U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared in Cooperation with the
LOUISVILLE AND JEFFERSON COUNTY METROPOLITAN SEWER DISTRICT

WATER-RESOURCES INVESTIGATIONS REPORT 94-4099
Water levels and pumpage, downtown Louisville - SHEET 1 OF 2

Unthank, M.D., and others, 1995, Ground-water levels in and pumpage from the alluvial aquifer at Louisville, Kentucky, May 1989-May 1991

Figure 1. Locations of wells equipped with continuous recorders in the Louisville area.

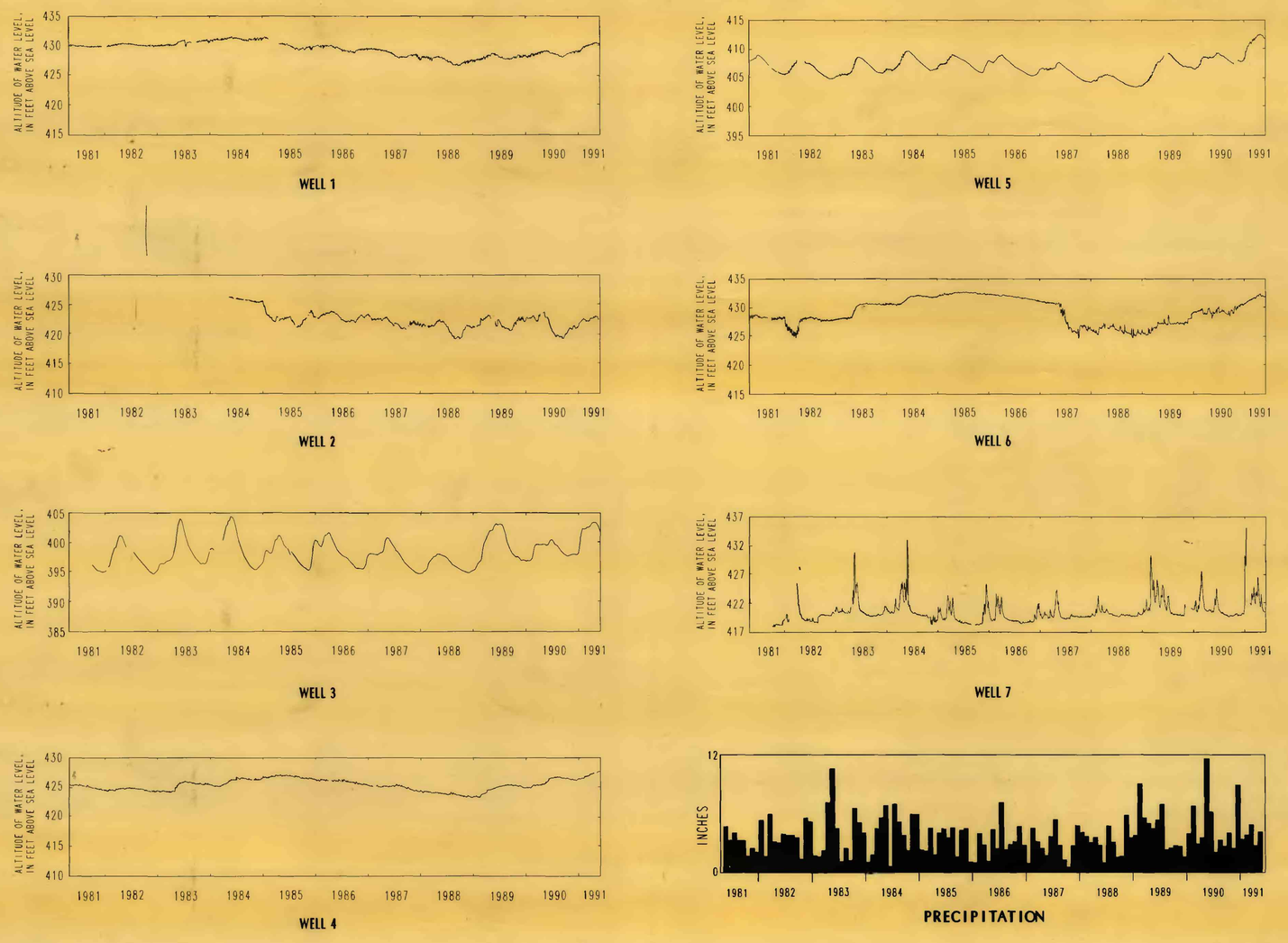


