rocks and Quaternary alluvium occur only along the Cumberland River Valley and some of its tributaries. Silurian rocks are not exposed in surface outcrops, but do occur in the subsurface in the northwestern part of the quadrangle where they pinch out against the pre-Chattanooga unconformity. Mississippian rocks, including the reef limestones, are exposed over much of the quadrangle.

rocks units across the arch, including the Chattanooga Shale. The Cumberland Saddle aggregate. remained a stable but positive feature through Cambrian-Ordovician tectonic activity

Major Mineral Deposits and the Taconian Orogeny, during which the Illinois and Appalachian Basins subsided. North-trending surface faults displace Mississippian rocks in Monroe and Cumberland Counties. Although only a few surface faults are present in south-central Kentucky, the paleotopography of the top of the Knox surface suggests the presence of additional subsurface faults (Anderson, 1991).

Analysis of color-infrared remotely sensed imagery and paleolineaments on top of the Knox seems to indicate a N20°W, N20°E, and N60°E regional fracture system in south-central Kentucky (Anderson, 1991). There are also north-south and east-west components of the lineaments in the vicinity, and extensive regional north- and northeasttrending tectonic fracture systems on the eastern flank of the Cincinnati Arch in Kentucky and Tennessee. Northeastern and northwestern linear trends also occur in the Central Tennessee Zinc District. These dominant north- and northeast-trending linear features southern Kentucky. One of the major deposits is located near Fountain Run in Monroe southern Kentucky and northern Tennessee are considered to have been caused tectonic stresses, subsurface faulting, and basin subsidence. Two major unconformities in the area affect overlying paleotopographic features.

Structure contours are mapped in many quadrangles above the Chattanooga black shale unconformity, which shows pre-Chattanooga paleotopography (see Fig. 2). The Ordovician post-Knox unconformity (Anderson, 1991) also shows post-Knox paleotopography as described by Anderson (1991). The northeast-trending Sunnybrook Anticline adjacent to this quadrangle, in southwestern Wayne County, Ky., in the Powersburg 7.5-minute quadrangle, is an example of a post-Knox surface structure that is apparently related to the paleokarst linear trends in the Knox, suggesting that the linear trends influenced later tectonism (Anderson, 1991).

sandstone suitable for building stone, sand and gravel used for general construction 1991). purposes, and shale and clay-shale, some of which was suitable for use in the refractory

Minor Mineral Deposits ndustry. Mineral deposits containing zinc and barite have been identified, but not mined.

Production data up to 2007 show that the seven counties in the Tompkinsville area quadrangle. Barite occurs in veinlets in shale of the Fort Payne Formation and in the accounted for over 6 percent of the state's annual oil production. Only minor amounts Leipers Limestone in the Amandaville 7.5-minute quadrangle. These veinlets of barite of natural gas were extracted from this quadrangle. Nine counties are wholly or partly in the Leipers Limestone occur in a fault zone in the southeastern corner of that within the Tompkinsville 30 x 60 minute quadrangle. Monroe and Cumberland Counties quadrangle. Small crystals of galena, sphalerite, pyrite, and fluorite are also disseminated lie completely within the mapped area, and Adair, Allen, Barren, Clinton, Metcalfe, in the barite veins (Taylor, 1962). Russell, and Wayne Counties are partially within the quadrangle. Since Allen County

In the Vernon-Celina 7.5-minute quadrangle, a mineralized zone 30 to 40 ft wide, has no producing wells and Wayne County has only five, neither is discussed here. containing sphalerite with some galena and calcite, is exposed in mineralized rock in The KGS oil and gas production database showed that through 2008 the Tompkinsville the upper part of the Cumberland Formation (Late Ordovician age). This zone is about quadrangle contained 21,846 known wells. Of these, 5,735 were known successful wells. 40 ft beneath the Chattanooga Shale, just west of a fault. The minerals occur in a series here were 5,084 oil completions, 628 gas completions, and 23 combined oil-and-gas of roughly parallel veins along what appears to be shear fractures associated with lateral

wells. This database contains wells that were known and permitted beginning in 1960. movement along the fault. Sphalerite is present both as vein-filling material and as
 Fable 1. Total cumulative oil production and most recently available annual oil production
 in.) veins along fractures. Clear to white calcite is the principal gangue mineral occurring
 for counties

