

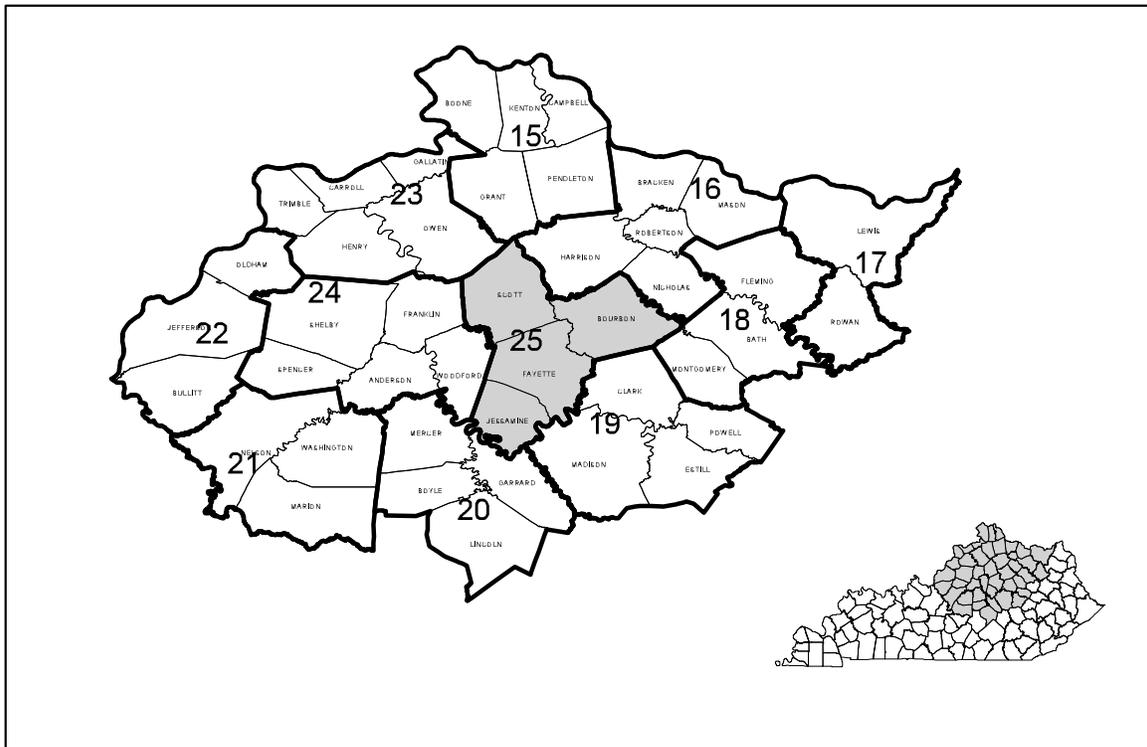
DEPARTMENT OF THE INTERIOR  
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THE COMMONWEALTH OF KENTUCKY  
AND THE KENTUCKY GEOLOGICAL SURVEY  
UNIVERSITY OF KENTUCKY