Figure 2. Water levels at selected wells and precipitation in the Louisville area.

Figure 3. Altitude of water table in the Louisville area, May 1989.

Figure 4. Altitude of water table in the Louisville area, May 1991.

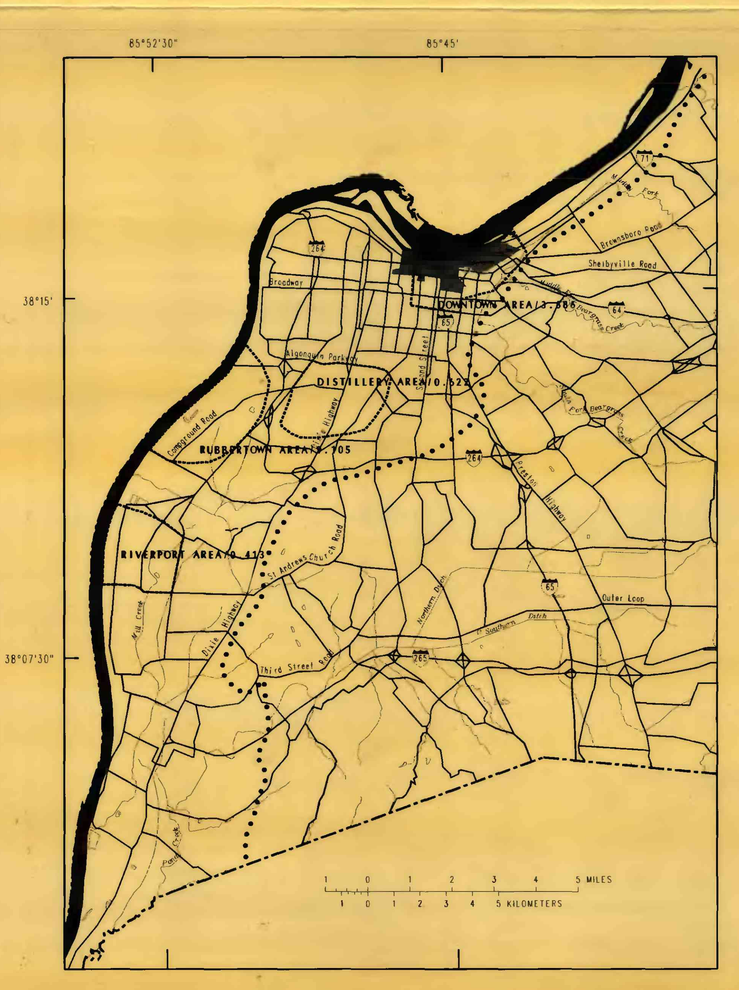
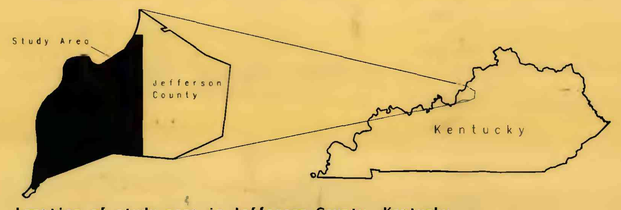


Figure 5. Distribution of ground-water withdrawal in the Louisville area, 1989-1991.

CONVERSION FACTORS

Multiply	By	To obtain
foot	0.3048	meter
million gallons per day	3.785	cubic meters per day



Location of study area in Jefferson County, Kentucky.