County	Total oil production through 2006 (million barrels)	County oil production through 2006 (million barrels)	Percent of total production for 2006
Adair	3.964	43,773	2.02
Barren	4.294	10,477	0.48
Clinton	8.005	43,717	2.01
Cumberland	4.123	29,668	1.37
Metcalfe	2.958	11,535	0.53
Monroe	0.914	353	0.02
Russell	0.546	3,736	0.17
TOTAL	24.804	143,259	6.60

The majority of the producing strata occur in rocks of Ordovician age. The source rock for most of the oil and gas deposits in this area is thought to be the Upper Devonian plack shale. The major producing zones in the Ordovician rocks are, in ascending order: • The Knox Group: Wells in this group occur in most of the guadrangle. Many producing wells are on paleokarst highs and erosional remnants, but some production is fracture-related.

• The Murfreesboro Formation: Wells from this formation also occur primarily

in the eastern half of the quadrangle. Producing areas are in randomly

occurring localized porosity regions. • The High Bridge Group (equivalent to the Stones River Group of Tennessee): Wells from this group occur in the eastern half of the quadrangle. Production is primarily from fractured reservoirs, possibly associated with secondary dolomites (hydrothermal alteration resulting in secondary porosity). • The Lexington Limestone (also called Trenton and Sunnybrook): Wells from this formation occur in many areas of this quadrangle. "Sunnybrook"

refers to a bioclastic unit within the Lexington and below the Granville (see below). Producing areas occur in localized porosity zones, with the exception of a few fracture-controlled linear pools. The Granville sands (drillers' term for a coarse-grained limestone porosity zone within the Lexington Limestone): Wells from this zone occur in the eastern half of the quadrangle. These limestone sands are thin, often

lenticular, porous, bioclastic zones associated with beach strand lines, offshore bars, and tidal deposits. They sometimes form narrow, arcuate structures as much as 20 mi long. • The Leipers Limestone: Wells from this formation occur in the western half of the quadrangle. The geology of these reservoirs is similar to that of the

 The Corniferous (a drillers' term referring to miscellaneous producing intervals between the Devonian shales and the Silurian Brassfield Formation or Ordovician rocks if the Brassfield is missing): Wells from this producing zone occur primarily in the northwestern corner of the quadrangle. Traps in the Corniferous are typically erosional remnants associated with an

angular unconformity capped by the Chattanooga Shale.

producing zones above the Devonian shale in the Mississippian Fort Payne Formation. Producing areas are distributed throughout the quadrangle and correspond to isolated, crinoid-rich, and often highly compartmentalize carbonate bioherms. These bioherms at the base of the Fort Payne are locally known as the "Beaver sand."

Field but only minor amounts of coal have been produced in the quadrangle. Most of aquifers either directly, through swallow holes (points along streams and sinkholes where the coals are thin and discontinuous. A coal seam, in part of mineable thickness, underlies surface flow is lost to underground conduits) or indirectly, through the pores in the soil most of Poplar Mountain, Short Mountain, and County Line Ridge in the eastern part overlying the limestone bedrock. Contaminants associated with agriculture and urban of Clinton County. According to the Kentucky Geological Survey's coal production development can be transported by overland flow into these swallow holes, where they database, as of 2000, Clinton County has produced approximately 2.25 million short quickly enter the conduit aquifer system (Currens, 2002). tons of coal. There was some early mining in this county from 1869 through 1879, but Contaminants associated with trash deposited in sinkholes as well as overland flow it did not begin in earnest until 1942. From 1942 through 1971, underground mining in both urban and rural areas can also percolate through the overlying soil in the sinkhole produced approximately 1 million short tons and from 1984 through 1988 produced and then quickly enter the conduit system. Once the underlying conduits become large nearly 0.5 million short tons. Since 2000 there has been no further coal mining in Clinton enough, insoluble soil and rock particles are more easily carried away. All of the dissolved A very small part of Wayne County is in this quadrangle and adjacent to Clinton sinkhole is sometimes visible, but is commonly covered by soil and broken rock, and County. This county has produced approximately 6 million short tons of coal, only a small can be partly or completely filled with this material. This opening can vary from a few amount of which was from this quadrangle. Its mining history closely parallels that of inches in diameter to many feet. Cover-collapse sinkholes are sinkholes that occur in

