Geology and Ground-Water Resources of the Henderson Area Kentucky

By EDWARD J. HARVEY

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CONTENTS

ILLUSTRATIONS

[All plates are in pocket]

TABLES

GEOLOGY AND GROUND-WATER RESOURCES OF THE HENDERSON AREA, KENTUCKY

By Edward J. Harvey

ABSTRACT

The Henderson area, the Kentucky portion of the 15-minute Henderson quadrangle, is in the Western Coal Field region of Kentucky, on the Ohio River in Henderson County, Ky. The area covers about 130 square miles of flood plain, terrace, and rolling upland. The city of Henderson, population 16,837, stands on the riverbank about 60 feet above normal river level. The climate is humid and temperate with a mean annual temperature of 57°F and average annual precipitation of 41.24 inches. Henderson County contains rich farmland devoted chiefly to raising stock, corn, soybeans, hay, wheat, and tobacco. Water, oil, and coal are the only mineral resources produced at present.

Pleistocene and Recent deposits almost completely cover the bedrock which is of Pennsylvanian age. The valley of the Ohio River is filled with alluvial material consisting of coarse sand and gravel in the central part, and silt, fine sand, and a little gravel along the margins. The tributary valleys are filled almost entirely with silt and clay. Deposits of windblown silt and fine sand occur in dunes on the terrace and in the uplands. The alluvium of the Ohio River valley constitutes the chief aquifer in the area.

The Lisman formation of Pennsylvanian age underlies the surface or is covered by alluvium everywhere in the area except in the lower reaches of the valley of Canoe Creek. The formation, which is exposed only in the bluffs along the river and in a few recent road cuts, consists of shale, sandstone, several beds of limestone, and coal with its associated underclay. The Anvil Rock sandstone member of this formation is one of the widely used aquifers in the area. The Carbondale formation underlying the Lisman formation contains in its upper part a water-bearing sandstone which is not as widely used as a source of water because of its greater depth, generally smaller yield, and mineralized water. In parts of the area it is not possible to obtain water from either of these aquifers; the areas where water is available are shown on maps in the report.

On the basis of yield, the alluvium is the principal aquifer in the area; as much as 4,000 gallons per minute (gpm) is obtained by collector-type wells situated on the riverbank. The largest yield reported from a vertical screened well is 325 gpm, but this is by no means the maximum yield to be expected from this type of well. The aquifer is recharged by seepage through the bed and banks of the river, by underflow from the east along the valley and from the uplands to the south, and by precipitation. Ground water is discharged to the west by surface and subsurface flow, by plants through evaporation and transpiration, and by wells.

Most water obtained from the alluvium is very hard. The hardness ranges from 26 to 564 parts per million (ppm) with a median value of 357. The iron content is usually less than 1 ppm, but in isolated cases exceeds 10 ppm. In other respects, the water is satisfactory for most uses.

Wells in the sandstone aquifers of Pennsylvanian age yield 1 to 20 gpm through a large part of the rural area. Away from the sand and gravel of the Ohio River, these aquifers are the only possible source of ground water in 60 percent of the Henderson area, which in-

cludes a large part of the tilled farmland. The aquifers are recharged by precipitation on the outcrop areas in the uplands both within the area and to the east. Water is discharged from these aquifers by underflow to the alluvium, by plants, and by wells.

Water from these aquifers to depths of 300 feet is usually of satisfactory chemical quality for most uses, but extremely variable in many respects. The hardness ranges from 8 to 440 ppm; nitrate from 0 to 72 ppm. Water from the Anvil Rock sandstone member in many places contains enough nitrate to be dangerous to infants using the water. Water from the sandstone of the Carbondale formation may contain enough fluoride to cause mottling of teeth of small children.

It is estimated that about 7,800 million gallons or 24,000 acre-feet of water is used annually in the Henderson area. Of this total, 82 percent is derived from ground-water reservoirs, 17 percent is taken directly from the Ohio River, and 1 percent is from ponds. Much more ground water can be obtained in the flood plain where thick beds of sand and gravel occur. Geologic sections and a bedrock contour map show the extent of these deposits. On the terrace northeast of Henderson there is little chance for large-scale development. As bedrock can be seen along the water's edge at Henderson when the river is in pool stage (338 feet above mean sea level), it is doubtful that more than a few gallons per minute can be obtained from wells in the city. In the large plain of Canoe Creek, where it enters the Ohio River from the south, oil and coal tests penetrated a small amount of sand and gravel. Although no vertical screened wells have been constructed in that area, it is possible that supplies of 50 gpm may be developed in some parts of it.

INTRODUCTION

PURPOSE AND SCOPE OF REPORT

This report on the source, occurrence, and quality of ground-water supplies in the Henderson area is one of a series of studies on the ground–water resources of Kentucky, being made by the United States Geological Survey in cooperation with the Kentucky Agricultural and Industrial Development Board. Figure 1 is an index map of Kentucky showing the location of the Henderson area and of other areas in the State where ground-water investigations have been commenced or completed.

The area covered by this report is the Kentucky portion of the Henderson 15-minute quadrangle of the U. S. Geological Survey, which includes the northern part of Henderson County, Ky., and the southern parts of Vanderburgh and Posey Counties, Ind. The Kentucky portion of the quadrangle extends to the north bank of the Ohio River and covers about 130 square miles. As the index map shows, the area lies on the northern margin of the section of Kentucky commonly known as the Western Coal Field. The principal city in the area is Henderson. Anthoston is an unincorporated village in the southeastern section, and Geneva is an unincorporated village about 5 miles west of Henderson.

An ever-increasing need is developing for basic information concerning the quality and quantity of available ground-water

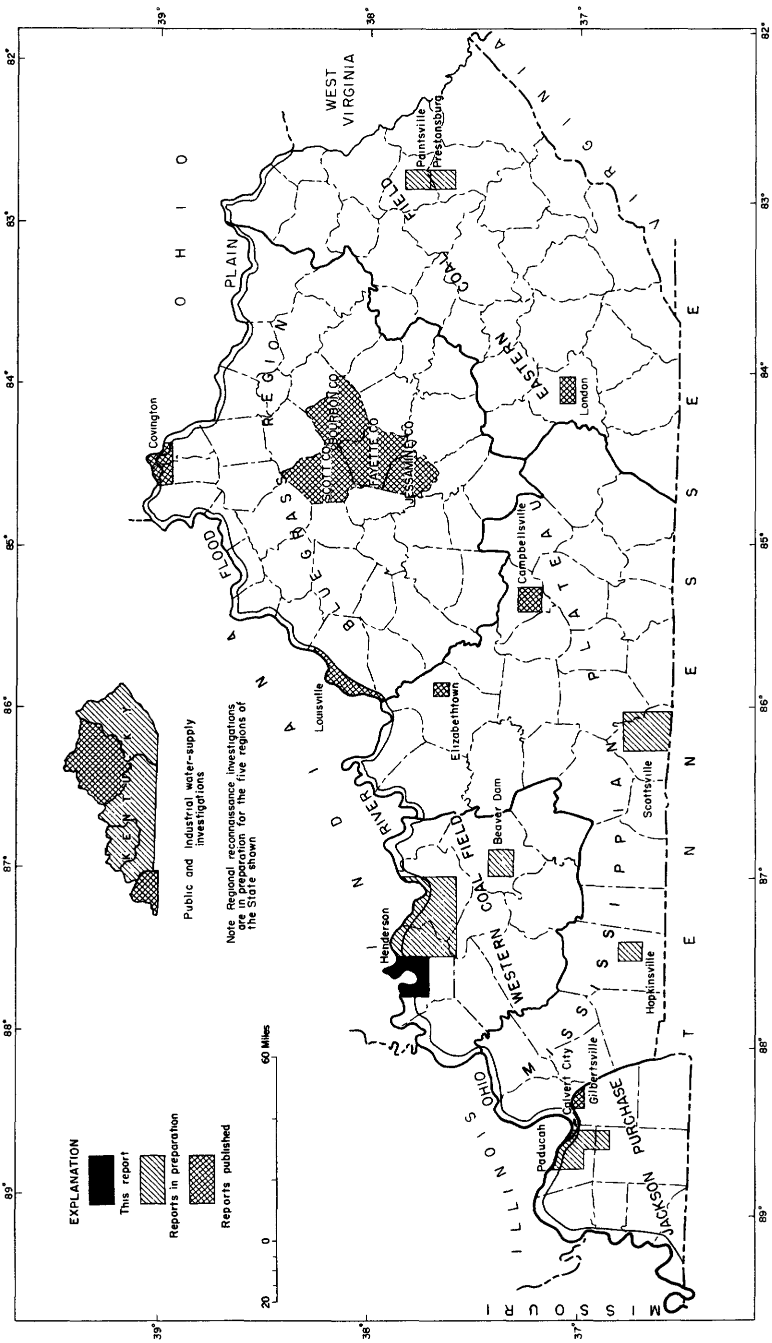

Figure 1.—Index map of Kentucky showing progress of ground-water investigations.

supplies. This report is designed to show the extent and thickness of the water-bearing formations, where they are most productive and least productive, and the chemical quality of the water they yield. The Henderson area is representative of much of the Ohio Valley in this region, and of the Western Coal Field, so that the information presented here can be used as a guide elsewhere in the Western Coal Field region.

PREVIOUS INVESTIGATIONS

There have been no previous investigations of ground water in this area, but the basic geology is described in several reports. In 1922 C. V. Theis[1] described the geology of Henderson County and later (1927) prepared a contour map on the No. 9 coal in Henderson County. The Kentucky Geological Survey has published a report by F. H. Walker and others (1951) on the geology and mineral resources of the Henderson quadrangle.

Geologic publications on areas surrounding Henderson County, useful in the preparation of this report, are referred to in the list of references.

METHODS OF INVESTIGATION

A complete inventory of all wells in the Henderson area was started in the fall of 1949. Information was obtained on about 1,200 water wells, springs, and coal-test and oil-test holes. Well depths; depths to water; pumping levels when obtainable; nature, depth, and thickness of the aquifer; and the quality of the water were among the kinds of information gathered. The data obtained in this inventory are given in tables 11 and 12. Plates 1, 2, 3, and 4 show the locations of all the wells and other borings, and springs that were scheduled.

Logs of water wells were obtained from many drillers and well owners, and a number of samples of drillings were obtained from wells being drilled during the investigation. The samples were examined in the field or office with a hand lens or binocular microscope. Logs of coal-mine shafts and borings for coal, gas, and oil were obtained also. Logs selected for the report are given on pages 203–224 and many others are available in the files of the U. S. Geological Survey. Because of the thick cover of soil and windblown silt or loess, there are few exposures of rock in

[1]Theis, C. V., 1922, The geology of Henderson County, Ky.: Unpublished doctoral thesis in files of library of Univ. of Cincinnati, Ohio, 223 p.

the area. Plate 5 is a map based on subsurface information showing the elevation of bedrock in the buried channel of the Ohio River. The map shows also the availability of water in the alluvium of the main valley and the tributaries. Plates 8 and 10 are contour maps of the upper surfaces of the two widely used sandstone aquifers, the upper sandstone member of the Carbondale formation and the Anvil Rock sandstone member of the Lisman formation. Plates 6 and 7 show geologic sections across the area.

Water-level measurements were made in many wells by tape or recording gages to determine the nature and magnitude of the fluctuations of water level. These water-level measurements are presented in table 14. Continuous water-level records, such as those obtained with a recording gage, show the fluctuations caused by changes of atmospheric pressure or by pumping; they also show whether the water levels respond quickly or slowly to rainfall or river rise. Plates 12 and 13 show hydrographs of selected wells compared with rainfall and stage of the Ohio River. Plates 9 and 11 show by contours the elevations of water levels over parts of the area in the upper sandstone member of the Carbondale formation and the Anvil Rock sandstone member.

Samples of water were collected from 66 wells and 3 springs. Five wells were resampled at different seasons. The analyses are presented in table 4. Medians of analyses are presented in table 5. Selected analyses are shown graphically on the cross sections on plate 7 and in figure 10. The samples were collected by members of the party in the field and sent to the Quality of Water Laboratory of the U. S. Geological Survey in Columbus, Ohio, where the analyses were made under the direction of W. L. Lamar, district chemist. The Kentucky State Department of Health, through the Henderson Health Center, analyzed samples from many wells in Henderson County for bacterial contamination and nitrate content. This information was collected periodically at the Health Center to supplement Survey analyses for nitrate content of ground water and to aid in geologic correlation.

Ground-water investigations are under the general supervision of A. N. Sayre, chief of the Ground Water Branch, of the U. S. Geological Survey. M. I. Rorabaugh, district engineer in Kentucky, and E. H. Walker, geologist, were the immediate supervisors. During the course of this work the author was assisted by B. W. Maxwell and R. W. Devaul.

WELL-NUMBERING SYSTEM

All wells, coal and oil tests, bridge borings, and other test holes on which data are available were assigned numbers at the time the information was collected. The 15-minute quadrangle was divided into nine 5-minute rectangles and the longitude and latitude of the east and south boundaries of each rectangle were used to designate well locations as shown in figure 2.

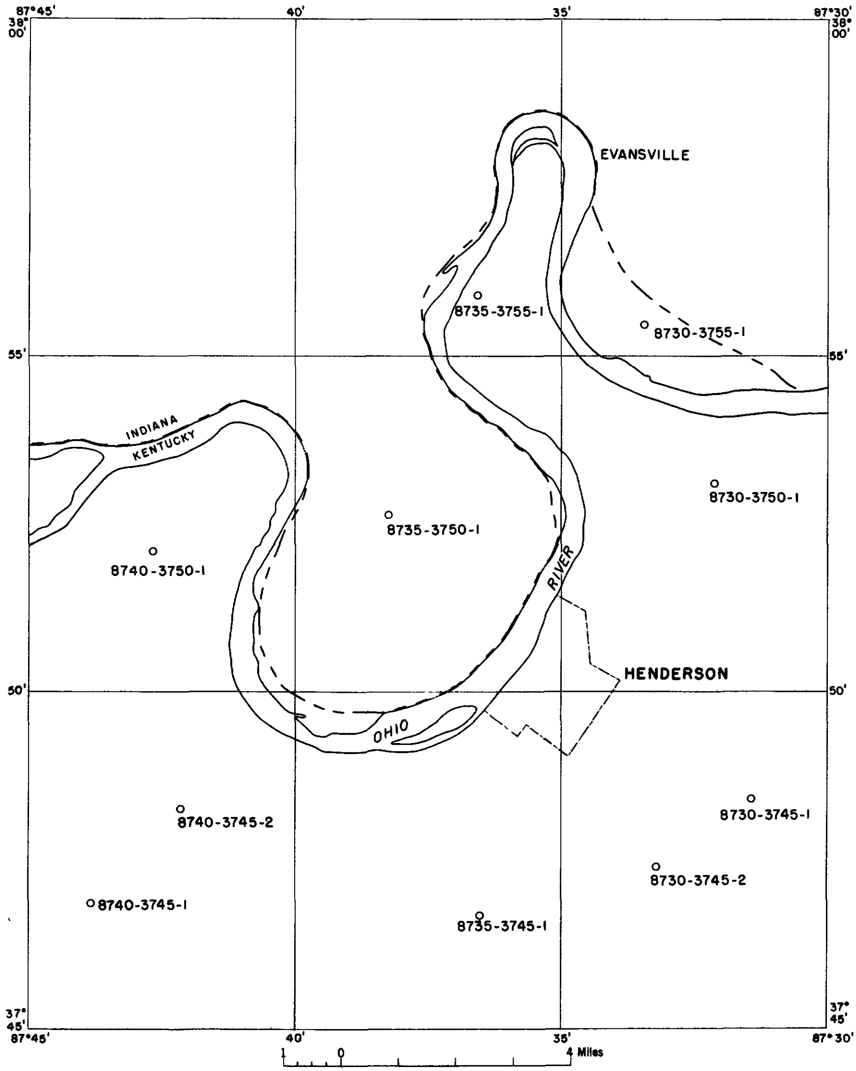

Figure 2.—Map of Henderson area, Kentucky, showing well-numbering system.

