

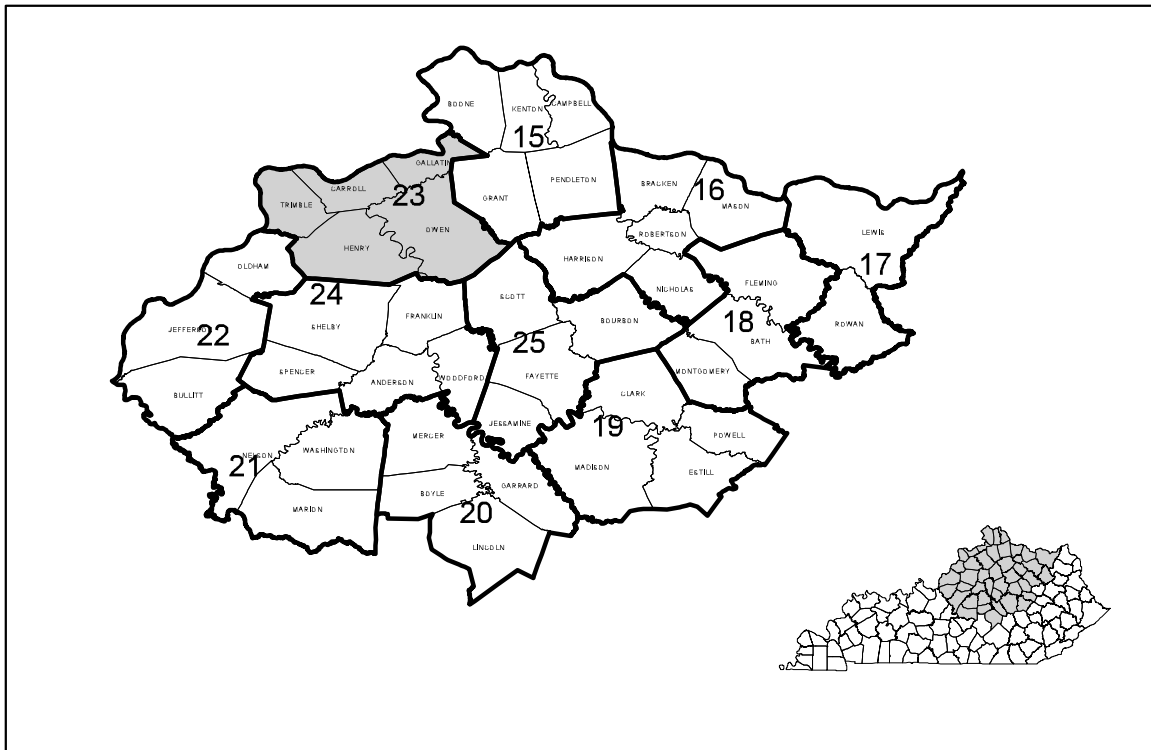
DEPARTMENT OF THE INTERIOR  
UNITED STATES GEOLOGICAL SURVEY

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THE COMMONWEALTH OF KENTUCKY  
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UNIVERSITY OF KENTUCKY

