

SYSTEM	SERIES	GROUP	FORMATION	SECTION	THICKNESS IN FEET	LITHOLOGY	TOPOGRAPHY AND GEOLOGIC SETTING	HYDROLOGY
QUATERNARY	Pleistocene and Recent	Pleistocene	Alluvium		0-20	Brown to gray silt and clay in stream valleys. Brown sand and gravel containing some silt and clay in valleys of East Fork of Clark River and Cypress Creek.	Deposits are as much as 70 feet thick in the flood plain and in terraces along East Fork of Clark River and Cypress Creek. Thinner deposits are in the valleys of small streams.	Underlies availability area 1. Few wells in the quadrangle obtain water from these deposits. In the East Fork of Clark River valley should yield adequate quantities of water for domestic purposes. Analysis of one water sample shows the water is soft, contains 1.7 ppm calcium per million or less, and has a pH of 6.1. A concentration of more than 0.3 ppm shows staining of clothes and utensils and imparts a disagreeable taste to water.
			Loess		0-10	Fan to gray compact unstratified silt and clay.	Deposit mantles flat and gently rolling uplands. Removed by erosion along ridges and on steep slopes.	Not water bearing.
			Gravel and sand		0-50	Red to brown round to angular chert pebbles that contain some well-rounded quartz pebbles. Tan to brown medium-grained quartz sand that contains small angular chert fragments and small amounts of mica.	Underlies uplands and ridges and their eroded edges and a low level terrace along Little John Creek (northwest corner of quadrangle). Also forms cultural deposits on steep slopes.	Underlies availability area 2. Most large-diameter wells at Draffville yield adequate quantities of water for domestic purposes. Water is moderately hard, has a pH of 6.1, and contains less than 0.3 ppm of iron. A spring near State Park yields adequate quantities of water for domestic purposes. Many wells with gravel are reported inadequate or go dry during late summer.
TERTIARY	Pliocene(?)	Pliocene(?)	Porters Creek Clay		0-41	Dark gray to black massive slightly micaceous clay. Clay is jointed and breaks with a conchoidal fracture.	Occurs only within a small faulted area north of Oak Valley Church.	Underlies availability area 3. Not water bearing. Holds up perched water in overlying cultural gravel beds. Continues water in underlying aquifers.
			McNairy Formation		0-300	Dark gray to black lignitic clay, interstratified with gray fine-grained micaceous sand. Brown to red fine to medium-grained silty sand that contains thin beds of dark gray lignitic clay or shales. White to gray very fine-grained micaceous sand and gray clay.	Exposed on eroded uplands and ridges and along degrading streams. Interstratified sand and clay units exposed near Scale and in ridges south of Little John Creek. Brown to red sand unit exposed in middle of quadrangle area. White to gray very fine-grained micaceous sand unit is exposed in ridges along Kentucky Lake.	Shallow perched zones underlie availability area 4. Main zone of saturation underlies availability area 5. Yields adequate quantities of water for domestic purposes in zones of shallow, perched water. Most wells finished in main zone of saturation yield adequate quantities of water for homes, roads, restaurants, and gasoline stations. Water ranges from soft to moderately hard, contains from 5.8 to 6.8 iron content ranges from 0.02 ppm to 0.8 ppm.
CRETACEOUS	Upper Cretaceous	Tuscaloosa Formation			0-235	Fan to light gray rounded chert pebbles, fine- to medium-grained sand, and dark gray clay. Gray gravel found in matrix of chert fragments and fragmentary chert nodules.	Exposed on ridges along Kentucky Lake.	Underlies availability area 6. Yields adequate quantities of water for domestic purposes. Water ranges from soft to hard water and more alkaline water occurs near the base of the formation. Some wells yield water containing more than 0.3 ppm of iron.
			St. Louis Limestone		0-100	All rocks below the Cretaceous are of Paleozoic age and are the "bedrock" of well owners.	Weathered chert rubble exposed along shore of Kentucky Lake. Un-weathered limestone encountered only in wells drilled on ridge between Cypress Creek and Kentucky Lake.	Underlies availability area 7. Yields adequate quantities of water for domestic purposes. A well at Kentucky Dam Village (east of Scale) yields up to estimated 120 gpm (gallons per minute). Water ranges from soft to very hard. Iron is in excess of 0.3 ppm in some places.
			Warsaw Limestone		0-50	Light to medium gray medium to coarse crystalline limestone that contains nodules of gray porous chert.	Exposed along shore of Kentucky Lake.	Underlies availability area 7. Yields adequate quantities of water for domestic purposes. Water is reported to be hard or very hard.
MISSISSIPPIAN	Lower Mississippian	Fort Payne Formation			0-45	Dark gray to black fine-grained argillaceous limestone interbedded with dark gray to black chert.	Exposed along shore of Kentucky Lake and on ridges along Little Bear Creek.	Underlies availability area 7. Yields adequate quantities of water for domestic purposes. Analysis of one water sample shows the water is very hard, contains 1.2 ppm of iron, and has a pH of 7.4. This water sample also contained 2.8 ppm of dissolved hydrogen sulfide gas, "sulfur water."
			Chattanooga Shale		0-215	Black fine-grained shale. Shale is cut by system of joints.	Exposed in fault on south side of Little Bear Creek.	Underlies availability area 7. Generally not water bearing. Small amount of water might be available from joints in outcrop area.
DEVONIAN	Middle Devonian	Devonian rocks, undifferentiated			0-300	Light-gray coarse crystalline, dolomitic, cherty limestone.	Not exposed. Underlies quadrangle at depths ranging from 100 to 360 feet.	Underlies availability area 7. Yields adequate quantities of water for domestic purposes. Water ranges from hard to very hard, iron content ranges from 0.43 to 0.80 ppm, and the pH ranges from 7.4 to 7.7.