Wells in the southeast 5-minute rectangle are designated by the longitude of the eastern boundary, 87°30', and the latitude of the southern boundary, 37°45'. The first well inventoried is given the complete designation of 8730–3745–1. The second well inventoried is designated 8730–3745–2. Similarly the first well inventoried in the south-central rectangle is designated 8735–3745–1. In tables 11 and 12, the well and spring inventories, directions and distances from Henderson or a small town are given to facilitate location of wells on the various maps.

ACKNOWLEDGMENTS

Homeowners and farmers of the area were very cooperative in giving information used in this report. Roscoe Jenkins, Fielding Jones, Ashford Robards, Stanton Sircy, R. A. Toombs, and J. D. Tucker, drillers in the area, cooperated in saving samples of well cuttings, in making water-level measurements in wells under construction, and in supplying information on wells drilled in previous years. The Heldt-Monroe Hardware Co., the Diehl Pump and Supply Co., of Evansville, Ind., and the Ranney Construction Co., of Louisville, Ky., supplied information on the larger ground-water supplies in the area.

The writer is indebted to the oil producers and drilling contractors who furnished information on the depth to bedrock and the nature of alluvial materials in the Ohio River valley. J. B. Vaughn, of the Ashland Oil and Refining Co., made electric logs and driller's logs available whenever needed. Correlation problems were discussed with Iley Browning, Sr., Joseph Cathey of the Kentucky Geological Survey, and Robert Puryear, formerly with that organization, supplied much information on locations of new wells.

GEOGRAPHY

CLIMATE

The climate of the area is humid and temperate. The prevailing winds are from the south. Although cold winds sometimes blow from the north and northwest following cold-front passages, the cold periods are usually short, and generally the weather is similar to that of neighboring States to the south.

According to the records of the U. S. Weather Bureau station at Evansville, Ind., 14 miles north of Henderson, the growing season between killing frosts averages 210 days, though it has extended as long as 250 days and has been as short as 169 days. Figure 3 illustrates the maximum, minimum, and average temperatures and rainfall for the 39-year period of record of the

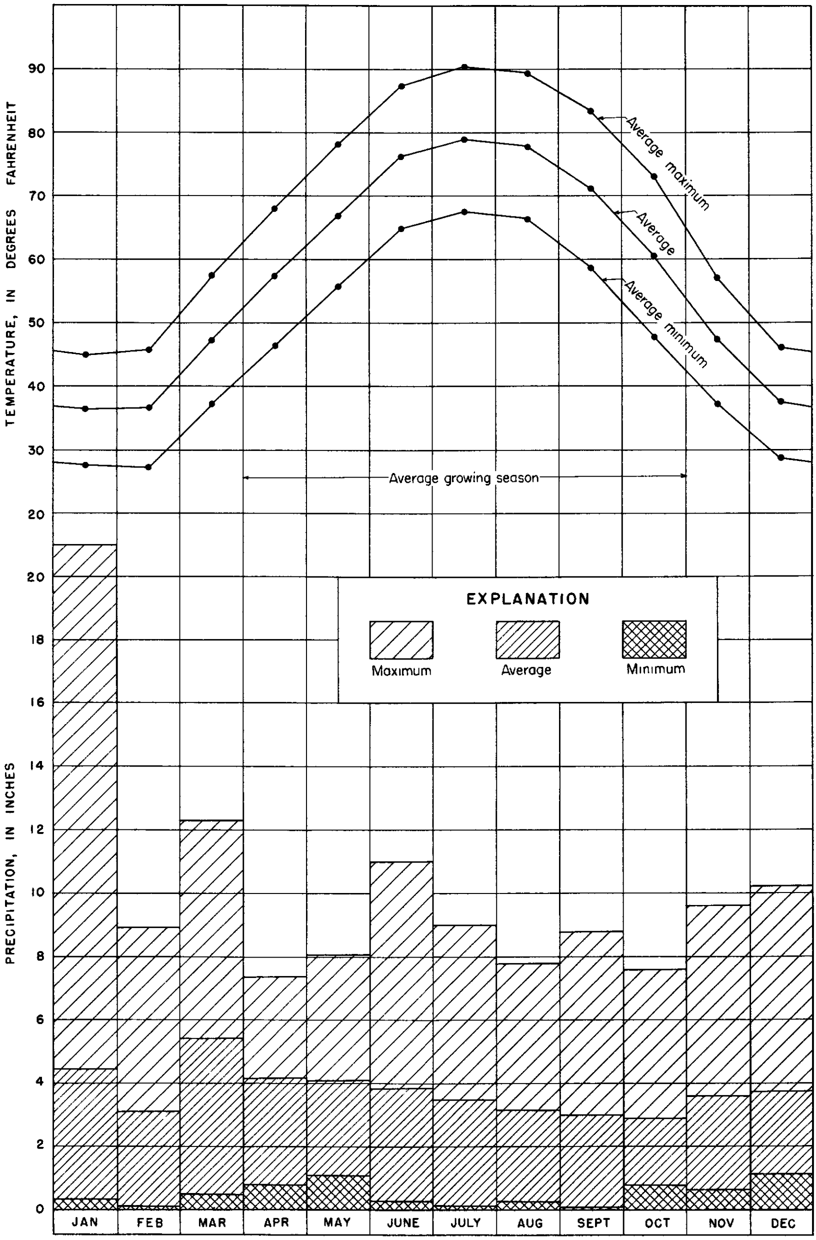

Figure 3.—Graphs showing monthly temperature and precipitation at Henderson, Ky. (From records of U. S. Weather Bureau.)

weather station located 4 miles south of Henderson. The average temperature in the coldest month, January, is 36.4° F; and in the warmest month, July, the average temperature is 78.8° F. The mean annual temperature is 57° F.

Precipitation is usually well distributed throughout the year, although maximum rainfall occurs in the early spring and the minimum in late summer and early autumn. Most of the precipitation occurs as rainfall; snowfall is meager and infrequent and

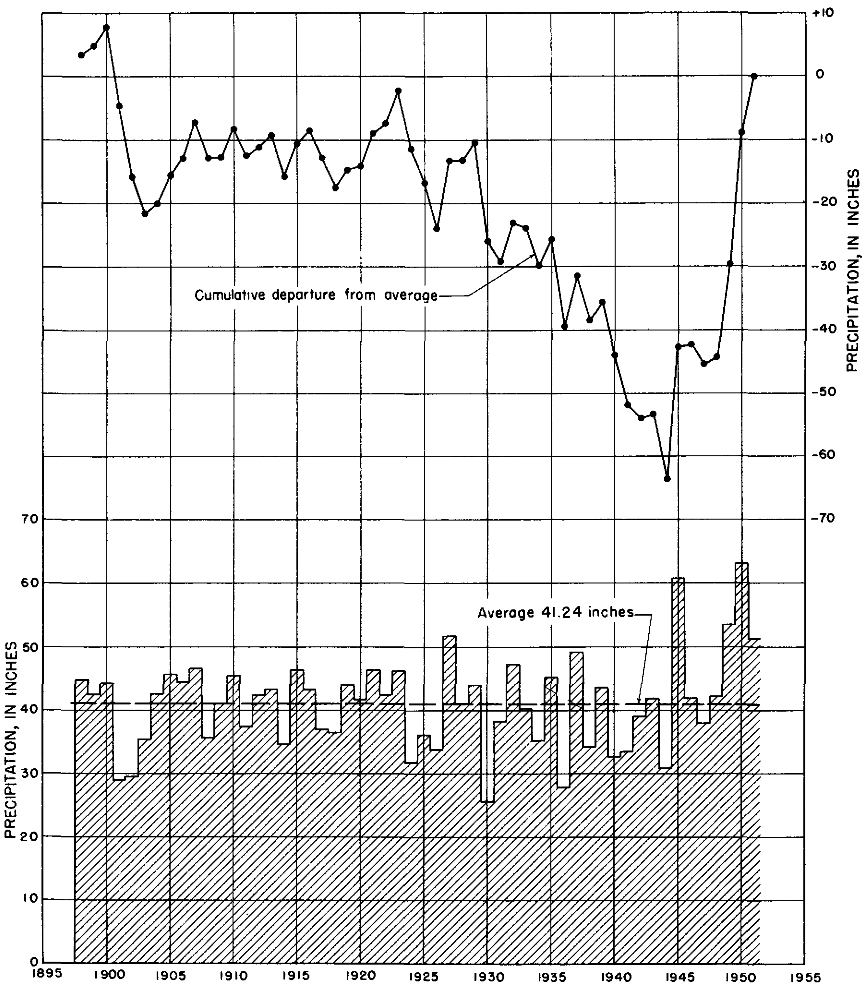

Figure 4.—Graphs showing annual precipitation at Evansville, Ind., and cumulative departure from average precipitation, 1898-1951. (From records of U. S. Weather Bureau.)

usually does not stay on the ground more than a day or two at a time. According to the Evansville records only twice since 1897 has more than 5 inches of rainfall occurred in a 24-hour period, the maximum being 6.94 inches on October 5 and 6, 1910.

Figure 4 shows the annual precipitation for the 54-year period of record at the Weather Bureau station at Evansville. The average annual precipitation is 41.24 inches, and the annual departures from the average are shown at the top of the figure, plotted as a cumulative-departure curve for the period of record. Each rise in the curve indicates a year of above-average rainfall and each downtrend indicates a year of deficient rainfall. In the period between 1929 and 1945 rainfall was generally deficient, but from 1945 to 1951 annual rainfall was far above average.

NATURAL RESOURCES

Petroleum is the principal mineral resource exploited at present. No gas is produced in this area. Figure 5 shows the location of existing pools, which range in size from 10 acres with 1 well (Elam Flats pool) to 240 acres with 26 wells (Geneva pool). Table 1 gives a brief résumé of production and discovery dates. The oil production comes from formations of the Meramec and Chester groups at depths of 1,578 to 2,607 feet. More detailed information is available in the report of the Kentucky Geological Survey by F. H. Walker and others (1951). Further exploratory drilling will probably open new pools in the area in known producing horizons. Deep horizons known to produce oil elsewhere have not yet been tested in this area.

One coal mine, producing from the Kentucky No. 9 coal seam is currently operating on a small scale. Ten other mines within the limits of the quadrangle formerly produced coal.

A variety of raw materials for building and construction have been obtained in the area in past years. Many years ago the Madisonville limestone member of the Lisman formation was quarried at Rock Springs, 3 miles northwest of Geneva, where it is 8 to 10 feet thick. Several small pits were opened in sandstone and limestone in the vicinity of Audubon Park, north of Henderson, for road material and building stone used in the construction of the park. Formerly, gravel was dredged from the Ohio River in the vicinity of Henderson and Evansville. As the available supply of gravel was exhausted, dredging operations were gradually moved upstream, until now they are carried on near Tell City and Rockport, Ind., 50 to 60 miles upstream. Deposits of loess were used until 1946 for brick manufacture, and, although a large

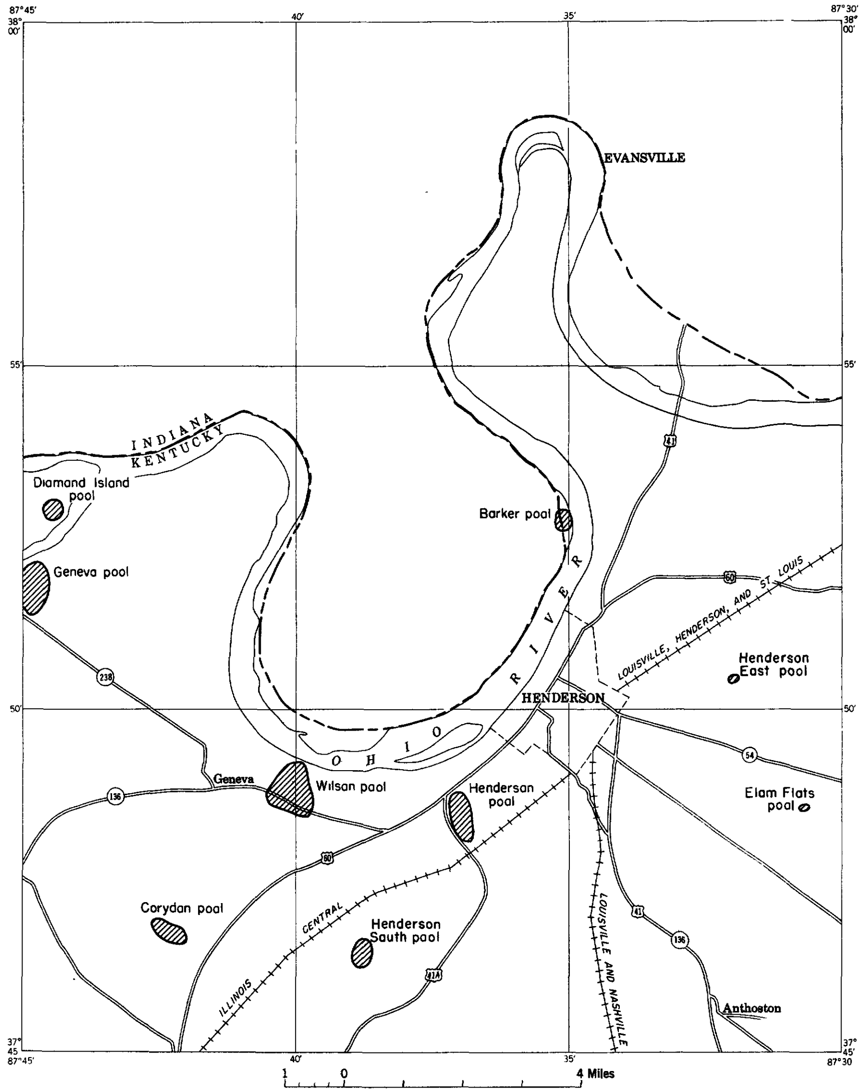

Figure 5.—Map of Henderson area, Kentucky, showing location of oil pools.

quantity of bricks was made from this material, the loess is considered inferior to clays because of its higher content of calcium carbonate.

