DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
THOMAS B. NOLAN, DIRECTOR

PREPARED IN COOPERATION WITH
THE COMMONWEALTH OF KENTUCKY, UNIVERSITY OF KENTUCKY
KENTUCKY GEOLOGICAL SURVEY
WALLACE W. HAGAN, DIRECTOR AND STATE GEOLOGIST

HYDROLOGIC INVESTIGATIONS
ATLAS HA-117

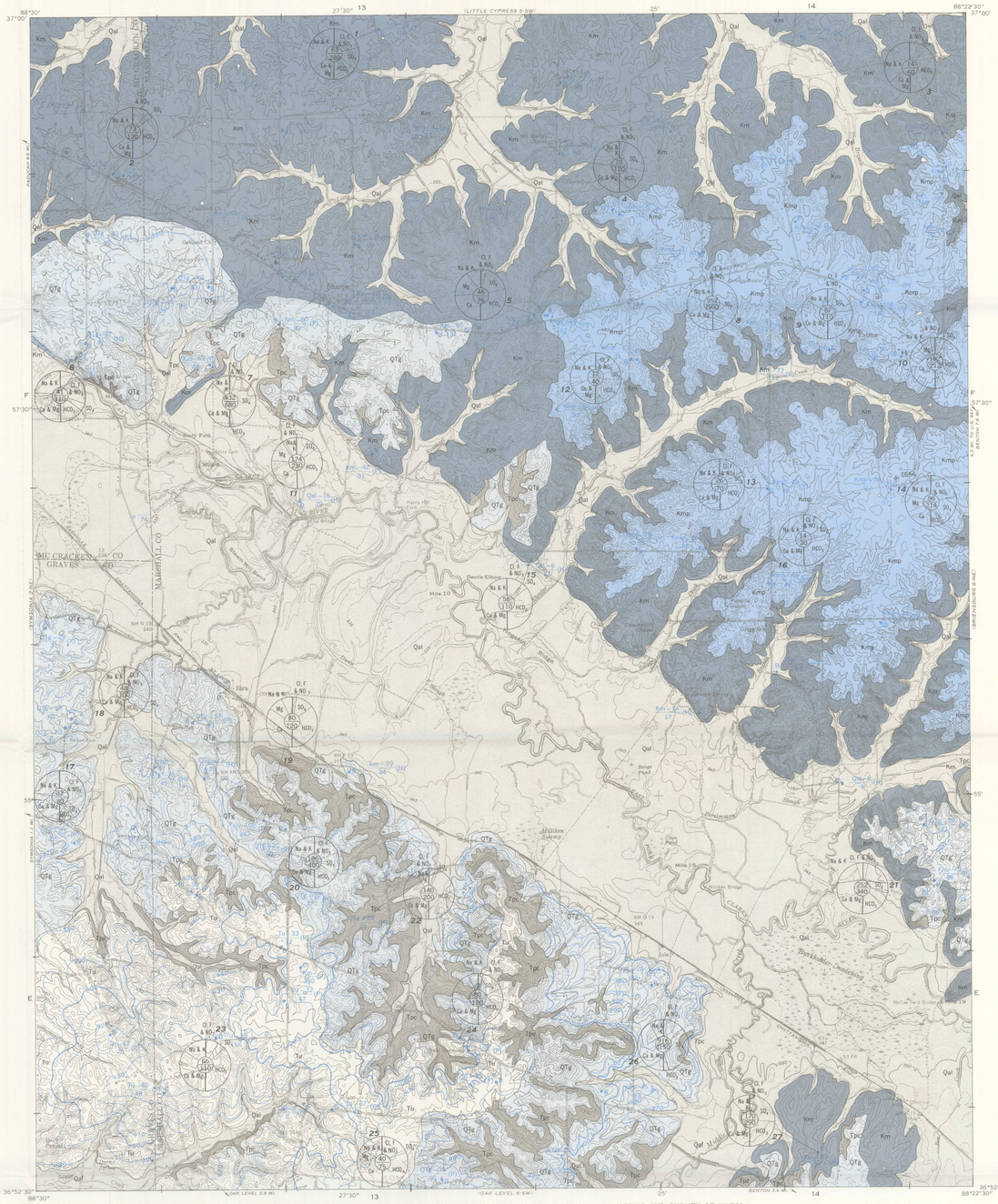
SYSTEM	SERIES	GROUP	FORMATION	SECTION	THICKNESS, IN FEET	LITHOLOGY	TOPOGRAPHY AND GEOLOGIC SETTING	HYDROLOGY
QUATERNARY	Pleistocene and Recent		Alluvium		0–80′	Tan to gray silt and sand commonly in upper part. Grades downward to clayey and sandy gravel at base. Thin beds of clay in places.	Flood-plain and terrace deposits in the valleys of the regional drainage system. The alluvium of major flood plain is as thick as 70 feet but thins to less than 10 feet in many tributary valleys.	Water bearing in availability area 1. Yields domestic supplies of ground water to large-diameter bored or dug wells less than 30 feet deep in major flood plain. Shallow wells in tributary valleys commonly are less than 15 feet deep and generally adequate for supply. Water table fluctuates with seasonal rainfall. Quality of water variable, depending on rock recharge from rainfall and from springs along flood-plain margins. Iron content and hardness may be objectionable in places. Greater concentrations than 0.3 parts per million iron in water, considered to be the objectionable limit, may stain plumbing fixtures and laundry.
			Loess		0–10′	Tan or buff to brown unstratified noncalcareous silt and clay; may be reworked with gravel at base.	Wind-borne deposits which mantle the uplands and drape down hillsides. Thickest in upland; partly eroded in places.	Yields little or no water to dug wells. Probably transmits some rainfall to underlying aquifers.
			Gravel and sand[1]		0–80′	Red to brown well-rounded to angular iron-stained chert pebbles and cobbles with some quartz pebbles. Sand is quartz or chert and occurs as matrix of or poorly sorted red to tan crossbedded lenses. Iron-cemented zones are common in either the gravel or sand. Discontinuous clay beds in places.	Stream-laid deposits in the uplands and formerly extensive over the area. Now eroded thin or removed in places. Exposed in hillsides, road cuts, and tributary valleys. As thick as 60 feet in northwestern part of quadrangle. Rest on sediments that range in age from Cretaceous to Eocene.	Water bearing in availability area 2. Yields adequate domestic water supplies and may suffice for small commercial establishments where saturated zone is relatively thick. Most shallow, large-diameter wells are dug or bored and commonly are less than 50 feet deep. The water is generally soft, contains low concentrations of dissolved solids, and has an iron content usually in negligible amounts.