AVAILABILITY OF GROUND WATER IN CARROLL, GALLATIN,  
HENRY, OWEN, AND TRIMBLE COUNTIES, KENTUCKY

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

HYDROLOGIC INVESTIGATIONS  
ATLAS HA-23



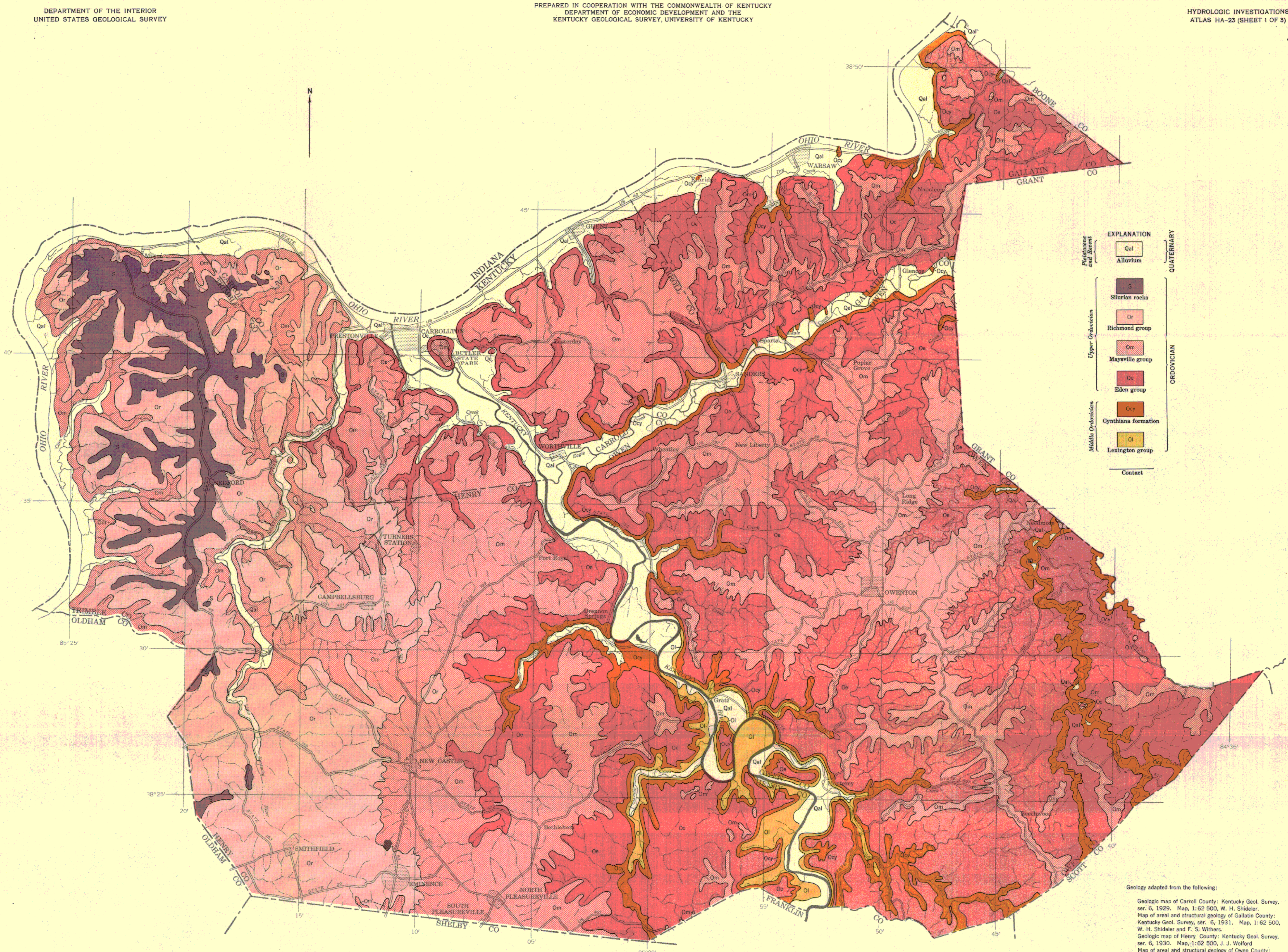
INDEX MAP OF THE BLUE GRASS REGION, KENTUCKY, SHOWING COUNTY  
GROUPS AND AREA OF THIS ATLAS

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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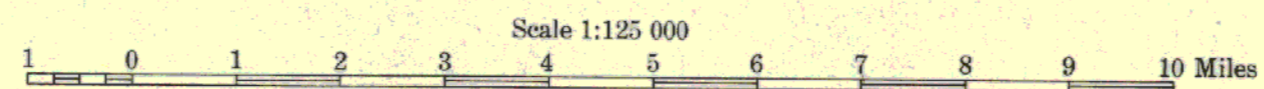


Base from general county highway maps of Kentucky, 1950,  
Kentucky State Highway Department, State-wide  
Planning Survey

Geology adapted from the following:  
Geologic map of Carroll County: Kentucky Geol. Survey,  
ser. 6, 1929. Map, 1:62 500, W. H. Shideler.  
Map of areal and structural geology of Gallatin County:  
Kentucky Geol. Survey, ser. 6, 1931. Map, 1:62 500,  
W. H. Shideler and F. S. Withers.  
Geologic map of Henry County: Kentucky Geol. Survey,  
ser. 6, 1930. Map, 1:62 500, J. J. Wolford.  
Map of areal and structural geology of Owen County:  
Kentucky Geol. Survey, ser. 6, 1931. Map, 1:62 500,  
J. J. Wolford, M. S. Chappars, and F. S. Withers.  
Geologic map of Trimble County: Kentucky Geol. Survey,  
ser. 6, 1929. Map 1:62 500, W. H. Shideler

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GEOLOGIC MAP OF CARROLL, GALLATIN, HENRY, OWEN, AND TRIMBLE COUNTIES, KENTUCKY (COUNTY GROUP 23)



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EXPLANATION

**Area 1**  
Many properly constructed drilled wells in this area will produce several hundred gallons per minute from alluvial material unless bedrock is encountered at shallow depths. Maximum reported yield is 500 gpm. Most drilled wells will produce enough water for a domestic supply with a power pump and pressure system (more than 500 gallons a day) at depths of less than 100 feet. Water is hard or very hard but otherwise of good quality.