Much of the region years ago was covered with timber, but today, except for scattered groves of second-growth timber in the hills and on the flood plain, most of the land has been cleared.

Table 1.—*Oil production in the Henderson area, Kentucky*

[Data from Oil and gas field development in United States and Canada, 1951 [1952], by W. H. Winckler, ed., and others]

Pool[1]	Discovery year	1951 production (barrels)	Cumulative production to October 1952 (barrels)	Producing formation
Barker	1952	-------	2,281	Cypress sandstone.
Corydon	1939	6,238	266,351	Ste. Genevieve limestone (McClosky sand of Indiana and Illinois).
Diamond Island	1949	11,654	40,669	Rosiclare sandstone, member of Ste. Genevieve limestone.
Elam Flats	1951	1,198	3,464	Aux Vases sandstone.
Geneva	1943	42,080	560,834	Waltersburg sandstone. Tar Springs sandstone. Cypress sandstone (Jackson sand of local usage). Ste. Genevieve limestone (McClosky sand of Indiana and Illinois).
Henderson	1945	7,456	263,566	Waltersburg sandstone. Lower O'hara limestone member of Ste. Genevieve limestone.
Henderson East	1952	-------	1,699	Waltersburg sandstone.
Henderson South	1951	29,245	74,953	Waltersburg sandstone. Ste. Genevieve limestone (McClosky sand of Indiana and Illinois).
Wilson	1946	13,026	196,704	Do.

[1]For location of oil pools, see figure 5.

About 70 percent of the Henderson area is cropland or pasture; the remainder is woodland.

Three main types of soil exist in the area. The flood plain and terrace of the Ohio Valley have a sandy alluvial soil with some admixture of loess near the hills. In the tributary creek bottoms there are silty and clayey loams and black mucks. Except for scattered patches of marl reported on the lower flanks of the hills, they are entirely covered with brown loess soil.

POPULATION AND DEVELOPMENT

The total population of Henderson County according to the 1950 census was 30,715, of which 16,837 lived in the city of Henderson. It is estimated that about 3,000 people live in the rural areas of the Henderson quadrangle. Corydon, about 8 miles southwest of Henderson and outside the area of this report, is the only other incorporated town in the county. There are 13 unincorporated villages in the county, of which only Anthoston and Geneva are within the Henderson quadrangle.

Henderson County has more than 1,600 farms, averaging 153 acres according to the 1950 census. Of a total area of 281,600 acres, 253,000 acres is in farms, of which 120,000 acres is planted in crops and 79,000 acres is pasture. The remaining 54,000 acres is woodland or unused land. The principal crops are corn, 66,500 acres; soybeans, 18,900 acres; hay (all kinds), 16,850 acres; wheat, 4,500 acres; tobacco, 2,585 acres; and miscellaneous crops and uses, 10,665 acres. At present no farmland is irrigated. Stockraising has increased greatly in the past few years. With the building of the soybean mill at Henderson in 1942, an upsurge in acreage planted in soybeans took place, so that they now rank second among the crops planted in this area.

The city of Henderson was founded in 1797 by the Transylvania Co., and enjoyed a continuing growth to 1900 when it was an important river port and tobacco market. At that time the population was 18,000 people, and 21 firms were in the tobacco business whereas today there are only 3 firms in the tobacco business. The decline in the tobacco business accounts to some extent for the overall decline in population since 1900.

In the city of Henderson 48 manufacturing firms employ about 2,600 people. Seventeen of these firms are in the furniture and allied industries and employ about 1,000 people. Three firms manufacturing clothing employ over 400 people, and the chemical industry employs almost 300 people. Manufacturing as well as agriculture has become more diversified in recent years.

The Louisville & Nashville Railroad crosses the Henderson area connecting Henderson with Evansville, Ind., to the north, Owensboro and Louisville, Ky., to the east and northeast, respectively, and Nashville, Tenn., to the south. A branch line of the Illinois Central System connects Henderson with Paducah, Ky., and other cities to the southwest.

U. S. Highway 41 which crosses the Ohio River north of Henderson is the main north-south route, and U. S. Highway 60 crosses the quadrangle from east to southwest. Four paved State highways cross the quadrangle in various directions. Kentucky Highway 268, leading from Henderson west to the Ohio River ferry at Mount Vernon, Ind., is usually closed once or twice during the flood season. In exceptional flood seasons, U. S. Highway 60 is closed to the east and at several points southwest of the quadrangle. The area is covered by a network of improved county roads, generally surfaced with gravel; and, except for those roads located in the flood plain, they are generally passable throughout the year.

Barge transportation is available on the Ohio River and the Green River, which joins the Ohio River $6\frac{1}{2}$ miles northeast of Henderson. Barges are locked through Dam 48 (see pl. 3), $1\frac{1}{2}$ miles northeast of Geneva.

TOPOGRAPHY AND DRAINAGE

The Western Coal Field in which the Henderson quadrangle is situated, lies in the eastern part of the Eastern Interior Coal Basin (McFarlan, 1943, p. 201), a subdivision of the Interior Low Plateaus. On the boundaries of the coal field to the east and south of the quadrangle, where streams cross the outcrop of the Caseyville sandstone, the topography is rough, and the relief is close to 300 feet. Proceeding in a northward direction to the Henderson area, the surface becomes more subdued owing to a general lowering of hilltop levels, broadening valleys, and the thickening blanket of loess which gives a gently rounded appearance to the slopes. A belt of increased topographic relief that follows the Rough Creek fault zone contrasts with flatter areas to the north and south. This hilly area, 5 to 10 miles wide, extends across the coal field in an easterly direction through Sebree in Webster County, about 15 miles south of Henderson.

Plate 5 shows the three natural divisions of the Henderson area: the Ohio River flood plain and terraces, the tributary valleys, and the uplands. The highest elevations of 580 to 600 feet are found in the bluffs along the river; the lowest elevation, 340 feet, is at the point where the Ohio River leaves the quadrangle on the west. Despite the 240 feet of relief the area as a whole is gently rolling.

The valley of the Ohio is about 6 miles wide, and the river, barely one-half mile wide, follows large meander swings across the area from east to west. Dam 48 is about $1\frac{1}{2}$ miles northeast of Geneva. In periods of low water, the pool level below the dam is maintained at about 328 feet, and above the dam, 338 feet above sea level (Ohio River datum).

Most of the valley is a flood plain and a low terrace or "second bottom" at an elevation of 370 feet or below, crossed by shallow sloughs. Much of this area is flooded during winter and spring rises of the river. On the margin of the present flood plain, the remnants of an older and higher flood plain, or "third bottom," form a terrace at an elevation of 390 feet, above the reach of floods. The city of Henderson, as well as the surburban area to the north and the village of Geneva to the west, is located on the terrace. The hills and low ridges that interrupt the level terrace are old sand dunes and bars, now covered with vegetation.

The floors of the tributary valleys, such as the Canoe Creek plain, are flat and wide for some distance back from their mouths owning to filling with stream and lake deposits to the height of the terrace mentioned above. The small isolated hills that rise 20 to 60 feet above the valley floors are outliers of the hilly upland partly buried in alluvial deposits. Canoe Creek (pl. 3) and other streams that run in these filled valleys have low gradients and meander widely. Drainage ditches have been dug, and the land tilled to improve the rich, low-lying farmland of the valleys and terrace.

Rolling upland, ranging in elevation from 400 to 500 feet, covers much of the southern part of the quadrangle. Bedrock occurs beneath a blanket of loess which attains a thickness of 40 feet in places and forms the characteristic subdued slopes.

GEOLOGY

This area was under the sea during a large part of the Paleozoic era when more than 6,000 feet of sedimentary rocks accumulated in the basin. In the Pennsylvanian period, toward the close of the era, almost 3,000 feet of sandy sediments were deposited under both continental and marine conditions. Uplift occurred later, resulting in mild folding and faulting of the Paleozoic strata. Locally there is no record of deposition from the close of the Paleozoic era until late Tertiary or early Quaternary time, and it is believed that this was a long period of erosion. Gravels now preserved on hilltops were laid down by streams either before or early in the Pleistocene epoch. In the Pleistocene epoch, the Ohio River was cutting deeper into its rock bed. After several southward advances of glacial ice, the glaciers retreated, and large amounts of sand, gravel, and mud were washed down into the valley of the Ohio River and its tributaries. High winds from the north created dust and sand storms, depositing a thick blanket of loess over the countryside and building sand dunes near the river. At present the land surface is being subjected to erosion, and the Ohio River has partly excavated the valley deposits.

In the pages that follow, emphasis is placed on the younger rocks and sediments because they contain the usable fresh-water supplies.

HISTORY

EARLY PALEOZOIC TIME

During the early Paleozoic era before Pennsylvanian time, western Kentucky was flooded repeatedly by the seas that moved in over many parts of what is now the North American continent. A good record of the geologic history and nature of the materials deposited in this area is embodied in the log of an oil well drilled by the Pure Oil Co. and others on the M. L. Walker farm, 1 mile south of Sebree and 16 miles south of Henderson in Webster County. The generalized column shown in figure 6 is from the detailed description of samples (Freeman, 1951). The well started in Pennsylvanian rocks near the surface and ended in the Cambrian strata, penetrating almost 7,000 feet of Paleozoic strata. The well did not reach the pre-Cambrian basement complex. The strata, shown in the figure, were assigned to the various periods by Freeman. Major breaks in the stratigraphic record called unconformities occur at the boundaries of the periods. These breaks represent interruptions in the deposition of whatever sediment was being brought into the basin at the time.

During pre-Mississippian time, limestone, dolomite, and a little sandstone and black shale were deposited in a marine environment. The sandstone of early Ordovician age, represents the only substantial influx of sand to the basin. This is the St. Peter sandstone, about 85 feet thick, occurring at a depth of 5,510 feet in the well.

The subdivision of the Mississippian system into three groups is shown in table 2 and figure 6. The early Mississippian seas advanced over the land surface, and mud was deposited to form the shales of the lower part of the Osage group. Later in Osage and also in Meramec time when the seas became deeper, clearer, and more conducive to life, thick deposits of limestone were formed from the remains and secretions of organisms. The last division of the Mississippian system, the Chester group, was marked by a gradual recession of the seas with greater variations in the sedimentation of the basin resulting in alternating beds of sandstone, shale, and limestone. Finally, the close of the Mississippian period was marked by the emergence of this part of the continent. Streams flowing to the seas over the newly formed land surface carried away a part of the earlier deposits. Stream channels, cut several hundred feet deep, reached far down into the Chester group giving pronounced topographic relief to the surface. It was upon this surface that the early Pennsylvanian sediments were deposited.

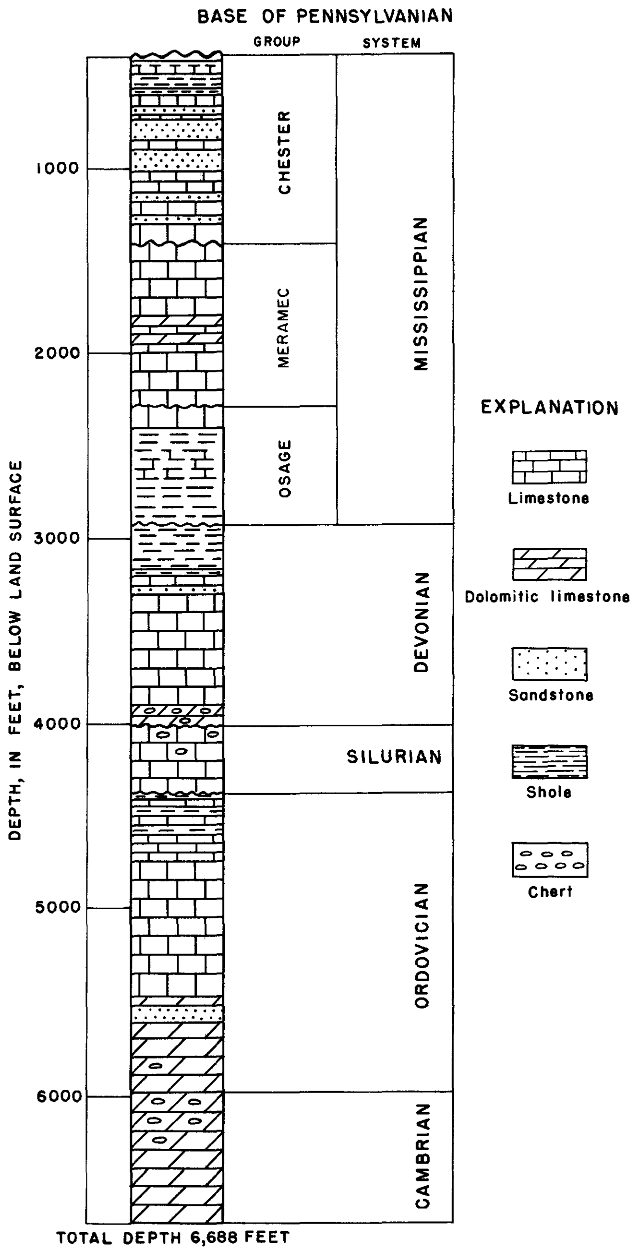

Figure 6. —Generalized log of rocks penetrated in an oil-test hole near Sebree, Ky. (Freeman, 1951, p. 133; Jillson, 1929; and Wilmarth, 1930).

Table 2.—Generalized section of the geologic formations exposed or penetrated in the Henderson area, Kentucky

[Formations below the Lisman formation are not exposed in the Henderson area]

System	Series	Group	Formation	Thickness (feet)	Character	Water-bearing characteristics
Quaternary	Recent and Pleistocene		Union formation of Glenn, 1912	0-50	Silt and some fine-grained sand, mantles uplands.	Extremely small yields of hard water to a few dug wells.
			Alluvium of Ohio Valley	0-130	Sand and gravel overlain by silt and clay.	Wells yield as much as 4,000 gpm of hard water.
			Alluvium of tributary valleys	0-80	Principally silt and clay.	Yield of wells usually less than 1 gpm.
Quaternary and Tertiary	Pleistocene and Pliocene		LaFayette? gravels of Leverett	0-1	Pebbles of chert and quartz; scattered patchy deposits.	Not a source of water for wells.
Pennsylvanian		McLeansboro	Lisman formation	0-300	Shale, sandstone, coal, and several thin limestone beds. Coarsed-grained Anvil Rock sandstone member, 20 to 50 ft thick, in lower part.	Anvil Rock sandstone member yields 1 to 20 gpm of generally soft to medium-hard water in the southeast and hard to very hard water in the southwest.
			Carbondale formation	300-400	Shale, coal beds, several thin limestone beds, and a prominent white, medium-grained sandstone, 20 to 100 ft thick.	Sandstone yields 1 to 10 gpm of soft to medium-hard sodium bicarbonate water in some areas and very hard water in other areas.
		Pottsville	Tradewater formation	450-550	Mainly shale with coal seams, and a thin persistent limestone bed. Several sandstones usually occur.	Sandstones yield small supplies of mineralized water.
			Caseyville sandstone	500-600	Massive sandstones, medium-grained, pebbly; a few beds of shale, coal, and limestone.	Yields as much as 50 gpm of mineralized, salty water.
Mississippian		Chester		915	Limestone, shale, and several sandstones.	
		Meramec		860	Mainly limestones, oolitic in upper part, dolomitic in lower part.	
		Osage		650	Limestones and shales.	