Water-level data for the alluvial aquifer at Louisville, Ky., have been collected by the U.S. Geological Survey, in cooperation with local and State agencies since September 1943; the data are currently being collected in cooperation with the Louisville and Jefferson County Metropolitan Sewer District. The current observation-well network (fig. 1) is maintained for long-term trend analysis and water-management decisions in anticipation of increased ground-water use in the alluvial aquifer.

The altitude of the water table in the alluvial aquifer has increased as much as 5 feet in some areas during the 2-year period from May 1989 through May 1991 (figs. 3 and 4). Hydrographs for observation wells throughout the alluvial aquifer (fig. 2) show that water levels fluctuate seasonally and in response to wet and dry years; overall, the water-level trend has been upward in recent years. The exception is well 2, in downtown Louisville. (Trends in water levels in the downtown area are discussed on sheet 2.) Generally, water-level contours are parallel to the Ohio River, and altitudes decrease toward the river. Water-level contours from this pattern deviate in areas where ground-water withdrawals disrupt the natural water-table gradient. Ground-water withdrawals in the industrial areas in west Louisville and in the Riverport area have lowered the water table; thus, water-level contours curve away from the river near the withdrawal areas (figs. 3-5). Ground-water withdrawals in the downtown Louisville and Distillery areas have caused some flattening of the water table, as indicated by the curvature of the 425-foot water-level contour in figures 3 and 4.

Base from U.S. Geological Survey digital data, 1:100,000, 1983
Universal Transverse Mercator projection, Zone 16

GROUND-WATER LEVELS IN AND PUMPAGE FROM THE ALLUVIAL AQUIFER AT LOUISVILLE, KENTUCKY, MAY 1989-MAY 1991

By
Michael D. Unthank, Christi L. Stevens, Hugh L. Nelson, Jr., and Jane M. Poole

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WATER-RESOURCES INVESTIGATIONS REPORT 94-4099
Water levels and pumpage, downtown Louisville - SHEET 2 OF 2

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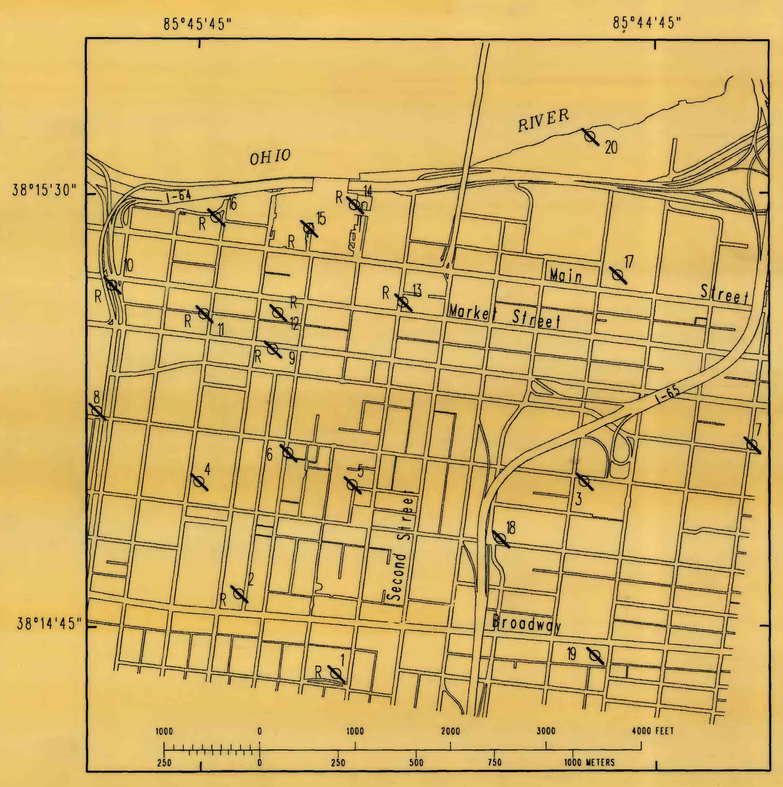