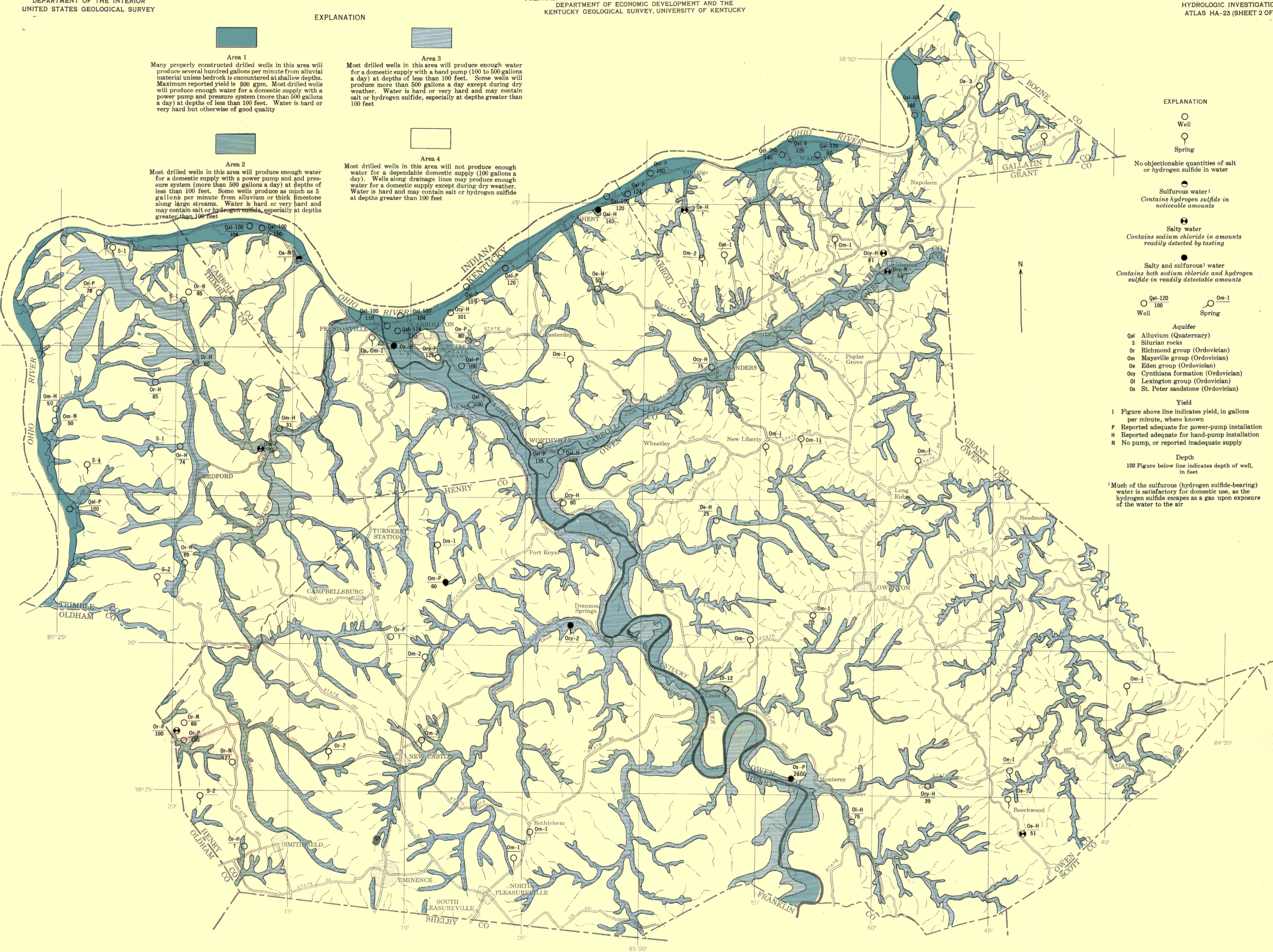
**Area 3**  
Most drilled wells in this area will produce enough water for a domestic supply with a hand pump (100 to 500 gallons a day) at depths of less than 100 feet. Some wells will produce more than 500 gallons a day except during dry weather. Water is hard or very hard and may contain salt or hydrogen sulfide, especially at depths greater than 100 feet.