Age undetermined. Estimates of age range from Pliocene or older to Pleistocene.
*May contain beds of Clayton age at the top.
†Lower part of the formation includes the Salem Limestone.

EXPLANATION

	Gravel		Sand		Silt		Loess		Clay or shale		Mica		Glaucite		Limestone		Dolomite		Cherty limestone		Argillaceous limestone		Crystalline limestone		Cherty dolomite
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FIGURE 2—GENERALIZED COLUMNAR SECTION AND WATER-BEARING CHARACTER OF GEOLOGIC FORMATIONS

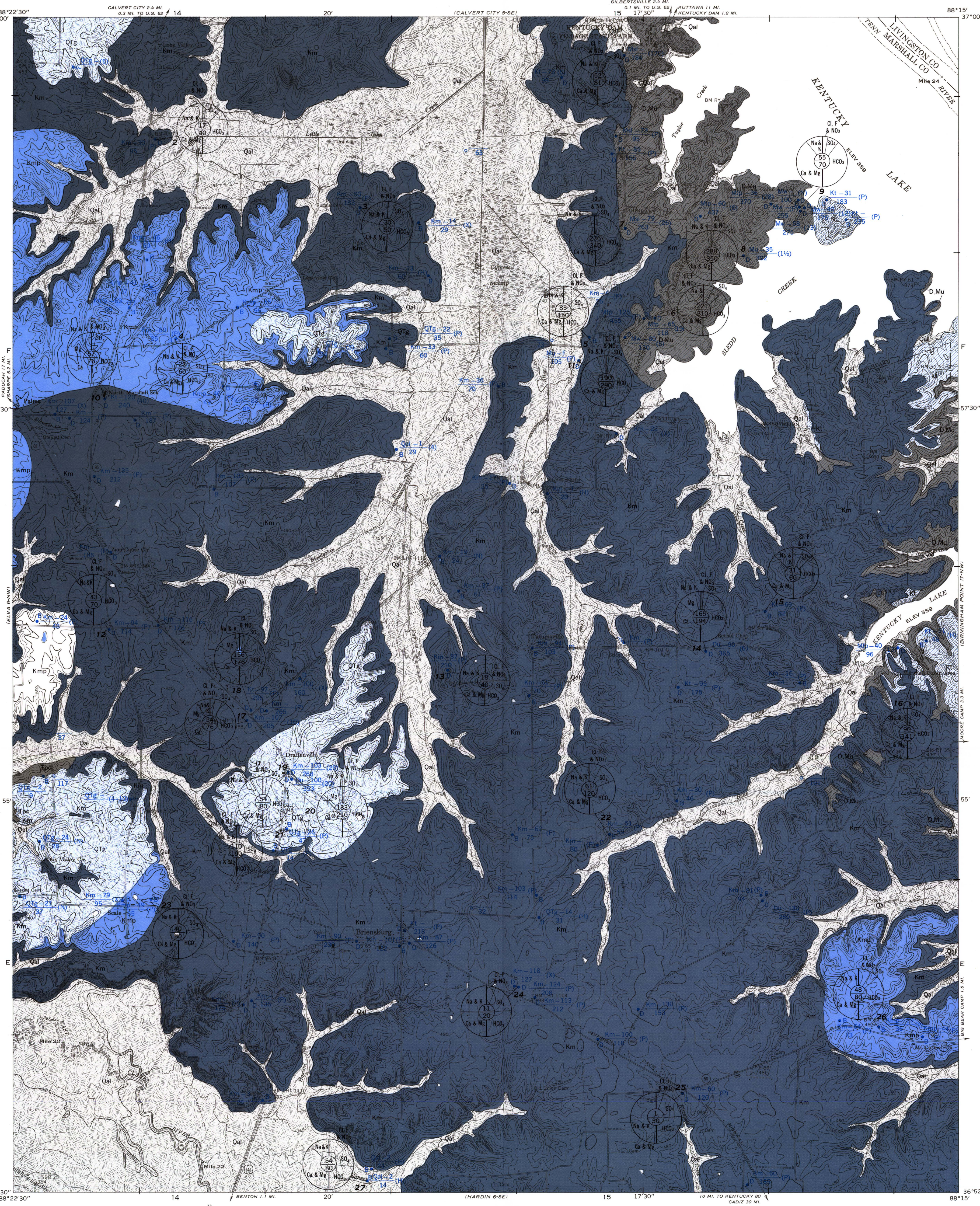


FIGURE 1—MAP SHOWING AVAILABILITY OF GROUND WATER, LOCATION OF WELLS AND SPRINGS, AND QUALITY OF WATER

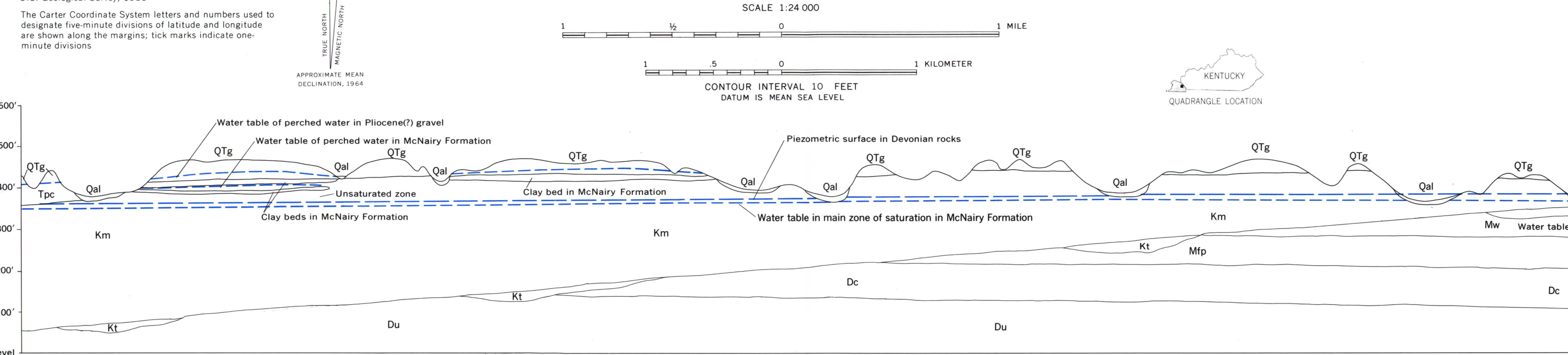


FIGURE 3—GENERALIZED GEOLOGIC SECTION ALONG A NORTHEAST-TRENDING LINE FROM SCALE TO KENTUCKY LAKE

EXPLANATION

The water availability areas on this map show the occurrence and availability of ground water in the shallowest aquifer that may yield adequate amounts of water for domestic use in each area. It is considered in this report, an adequate domestic supply will deliver approximately 200 gallons per day from a well equipped with a power pump and pressure-distribution system. The shallowest aquifer is underlain by deeper aquifers whose depths and water-bearing properties are described in the generalized columnar section, figure 2.

AREA 1
Water in Quaternary alluvium
Large-diameter wells in Cypress Creek valley and in the East Fork of Clark River valley should yield sufficient water for a domestic supply from the alluvium. The shallowest aquifer is underlain by deeper aquifers whose depths and water-bearing properties are described in the generalized columnar section, figure 2.

AREA 2
Water in gravel of Pliocene(?) age
Large-diameter wells range in depth from 9 to 47 feet. Most wells at Draffville yield adequate quantities of water for domestic purposes. Wells in other parts of availability area 2 may yield sufficient water for domestic supply if they are developed to a depth below the water-bearing bed in grain additional storage. A few developed springs furnish adequate water for domestic supplies, many springs are dry or nearly dry in the summer. If the Pliocene(?) deposits are dry or yield only small amounts of water, wells may be developed to obtain water from the underlying McNairy Formation or bedrock of Paleozoic age.