EXPLANATION

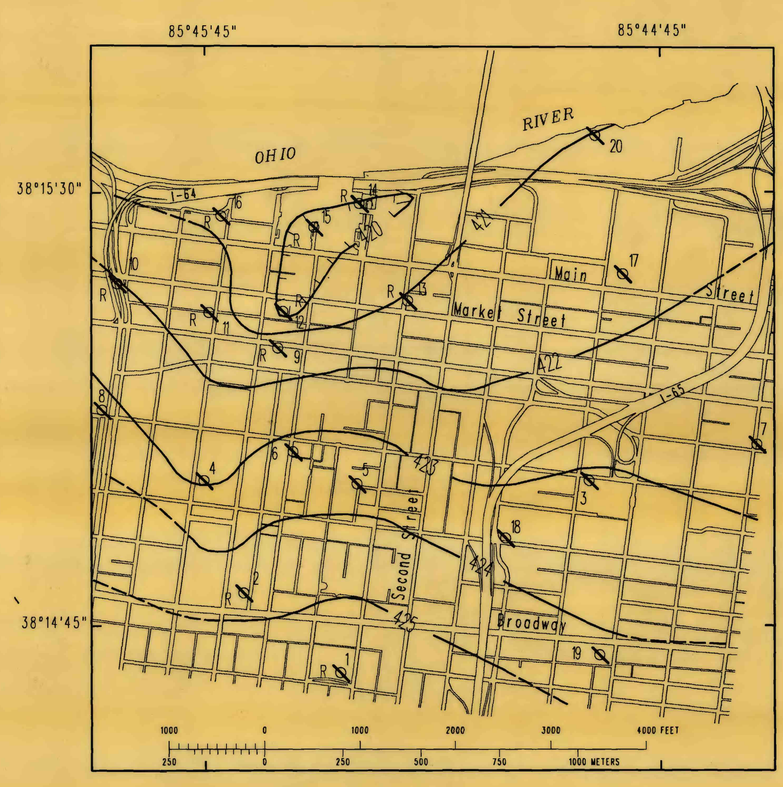
R 2 — OBSERVATION WELL WITH RECORDER AND IDENTIFIER

5 — OBSERVATION WELL AND IDENTIFIER (well measured twice per year)

Figure 6. Observation-well network in the downtown Louisville area.