AVAILABILITY OF GROUND WATER IN BOURBON, FAYETTE,  
JESSAMINE, AND SCOTT COUNTIES, KENTUCKY

By  
W.N. Palmquist, Jr., and F.R. Hall

HYDROLOGIC INVESTIGATIONS  
ATLAS HA-25



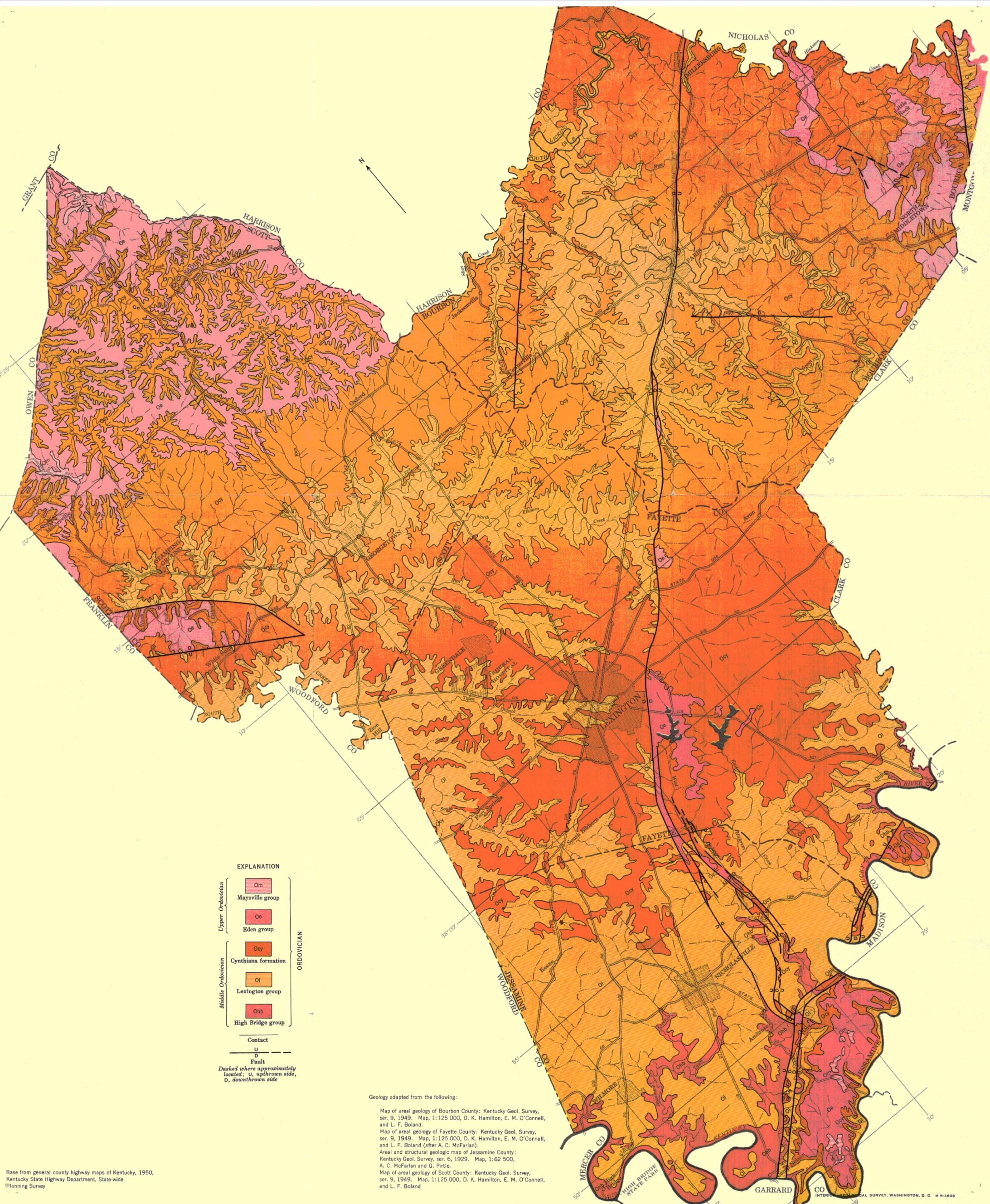
INDEX MAP OF THE BLUE GRASS REGION, KENTUCKY, SHOWING COUNTY  
GROUPS AND AREA OF THIS ATLAS

This is 1 of 11 atlases (HA-15 to HA-25) showing geology and availability of ground water in the Blue Grass region, Kentucky U.S. Geological Survey Water-Supply Paper 1533 contains a text description and illustrations providing further information on the occurrence and quality of ground water in the Blue Grass region.

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**EXPLANATION**

Upper Ordovician	Om	ORDOVICIAN
	Maysville group	
Oe		
Eden group		
Ocy		
Cynthiana formation		
Oi		
Lexington group		
Ohb		
High Bridge group		
Contact		Dashed where approximately located; U, upthrown side, D, downthrown side
Fault		

Geology adapted from the following:

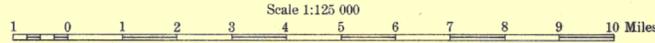
Map of areal geology of Bourbon County: Kentucky Geol. Survey, ser. 9, 1949. Map, 1:125 000, D. K. Hamilton, E. M. O'Connell, and L. F. Boland.