INDUSTRIAL MINERALS The limestone and dolomite deposits in this quadrangle are extensive and easily accessible. Since the late 1980's, the value of quarried limestone, on a statewide basis nas exceeded that of both oil and natural gas (Anderson and Dever, 2001). The Monteagle Limestone is most common in the southeastern corner of this quadrangle. Test samples in the Savage-Moodyville and Albany 7.5-minute quadrangles demonstrate should be done to ensure safe drinking water. that the Monteagle is of chemical grade (more than 95 percent CaCO₃) and is available n large quantities. Tests from nearby areas indicated that much of the oolitic limestone of the upper part of the Ste. Genevieve Limestone and the lower part of the upper member of the Monteagle Limestone averages more than 97 percent calcium carbonate

(Stokley and McFarlan, 1952). These limestones are also suitable for agricultural lime,

construction material, or manufacturing purposes.

he geology of the Tompkinsville 30 x 60 minute quadrangle was digitally compiled The Salem and Warsaw Limestones are exposed in large areas of this quadrangle mostly from U.S. Geological Survey 7.5-minute geologic quadrangle maps (GQ's), as The quality of this limestone is highly variable. In some areas it contains abundant shale cited in the references. The original GQ's were products of a cooperative mapping project — and in other places chert. There are, however, large areas in the Amandaville 7.5-minute between the U.S. Geological Survey and the Kentucky Geological Survey from 1960 to quadrangle where chert and shale are rare and the limestone is a relatively pure. Samples 1978. The conversion into digital format has been another USGS-KGS cooperative of the Salem and Warsaw Limestone near the western border of the quadrangle, program funded through the State Geologic Mapping component of the National demonstrated that it is suitable for use in power plants that use atmospheric fluidizedpoperative Geologic Mapping Program (NCGMP STATEMAP). Several regional geologic bed combustion to reduce their SO₂ and NO_x emissions. Pilot-plant tests using this tudies on mapping and stratigraphy (Lewis and Potter, 1978; Sable and Dever, 1990; limestone showed SO₂ emissions of approximately 1 lb/million Btu and NO_x emissions Anderson, 1991) have resulted in changes or updates in the stratigraphic nomenclature of 0.2 lb/million Btu. These levels were both below the emission standards of 2 and 0.6 and correlation. These changes are shown on this map, and were necessary for lb, respectively (Barron and others, 1991). These limestones also constitute a potential compilation of regional maps and for stratigraphic continuity between 7.5-minute source of crushed rock for aggregate and for agriculture, and perhaps for other types uadrangles. The 7.5-minute quadrangles that make up the Tompkinsville 30 x 60 minute of industrial stone.

VGQ data can prepare custom geologic maps by overlaying data using their own GIS

The early settlers quarried the limestone and used the blocks for bridge abutments,

or CAD software. KGS has also developed an Internet map server where users can mills, and homes. Dimension stone can be obtained from the even-bedded dolomite of

Sandstone suitable for building stone could be quarried from the Hartselle Sandstone

Large deposits of well-sorted quartzose sand, mapped as brecciated sandstone, are exposed in the Tompkinsville 7.5-minute quadrangle. This sand has been used locally as mortar sand and for use in finish cement. Much clay is mixed with the sand, and the The Tompkinsville 30 x 60 minute quadrangle lies along the Cincinnati Arch, an material must be washed before it can be used. The uniformity of grain size, easy access, elongate structural feature located between the Nashville Dome of central Tennessee and large tonnages available suggest that these deposits could serve as a commercial Sand. a possible source of concrete, foundry, or plaster aggregate, is present as a sandstone lens as much as 20 ft thick in the Creelsboro 7.5-minute quadrangle. The

> Gravel occurs along the Barren and Cumberland Rivers and their major tributaries but have been used locally as road metal and fill. No commercial sand and gravel operations are active in this quadrangle.