Devonian				1,100	Limestone overlain by several hundred feet of black shale.	Highly mineralized salty water from various permeable zones.
Silurian				400	Massive dolomitic limestone.	
Ordovician				1,600	Massive dolomitic limestone with some siltstone, shale, and sandstone.	
Cambrian				700+	Massive dolomitic limestone.	

PENNSYLVANIAN PERIOD

The sandy strata deposited in Pennsylvanian time in this region were formed largely in a continental environment, interrupted by brief invasions of the sea. These strata contrast with the massive limestones of preceding periods deposited in a marine environment. Plant remains and tree stumps, found in many places in the sandstones and shales of the coal field, are evidence of deposition on a land surface or in nearshore bays and estuaries. Rapid lateral changes in rock types together with variations in thickness of strata indicate channel filling and delta building by large streams.

According to a generalized section of the Western Coal Field constructed by Wanless (1939), at least 2,750 feet of sediments were deposited in the basin during this time. About 1,500 feet of strata of this age occur in the Henderson area. The difference of 1,250 feet is due largely to the erosion of the upper part of the section, which includes rocks of late Conemaugh and Monongahela age.

The lower part of the section, formed in the early part of the period, consists of thick sandstones and conglomerates. This part of the sequence is relatively barren of coal beds. Later, coal beds, shale, and thin limestones became more prominent, indicating rhythmic advances and withdrawals of the sea.

After a long period of deposition widespread erosion followed, and a part of the section was eroded. It is not known if sediments were deposited in this area during the Permian period which followed. Probably the area was above sea level through this closing phase of the Paleozoic era.

Widespread faulting occurred sometime after the Pennsylvanian strata were deposited. Faults with trends generally in a northeasterly direction intersect all the strata present in the Western Coal Field.

MESOZOIC ERA

Rock formations of Mesozoic age are unknown in this area. It may be that the area was an emergent land mass with widespread erosion removing part of the strata formed in the previous era.

TERTIARY AND QUATERNARY PERIODS

PLIOCENE AND PLEISTOCENE EPOCHS

In the counties bordering the Green and Ohio River valleys high-level gravel beds are found in many places. Leverett (1929) discussed the widespread occurrence of these deposits, saying that they occur over a width of about 30 miles at elevations not known to exceed 600 feet above sea level.

In the Henderson area, especially near the Ohio River at an elevation of 450 to 600 feet, scattered quartz and chert pebbles are sometimes found. These are remnants of more extensive deposits laid down by streams before the advent of Pleistocene glaciation. Patches of such gravel deposits are known about 8 miles east of Henderson at an elevation of 550 feet and in the hills 10 miles southeast of Henderson.

The beds of similar gravels found in the area along the Ohio and Green Rivers at an elevation of 380 to 420 feet were probably derived from the higher beds and redeposited at a much later date, sometime during the Pleistocene epoch.

PLEISTOCENE AND RECENT EPOCHS

During the Pleistocene epoch, glacial ice advanced to the south four times. The oldest stage was the Nebraskan, followed by the Kansan, Illinoian, and Wisconsin. Between each two stages of advance there was an interglacial stage of ice melting and retreat. According to Leverett (1929, p. 27), the Ohio had cut its channel to its present depth and was flowing on a bedrock floor before the advance of the Illinoian glacier. The shape, depth, and width of the valley in this area is shown on the bedrock-contour map, plate 5, and on the cross sections, plates 6 and 7. With the close of Illinoian glaciation, the valley began to fill with deposits of outwash released from the melting ice. The glacier again advanced during the Wisconsin stage, though its advance fell short of the previous one.

With the accumulation of ice on the continent in the Wisconsin advance, sea level was lowered so that the Ohio River with its increased gradient excavated Illinoian deposits. As the glacier melted, the valley was refilled with glacial outwash deposits to an elevation of about 400 feet in the Henderson quadrangle. Although the general level of the flood plain is about 30 feet below this elevation at present, small patches of bedded deposits and boulders of fresh granite at elevations of about 400 feet are evidence of the height to which valley fill accumulated.

The bluffs rise abruptly at the margins of the flood plain, and the floor of the valley, as shown in the cross sections, slopes gently from the margins to the central part of the valley. The valley is 7 miles wide in the Henderson area and attains a width of 10 miles at some other places in the coal field. The great width of the valley and its tributaries can be attributed to the general softness of the Pennsylvanian rocks. Where the Ohio River flows across the resistant limestones of Mississippian age both upstream and downstream from the coal field, the valley is barely a mile wide.

The valley of the Ohio is filled largely with sand and gravel, overlain by clay, silt, and fine sand. The cross sections on plates 6 and 7 show the nature and thickness of the glacial outwash. While the valley of the Ohio River was being filled with coarse sand and gravel, finer sand, silt, and clay were being deposited in the tributaries. Extensive lakes occupied the broad, flat reaches of the tributaries when the drainage outlets to the Ohio River were choked by large amounts of glacial outwash from the melting glacier. Holes drilled in the flat areas of the tributaries south of the flood plain penetrate silt and clay deposits that were laid down in quiet water. These deposits in many places are at least 40 feet thick.

Silt and fine sand were lifted from the broad, flat areas of the flood plain, carried by the wind, and laid down as a blanket of loess over the leeward areas south of the river. Near the river, sand dunes covered by loess are found in Atkinson Park in the north end of Henderson. A long, narrow ridge about 10 feet high, that extends across U. S. Highway 41 merging with the loess-covered hills south of the highway, is a natural river levee formed when the river was flowing at a higher level than at present. Dunes occur also in Henderson as well as west of town, and levees and dunes are found north of Geneva.

Since the time of deposition of these materials, cutting and removal of the sediments has been started. At Henderson, the river is presently cutting into limestone, shale, and sandy shale of the Carbondale formation both north and south of town; in other words, the river is now cutting into its old valley wall whereas out in the middle of the valley a large amount of sand and gravel, silt, and clay remains yet to be removed before the river will flow on its pre-Illinoian rock floor.

STRUCTURE

The Western Coal Field of Kentucky is part of a structural basin that extends into Illinois and Indiana. Its approximate boundaries in Kentucky are shown on the index map, figure 1. From the boundaries on the east and south, where the Caseyville sandstone of early Pennsylvanian age is exposed, the strata dip inward to the west and north. Regional dips carry the beds to greater depth in Illinois where the deepest part of the basin lies.

The apparent simplicity of structure is complicated by the Rough Creek fault zone extending in an easterly direction from Illinois into Kentucky passing through Sebree, about 15 miles south of Henderson. The faults at the north and south edges of the zone are reverse faults; in the center of the zone are upthrown blocks of older strata. Bordering the fault zone on the south is an eastward-trending downwarp known as the Moorman syncline. Normal faults occur both north and south of the fault zone, generally with northerly trends in the western part and easterly trends in the southern part of the coal field.

The Henderson quadrangle lies approximately in the middle of the structural basin. The cross sections on plate 7 show that the upper Pennsylvanian rocks in the Henderson quadrangle are mildly warped with an average regional westerly dip of 17 feet to the mile. This regional dip is somewhat less than that of Mississippian formations, which is 25 feet to the mile as given by Walker and others (1951). Contours drawn on the tops of the two principal bedrock aquifers, shown on plates 8 and 10, also illustrate the regional dip of the strata. Theis (1927) drew a structure map for Henderson County with contours on the No. 9 coal. A contour map on the same horizon, based on additional data, was included in a report by Walker and others (1951) covering the Henderson quadrangle.

Although there are few outcrops in the Henderson quadrangle, enough surface exposures of the Madisonville limestone member of the Lisman formation are found in the river bluffs to determine the regional dip of the Pennsylvanian strata. At the eastern boundary of the quadrangle in the bluffs along the Ohio River, the Madisonville limestone member is exposed at an elevation of 580 feet. In Audubon Park northeast of Henderson, it stands at an elevation of about 500 feet. The bed cannot be traced across town, but at the western boundary of the quadrangle the limestone again crops out at an elevation of about 380 feet. The total descent is about 200 feet in 14 miles, or an average of about 14 feet per mile. This average dip is taken oblique to the downdip direction, but it corresponds with the dip of 13.3 feet per mile for the No. 9 coal in the same direction indicated by subsurface data.

Mild warping has created minor structures consisting of anticlines plunging generally toward the north or south. Several domes with a small amount of closure are known in the area where the Henderson, Geneva, and Wilson pools are located, as shown in figure 5. Faulting is unknown in the Henderson area.

GROUND WATER

Water follows an endless path between the earth and the atmosphere in a circuit known as the hydrologic cycle. A part of the rain and snow falling on the ground goes directly to the streams and rivers as surface runoff, then to lakes or seas, and eventually it returns to the atmosphere. Part of the moisture is evaporated directly to the atmosphere. Another part is transpired to the atmosphere by vegetation. A small part of the rainfall percolates downward, eventually reaching the ground-water reservoir. Upon reaching the reservoir the water moves slowly through the ground to a point of discharge, such as a spring, a stream, or a lake.

OCCURRENCE

SOURCE

Two important sources of ground water exist in this area. Precipitation is one source of replenishment of the ground-water supply. Another is streamflow that enters the formations as influent seepage or induced recharge. Induced recharge occurs if a connection between the river and the ground-water reservoir exists, and pumping from wells adjacent to a river has lowered the water surface below river level. Rivers in flood add to the supply of water in storage by loss of water from the river into the banks and by downward percolation through the flood plain.

STORAGE

Water is stored in openings of all shapes and sizes, to a great depth below the surface. Few, if any, rocks at the surface are so solid and compact that they do not contain some pore spaces. Porosity is the percentage of the volume of rock or other material that is occupied by interstices or void spaces. Primary porosity in a sand or a sandstone depends mainly on the sorting of the individual grains. If the grains or fragments are all the same size, the sorting is good, and the porosity is high. If the voids between grains of one size are partly filled by grains of another size, the sorting is poorer, and the porosity is lower. The porosity may be reduced by deposition of mineral matter between grains or increased by removal of the cement binding the grains together. Secondary porosity refers to openings developed after deposition and consolidation of the sediments composing the formation. Openings due to solution of limestone and fractures developed in all kinds of rocks are classified as secondary.

Whereas porosity is the capacity of a rock to contain a liquid or gas, permeability refers to its capacity to transmit liquid or gas under pressure. The ability of the water-bearing material to let water pass through the openings depends on the interconnection of the individual openings and the size of the openings. Rocks or other materials are considered impermeable when water cannot be produced from them because the openings are too small or not connected. Much more water will pass through a clean, well-sorted gravel or poorly cemented sandstone than will pass through a deposit of fine sand and silt or a well-cemented sandstone.

In digging a well, a depth will generally be reached at which all the openings are filled with water and water flows into the well. The top of this saturated zone is the water table. In the Henderson area it lies at depths ranging from less than 1 foot to more than 25 feet below the land surface, depending on the location and time of year. Hydrographs of wells 8735–3745–34 and 8730–3745–121 (pl. 12) show the shallow depth of the water table in the valley and the greater depth in the upland. Water-table conditions are recognized in digging or drilling a well by the fact that water does not rise in the well above the point at which it is encountered.

Above the zone of saturation is the zone of aeration through which water percolates in reaching the water table. Just above the water table, and connected with the zone of saturation, is a belt called the capillary fringe. In this fringe, which is thickest in fine-grained and thinnest in coarse-grained materials, water is drawn upward by capillary action through the very small openings between particles of soil or rock. In an excavation, the ground may be wet for some depth through the capillary fringe, but little water will enter the excavation until the water table has been reached.

The capacity of a formation to yield water to the pull of gravity is the specific yield, defined as the percentage of the total volume that is occupied by available ground water. Similarly, the specific retention is the percentage of the total volume occupied by water that is not available to a well. Together the specific yield and specific retention equal the porosity. If 100 cubic feet of material yields 2 cubic feet of water and retains 10 cubic feet of water, the specific yield is 2 percent and the specific retention is 10 percent. The porosity is 12 percent. In coarse gravel of the Ohio River valley, the specific yield is large and the specific retention is small. In the clay and silt of the tributary valleys, the opposite holds true.

MOVEMENT

In many parts of the Henderson area, water rises above the point at which it is encountered in drill holes. A bed of shale overlying a water-saturated sandstone acts as a confining layer and the water in it is under hydrostatic pressure, so that a pressure release occurs when a well penetrates the confining layer. Hydrostatic or artesian pressure exists in the water-bearing bed, and the wells penetrating the bed are artesian wells. The relationship of artesian conditions to water-table conditions is shown in figure 7, an idealized sketch showing the transition

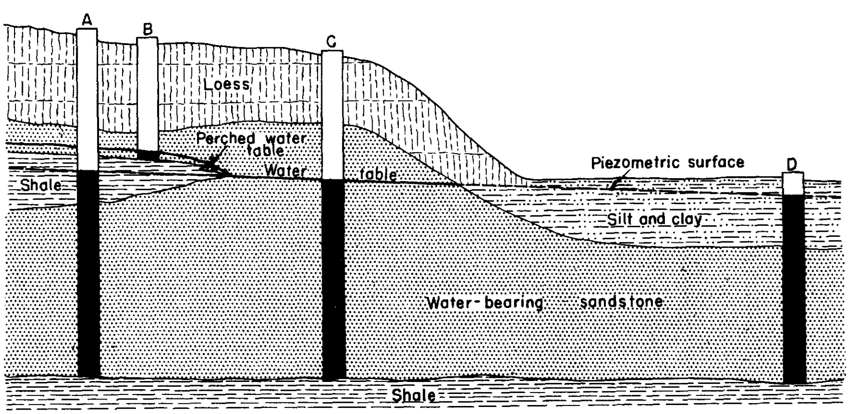

Figure 7.—Diagram showing water-table and artesian conditions.

from water-table to artesian conditions as the water-bearing bed dips below a confining bed. Well *A* has artesian pressure because water will not be obtained until the shale beds have been penetrated, and then it rises some height in the well. Well *B* taps a thin "perched" water body above the layer of shale. The silt and clay in well *D* acts as a confining layer, and water rises in the well after the sandstone has been reached. Well C exhibits water-table conditions because the sandstone is not confined at that point.

The piezometric surface, as shown in the figure, is an imaginary surface that every where coincides with the height attained by the rise of water in artesian wells. Water flows in the direction of slope of the piezometric surface or water table, and the rate of slope is the hydraulic gradient, usually expressed in feet per mile.

The water table and piezometric surface are constantly changing in position. Changes in water levels in wells and variations in spring flow are indexes of changes in the volume of water in the ground-water reservoir. Water levels rise when water is added to the reservoir faster than it is lost. Similarly, a fall in water levels occurs when loss exceeds gain. Hydrographs, such as those shown on plates 12 and 13, are records of daily, seasonal, and yearly changes in the height of the water table or piezometric surface. These changes in ground-water levels constitute part of the evidence that water is not stagnant but continually moving. The large number of small springs and seeps that can be seen along the bank of the Ohio River when the river is low are evidence of movement of water from the uplands to the river.