Map of areal geology of Fayette County: Kentucky Geol. Survey, ser. 9, 1949. Map, 1:125 000, D. K. Hamilton, E. M. O'Connell, and L. F. Boland (after A. C. McFarlan).

Areal and structural geologic map of Jessamine County: Kentucky Geol. Survey, ser. 6, 1929. Map, 1:62 500, A. C. McFarlan and G. Pirtle.

Map of areal geology of Scott County: Kentucky Geol. Survey, ser. 9, 1949. Map, 1:125 000, D. K. Hamilton, E. M. O'Connell, and L. F. Boland.

**GEOLOGIC MAP OF BOURBON, FAYETTE, JESSAMINE, AND SCOTT COUNTIES, KENTUCKY (COUNTY GROUP 25)**



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Base from general county highway maps of Kentucky, 1950, Kentucky State Highway Department, State-wide Planning Survey

EXPLANATION



Area 2

Most drilled wells in this area will produce enough water for a domestic supply with a power pump and and pressure system (more than 500 gallons a day) at depths of less than 100 feet. Some wells produce as much as 300 gallons per minute from alluvium or thick limestone along large streams. Water is hard or very hard and may contain salt or hydrogen sulfide, especially at depths greater than 100 feet.



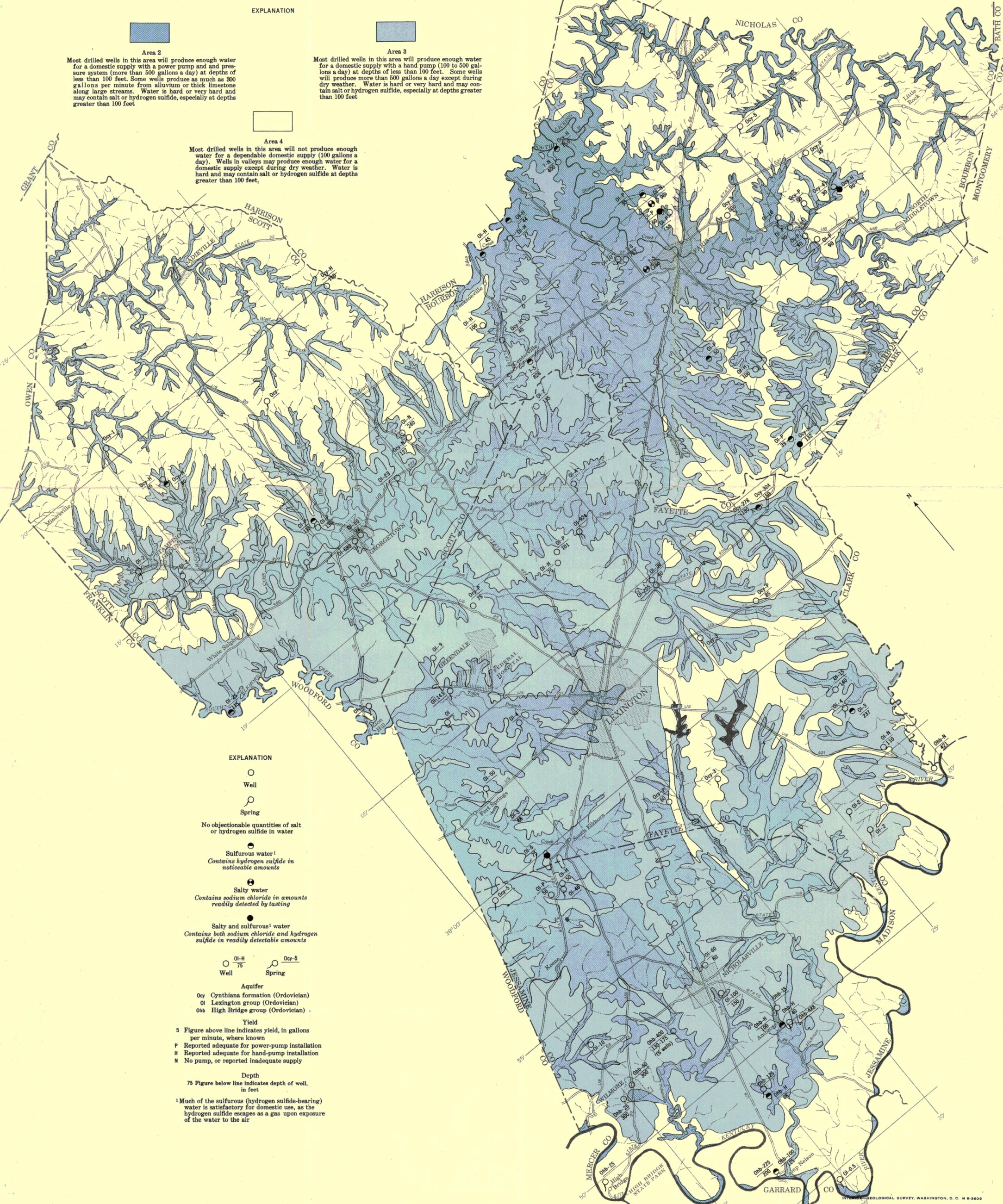
Area 3

Most drilled wells in this area will produce enough water for a domestic supply with a hand pump (100 to 500 gallons a day) at depths of less than 100 feet. Some wells will produce more than 500 gallons a day except during dry weather. Water is hard or very hard and may contain salt or hydrogen sulfide, especially at depths greater than 100 feet.