AREA 3
Water in Porters Creek Clay
The Porters Creek Clay is not water bearing. Small quantities of water occur in cultural gravel that underlies the clay. This shallow water is generally inadequate for a domestic supply, large-diameter wells that are drilled into the underlying clay may provide sufficient quantities of water for a small water supply. If the Pliocene(?) deposits are dry or yield only small amounts of water, wells may be developed to obtain water from the underlying McNairy Formation or bedrock of Paleozoic age.

AREA 4
Perched water in McNairy Formation
Large-diameter wells less than 30 feet deep generally yield adequate quantities of water for domestic purposes. Water levels stand higher than in the underlying main zone of saturation and wells can be drilled with increasing pump discharge rates at a relatively low cost. Only small amounts of water are obtained from perched zones in the McNairy Formation wells may be developed to obtain water from the underlying main zone of saturation in the McNairy Formation or bedrock of Paleozoic age.

AREA 5
Water in main zone of saturation of McNairy Formation
Furnishes sufficient water for an adequate domestic supply to many wells. Small-diameter wells in a zone of sufficient thickness capable of being reached by a well screen in depth from 40 to 285 feet. Large-diameter wells are dug or bored below the potential yield of wells tapping the main zone of saturation of the McNairy Formation is not known, but some small-diameter wells furnish enough water for homes, roads, and gas stations. Properly constructed wells probably could yield 50 to 100 gallons per minute from this zone, saturated sand. Larger amounts of water can be available in some areas from the underlying bedrock of Paleozoic age.

AREA 6
Water in Tuscaloosa Formation
Furnishes sufficient water for an adequate domestic supply to a few wells. The potential yield of wells tapping the main zone of saturation of the McNairy Formation is not known, but some small-diameter wells furnish enough water for homes, roads, and gas stations. Properly constructed wells probably could yield 50 to 100 gallons per minute from this zone, saturated sand. Larger amounts of water can be available in some areas from the underlying bedrock of Paleozoic age.

AREA 7
Water in Devonian and Mississippian rocks
Furnishes sufficient water for an adequate domestic supply to most small-diameter wells. Wells range in depth from 30 to 255 feet and are completed without screens or casing in the rock. The potential yield of wells tapping these rocks of Paleozoic age is not known, but ground water generally is available in quantities greater than are needed for most domestic purposes. Many wells penetrating creviced limestone now yields more than 10 gallons per minute and one well has a reported yield of 120 gallons per minute. A few wells that encounter no crevices and penetrate only dense, tight limestone yield insufficient water for a domestic supply.

Area boundary

Test hole

Figure below line is depth of test hole
Water well

D, Drilled well, generally steel casing with well screen on lower end.
B, Bored or dug well, generally 12-inch concrete tile casing open at the bottom.

Analysis number	1	2	3	4	5	6	7	8	9	10
Iron content	12	0.46	6.4	0.18	3.2	0.02	0.33	0.19	4.8	0.86
pH	6.8	5.8	6.1	6.5	5.9	7.4	7.6	7.8	6.2	6.8

Analysis number	11	12	13	14	15	16	17	18	19	20
Yield in gallons per minute, or adequacy (see below)	6.1	0.11	0.17	0.82	0.13	0.06	0.71	0.87	0.54	0.43
Iron content	7.4	6.4	5.6	7.4	6.5	7.6	6.8	7.3	6.6	7.1

Analysis number	21	22	23	24	25	26	27
Iron content	0.22	3.3	0.02	0.22	1.9	1.16	1.7
pH	6.1	6.6	6.4	5.9	6.1	6.4	6.1

YIELD OR ADEQUACY
(S) Gallons per minute, where known
(P) Well reported adequate for power pump for domestic and/or stock supply
(H) Well reported adequate for hand pump or well bucket
(O) Well reported not adequate
(N) No yield data available

EXPLANATION
Qa Alluvium of Quaternary age
Qte Gravel and sand of Pliocene(?) age
Km McNairy Formation of Cretaceous age
Kt Tuscaloosa Formation of Cretaceous age
Mf Fort Payne Formation of Mississippian age
Ml St. Louis Limestone of Mississippian age
Mw Warsaw Limestone of Mississippian age
Mu Devonian rocks undifferentiated
Du Devonian rocks undifferentiated

AVAILABILITY OF GROUND WATER IN THE BRIENSBURG QUADRANGLE, KENTUCKY

By
L. M. MacCary
1964