TERTIARY	Eocene (undifferentiated)	Midway	Sand and clay		0–80′	White well-sorted medium-grained sand and medium-gray to white sometimes mottled clay. Sand is quotidied to shades of red in exposure. Clay commonly is lignitic and sandy. Lower clay conglomerate has a matrix of very poorly sorted sand. Basal coarse sand in places. Discontinuous clay beds or lentils are common.	Continental deposits exposed in southwestern part of quadrangle at altitudes as high as 490 feet in road cuts and valley walls. The deposit may be as thick as 80 feet in extreme southwest but thins to the east and northeast and absent outside of availability area 3 (fig. 1). Rests on an eroded surface of the Porters Creek Clay.	Water bearing in availability area 3. Yields adequate perennial water supplies to homes and small commercial establishments through large-diameter bored or dug wells commonly less than 80 feet deep. Local occurrences of shallow water above clay lenses may suffice for the home. Quality of water is satisfactory for most uses. The water is soft to moderately hard, low in dissolved solids, and the iron content is rarely in objectionable concentrations.
	Paleocene		Porters Creek Clay		0–190′	Dark-gray to black massive, slightly micaceous clay with molds of invertebrate marine fossils in places. Glauconite in a few sandy zones. Dry clay yields conchoidal fracture. Contains thin beds of gray fine-grained micaceous sand. Joints and fractures commonly filled with sand are called sandstone dikes. Dark-gray to greenish-gray very glauconitic and micaceous clay and fine-grained sand at base usually brown in exposure; massive clay in places.	Marine deposits exposed in hillsides and valley floors in availability area 4 (fig. 1). Concealed beneath the Eocene sands. As thick as 180 feet near Sugar Creek but thins to north and northeast and absent in availability areas 5 and 6.	Not significant as an aquifer. Thin sand beds may yield some water to large-diameter wells. The thick clay retards descending water and confines water in the underlying McNairy Formation in availability areas 2, 3, and 4. The sandstone dikes could yield enough water for a domestic water supply.
CRETACEOUS	Upper Cretaceous		McNairy Formation[2]		200–300′	White to gray fine- to medium-grained micaceous sand interlaminated with dark gray to black massive, in some places sandy, micaceous clay. Lignite beds are common. Medium- to coarse-grained sand at base.	Deltaic deposits exposed beneath Pliocene(?) gravel in availability area 5 (fig. 1). Deposits occur in entire quadrangle and are as thick as 300 feet in the western part of the area. Thinner deposits, about 200 feet thick, are to north and northeast. Rests on an eroded Paleozoic rock surface except where separated by the Tuscaloosa Formation in local areas.	Water bearing in entire quadrangle. Yields a plentiful supply of ground water to both drilled and bored wells. Shallow perched water zones will supply enough water for the home. Confined water, adequate for commercial or public supply, rises in some wells to altitudes of about 375 feet in availability areas 2, 3, and 4. The depth in these areas ranges from less than 70 feet in the northern and eastern parts to more than 200 feet in the southwestern part. Quality of water in this range of quality of water apparently is suitable for domestic or public supply. Water is soft to very hard and in places contains relatively high concentrations of dissolved solids. The iron content may be objectionable.