The water level in an artesian well is subject to small fluctuations caused by changes in atmospheric pressure. Figure 8 shows a graph of atmospheric-pressure changes converted from inches of mercury to feet of water, and the related fluctuations of water level in an artesian well.

The range of the seasonal variations in water levels and the promptness with which the levels respond to conditions that affect them may reflect several characteristics of the well and the aquifer from which it derives its water. A well in the outcrop area of a permeable sandstone may show immediate response to rainfall. For example, well 8730–3745–162 (pl. 12), at Anthoston in the Anvil Rock sandstone member, shows sharp rises and large seasonal variation in level; whereas wells 8730–3745–198 and 221 (pl. 12), 3 to 5 miles from the outcrop area of the sandstone, show smaller but steady rises in water level. Other wells respond to changes in river stage as well as to rainfall. Wells near the river, 8730–3750–142, 143, and 209 and 8730–3755–5, (pl. 13), show large fluctuations because of seasonal river rise; but well 8730–3750–38 (pl. 13), 1 mile from the river, shows considerably less seasonal change. In an area such as this, where a sandstone may grade into shale and again to sandstone in short distances, the effects of rainfall or river infiltration may be dampened considerably because of poor connections to the outcrop area or the bed of a river.

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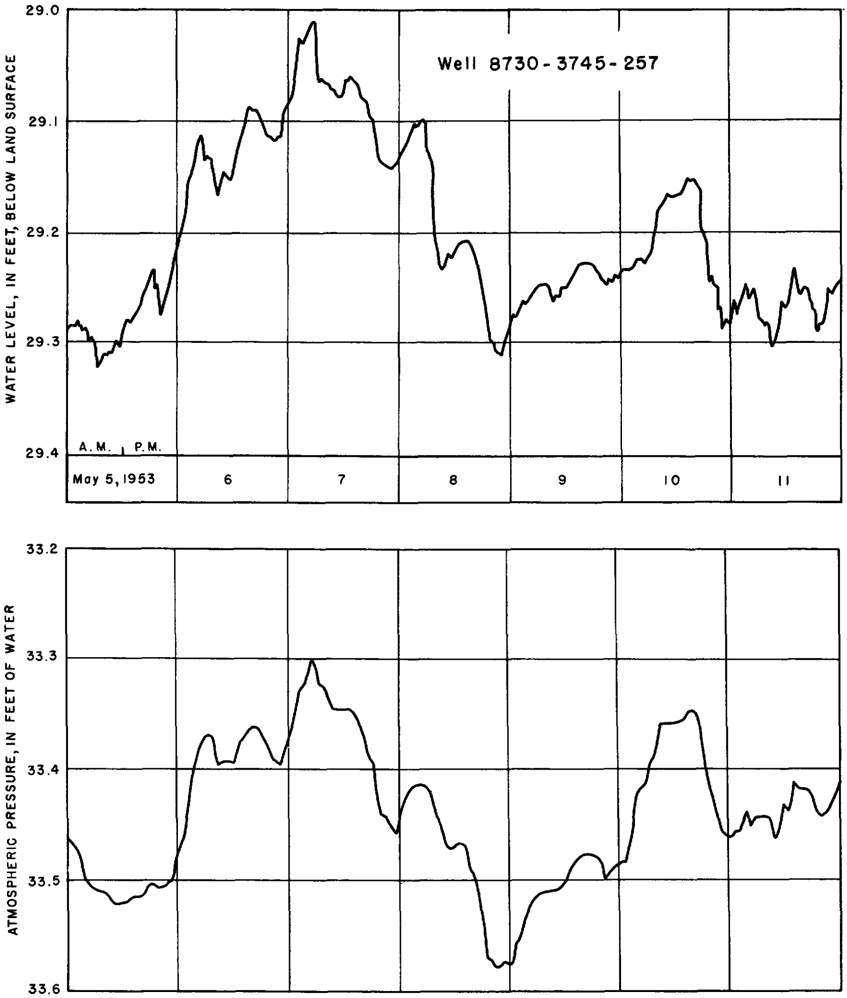

Figure 8.—Graphs showing correlation between changes in atmospheric pressure and water-level fluctuations in an artesian well at Henderson, Ky.

Natural recharge to a reservoir is of two kinds: rain and snow-melt percolation from the land surface, and stream-bed infiltration. During the growing season, when evapotranspiration losses are high, most of the precipitation is required to replace depleted soil moisture. During the nongrowing season, however, once the soil moisture is replenished recharge from precipitation adds greatly to the supply of water in storage. This contrast is shown in the hydrograph of well 8730–3745–162 (pl. 12), located in the outcrop area of the Anvil Rock sandstone member at a place where the loess cover is in places rather thin. During the storm period at the end of August 1950, when more than 5 inches of rain fell, the water level rose less than 2 feet in the well. During the storm period January 13 to 15, 1951, when only 3.41 inches of rain fell, the water level rose about 13 feet.

Effective recharge by rainfall occurs in the outcrop areas of the sandstones east and southeast of the quadrangle. Within the quadrangle, recharge due to rainfall occurs also in the hilly areas in the south and east as shown by the water-level contour map, plate 11. It is evident that recharge is more effective in the hills, where loess overlies the sandstone, than in the valleys, where alluvial clay, even less permeable than the loess, is in contact with the sandstone. As the sandstone goes deeper beneath the surface in the southwest and the overlying shale becomes thicker, the effectiveness of rainfall in recharging the aquifer is diminished.

The alluvium bordering the river is recharged during the winter and spring flood season. The amount of recharge depends on the kind of materials forming the stream bed, banks, and the flood plain; on the height of the flood; and on the length of time the flood waters are in contact with the surfaces of infiltration. The hydrograph of well 8730–3755–5 (pl. 13) shows the correlation between the water level in a well in the alluvium and an Ohio River flood. However, the rise also correlates with a period of excessive rainfall so that infiltration is not proved by this graph alone. Well 8735–3750–4 (pl. 13), however, shows a correlation with a river rise at a time when no rainfall occurred in the area. Infiltration may be induced by lowering the water level in a well field adjacent to the river enough that the water level stands below river level.

Discharge, usually with lowering water levels, is due to natural causes such as spring flow, seepage into streams, evaporation and transpiration by plants, and manmade causes, such as seepage from field tile to drainage ditches, and pumping of wells. The maximum loss from the ground-water supply occurs during the summer months, as shown by the hydrographs. Discharge occurs throughout the year, but in the winter months recharge is greater than discharge, and consequently the water levels rise.

As shown on plate 11, contours on the water level in the Anvil Rock sandstone member are irregular, owing to local areas of recharge in the uplands. Discharge takes place to the intervening stream valleys or directly to the Ohio River valley. Plate 9 is a contour map of the piezometric surface of the upper sandstone member of the Carbondale formation. The surface descends from the southeast toward the Ohio River. A low area southeast of Henderson is caused by pumping in the area, and water levels have apparently declined over a period of years.

The water surface in the alluvium generally slopes toward the Ohio River as shown in the cross section, figure 14. In the years of abundant rainfall and high winter river stages, the water table is higher than in dry years. The period from 1945 through 1951 was abnormally wet, as shown by the annual rainfall and cumulative-departure graphs in figure 4. In that period, rainfall in only one year, 1947, failed to equal or exceed the average for the 50-year period. This long wet period coincided with the extensive home building that began about 1945 in the suburban area northeast of Henderson. In the summer of 1952, several homeowners were forced to drive their sandpoint wells deeper into the alluvium or lower their pump intakes because of a slight drop in the water table. The hydrograph of well 8730–3750–209 (pl. 13) shows the annual cycle of high winter and low autumn water levels. If the decline shown by this hydrograph is projected into the future it is possible that driven wells 50 feet deep or less may furnish insufficient water during a protracted dry spell.

Well yields are usually given in gallons per minute or gallons per hour. They can be given also in terms of gallons per minute per foot of drawdown. This is called the specific capacity of the well. Several new drilled domestic wells in the Henderson quadrangle were rated in this manner, and the data are given in table 3. Specific capacities of wells completed in the Anvil Rock sandstone member ranged from 0.07 to 1.5 gpm per foot of drawdown. Vertical screened wells and test wells completed in the alluvium at Henderson, Ky., and Evansville, Ind., have specific capacities that range from 4 to 50 gpm per foot of drawdown. See, for example, table 11, well numbers 8730–3750–291, 8730–3755–11, 8735–3745–6 and 7. The collectors at the Spencer Chemical Co., west of Henderson, pumping from alluvial sand and gravel, in the first 6 months of 1943 showed values of 80 to 220 gpm per foot of drawdown. These values, however, are not directly comparable to those for vertical wells.

Although well yields are very useful figures to have available, they do not show what the sustained yield of an aquifer might be

Table 3.—*Yield of selected wells completed in the Anvil Rock sandstone memoer in the Henderson area, Kentucky*

Depth of well and static water level below land surface; r, reported.

Well no.	Depth of well (feet)	Date of test	Static water level below land surface (feet)	Saturated thickness of aquifer (feet)	Length of test (minutes)	Yield (gpm)	Drawdown (feet)	Specific capacity (gpm per foot of drawdown)
8730-3745-5	r65	1942	r37	27	90	12	15	0.8
185	47	Nov. 1949	r11	23	------	2.5	36	.07
253	46.5	July 1950	28.3	3.5	30	15	14	1.07
257	40	Apr. 1951	12.1	10	30	15	18	.83
269	71	Nov. 1952	r30	41	30	15	10	1.5
8735-3745-223	60	Apr. 1950	11.2	20	10	15	48	.31
8740-3745-84	85	------	16.0	15	------	15	22	.7
137	98	July 1951	20.3	------	10	6	15	.4
196	90	Aug. 1951	15.7	20	30	15	18	.83
232	95	Oct. 1952	30.4	13	30	15.5	24.5	.63

nor the extent to which one well might interfere with another. Aquifer tests (pumping tests) are made to determine the amount of water in storage in the aquifer and the rate of flow of water through the aquifer. This information is valuable when used in conjunction with the known geologic conditions, such as the extent of the water-bearing formation, its thickness, lateral variations in its permeability, source of recharge to the aquifer, and other natural conditions which impose limitations on the performance of the aquifer. The coefficient of transmissibility (rate of flow at a specified gradient), and coefficient of storage (amount of water available from storage), are determined by means of pumping tests.

METHODS OF RECOVERY

Most of the wells in use in the Henderson quadrangle are drilled wells (in the uplands) or driven wells (in the river valley), replacing many of the dug wells put down years ago. Electric or gasoline motor-driven pumps have been installed on about 50 percent of the wells in use in the area. Of the wells in use at the time of this report (1953), 10 are nondomestic wells capable of producing more than 50 gpm.

TYPES OF WELLS

The older wells in the area were dug by hand into the alluvium of the valleys or blasted into rock in the uplands and walled to the surface with brick or stone. These wells are usually not more than 30 to 35 feet deep, although a few extend to depths in excess of 50 feet. In many places, the yields of the wells have been found inadequate when electric or gasoline motor-driven pumps were installed. The output of many dug wells has been increased by drilling a 6- or 8-inch diameter hole from the bottom of the well deeper into the aquifer. Objections to dug wells at present are the high cost of labor for digging and walling up a large-diameter well and the possibility of contamination from surface sources.

In recent years, wells drilled with cable-tool rigs have been put down in the uplands, with casing set in the first hard stratum. These wells are drilled by raising and dropping a heavy string of tools having a chisel bit to break up the rock. A bailer is lowered into the hole to bring out the rock cuttings. Screens are not used in this type of well when completed, and the water is produced from sandstone or limestone aquifers.

In the Ohio River valley, screened wells are finished in the alluvial sand and gravel. Dummy casing is driven through the loose material, which is bailed from the hole. A screen attached to casing of smaller diameter is set at the correct depth in the sand and gravel inside the dummy casing, and the dummy casing is removed from the hole, allowing the water-bearing sand to close in around the screen. Generally, a screen size is selected that will permit the finer grained 60 percent of the particles in the formation around the screen to pass into the well and be removed before the well is put in operation. Screens used in the area have openings ranging from 0.016 inch (medium sand) to 0.110 inch (fine gravel). The well is surged by pumping for short periods of time, allowing the water in the pump column to wash back into the aquifer when the pump is shut off. A surge block that fits snugly inside the casing or screen is often used. Suction is created by raising the surge block, bringing the fine material from the aquifer into the well, from which it is removed by either bailing or pumping. Only 5 wells of this type are in use in the Henderson area. The depths range from 65 to 110 feet, the total depth of the aquifer Gravel-wall wells are similar to screened wells, except that in the annular space between the permanent screen and the outside or dummy casing, sized sand or gravel is packed while the casing is being pulled out. No wells of this type have been constructed in this area.

Driven wells are small-diameter screened wells used for small domestic and farm supplies on the flood plain and terrace. The average depth of this type of well is about 50 feet, although a few driven wells in the dunes north of Geneva are about 100 feet deep. Driven wells are started by augering a hole through the surface silt, clay, and fine sand. A screened sand point attached to a drive pipe is then driven into the water-bearing sand and gravel to the desired depth.

A collector consists of a concrete caisson set in sand and gravel. From the wall of the caisson horizontal screens, called laterals, radiate to distances of 100 to 300 feet, generally in the direction of a body of surface water. Water flows from the sand and gravel into the horizontal screens to the caisson, whence it is lifted by pumps installed in the top of the collector and delivered to the distribution system. Wells of this type are capable of large production when located in beds of permeable material having adequate connection for recharge from the river through its bed. The caisson is lowered by its own weight by excavating the alluvial materials within the caisson, allowing it to settle to the bottom of the aquifer. As each section settles, additional sections of the caisson are added at the top. The caisson is built high enough above the ground so that the pumps will not be endangered by flood waters. Three wells of this type are in operation west of Henderson on the flood plain at the edge of the river. The wells average about 70 feet deep below ground surface, the total depth of the alluvium at this place.

METHODS OF LIFT

Most wells in the Henderson area are equipped with pumps operated by hand, windpower, electric motors, or gasoline engines. However, buckets either with or without windlasses are in use in many dug wells. Bailers of smaller diameter which will fit in drilled wells are used to some extent.

Shallow-well suction pumps, such as pitcher pumps and power-operated centrifugal and reciprocating piston pumps, are used in wells in which the pumping level does not drop more than about 22 feet below the pump. Although the static water level may be less than 22 feet below the pump, the drawdown due to pumping may be large enough to drop the pumping level sufficiently below 22 feet so that the pump becomes inoperative until the well refills.

For wells in which the pumping level drops below 22 feet, deep-well pumps are used. Working-head or deep-well cylinder pumps are similar to pitcher pumps except that the cylinder, similar in action to the pump head of the pitcher pump, is set at any depth below the surface and the piston is connected by means of rods to the power source at the surface.