Area 4

Most drilled wells in this area will not produce enough water for a dependable domestic supply (100 gallons a day). Wells in valleys may produce enough water for a domestic supply except during dry weather. Water is hard and may contain salt or hydrogen sulfide at depths greater than 100 feet.



EXPLANATION



Well



Spring

No objectionable quantities of salt or hydrogen sulfide in water



Sulfurous water<sup>1</sup>

Contains hydrogen sulfide in noticeable amounts



Salty water

Contains sodium chloride in amounts readily detected by tasting



Salty and sulfurous<sup>1</sup> water

Contains both sodium chloride and hydrogen sulfide in readily detectable amounts



Well



Spring

Aquifer

Ocy Cynthia formation (Ordovician)

OI Lexington group (Ordovician)

Obh High Bridge group (Ordovician)

Yield

5 Figure above line indicates yield, in gallons per minute, where known

P Reported adequate for power-pump installation

H Reported adequate for hand-pump installation

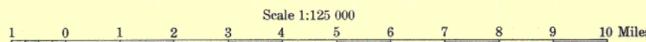
N No pump, or reported inadequate supply

Depth

75 Figure below line indicates depth of well, in feet

<sup>1</sup>Much of the sulfurous (hydrogen sulfide-bearing) water is satisfactory for domestic use, as the hydrogen sulfide escapes as a gas upon exposure of the water to the air

AVAILABILITY OF GROUND WATER IN BOURBON, FAYETTE, JESSAMINE, AND SCOTT COUNTIES, KENTUCKY (COUNTY GROUP 25)