Shale and clay shale deposits in the easternmost quarter of this quadrangle could be

the clay fraction

The Mascot Dolomite, the upper unit of the Cambrian-Ordovician Knox Group, is a major host for Mississippi Valley-type ore deposits in south-central Kentucky. The development of an erosional unconformity at the top of the Knox Group and its resulting paleoaquifer and karst system created diagenetic changes, migration avenues, and solution-collapse breccias that controlled subsequent fluid migration and accumulations of base metals and hydrocarbons (Anderson, 1991). Since the discovery of the Elmwood zinc deposit in central Tennessee in 1967, mining companies have conducted extensive exploratory drilling for zinc in the Knox of southcentral Kentucky, most recently in 1991. Two major and several minor zinc deposits have been discovered in the Knox in eposit is located near Gamaliel in Monroe County (Anderson, 1991). Extensive drilling has defined the extent of these ore bodies. In 1976, Cominco American Inc., American 3 melting and Refining Company, and National Lead Industries jointly opened a exploration shaft near Burkesville to examine the potential for mining one of the zinc deposits. A combination of economic conditions and mining problems forced the closing of the shaft in 1979. These zinc deposits are formed in solution-collapse breccia bodies, associated with

ne Knox unconformity and with algal stromatolites. These deposits are about 600 to 800 ft below the unconformity and are of low grade, 2 or 3 percent (W.H. Anderson, KGS personal communication, 2003). The sphalerite in these deposits contains trace amounts of cadmium, germanium, gallium, and indium that were consistent with high trace-element values for Kentucky and Tennessee sphalerite. Recovery of these trace Oil and natural gas are the principal economic resources of this quadrangle. A small elements as byproducts of zinc smelting could increase the value of a marginal-grade amount of coal has also been mined. Other mineral resources include limestone, zinc deposit. No zinc is currently being mined in this 30 x 60 minute quadrangle (Anderson,

Surface deposits of barite occur as irregular concretions and as the cores of quartz

is present in geodes in the lower part of the Fort Payne Formation (Lewis, 1972).

structure (the Cincinnati Arch and the resulting dip of the rocks away from the arch), the composition of the underlying rocks, and the surface and subsurface drainage patterns. The drainage patterns and rock composition are the more significant controls and tend to mask the influence of the regional structure. The depth of the interface beneath the ennyroyal Plateau is coincident with the maximum depth of large solution openings' and is essentially a subdued reflection of the topography of the plateau. The interface the Cumberland River

extremely unstable on steep slopes. During construction of foundations or roads, on or across the Paragon, special precautions should be taken to ensure adequate drainage and to avoid oversteepened slopes.