			Tuscaloosa Formation		0–60′	White well-rounded chert pebbles and cobbles in tripolitic and sandy matrix.	Stream-laid deposits which fill the channels and depressions in eroded Paleozoic rock surface. Concealed in this area. Thickness is unknown but in adjacent areas to south and east the gravel is thicker than 60 feet.	Probably will yield adequate domestic supplies where the formation is present. Absent in parts of the quadrangle. Tripolitic matrix of formation could be troublesome in clogging well screens. Quality of water probably is suitable for most uses. The water may be hard and contain an objectionable amount of iron in places.
	Upper Devonian		Chattanooga Shale		0–30′	All rocks below the Cretaceous are of Paleozoic age and are the "bedrock" of drillers. Black micaceous fissile siliceous and indurated shale; weathered in upper part.	Marine shales concealed in the subsurface. Probably removed by the pre-Cretaceous erosion in much of quadrangle. Remnants may have been preserved in area north of Highway 68. Underlain unconformably by limestone of Devonian age.	Not significant as an aquifer. Confines water in underlying limestone.
DEVONIAN	Lower and Middle Devonian		Devonian rocks (undifferentiated)		900′+	Slightly calcareous dolomitic chert rubble composed of angular weathered dolomitic fragments in upper part. Underlain by gray to white finely- to coarsely-crystalline limestone and dolomite, siliceous and silty in zones, with white to dark-gray chert interbeds. Limestone, shale, and dolomite of Silurian and Ordovician age at depth.	Consolidated marine sediments concealed beneath the Cretaceous deposits. Pre-Cretaceous weathering and leaching indicated by upper chert rubble zone which may be as much as 70 feet thick in places. Rock of Silurian age is recorded between 1,200 and 1,585 feet in depth in oil-test well. The Paleozoic rock probably is broken and shattered by faults in some places.	Water bearing in entire quadrangle at depths ranging from about 200 feet in the northern and eastern parts to depths greater than 500 feet in the southwestern part. Probably will yield a large quantity of water confined in crevices or solutional channels in limestone. Upper porous chert rubble may contain an abundance of water. Fault zones generally are excellent ground-water sources. The confined water is not developed in this quadrangle. Quality of water probably is suitable for many uses. The water may be hard and contain an objectionable amount of iron in places. Hydrogen sulfide is present in water from Paleozoic rock in adjacent quadrangles in some places.

[1]Age undetermined. Estimates of age range from Pliocene or older to Pleistocene
[2]May contain beds of Clayton age at top

EXPLANATION

Gravel · Sand · Silt · Loess · Clay or shale · Carbonaceous material · Mica · Glauconite · Chert rubble · Limestone · Dolomite · Crystalline limestone · Cherty limestone · Cherty dolomite

FIGURE 2.—GENERALIZED COLUMNAR SECTION AND WATER-BEARING CHARACTER OF GEOLOGIC FORMATIONS


88°30'
37°00'
27'30"
13
14
88°22'30"
57'30"
55'
36°52'30"
25'
20'
ILLITTLE CYPRESS 5-SW
PADUCAH 2.5 MI
OAKLEY
OAK LEVEL 0.8 MI
OAK LEVEL 6.9 MI
BENTON 2.5 MI
KENTUCKY 4.2 MI
BENTON 6 MI
Elva
Oakland
Harris Hill
Dewitt Elkhorn
Mill Creek
Hillview Estates
Hillview Heights
Hillview Subdivision
Hillview Park
Hillview Manor
Hillview Terrace
Hillview Addition
Hillview Acres