Table 1. *Observation wells in the downtown Louisville area, 1991*

Well Identifier	Local name or number	Latitude	Longitude	Owner	Land-surface datum (feet above sea level)	Well depth (feet)	Water-level altitude (feet above sea level)	Period of record
1	Public Library	38°14'41"	85°45'27"	City of Louisville	454.23	105.0	426.00	February 1937 to May 1991
2	Courier Journal	38°14'47"	85°45'40"	Gannett, Inc.	455.83	190.0	424.66	October 1953 to May 1991
3	89-2	38°15'00"	85°45'55"	University of Louisville	459.98	46.7	423.14	September 1989 to May 1991
4	South Central Bell	38°15'00"	85°45'47"	South Central Bell Telephone Co.	459.11	87.0	422.96	October 1978 to May 1991
5	Stewart's #5	38°15'03"	85°45'26"	Hillard Lyon	461.54	124.0	423.70	March 1981 to May 1991
6	Kentucky Towers	38°15'03"	85°45'33"	Kentucky Towers	460.00	104.0	423.45	September 1948 to May 1991
7	CP 7A	38°15'04"	85°44'32"	City of Louisville	467.19	84.6	422.53	July 1980 to May 1991
8	Beecher Park	38°15'08"	85°45'57"	City of Louisville	459.47	109.8	423.37	July 1977 to May 1991
9	CP 11A	38°15'14"	85°45'35"	Jefferson County	461.52	108.0	421.58	May 1984 to May 1991
10	Roy Wilkins Blvd.	38°15'17"	85°45'55"	City of Louisville	457.59	86.4	422.04	October 1986 to May 1991
11	Mazzoni	38°15'18"	85°45'44"	City of Louisville	455.13	98.0	421.48	October 1986 to May 1991
12	Courthouse Annex	38°15'18"	85°45'34"	City of Louisville	461.63	102.0	419.89	November 1986 to May 1991
13	Levy's	38°15'18"	85°45'18"	Mett's Co., Inc.	464.72	99.0	421.09	January 1987 to May 1991
14	The Galt House	38°15'24"	85°45'23"	City of Louisville	436.36	77.5	419.63	October 1986 to May 1991
15	Belvedere	38°15'27"	85°45'30"	City of Louisville	452.43	89.9	419.61	October 1986 to May 1991
16	Fort Nelson	38°15'28"	85°45'42"	City of Louisville	450.56	88.0	420.89	October 1986 to May 1991
17	Louisville Scrap Metal	38°15'22"	85°44'52"	Louisville Scrap Metal Co., Inc.	460.00	91.1	421.41	April 1991 to May 1991
18	Jewish Hospital	38°14'54"	85°45'05"	Jewish Hospital	460.50	116.0	423.48	April 1991 to May 1991
19	Metro United Way	38°14'22"	85°44'48"	Metro United Way	460.50	103.9	424.18	April 1991 to May 1991
20	Waterfront Park	38°15'40"	85°44'37"	City of Louisville	441.20	130.0	421.41	April 1991 to May 1991



EXPLANATION

—425— WATER-TABLE CONTOUR--Shows altitude of water table. Dashed where approximately located. Hatchures indicate depression. Countour interval 1 foot. Datum is sea level

R 9 — OBSERVATION WELL WITH RECORDER AND IDENTIFIER

4 — OBSERVATION WELL AND IDENTIFIER

Figure 7. Altitude of water table in the downtown Louisville area, May 1991.