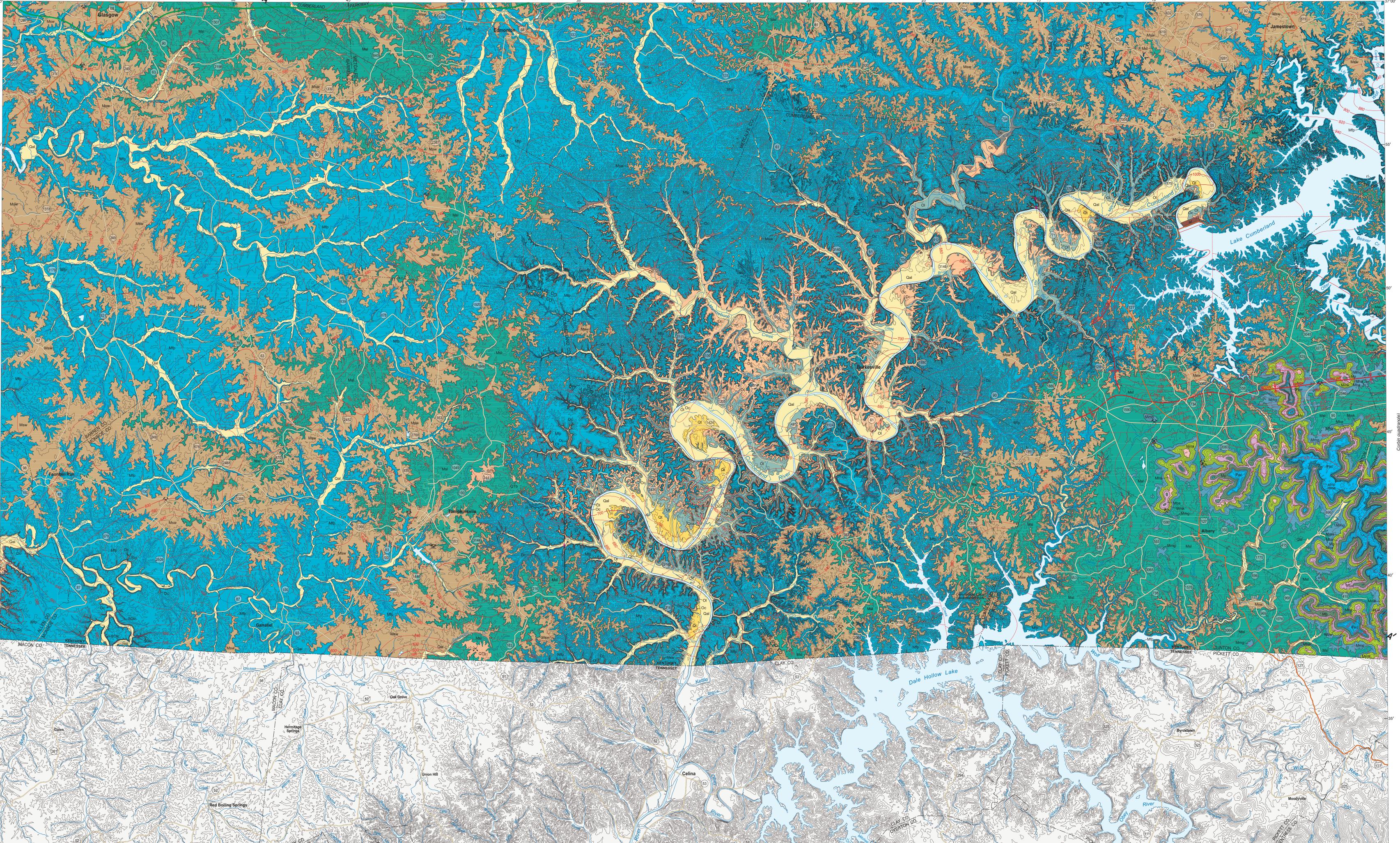
along the valleys of the major rivers and their tributaries. These rivers, by solution and abrasion of the underlying limestone, have incised their valleys from less than 100 ft to more than 300 ft below the uplands (Hopkins, 1966). Fhere are three common karst-related hazards (Currens, 2002): sinkhole collapse, sinkhole flooding, and groundwater contamination. Sinkhole collapse occurs by two methods. In the first way, the bedrock roof of a cave becomes too thin to support the weight of the bedrock and soil above it. The cave roof then collapses, forming a collapse sinkhole. Bedrock collapse is rare and the least likely way a sinkhole can form. The

dissolve and be carried away underground, and for the soil to gradually slump or erode Sinkhole flooding occurs when there is more precipitation than the conduits (and caves) can handle. There are two types of sinkhole flooding. In the first type, the throat of the sinkhole may be constricted and thus unable to carry away water as fast as it flows in. Frequently, the throat of the sinkhole is clogged by trash and junk, soil eroded from fields and construction sites, and sometimes by natural rockfall within the conduit. The second type of sinkhole flooding is caused when the sinkhole's discharge capacity is limited farther downstream. This can be caused by caves blocked with trash or rock fall, limited conduit size, or backflooding from other sinkholes. Some sinkholes that drain normally during modest storms may actually become springs and discharge water from