Ejector or jet pumps are driven by electric motors at high speed. Lifting water by this method depends on creating a vacuum by water under high pressure at the mouth of the jet which sucks additional water from the well, pushing it up to the surface through the delivery pipe. Part of the water raised to the surface is continually returned to the jet in the well through the pressure pipe.

Turbine pumps are deep-well pumps, generally used for larger supplies than the ordinary domestic or rural farm use. The few pumps of this type in use in the Henderson area are on the flood plain or adjacent terrace. In most installations the turbines or "bowls" are set below the water level and the motor or engine is at the surface, driving the turbines through a pump shaft. Submersible pumps consist of a close-coupled electric-powered turbine pump which is lowered into the well and operated at various depths below water. Several units for domestic and farm use have recently been installed in this area.

QUALITY

COMPOSITION

From the time water falls on the surface as rain or snow, its composition and quality change. Rain water is very soft and low in mineralization but it contains some of the gases dissolved from the atmosphere and perhaps some organic or mineral dust particles. As the water seeps through the openings in soil, unconsolidated deposits, and rock formations it dissolves a variety of substances. The type and amount of the substances dissolved in ground water depend on the kind and amount of substances present in the water as it enters the rocks, particularly oxygen, carbon dioxide, and organic acids, on the type of rock materials with which the water comes in contact, and on the length of time in contact. The concentration of dissolved substances usually increases with depth, because the waters there circulate slowly and have been long in contact with rock minerals; moreover, at depth, some of the waters may be those of the ancient seas in which the sediments were deposited. The activities of man locally influence the quality of ground water where sewage or industrial wastes reach the water table, or where pumping induces the encroachment of inferior water from a natural source.

Table 4 presents partial analyses of waters from 46 wells and 3 springs and comprehensive analyses of waters from 17 wells. Table 5 summarizes the quality of the water from the three principal aquifers, the Carbondale and Lisman formations and the alluvium, giving the median values of the more important constituents, and compares these waters with Ohio River water. The median is the value in the middle of a series from high to low and is often more typical than the average which may be much influenced by a few abnormally high or low values. Table 6 gives a summary of the source and significance of the dissolved substances.

In this area, the ground waters from formations near the surface are of the calcium bicarbonate type, although in a few places shallow wells produce sodium bicarbonate waters. Except for hardness, the only objectionable feature of shallow water is a high iron content; in most of the waters there is enough iron to stain laundry and enamel to some extent. With increasing depth, the waters acquire objectionable amounts of sodium chloride and sulfate. Detailed descriptions of the waters characteristic of the several water-bearing formations are given in a later section.

The principal ionic constituents in ground water are the cations calcium, magnesium, sodium, and potassium, and the anions bicarbonate, sulfate, and chloride. Other constituents often present in smaller amounts include the following: silica, iron, manganese, aluminum, nitrate, fluoride, and boron. The common cations usually carry one or two positive charges and are sometimes called "bases"; the anions carry one or two negative charges and are called "acids".

A cation combines with an anion to form a chemical compound such as sodium chloride, common table salt. The amount of any ion listed in an analysis is given in parts per million. This figure may be converted to grains per gallon by multiplying the parts per million by 0.0584. The chemical content can be expressed also by the chemical combining weight or equivalents per million because chemical combination does not take place unit for unit. Thus, 22.997 ppm of sodium combines with 35.457 ppm of chloride. Parts per million are converted to equivalents per million by dividing the parts per million by the reacting value of the constituent. Analyses expressed in equivalents per million are shown graphically on the cross sections on plate 7 and figure 10. A unit equivalent of a cation, such as sodium, will combine exactly with a unit equivalent of an ion, such as chloride, to form a compound such as sodium chloride.

Table 4.—*Chemical analyses of water from wells, springs,*

[Analyses by U. S. Geological Survey. Dissolved constituents given

Well no: a, sample contained 0.07 ppm manganese.
b, sample contained 0.04 ppm manganese.
Depth of well: r, reported.

Well no.	Depth of well (feet)	Geologic horizon	Date of collection	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)
8730-3745-1	176	Carbondale	Jan. 21, 1953					
10	r80	do	Mar. 30, 1950	55		0.15		
			Dec. 22, 1952					
14	r105	do	Mar. 30, 1950	55		.16		
32	r180	do	do	57	5.6	.37	74	13
35	r65	Lisman?	Dec. 29, 1949	54		.46		
49	r95	Carbondale	Dec. 22, 1952	58				
61	r240	do	do	57				
66	r220	do	Dec. 29, 1949			.24		
			July 26, 1952					
71	80	do	Mar. 30, 1950	58	7.5	.69	30	9.2
76	r127	do	Dec. 29, 1949	55		.33		
80	r86	Lisman	Dec. 30, 1949		32	3.0	16	8.7
133	r91	Lisman?	Dec. 29, 1949	59		.26		
143	61.2	Lisman	July 28, 1950	59		.69		
149	81.8	do	Dec. 29, 1949	59		2.9		
159	70.6	do	do	56		1.8		
214	r400	do	do			1.4		
219	72	do	do			1.8		
220	75	do	Mar. 29, 1950					
8730-3750-1	r140	Carbondale	Dec. 22, 1952					
8		Lisman	Dec. 28, 1949	54		.24		
12	r155	Carbondale	do			.59		
20	r60	Lisman	Dec. 22, 1952	54				
28	r360	Carbondale	Dec. 29, 1949			.31		
			Dec. 22, 1952					
29	r200	do	do					
56	r73	Alluvium	Dec. 28, 1949	57		.49		
66	r125	Carbondale	Mar. 30, 1950		9.6	4.4	86	32
			July 18, 1951	57		2.7		
73	r165	do	Dec. 28, 1949	58		1.0		
			Dec. 22, 1952	58				
106	r70+	Carbondale?	Mar. 30, 1950			2.1		
125	r65.5	Alluvium	do		17	.22	102	38
141	r54	do	do	54		.21		
145	r35	do	Dec. 28, 1949	56		4.2		
146	r45	do	do	56	10	.99	152	45
155	r325	Carbondale	Mar. 30, 1950		6.5	.32	13	3.7
156	r150	do	Dec. 22, 1952	56				
171	r80	Lisman	Mar. 30, 1950	58		.92		
172	12	do	do	55		.98		
178	r30	Alluvium?	Dec. 28, 1949	54		.68		
188	r210	Carbondale	do			.24		
			July 26, 1952					
193	r285	do	Dec. 28, 1949		9.5	.20	10	2.4
205	r30	Alluvium?	do	55		.32		
210	r78	Alluvium	Dec. 30, 1949	57		.81		
			July 19, 1951	58		.21		
236	r60	do	Mar. 30, 1950	59	14	.32	94	34
320		do	July 25, 1952	56		.27		
8735-3745-6	r110	do	Dec. 29, 1949	56	12	4.5	92	31
			July 18, 1951	56		4.6		
a10	r71	do	Sept. 5, 1952		3.7	.17	52	12
14	12	Lisman	July 28, 1950	59		.29		
20	r200	Carbondale	Dec. 29, 1949	58		5.1		
26	r150	do	do	56		.23		
33	152	do	Mar. 29, 1950	56	4.0	1.5	84	27
37	r124	do	Dec. 29, 1949	56		5.1		

and test borings in the Henderson area, Kentucky

in parts per million. For location of wells, see plates 1-4]

Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$: Total	Hardness as $CaCO_3$: Noncarbonate	Specific conductance at 25°C (micromhos)	pH
---	---	1,220	---	---	118	4.2	0.1	---	---	---	2,040	---
---	---	1,110	19	15	34	1.1	.8	---	61	---	1,730	---
---	---	1,110	---	---	34	1.1	3.8	---	---	---	1,700	---
---	---	1,320	18	6	308	6.4	.3	---	29	---	2,860	---
24		326	0	2.6	6.8	.3	13	308	238	0	527	7.9
---	---	270	---	1	10	---	20	---	202	---	467	---
---	---	765	44	---	10	1.2	1.5	---	---	---	1,290	---
---	---	1,395	74	---	272	5.6	1.2	---	---	---	2,850	---
---	---	1,330	59	13	181	---	2.6	---	8	---	2,600	---
---	---	1,420	30	---	---	4.6	---	---	---	---	---	---
190		618	0	2.3	9.8	.5	1.5	555	113	0	889	8.0
---	---	548	---	1	41	---	.2	---	306	---	972	---
15		100	0	1.0	7.0	0	18	148	76	0	218	7.8
---	---	45	---	34	34	---	37	---	99	---	359	---
---	---	114	---	2	9	.2	2.8	---	68	---	196	---
---	---	61	---	26	13	---	15	---	61	---	229	---
---	---	84	---	6	11	---	1.4	---	48	---	185	---
---	---	92	---	1	4	---	5.0	---	66	---	164	---
---	---	20	---	28	6	---	26	---	44	---	161	---
---	---	10	---	34	32	---	72	---	118	---	385	---
---	---	805	103	---	51	3.4	1.8	---	---	---	1,730	---
---	---	509	---	23	6	---	2.7	---	440	---	789	---
---	---	827	19	14	94	---	7.2	---	128	---	1,550	---
---	---	526	---	---	11	.2	8.5	---	---	---	842	---
---	---	929	---	12	68	---	1.4	---	96	---	1,550	---
---	---	998	---	---	85	3.0	.8	---	---	---	1,720	---
---	---	1,140	69	---	130	4.8	2.0	---	---	---	2,170	---
---	---	312	---	70	11	---	.0	---	308	---	617	---
15		398	0	45	4.4	.2	.0	388	346	20	639	7.6
---	---	421	---	40	5	.1	.2	---	378	---	751	---
---	---	554	---	10	23	---	1.2	---	237	---	871	---
---	---	550	---	---	26	.6	1.1	---	---	---	923	---
---	---	364	---	59	6	.1	.0	---	351	---	642	---
12		416	0	73	10	.2	7.6	462	411	70	759	7.6
---	---	410	---	51	7	.2	1.1	---	382	---	693	---
---	---	140	---	59	7	---	.8	---	146	---	367	---
17		434	0	136	22	0	90	691	564	209	1,060	7.9
301		780	22	2.9	14	1.0	.5	742	48	0	1,200	8.2
---	---	1,100	69	---	146	4.0	2.0	---	---	---	2,210	---
---	---	602	---	6	4	.8	.1	---	343	---	857	---
---	---	25	---	5	4	.2	3.7	---	13	---	59.3	---
---	---	572	---	273	152	---	106	---	842	---	1,850	---
---	---	1,410	33	7	198	---	8.5	---	44	---	2,650	---
---	---	1,305	25	---	---	4.2	---	---	---	---	---	---
283		604	41	25	41	.6	1.2	711	35	0	1,170	8.0
---	---	318	---	131	9	---	3.2	---	404	---	759	---
---	---	286	---	28	6	---	.1	---	259	---	483	---
---	---	299	---	44	7	.1	2.7	---	331	---	548	---
	6.0	332	0	83	18	.1	4	434	374	102	697	7.4
---	---	416	---	83	7.0	.0	2.5	---	430	---	782	---
11		414	0	27	8.5	.1	2.1	390	357	18	680	8.0
---	---	391	---	34	9	.2	.5	---	339	---	659	---
22	2.0	113	0	94	31	.2	1.5	287	181	86	478	6.8
---	---	241	---	7	21	.2	15	---	227	---	494	---
---	---	352	---	16	4	---	.2	---	280	---	558	---
---	---	464	---	300	86	---	57	---	670	---	1,490	---
94		599	0	6.0	18	.9	.4	530	321	0	897	7.6
---	---	430	---	2	6	---	.0	---	248	---	640	---

Table 4.—*Chemical analyses of water from wells, springs,*

Well no.	Depth of well (feet)	Geologic horizon	Date of collection	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)
8735-3745-55	r155	Carbondale	Jan. 15, 1953	57	----	----	----	----
63	r72	Lisman	Dec. 29, 1949	60	----	0.20	----	----
77	r209	do	Mar. 29, 1950	55	21	6.8	8.0	3.9
83	r65	do	Dec. 29, 1949	58	----	2.2	----	----
100	r35	do	do	----	----	.16	----	----
			July 18, 1951	----	----	.02	----	----
			Dec. 5, 1952	60	----	----	----	----
106	r140	Carbondale	Mar. 29, 1950	58	27	.39	30	18
138	r60	Alluvium	do	56	11	13	92	48
160	r70	Lisman	do	58	16	.18	72	41
166	r130	Carbondale	do	54	----	5.3	----	----
8740-3745-17	r96	Alluvium	do	----	----	12	----	----
19	r121	do	do	57	----	1.4	----	----
23	r200	Lisman	July 28, 1950	54	----	.32	----	----
			July 18, 1951	----	----	.21	----	----
			Dec. 5, 1952	----	----	----	----	----
24	r132	do	July 28, 1950	60	----	1.4	----	----
b59	r233	Carbondale	July 18, 1951	----	8.8	2.2	8.8	7.3
8740-3750-3	r32	Alluvium	July 28, 1950	54	----	1.8	----	----
4	r45	do	do	56	----	.41	----	----

Table 5.—*Comparison of the chemical quality of water from the 3 principal aquifers and Ohio River water in the Henderson area, Kentucky*

[Median values for dissolved constituents given in parts per million. Maximum and minimum for Ohio River: From daily determinations of Evansville Water Co. Period of record: 1949-52 inclusive]

Characteristic or constituent	Aquifers			Ohio River		
	Carbondale formation	Lisman formation	Alluvium	Sept. 24-29, 1950	Maximum	Minimum
Number of analyses	21	20	17	----	----	----
Iron (Fe)	.4	.6	.6	0.04	----	----
Bicarbonate (HCO_3)	618	106	332	76	108	21
Sulfate (SO_4)	8	6	51	63	----	----
Chloride (Cl)	20	10	7	20	----	----
Fluoride (F)	.6	.2	.2	.4	----	----
Nitrate (NO_3)	1.0	15	2.5	2.0	----	----
Hardness as $CaCO_3$	193	106	357	118	212	58
Specific conductance at 25°C (micromhos)	972	320	693	319	----	----

and test borings in the Henderson area, Kentucky— Continued

Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$ Total	Hardness as $CaCO_3$ Noncarbonate	Specific conductance at 25°C (micromhos)	pH
-----	-----	379	-----	---	15	0.3	2.8	-----	-----	-----	1,020	---
-----	-----	112	-----	1	11	-----	37	-----	113	-----	282	---
9.4		46	0	11	3.6	.1	2.5	86	36	0	110	7.6
-----	-----	244	-----	2	6	-----	1.1	-----	190	-----	387	---
-----	-----	70	-----	3	14	-----	31	-----	87	-----	213	---
-----	-----	68	-----	2	21	.1	34	-----	98	-----	271	---
-----	-----	68	-----	-----	14	.1	24	-----	-----	-----	245	---
12		177	0	1.0	2.4	.4	29	197	149	4	325	7.7
49		639	0	.8	2.1	.4	5.9	524	427	0	897	7.5
8.4		372	0	9.5	11	.3	44	386	348	43	650	7.7
-----	-----	629	-----	1	4	.3	.4	-----	486	-----	874	---
-----	-----	594	-----	1	4	.6	.1	-----	446	-----	839	---
-----	-----	331	-----	26	3	.3	.3	-----	266	-----	539	---
-----	-----	372	-----	8	22	.3	55	-----	335	-----	741	---
-----	-----	512	-----	7	11	.1	14	-----	314	-----	834	---
-----	-----	474	-----	-----	37	.2	25	-----	-----	-----	895	---
-----	-----	455	-----	3	5	.2	1.4	-----	327	-----	683	---
909	9.2	1,044	10	.7	830	1.2	5.8	2,270	52	0	3,913	8.1
-----	-----	90	-----	14	4	.5	3.0	-----	26	-----	219	---
-----	-----	54	-----	15	6	.1	4.9	-----	64	-----	169	---

In converting parts per million to equivalents per million the sum of the cations will approximately equal the sum of the anions, within the limits of practical analytical procedure, because the ions are in equilibrium. Therefore, in the graphic plots referred to above, the column of cations is the same height as the column of anions. The order, from bottom to top, for the lefthand column of cations is calcium, magnesium, and sodium (plus potassium). For the righthand column the anions are, in order from bottom to top, bicarbonate (plus carbonate), sulfate, and chloride (plus nitrate and fluoride). The hardness is due mainly to the calcium and magnesium. It is expressed as parts per million of calcium carbonate and can be computed by multiplying the equivalents per million of calcium and magnesium by 50.