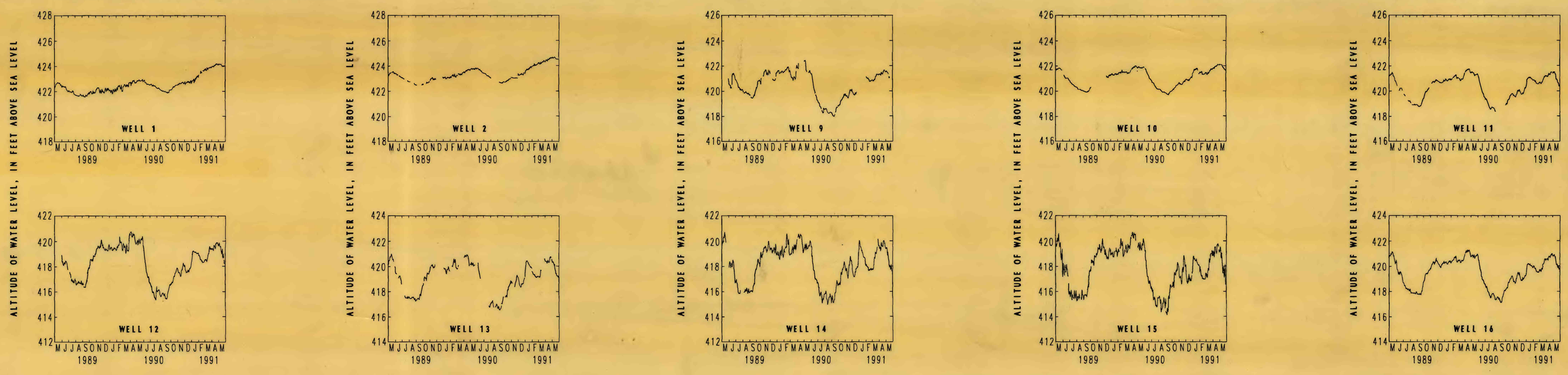
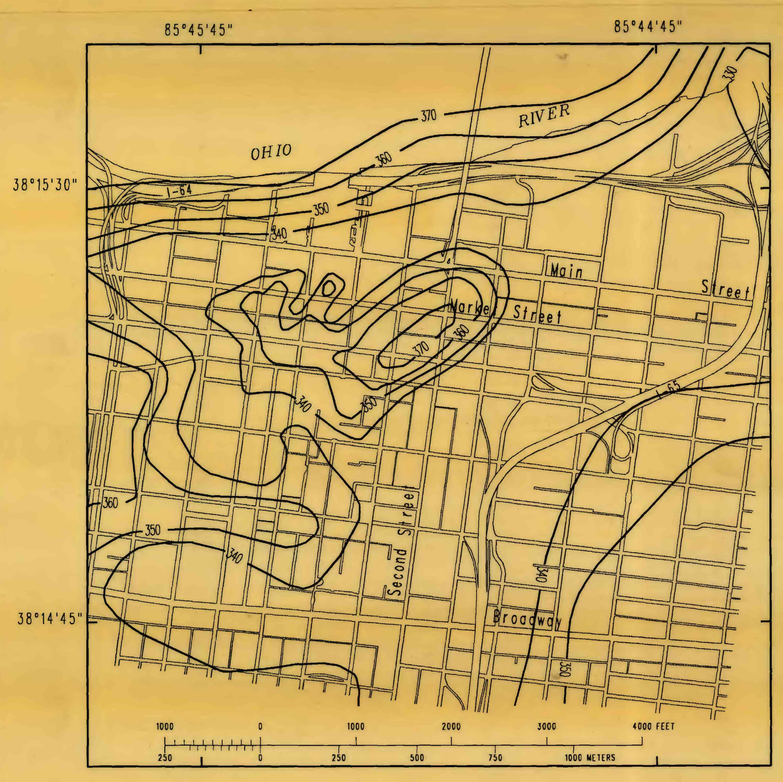


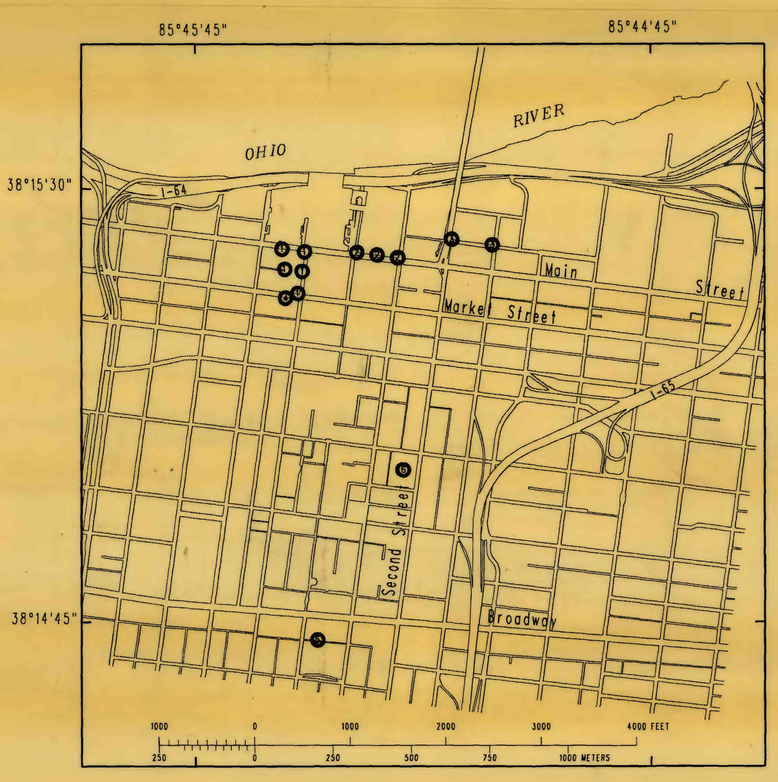
Figure 8. Hydrographs of daily mean water levels in selected wells in the downtown Louisville area, May 1989-May 1991.