The southeastern corner of the quadrangle lies within the Eastern Kentucky Coal region and the primary pathway for groundwater contamination. Water enters the karst

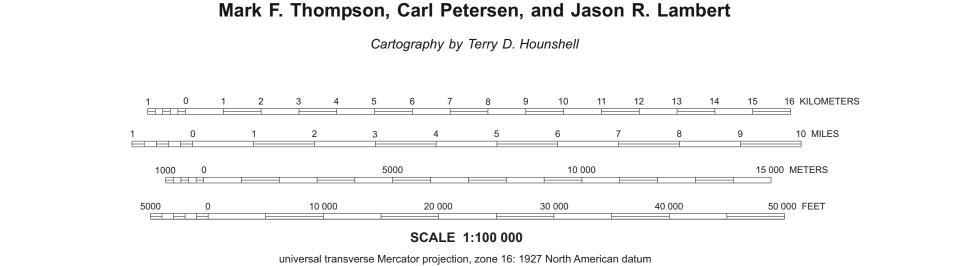
imestone and soil particles pass through the sinkhole's throat or outlet. The throat of a Clinton County, except for the early years. Coal mining ceased in Wayne County in 1989. the soil or other loose material overlying bedrock. When the overlying soil is repeatedly wetted and dried, small amounts of soil are dislodged and carried away by the conduit draining the sinkhole. The collapse occurs when the soil cover becomes too thin to support its own weight. The collapse occurs only in the overlying soil cover, not in the imestone bedrock (Currens, 2002). The hazard potential for sinkholes is related to any building, construction, or highway

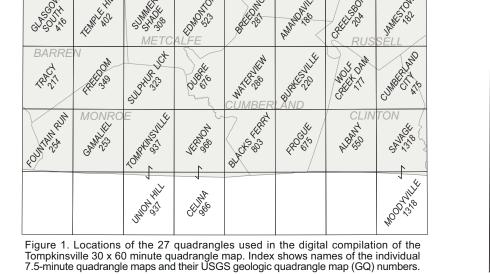
from pesticides, herbicides, or raw sewage could degrade the water supply. Adequate



(Campbellsville quadrangle)

GEOLOGIC MAP OF THE TOMPKINSVILLE 30 x 60 MINUTE QUADRANGLE, SOUTH-CENTRAL KENTUCKY







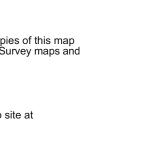
gure 2. Location of structure contours in the Tompkinsville 30 x 60 minute quadrangle. Index gives names of each mapped datum horizon. The horizon boundaries are shown on the geologic map as thin red dashed lines or faults. Contour interval is 20 ft with index contours at every 200 ft.

Kentucky Geological Survey

is highlighted in blue.

Public Information Center Toll free: (877) 778-7827 View the KGS World Wide Web site at www.uky.edu/kgs

For information on obtaining copies of this map and other Kentucky Geological Survey maps and



Interstate highway or parkway 5tructure contour, feet

—-—- County boundary

····· City boundary

····· Concealed fault

Inferred contact

----- Contact

Normal fault (U, upthrown side;

D, downthrown side)