The resistivity curves on electric logs of oil-test wells are useful in determining if usable water can be obtained from an

Table 6.—*Elements and substances commonly found in ground water*

Constituent	Source	Significance
Silica (SiO_2)	Siliceous minerals present in essentially all formations.	Forms hard scale in pipes and boilers. Inhibits deterioration of zeolite-type water softeners.
Iron (Fe)	The common iron-bearing minerals present in most formations.	Oxidizes to a reddish-brown sediment. More than about 0.3 ppm stains laundry and utensils reddish brown, is objectionable for food processing, beverges. Larger quantities impart taste and favor the growth of iron bacteria.
Manganese (Mn)	Manganese-bearing minerals.	Rarer than iron; in general has same objectionable features; brown to black stain.
Calcium (Ca) and magnesium (Mg)	Minerals that form limestone and dolomite and occur in some amount in almost all formations. Gypsum also a common source of calcium.	Cause most of the hardness and scale-forming properties of water; soap consuming.
Sodium (Na) and potassium (K)	Feldspars and other common minerals; ancient brines, sea water; industrial brines and sewage.	In large amounts give salty taste as sodium chloride; objectionable for specialized industrial water uses.
Bicarbonate (HCO_3) and carbonate (CO_3)	Action of carbon dioxide in water on carbonate minerals.	In combination with calcium and magnesium forms carbonate hardness which decomposes in boiling water with attendant formation of scale and release of corrosive carbon dioxide gas.
Sulfate (SO_4)	Gypsum, iron sulfides, and other, rarer, minerals, common in waters from coal-mining operations and many industrial wastes.	Sulfates of calcium and magnesium form hard scale.
Chloride (Cl)	Found in small to large amounts in all soils and rocks; natural and artificial brines, sea water, sewage.	In large enough amounts gives salty taste; objectionable for various specialized industrial uses of water.
Fluoride (F)	Various minerals of widespread occurrence, in minute amounts.	In water consumed by children, about 1.5 ppm and more may cause mottling of the enamel of teeth; as much as about 1.0 ppm reduces decay of teeth.
Nitrate (NO_3)	Decayed organic matter, sewage, nitrate fertilizers, nitrates in soil.	Values higher than the local average may suggest pollution. There is evidence that more than about 45 ppm NO_3 may cause methemoglobinemia ("blue baby") of infants, sometimes fatal; waters of high nitrate content should not be used for baby feeding (Maxey, 1950).

aquifer. The explanation on plate 7 shows part of an electric log in which the upper sandstone contains fresh water, and the lower sandstone contains mineral water probably unfit for ordinary uses. In these curves when the broken line, or long normal, lies outside the solid curve, or normal, the water in the formation is fresh, and when the broken line lies inside the solid line the water is probably too highly mineralized for most uses. The spontaneous-potential curve on the left side of the figure indicates a large negative potential when mineral water occurs. The spontaneous-potential curve shows little or no deflection in fresh-water-bearing sandstones in this area.

Electric logs of oil test wells are shown on plate 7. The log of well 8730—3750—240 illustrates the occurrence of fresh water at a depth of about 200 feet. The Sebree sandstone just below sea level has low spontaneous-potential and fairly low resistivity and probably contains brackish water. The spontaneous-potential and resistivity curves of the Curlew sandstone and lower sandstones indicate salty water.

CHARACTERISTIC PROPERTIES

The substances dissolved in water gives the water characteristic properties important to those who use the water for general or special purposes.

The pH, which is a measure of the hydrogen-ion concentration, is useful in predicting the scale-forming or corrosive tendency of water. Pure water having no dissolved solids or gases has a pH of 7.0. However, water having a pH of 7.0 is not necessarily pure but may contain dissolved gases or solids. Increasing pH values, greater than 7.0, indicate decreasing hydrogen-ion concentration and such waters are on the alkaline side. Decreasing pH values, less than 7.0, indicate increasing hydrogen-ion concentration and such waters are on the acid side.

Specific conductance is a measure of the ability of water to conduct an electric current. It is useful as an indication of the amount of dissolved solids in the water and a convenient means of detecting changes in the mineral content during aquifer tests.

The dissolved-solids content represents the quantity of substances in solution, but it may include some organic matter and water of crystallization. The U. S. Public Health Service

(1946) requires that dissolved solids be limited to 500 ppm in water used on interstate carriers, though as much as 1,000 ppm is permitted where better water is not available.

Hard water is recognized by the large amount of soap needed to produce lather, and the scum of insoluble salts formed when the water is heated. The hardness is due chiefly to salts of calcium and magnesium, although iron, aluminum, manganese, certain other metals, and free acid may increase the hardness of water. The hardness caused by calcium and magnesium equivalent to the bicarbonate and (or) carbonate in a water is called carbonate hardness; hardness caused by other compounds of calcium and magnesium is called noncarbonate hardness. As used in this report, soft water, has a range in hardness of 0 to 60 ppm; medium-hard water, 61 to 120 ppm; hard water, 121 to 200 ppm; and very hard water, more than 200 ppm.

The temperature of ground water in this area to depths of about 250 feet usually covers a very small range from 56° to 60° F. The seasonal fluctuation in temperature of water from any one well deeper than 20 or 30 feet is also small, amounting to 1° to 2° F. However, water standing in a shallow dug well or issuing from a spring may have a somewhat greater range because of climatic influence. The temperatures given in table 4 do not always reflect the true ground-water temperature. In some instances the water sample was collected at a storage tank or hydrant, so that the water temperature may have been affected by air temperature.

Normally ground water originating at greater depth has a higher temperature than water from a shallow source. This temperature increase with depth is due to the temperature gradient of the earth, which is of the order of 1° F increase for each 50 to 100 feet of increased depth.

Wells, such as the collectors 8735–3745–8, 9, and 10, obtaining their supply by infiltration of river water show a far greater temperature variation than that for the average well. The temperature graphs in figure 16 show that the annual temperature cycle for the wells follows very closely the river-temperature cycle, though on a subdued scale, indicating that the well is yielding water that has infiltrated through the bed of the river.

GEOLOGIC FORMATIONS AND THEIR WATER-BEARING PROPERTIES

On the pages that follow, a description is given of the rock formations and the overlying mantle of unconsolidated deposits. Details are included concerning well yields, quality of water, and areas of recharge and discharge of the aquifers. The emphasis is placed on the fresh-water-bearing beds of the Pennsylvanian system and the Pleistocene series. The available information, which covers strata extending to a depth of nearly 7,000 feet, indicates that below a depth of about 350 feet the ground waters are saline and unusable for ordinary purposes; therefore, the deeper strata are treated only briefly in this report.

PRE-CARBONIFEROUS ROCKS

Sedimentary rocks of pre-Carboniferous age are present everywhere beneath the surface in the Western Coal Field. Table 2 shows the approximate thickness, general character, and water-bearing properties of the formations. At least 23 wells, ranging in depth from 1,786 to 6,688 feet, have been drilled below the Carboniferous in various parts of the coal field. Of the 23 wells, all reached the Devonian, 10 reached the Silurian, 3 reached the Ordovician, and 1 penetrated 700 feet into the Cambrian. The log of the Pure Oil Co. test (fig. 6) shows that at least 3,500 feet of strata consisting principally of limestone and dolimitic limestone of pre-Carboniferous age are present.

CAMBRIAN SYSTEM

The Cambrian strata occur in this area at a depth of about 6,000 feet. According to data from the interpretation of the Pure Oil Co. test, the total thickness of the Cambrian strata was not penetrated. Freeman (1951, p. 133) states that the bottom 713 feet of the 6,688-foot well was in dolomite of Cambrian age. The upper 600 feet of the dolomite is cherty; the lower 100 feet, sandy. No information on the existence of porous zones or nature of formation water is available, but any water present doubtless is salty.

ORDOVICIAN SYSTEM

In the Pure Oil Co. test 1,610 feet of limestone, dolomite, shale, and sandstone, between 4,365 and 5,975 feet, was assigned to the Ordovician by Freeman (1951, p. 133). A porous zone with a show of oil in a limestone of Chazy and Black River age occurred at a depth of 4,875 feet. This porous zone was tested and in 2 hours 1,500 feet of the well filled with salt water. No analysis of this water is available. Some gas was found in the St. Peter sandstone which extends from a depth of 5,510 to 5,595 feet.

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SILURIAN SYSTEM

Three wells in the coal field have been drilled through the entire thickness of the Silurian system. According to Freeman (1951, fig. 3), the Silurian is thickest south of the Rough Creek fault zone where it exceeds 500 feet. The strata consist of gray to pink limestones containing some chert. No information is available on porous zones or quality of water in these strata.

DEVONIAN SYSTEM

Devonian strata are reached at a depth of 3,100 to 3,600 feet in the Henderson area but lie at depths of only 500 to 1,300 feet in the eastern and southern parts of the coal field, according to Freeman (1951). The Devonian ranges in thickness from 100 feet in the eastern part of the coal field to more than 1,100 feet in the west. The strata consist of several hundred feet of black shale underlain by limestone. The only sandstone occurs as a thin bed less than 10 feet thick about 100 to 200 feet below the black shale.

A little information is available concerning porous zones in the Devonian. A well 4,384 feet deep drilled 9 miles east of Henderson by the Magnolia Petroleum Co. produced brine from a depth of 4,030 feet. Records from an unidentified source show that salt water was bailed from the hole at the rate of one-half barrel an hour. A partial analysis of the water from this well is given below. It represents the most saline water in the Western Coal Field for which data are available:

Chemical constituents	*Parts per million*
Dissolved solids	166,000
Sodium (Na)	51,400
Calcium (Ca)	8,980
Magnesium (Mg)	2,730
Sulfate (SO_4)	350
Chloride (Cl)	103,000
Bicarbonate (HCO_3)	793

CARBONIFEROUS ROCKS—MISSISSIPPIAN SYSTEM

The strata deposited in this area in the Mississippian period consist of limestones, shales, and sandstones belonging to the Osage, Meramec, and Chester groups as shown in figure 6. Formations composing the three groups have been described at areas of typical development by various writers in Kentucky and adjoining States. A geologic map of the western Kentucky fluorspar district compiled by Weller and Sutton was published in 1951. The map embraces part of the outcrop area of the Chester and Meramec groups adjoining the Western Coal Field on the southwest.

OSAGE GROUP

The Osage group is the lowest group and consists of about 500 to 700 feet of shale and cherty limestone. According to Freeman (1951), in her interpretation of the strata found in the well drilled by the Pure Oil Co., 651 feet of shale and fossiliferous limestone represent the Borden-New Providence sequence of the Osage group. No information is available on porous zones or quality of water in this group.

MERAMEC GROUP

The Meramec group overlies the Osage group and consists of about 900 feet of oolitic, fossiliferous, and cherty limestone. In the Western Coal Field the rocks of this group are not exposed except in a few localities along the southwest margin where they occur in fault blocks. From top to bottom, the group contains the following formations:

Ste. Genevieve limestone
St. Louis limestone
Spergen (Salem of local usage) limestone
Warsaw (Harrodsburg of local usage) limestone

The widely developed McClosky sand oil-producing zone occurs in the Ste. Genevieve limestone. Most of the oil tests in this area penetrate the Ste. Genevieve, stopping above the St. Louis limestone which is about midway in the Meramec group.

Table 7 gives data obtained in testing the permeability and saturation of possible oil-bearing formations which, in the cases cited, produced brine. No information is available on the yield of brine from the Spergen (Salem of local usage) limestone. The possible yield of brine from the Ste. Genevieve limestone is indicated by the fill-up of the drill stem.

The producing ability of a formation is determined by making a drill-stem test. This is done by lowering a drill-stem testing tool to the formation. The hollow drill stem is allowed to fill with

Table 7.—*Artesian head of waters from Mississippian formations in the Henderson area, Kentucky*

[Rise in water level above formation: Data are based on 1- to 2-hour drill-stem tests in oil exploration]

Formation	Number of tests	Rise in water level above formation	
		Average (feet)	Range (feet)
Waltersburg sandstone	7	657	30-1,170
Tar Springs sandstone	2	125	100-150
Cypress sandstone	6	570	240-1,400
Bethel sandstone	2	1,400	155-2,600
Aux Vases sandstone	3	400	30-1,080
Ste. Genevieve limestone (McClosky sand of Indiana and Illinois)	22	1,000	15-2,280

whatever fluid is contained in the formation. As the drill stem is raised from the hole, a measure of the number of feet the fluid rose in the drill stem and a record of the pressure in the formation are obtained.

CHESTER GROUP

The Chester group includes the uppermost rocks of the Mississippian system. It is separated from the Meramec group below, and the Pennsylvanian system above, by erosional unconformities.

The Chester group has been subdivided into the formations listed below in order from youngest to oldest:

Kinkaid limestone
Degonia sandstone
Clore limestone
Palestine sandstone
Menard limestone
Waltersburg sandstone
Vienna limestone
Tar Springs sandstone
Glen Dean limestone
Hardinsburg sandstone
Golconda formation
Cypress sandstone
Paint Creek shale
Bethel sandstone
Renault formation
Aux Vases sandstone

Except for small exposures of limestones of the Chester group in fault blocks along the Rough Creek fault zone south of Henderson and along the margins of the coal field, the strata are beneath the surface. Variations in thickness of the Chester group over the area depend partly on the original thickness of material accumulated, partly on how much compaction took place, and partly on the depth of erosion at the close of the Mississippian period. In the Henderson area, the Chester group is 800 to 1,000 feet thick and underlies the Pennsylvanian system at a depth of 1,500 to 1,600 feet below the surface. The cross sections on plate 7 show the relationship of the Pennsylvanian system to two limestone marker beds, of the upper Chester, the Menard and Vienna limestones.