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SYSTEM	SERIES	GROUP	FORMATION	THICKNESS, IN FEET	SECTION	LITHOLOGY	TOPOGRAPHY	HYDROLOGY	
TERTIARY (?) TO QUATERNARY	PLEISTOCENE (?) TO RECENT	MAYSVILLE	ALLUVIUM			Sand and silt with some coarser material along Kentucky River; thin and fine grained along tributary streams.	Thin, discontinuous flood plains and terraces along the Kentucky River and larger tributaries.	Yields 100 to 500 gpd (gallons per day) to wells in thick deposits along the Kentucky River; elsewhere, too thin and too fine grained to yield much water. Water is hard.	
			IRVINE (?) FORMATION			Unconsolidated deposits of brown chert fragments and well-rounded pebbles in a red-brown sandy clay matrix.	High-level terraces along the Kentucky River.	Yields water to small springs; to thin and scattered to be important as an aquifer.	
UPPER ORDOVICIAN	E D E N	MAYSVILLE	FAIRVIEW FORMATION	40±		Thin to medium-thick beds of gray locally rubbly limestone and bluish-gray calcareous shale.	Ridgetops in northern Scott County, extreme southeastern Bourbon County, and southeastern Jessamine County.	Yields water to dug wells.	
			UNNAMED SANDSTONE MEMBER						
		E D E N	GARRARD SANDSTONE	0-70		Light-colored fine-grained calcareous sandstone or siltstone that grades upward and downward into sandy shale and limestone.	Ridges and high hillsides in southern Fayette County and southeastern Jessamine County; ledges along hillsides.	Yield water to dug wells and shallow drilled wells; units do not occur below stream level in this area. Water is hard.	
			80-150	Bluish-gray lumpy calcareous shale with thin, evenly bedded argillaceous limestone. Thick limestone beds near the base locally; may be almost entirely shale with little limestone in other places.		Long, narrow, steep-sided ridges and narrow, winding, V-shaped valleys in a dendritic drainage pattern in north half of Scott County. Shale on steep slopes weathers and washes away, leaving slopes covered with thin limestone slabs. The underlying Cynthiana formation extends into the Eden shale belt in broad, flat valleys. The contrast with the rolling upland of the outcrop areas of the Cynthiana and Lexington is striking. Shale of the Eden caps subdued ridges and hills in southeastern Fayette County, and underlies the rugged area in southeastern Jessamine County.	Yields 100 to 500 gpd to drilled wells in large valleys; yields almost no water to drilled wells on hillsides or ridgetops, but may yield some water to dug wells on ridgetops; yields water to small springs and seeps. Water is hard and in valley bottoms may contain salt or hydrogen sulfide. The shale has small, poorly connected openings, and ground-water circulation is slow. The few thick limestone beds may yield a little water to springs and seeps. On ridgetops, the shale impedes downward percolation of water and supports water in the lower soil zone and weathered-rock zone just below the soil. Dug wells, with their large wall area, are better suited to obtain this water; however, many go dry in the late summer or fall. The relatively impermeable shale prevents recharge to the underlying Cynthiana formation.		
		O R D O V I C I A N	L E X I N G T O N	CYNTHIANA FORMATION	40-150		Thin to thick-bedded fine- to coarse-grained siliceous and argillaceous limestone, locally crossbedded, rubbly, or bouldery, with drab or bluish-gray shale.	Gently rolling to moderately dissected upland, according to its proximity to major streams and the amount of shale. Largest sinkholes and best developed underground drainage are where the lower part of the formation is at the surface. Number and size of sinkholes indicate amount of underground drainage. Except for a few major streams, much of the drainage of the outcrop area of the Cynthiana is underground. Steep, dissected bluffs and walls where it is exposed along streams.	Yields 100 to 500 gpd to drilled wells in valley bottoms and along streams in upland; yields as much as 300 gpm (gallons per minute) in some places where thick limestone beds occur at and below stream level along large streams; yields water to springs in the Woodburn limestone member. Water is hard and may contain salt or hydrogen sulfide. Water from wells near fault zones may contain objectionable amounts of salt. Generally, the upper part of this formation contains much shale and yields less water than the lower part, which is mostly limestone in many places.
					WOOD-BURN LIME-STONE MEMBER		0-15	Fine to coarse-grained crystalline phosphatic limestone. Fresh surfaces are light gray and granular; weathered surfaces are rust gray and have pits developed by leaching.	
				BRANNON LIME-STONE MEMBER	0-40		Gray fine-grained argillaceous or siliceous limestone, locally shaly, having a concretionary or bouldery appearance; much shale in lower part.		