Concealed contact

Datum horizon boundary

Abandoned stone quarry or mine

Abandoned exploration shaft

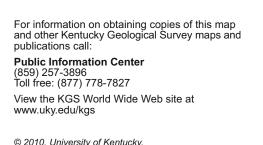
Abandoned pit; gravel or asphalt

Mineral prospect; lead or zinc

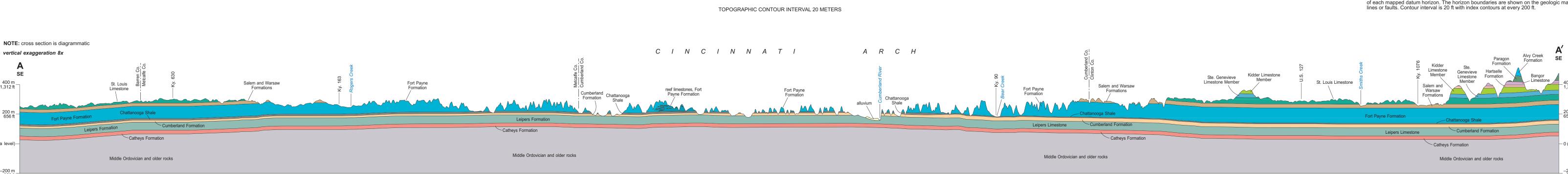
Active stone quarry or mine

Active pit; gravel

Strip mine



Madison Falmouth Maysville Ironton



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Many of these deposits are probably too cherty for use as high-grade concrete aggregate, Shale and Clay Shale

of economic value. Partially weathered shale of the Fort Payne Formation and residual red clay soil derived from weathered limestone of the Fort Payne Formation and the Warsaw and St. Louis Limestones in the Jamestown 7.5-minute guadrangle are sources of ceramic clays that probably are suitable for the manufacture of brick, tile, and artware. he deposits are small, and each clay deposit has different firing characteristics. Shale The Cincinnati Arch was uplifted and subaerially exposed during Middle Ordovician of the Fort Payne, weathered and unweathered, bloats at higher temperatures and may and Silurian time (Lewis and Potter, 1978; Anderson, 1991), resulting in thinning of some be useful in its bloated or expanded shale form in the manufacture of lightweight

geodes in shale of the Fort Payne Formation in the Wolf Creek Dam 7.5-minute

cement in brecciated rock between the veins. Galena is concentrated in thin (1/8 to 1 with the sphalerite and is disseminated in the barren country rock. Additional sphalerite

Most wells in the alluvial floodplains and terraces of the Cumberland and Barren Rivers are inadequate for a domestic supply. To produce significant amounts of water, wells drilled into karst aquifers must intersect a set of enlarged fractures, a dissolution conduit, or a cave passage with an underground stream. Information on groundwater quality and availability for wells drilled into specific formations in this quadrangle is contained in Brown and Lambert (1962), Lambert and Brown (1963), and Carey and Stickney (2001, 2002a, b. 2004, 2005a-d.). The saline-freshwater interface for the state was mapped by Hopkins (1966). In the Pennyroyal Plateau the major controls on the position of the interface are the regional

s between 200 and 300 ft below the ridges and as little as 50 ft below the channel of ENGINEERING GEOLOGY Unstable shales and karst terrain are two geologic issues that could cause hazards uring construction of roads, buildings, or other urban development. The clay shale of ne Paragon (previously Pennington) Formation becomes plastic when wet and is

Surface and near-surface limestone have the potential for karst hazards. The thickbedded limestone underlying the Pennyroyal Plateau, and to a lesser extent the Mammoth Cave Plateau, is readily soluble in groundwater and develops into a karst terrane. The arge number of sinkholes, caves, underground streams, and springs and the few surface streams show that the dominant drainage of this plateau is subsurface. Percolating groundwater in the underlying relatively pure, thick-bedded limestone has developed an intricate subsurface drainage system by solution along joint systems, fractures, and bedding planes. This has created the cave systems for which this region is famous. The discharge of groundwater from this subsurface system occurs as springs and seeps

second, and most common, way sinkholes form is for the bedrock under a sinkhole to

their throats during intense storms (Currens, 2002). Solution-enlarged openings of the conduit system serve as the primary aguifer in this

built over them that would be prone to collapse or subsidence. Groundwater contamination foundation testing should be done prior to construction in karst areas, and water testing