**Area 2**  
Most drilled wells in this area will produce enough water for a domestic supply with a power pump and pressure system (more than 500 gallons a day) at depths of less than 100 feet. Some wells produce as much as 5 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.

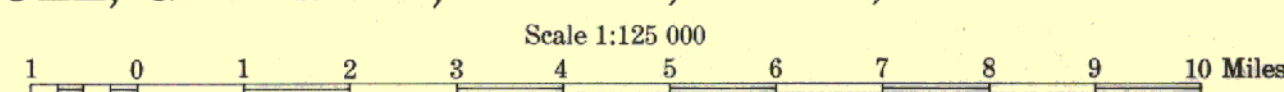
**Area 4**  
Most drilled wells in this area will not produce enough water for a dependable domestic supply (100 gallons a day). Wells along drainage lines may produce enough water for a domestic supply except during dry weather. Water is hard and may contain salt or hydrogen sulfide at depths greater 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
  - Qal-120 Well
  - Om-1 Spring
- Aquifer**
- Qal Alluvium (Quaternary)
  - S Silurian rocks
  - Or Richmond group (Ordovician)
  - Om Maysville group (Ordovician)
  - Oe Eden group (Ordovician)
  - Ocy Cynthiana formation (Ordovician)
  - OI Lexington group (Ordovician)
  - Os St. Peter sandstone (Ordovician)
- Yield**
- 1 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**
- 100 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 CARROLL, GALLATIN, HENRY, OWEN, AND TRIMBLE COUNTIES, KENTUCKY (COUNTY GROUP 23)