				BENSON LIMESTONE	35-40		Bluish-gray medium- to coarse-grained crystalline limestone in beds several inches to more than a foot thick, with shale partings.		
				JESSAMINE LIMESTONE	80		Hard bluish-gray fine-grained siliceous limestone in thin to medium-thick beds with much interbedded shale.	Gently rolling upland except along major streams, where much of it is dissected. Sinkholes are very common; the large ones occur in the Benson limestone. Underground drainage is well developed. The resistant beds form a subdued benchlike topography along hillsides and streams. The Lexington group is exposed in steep, dissected bluffs and cliffs near the deeply entrenched tributaries.	Yields more than 500 gpd to drilled wells in valley bottoms and along streams in upland; yield as much as 130 gpm in some places where thick limestone beds occur at and below stream level along large streams; yield small to large amounts of water to springs. Water is hard and may contain salt or hydrogen sulfide. Water from wells near fault zones may contain objectionable amounts of salt. The amount of water available in rocks of the Lexington group is dependent on the amount of shale. The Benson limestone contains little shale and, in most places where exposed, yields more than 500 gpd, and as much as 130 gpm where exposed at and below stream level. Wells drilled through the Benson and into the underlying Jessamine limestone yield little water. The contact between the Benson and Jessamine is marked by springs, some of which yield large quantities of water. The Jessamine and Logana formations contain much shale and yield more than 100 gpd only in stream valleys. The Curdsville limestone contains little shale, and yields more than 500 gpd in some places where exposed at and below stream level.
				LOGANA FORMATION	35		Thin-bedded bluish-gray fine-grained argillaceous or siliceous limestone with large amounts of interbedded shale.		
M I D D L E O R D O V I C I A N	H I G H B R I D G E	CURDSVILLE LIMESTONE	20		Gray coarsely crystalline siliceous limestone in medium-thick irregular beds with shale partings and chert zones; bentonite bed at the base.				
		TYRONE LIMESTONE	90		Pure limestone, in places lithographic, with scattered inclusions of coarsely crystalline calcite. Beds are mainly about 8 inches thick and break with a conchoidal fracture, exposing a gray-buff or cream color on the fresh surface; weathers chalky white with dark calcite crystals faces standing in relief; contains several bentonite beds ranging from a few inches to a few feet in thickness.				
		OREGON LIMESTONE	15-35		Gray to cream-colored granular finely crystalline magnesian limestone in uniform layers 8 inches to 1 foot thick; shows gray or black banding parallel to the bedding.				
		CAMP NELSON LIMESTONE	310		Irregular patches of gray-buff finely crystalline magnesian limestone similar to the Oregon in a matrix of dense dove-gray, locally lithographic limestone similar to the Tyrone with scattered small calcite crystals in layers a few inches to a few feet thick; weathers to honeycombed surfaces with less soluble magnesian limestone standing in relief.	Cliffs and steep hillsides along the Kentucky River and large tributaries in Jessamine County. The Camp Nelson forms flat terraces with occasional sinkholes in the bottom of the Kentucky River gorge and steep cliffs along the lower sides. It also extends up the large tributaries, forming flat bottoms and steep walls. The Oregon crops out in a band in the walls of the gorge and up a few large tributaries. The Tyrone crops out in the upper walls of the Kentucky River gorge and extends up the large tributaries nearly to the upland, forming broad, flat valleys with sinkholes and underground drainage.	Yields 100 to 500 gpd to drilled wells along the Kentucky River and large tributaries; yield as much as 225 gpm to wells adjacent to the Kentucky River; yield water to springs on hillsides and steep walls of tributaries. Water is hard and may contain hydrogen sulfide. Bentonite beds in the Tyrone formation prevent circulation of water in underlying rocks and are the horizon of many of the springs. Wells drilled through the Tyrone into underlying rocks produce little water except where the bentonite beds have been breached or removed by erosion. The Oregon limestone is too thin to be a distinct aquifer and may be considered with the underlying Camp Nelson limestone. The Camp Nelson yields water to wells where it is not covered by younger rocks, as in the floor of the Kentucky River gorge. There, wells produce as much as 225 gpm from solutionally enlarged fractures that are connected with the Kentucky River.		

GENERALIZED COLUMNAR SECTION AND WATER-BEARING CHARACTER OF THE ROCKS IN BOURBON, FAYETTE, JESSAMINE, AND SCOTT COUNTIES, KENTUCKY (COUNTY GROUP 25)

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