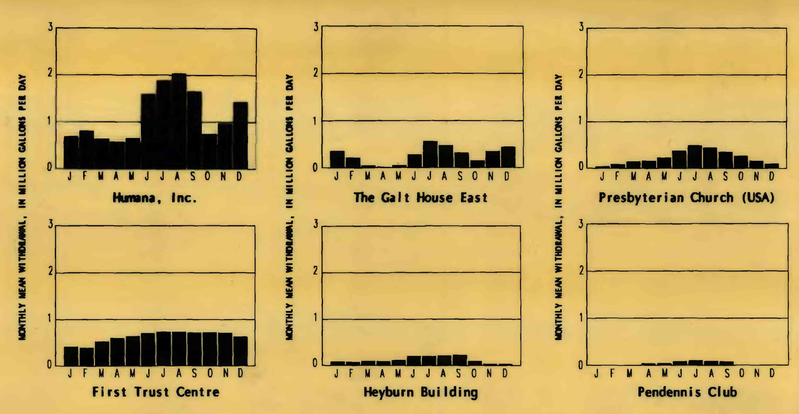


EXPLANATION

—340— BEDROCK CONTOUR--Shows altitude of bedrock surface. Contour interval 10 feet

Figure 9. Altitude of the bedrock surface beneath the downtown Louisville area, May 1991 (Modified from Price, 1962).





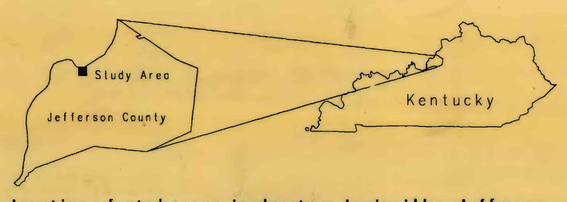
EXPLANATION

- WELL USED BY HUMANA, INC.
- WELL USED BY THE GALT HOUSE EAST
- WELL USED BY THE PRESBYTERIAN CHURCH (USA)
- WELL USED BY THE FIRST TRUST CENTRE
- WELL USED BY THE HEYBURN BUILDING
- WELL USED BY THE PENDENNIS CLUB

Figure 10. Locations of wells and permitted pumpage in the downtown Louisville area, 1990 (pumpage data from permit files of Kentucky Natural Resources and Environmental Protection Cabinet).

CONVERSION FACTORS

Multiply	By	To obtain
foot	0.3048	meter
million gallons per day	3.785	cubic meters per day



Location of study area in downtown Louisville, Jefferson County, Kentucky.

During the late 1970's, rising ground-water levels became a potential threat to buildings in the downtown Louisville area. The principal causes of the rising water levels were decreased withdrawals of ground water and above-normal precipitation. The resumption of pumping of ground water in 1985 for heating and cooling of some buildings in the area and the below-normal precipitation in 1987 and 1988 combined to cause water-level declines of about 4 to 5 feet in the downtown area (see hydrographs for wells 1 and 2, fig. 2, sheet 1).

Most of the pumping in downtown Louisville is concentrated relatively close to the Ohio River, along Main and Market Streets. The absence of an extensive cone of depression in the water-table surface indicates that the water is probably being induced from the river as water levels fall below the normal pool stage of the river. Hydrographs for the wells in this area (see fig. 8) depict a declining trend in water levels because the pumping rates in the downtown area probably exceed the rate at which water can be induced from the river into the aquifer. Hydrographs for wells outside the area of concentrated pumpage show expected seasonal variation in ground-water levels, a general rising trend possibly caused by the absence of large ground-water withdrawals nearby, and the above-normal precipitation during 1989 and 1990.

Base From Louisville Central Area, Inc., 1:2400, 1989
Universal Transverse Mercator projection, Zone 16

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