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| SYSTEM              | SERIES                    | GROUP | FORMATION                         | THICKNESS,<br>IN FEET | SECTION | LITHOLOGY  | TOPOGRAPHY   | HYDROLOGY   |
|---------------------|---------------------------|-------|-----------------------------------|-----------------------|---------|--|--|---|
| QUATERNARY          | PLEISTOCENE<br>AND RECENT |       | ALLUVIUM                          | 0-140±                |         | Silt and fine grained sand in upper part, and medium- coarse to grained sand with lenses of gravel in lower part in the Ohio River valley. Mostly silt, but some sand in the Kentucky River valley. Thin and fine grained in tributary-stream valleys.                                       | Flood plains and terraces of the Ohio and Kentucky Rivers and tributaries. Some Ohio River terraces are as much as 80 feet above normal pool stage.  | Yields as much as 500 gpm (gallons per minute) to drilled wells in the Ohio River valley; yields more than 500 gpd to wells in the Kentucky River valley. Water is hard, and the iron content may be high near the Ohio River valley walls and along the Kentucky River. Too thin and fine grained in tributary valleys to yield usable amounts of water.   |
| SILURIAN            |                           |       | LOUISVILLE LIMESTONE              | 10±                   |         | Massive fine-grained limestone.  | Tops of ridges in western part of area.  | Yields water to seeps.  |
|                     |                           |       | WALDRON SHALE                     | 10±                   |         | Greenish-gray coarse nonfissile calcareous or magnesian shale.   | Slopes between ledges above and below.   | May hold up some water in overlying Louisville limestone; otherwise too limited in outcrop area to prevent recharge to underlying Laurel dolomite.  |
|                     |                           |       | LAUREL DOLOMITE                   | 35-40                 |         | Bluish-gray fine-grained massive dolomitic limestone.  | Tops of ridges in western part of area.  | Yields 100 to 500 gpd to wells on broad ridges; yields water to small springs at contact with underlying Osgood formation.  |
|                     |                           |       | OSGOOD FORMATION                  | 15-20                 |         | Fissile to lumpy calcareous and magnesian shale with a few thin beds of fine-grained limestone.  | Slopes between ledges above and below.   | Yields almost no water from shale; yields water to seeps from limestone; impedes recharge to underlying rocks. Water is hard.   |
|                     |                           |       | BRASSFIELD LIMESTONE              | 1-4                   |         | Pink to yellow medium-crystalline to coarsely crystalline dolomitic limestone.   | Ledges on hillsides and in ravines.  | Yields water to seeps.  |
| RICHMOND            |                           |       | SALUDA LIMESTONE                  | 35-40                 |         | Thick-bedded fine-grained magnesian limestone having a sandy appearance.   | Tops of ridges and ledges on hillsides and along streams.  | Yields 100 to 500 gpd to drilled wells in valley bottoms, but almost no water to wells on hills; may yield a little water to dug wells on ridgetops; yields water to small springs and seeps. Water is hard and may contain salt or hydrogen sulfide below stream level.  |
|                     |                           |       | LIBERTY FORMATION                 | 40                    |         | Bluish-gray coarse shale with thin interbedded layers of crystalline limestone.  |  |   |
|                     |                           |       | WAYNESVILLE LIMESTONE             | 40-90                 |         | Green to gray massive fine-grained argillaceous limestone with thin beds of green shale.   | Moderately rolling upland where limestone predominates; more dissected where shale predominates.   | Yields 100 to 500 gpd to wells in valleys or on broad ridges, but almost no water to drilled wells on narrow ridges or hilltops; yield water to dug wells and to small springs. Water is hard and of good quality.  |
|                     |                           |       | ARNHEIM FORMATION                 | 60-100                |         | Bluish-gray lumpy claystone and thin-bedded shale with much interbedded knotty and rubbly limestone.   |  |   |
| MAYSVILLE           |                           |       | MC MILLAN FORMATION               | 75-125                |         | Thin- to medium-bedded argillaceous, locally rubbly, limestone with much interbedded, lumpy, and unevenly bedded bluish-gray calcareous shale. The Bellevue limestone member in the lower part is composed of thin, locally crossbedded or rubbly crystalline limestone with shale partings. | Gently to moderately rolling upland away from major streams; more highly dissected where shale predominates; broad, flat valleys, small sinkholes, and some underground drainage where limestone predominates. Lower part forms broad, flat ridges between steep-sided valleys cut into the underlying Eden shale. | Yields 100 to 500 gpd to wells in valley bottoms; yield more than 500 gpd from thick limestone beds in broad valley bottoms; yield almost no water to wells on hillsides or hilltops; may yield some water to dug wells on ridgetops; yield water to small springs. Small perennial springs in limestone in lower part of McMillan formation, especially in Henry County. Water is hard and may contain salt or hydrogen sulfide in valley bottoms. |
|                     |                           |       | FAIRVIEW FORMATION                | 77-100                |         | Alternating gray rubbly limestone and bluish-gray lumpy calcareous shale.  |  |   |
|                     |                           |       | EDEN                              | 180                   |         | Lumpy bluish-gray calcareous shale with thin evenly bedded argillaceous limestone. Little limestone in some places; may constitute half the section in other places. Rocks may be silty near the top.  | Rugged topography of narrow, steep-sided ridges and narrow, V-shaped valleys of dendritic drainage. Steep slopes erode easily and are covered with thin limestone slabs. The contrast with the uplands of the outcrop areas of the Maysville and Richmond groups is marked except near major streams.              | Yields 100 to 500 gpd in broad valley bottoms; yields almost no water to wells on hillsides or hilltops, although dug wells may obtain some water in ridgetops; yields water to small springs and seeps. Water is hard and may contain salt or hydrogen sulfide in valley bottoms.  |
| CYNTHIANA FORMATION |                           |       |                                   | 40-108                |         | Thin- to thick-bedded fine- to coarse-grained siliceous and argillaceous limestone, crossbedded, rubbly, or bouldery; various amounts of drab or bluish-gray shale.  | Broad valley bottoms along the Kentucky River and large tributaries; lower walls of the Kentucky River valley in the southern part of the area.  |   |
|                     |                           |       | DEVILS HOLLOW FACIES <sup>1</sup> | 0-25                  |         | Fine- to coarse-grained argillaceous or siliceous limestone.   |  |   |
|                     |                           |       | WOOD-BURN LIMESTONE MEMBER        | 40                    |         | Light-gray coarse-grained phosphatic limestone.  |  | Yields more than 500 gpd to wells in broad valley bottoms; yields 100 to 500 gpd to wells in small valleys; yields water to springs. Water is hard and may contain salt or hydrogen sulfide below stream level.   |
|                     |                           |       | BENSON LIMESTONE                  | 50-75                 |         | Thin to medium-thick beds of bluish-gray medium-crystalline to coarsely crystalline limestone and some shale.  | Broad, flat valley of the Kentucky River and large tributaries in the southern part of the area.   |   |
|                     |                           |       | JESSAMINE LIMESTONE               | 75-80±                |         | Irregularly bedded fine-grained limestone with much interbedded calcareous shale.  |  |   |

<sup>1</sup>Of McParlan and White, 1948.

GENERALIZED COLUMNAR SECTION AND WATER-BEARING CHARACTER OF THE ROCKS IN CARROLL, GALLATIN, HENRY, OWEN, AND TRIMBLE COUNTIES, KENTUCKY (COUNTY GROUP 23)

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