Sandstone beds are much more abundant in the Chester group than in the older groups and are separated from each other by limestone and shale beds. The sandstone beds range from about 10 feet to a little more than 100 feet in thickness. Some of the beds are blanket deposits of rather uniform thickness over fairly large areas, whereas others are lenticular, probably representing lagoon or offshore-bar deposits.

Salty water occurs in all the sandstone beds in various parts of the coal field and in a few permeable zones at other horizons in the Chester group. The figures in table 7 give an indication of the artesian head in the various permeable zones.

CARBONIFEROUS ROCKS—PENNSYLVANIAN SYSTEM

The Pennsylvanian system contains the sandstone beds which are the widely used bedrock aquifers in the Western Coal Field. The system contains, from youngest to oldest, the following formations:

Henshaw formation
Lisman formation
Carbondale formation
Tradewater formation
Caseyville sandstone

The Caseyville and Tradewater together constitute the Pottsville group, and the Lisman and Henshaw formations compose the McLeansboro group.

All the formations except the Henshaw formation, which is not present in the Henderson area, are described in this report. The oldest Pennsylvanian formation occurring in the Henderson area is the Caseyville sandstone and the youngest is the Lisman formation. On the following pages brief descriptions of the older strata are given. The younger formations are described in more detail because of widespread pumping from the water-bearing sandstone contained in them in the Henderson area.

The cross sections (pls. 6 and 7), the contour maps of the two fresh-water-bearing sandstones (pls. 8 and 10), and water-level contour maps for the two sandstone aquifers (pls. 9 and 11) describe the aquifers. Several figures which depict various aspects of the distribution, nature, and water-bearing characteristics of the aquifers are included in the text.

The Pennsylvanian strata found in this region differ in many respects from the underlying limestones and shales of Mississippian age. A large part of the strata were deposited on a land surface under continental conditions or close to shore in a marine environment. Table 2 gives the character of the formations and shows that, in the Pennsylvanian, limestones are few and in thin beds, in contrast with the much greater thickness of limestone in the Mississippian system. Carbonaceous impressions of plant remains are abundant in the Pennsylvanian deposits. Brief invasions by the sea resulted in the deposition of nodular shale beds, black carbonaceous shales, and thin limestone beds carrying impressions of marine organisms. Sandstone beds of the Pennsylvanian system are thicker and more numerous than those sandstones of the upper part of the Mississippian system. Crossbedding, cut-and-fill structure, quartz pebble conglomerate, and clay balls, together with great variations in thickness of early Pennsylvanian formations, indicate channel filling and delta building by large streams.

CASEYVILLE SANDSTONE

DESCRIPTION

The Caseyville sandstone of Pottsville age is the basal formation of the Pennsylvanian system in this area and takes its name from Caseyville, Union County, Ky., where exposures were described by Owen in 1856. The formation extends upward from the Mississippian strata to the Tradewater formation which includes Owen's No. 1a coal near its base. Normally, the Caseyville sandstone includes a basal conglomeratic sandstone, intermediate beds of shale containing one or more thin coals, and an upper sandstone which Norwood (1876) called the Bee Spring sandstone, named for exposures at Bee Spring, Edmonson County, Ky.

The sandstone beds are massive, crossbedded, cliff forming, usually coarse grained, and often conglomeratic. Well-rounded pebbles of vein quartz as much as half an inch across lie in thin layers parallel with the bedding. The cement consists of silica and limonite, and the sandstone is poorly to well cemented. Outcrops have a honeycombed appearance ("bee rock") because of differential weathering caused by irregular distribution of the limonitic cement.

The formation reaches its greatest thickness in the southern and western parts of the coal field and thins in the northeastern part. It is thickest where it fills channels in the eroded surface of the Mississippian rocks beneath, and generally a large thickness of sandstone is present in these channels. In Edmonson County to the southeast, the lower conglomerate occupying such a channel is 250 feet thick (McFarlan, 1943). Probably the thickness of the entire formation, if present, would be considerably greater. In the Tradewater River region of Hopkins, Union, and Webster Counties the thickness of the entire formation ranges from 200 to 500 feet. In Hancock County to the east the formation is 100 to 200 feet thick. In Henderson County the thickness is about 500 feet.

The Caseyville sandstone appears in all the deep wells drilled in the Henderson area, and the cross sections on plate 7 show the depth and thickness of the formation and its unconformable relation to the Mississippian rocks below. Where the Pennsylvanian-Mississippian boundary is a sandstone-limestone contact, the base of the Pennsylvanian system usually can be determined. In certain places, shales in the Caseyville sandstone are in contact with shales or sandstone of the upper part of the Mississippian system, and location of the boundary would be difficult to determine without detailed sample studies. Siever (1951) listed criteria for identification of the position of the unconformity from subsurface data. He stated also that the determination of the contact is primarily a problem in the stratigraphy of the Chester group.

The contact between the Caseyville sandstone and the overlying Tradewater formation has been placed at the top of the thick massive sandstones where a thin coal bed, which may be Owen's No. 1a coal, is present in places. The formation was not subdivided in this area, although two thick sandstones separated by a shaly zone containing one or more coal beds can be distinguished in many records.

Examinations of samples from oil tests drilled with rotary drilling rigs showed that the sandstones are made up of coarse quartz sand of varying degrees of roundness showing some frosted surfaces. It is likely that the quartz pebbles usually seen in outcrop are broken up in drilling, as only fragments were found in the samples. The sandstone in general is poorly cemented, as indicated by the fact that samples of drill cuttings often consist of individual grains of sand, not fragments of sandstone. Shale beds are variable in thickness and extent, making up 30 to 60 percent of the formation, and at some places forming a well-defined unit between the two main bodies of sandstone. In this unit, a few thin coal seams and some scattered beds of limestone usually occur.

The thickness of the Caseyville sandstone as interpreted from logs in the Henderson area is between 500 and 600 feet. Section *A-A'* on plate 7 shows a gradual thinning of the sandstone to the west, whereas the thickness of the overlying Tradewater formation increases in that direction. Major differences in thickness from well to well should be largely attributed to irregularities on the erosion surface at the base of the Pennsylvanian system.

YIELD

Along the margin of the coal field where the Caseyville sandstone lies near or at the surface, fresh water is obtained from the sandstones. Deeper in the basin, as in the Henderson area, brine is encountered and no use is made of it locally. However, brine derived from this formation is used in secondary oil recovery at Uniontown, 20 miles west of Henderson. The brine is obtained from sandstone 90 feet thick at a depth of 1,350 to 1,440 feet. The static water level stands 30 feet below the surface, and the pumping level is at 550 feet when the well is pumped at a steady rate of 50 gpm. This indicates a drawdown of 520 feet and a specific capacity of 0.1 gpm per foot of drawdown. A chemical analysis of the water is given in the section below.

CHEMICAL CHARACTER OF WATER

The following analysis furnished by the Sun Oil Co. and made by Bradford Laboratories, Evansville, Ind., describes brine obtained from the Caseyville sandstone at the water-flood supply well near Uniontown.

Chemical constituents and physical measurements	*Parts per million*
Silica (SiO_2)	14
Iron (Fe)	16
Manganese (Mn)	.3
Calcium (Ca)	1,360
Magnesium (Mg)	60

Chemical constituents and physical measurements—Continued	*Parts per million*
Alkalinity to phenolphthalein solution	0
Alkalinity as $CaCO_3$ to methyl orange	144
Sulfate (SO_4)	2,740
Chloride (Cl)	15,400
Soap hardness	3,650
pH	7.4
Temperature (°F)	76

Analyses of brines from the Powells Lake pool of the Gulf Refining Co., 6 miles north of Uniontown, show an average content of 15,700 ppm of chloride for 3 wells sampled. In the same pool, a sample from the Waltersburg sandstone of the upper part of the Chester group shows a chloride content of 32,000 ppm. The analyses indicate an increase in chloride content with increase in depth. Analyses of brines from Mississippian and Pennsylvanian formations are given in a report by McGrain (1953). The resistivity and spontaneous-potential curves of electric logs of wells drilled in the Henderson area indicate that only brine will be obtained from wells reaching the Caseyville sandstone.

TRADEWATER FORMATION

DESCRIPTION

The Tradewater formation was described by Glenn (1912b, p. 27) from exposures in the valley of the Tradewater River in the southwestern part of the Western Coal Field. At its type locality, the formation consists of about 700 feet of shale beds and several sandstones. The base of the formation is set just below the No. 1a coal and the top of the formation is set at the base of the Sebree sandstone of Glenn (1912b). In contrast to the underlying Caseyville sandstone, the Tradewater formation consists largely of shale or sandy shale; and more coal beds, thin limestones, and associated carbonaceous shales are found than in the Caseyville sandstone. The No. 7 (DeKoven) coal near the top of the formation and the Curlew limestone member about 200 feet below the top are very persistent marker beds.

The Tradewater formation includes in ascending order, from oldest to youngest, the following sandstone members: Grindstaff sandstone member, Finnie sandstone member, Aberdeen sandstone member, and Curlew sandstone of Owen (1856). Within short distances the thickness of any of them may range from a featheredge to more than 100 feet. Any of these sandstones may be very shaly in some areas and clean, medium to coarse grained, and permeable elsewhere. Generally, they do not contain pebbles as the Caseyville sandstone does in many places. Small grains or nodules of siderite or other iron-bearing mineral are abundant in most of the sandstones.

As the geologic sections on plate 7 show, the Tradewater formation lies at a depth of 480 feet beneath the surface in the eastern part of the quadrangle and about 600 feet in the western part. The thickness increases from 410 feet in the east to 550 feet in the west. In the Henderson area the most widespread and easily recognized member of the formation is the Curlew sandstone of Owen (1856) lying about 100 to 125 feet below the top of the formation. It reaches its greatest thickness west of Henderson in the vicinity of the Henderson pool, where it is more than 100 feet thick and consists of fine to coarse poorly cemented white quartz sandstone containing abundant white mica. This sandstone apparently represents a channel deposit, as do so many of the Pennsylvanian sandstones, probably locally unconformable on the underlying beds.

YIELD

The sandstone beds in the formation will probably yield small amounts of salty water in the Henderson area. A well 17 miles east of Henderson produces salty water from the Curlew sandstone of Owen at a steady pumping rate of 13 gpm with a drawdown of 59 feet and a specific capacity of 0.2 gpm per foot of drawdown. This water is used for secondary oil recovery.

CHEMICAL CHARACTER OF WATER

It seems likely that drilling anywhere in the Henderson area will encounter only salty water in the Tradewater formation for the following reasons: (1) A number of wells have been drilled in the Henderson quadrangle to depths of 400 feet or more in search of usable water in areas where younger sandstone beds furnish inadequate supplies. Some of these wells reached the sandstones in the lower part of the overlying Carbondale, and others may have reached the Tradewater formation. These wells were plugged after encountering mineralized water. (2) Electric logs of oil tests in the Henderson area indicate salty water in the sandstone of the Tradewater formation. (3) Electric logs of oil tests 16 miles east of Henderson indicate salty water in the vicinity of a water well for which an analysis showing 8,675 ppm of chloride is available. The water is derived from the Curlew sandstone of Owen, which lies at a depth of 245 feet below the surface at this place. The same aquifer lies at a depth of 500 to 690 feet below the surface at Henderson.

CARBONDALE FORMATION

DESCRIPTION

The Carbondale formation was described by Lines (1912) from exposures near Carbondale, Jackson County, in southwestern Illinois. The principal description of the formation in Kentucky is by Glenn (1922) from exposures in the valley of the Tradewater River and the area south of the Rough Creek fault zone in Webster County. The formation consists of shales, sandy shales, sandstones, several thin limestones, and two coal beds of economic importance. In Henderson County the total thickness of the formation is about 375 feet. Locally the following units can be recognized (listed from the top down):

No. 11 coal
Upper sandstone member
No. 10 coal
No. 9 coal
Pleasantview sandstone(?) of Wanless, 1929
Schultztown coal
Sebree sandstone of Glenn, 1912b

The Sebree sandstone of Glenn, 1912b is the basal unit of the formation and rests unconformably on the Tradewater formation. The No. 11 coal marks the top of the formation. Rarely are all the units listed above found in one place, as individually they thicken and thin or, locally, disappear altogether. The cross sections on plate 7 and various logs (p. 203–224) show the thickness and varying nature of the formation and some of its members. Like other Pennsylvanian sandstone beds, these thicken where they occupy channels cut into earlier deposits.

The No. 11 coal is missing in places owing to removal before deposition of the Anvil Rock sandstone member of the overlying Lisman formation. This coal bed, although traceable over certain areas and valuable as a key bed, is not as widespread as the No. 9 coal about 100 feet lower in the section. Figure 9 shows in detail the relation of the No. 9 coal to overlying beds in the Carbondale formation and to the Providence limestone member of the Lisman formation.

A consideration of the environment of deposition and cyclic repetition of the sediments helps in understanding the vertical sequence of the strata, the location of water-bearing sandstone beds, and the areal discontinuity of the strata.

The cycle of deposition or cyclothem has been recognized for a long time. Weller (1930) and Wanless and Weller (1932) among others have discussed and described it. The type of cyclothem found in the Western Coal Field is a sequence of strata beginning with a sandstone deposited on an erosion surface followed by a series of shales, coal, and limestones. Figure 9 illustrates a measured section and an ideal cyclothem showing the relative thicknesses of strata deposited under marine and continental conditions and the place of each rock unit in the cyclothem.

Comparison of the two columns shows that the ideal cyclothem is not customarily found. Units may be omitted or the upper part of the cyclothem may be eroded before the deposition of another sandstone on the irregular erosion surface. For example, figure 11 is a diagram of a channel south of Henderson apparently cut some depth into an earlier cyclothem so that some of the beds of the earlier cyclothem are missing.

The rocks shown in the section of figure 9 are, for the most part, buried in the Henderson quadrangle due to the westward dip from Spottsville, 10 miles east of Henderson, where these rocks are exposed and the section was measured. The two fresh-water-bearing sandstones in the Henderson area, the upper sandstone member of the Carbondale formation and the Anvil Rock sandstone member of the Lisman formation, are shown in this section.

Even though a particular cyclothem is not complete, the sequence of beds in it may be so distinctive that is can be traced in the outcrop area and from study of electric logs and sample cuttings in areas where the beds are buried. Thus, the cyclothem can be very useful in helping to determine when a sandstone aquifer may be expected.

The Sebree sandstone was named by Glenn (1922) from exposures at Sebree, Webster County, Ky. In the Henderson area, the member occurs at a depth of 400 to 550 feet below the surface and consists of about 50 feet of sandstone that may be somewhat shaly. The sandstone is made up of small to medium-sized grains of quartz, carbonized remains of plant fragments, and small nodules of iron carbonate. Clean gray sandstone is less common than the iron-bearing type. The Sebree sandstone of Glenn apparently does not yield fresh water in the Henderson area.

A recognizable sandstone is found in this area above the Schultztown coal and is regarded as the Pleasantview sandstone of Wanless. Wanless (1929) described this sandstone lying above the Colchester (No. 2) coal of Illinois, which he regards as the equivalent of the Schultztown coal of Kentucky. It occurs at a depth of

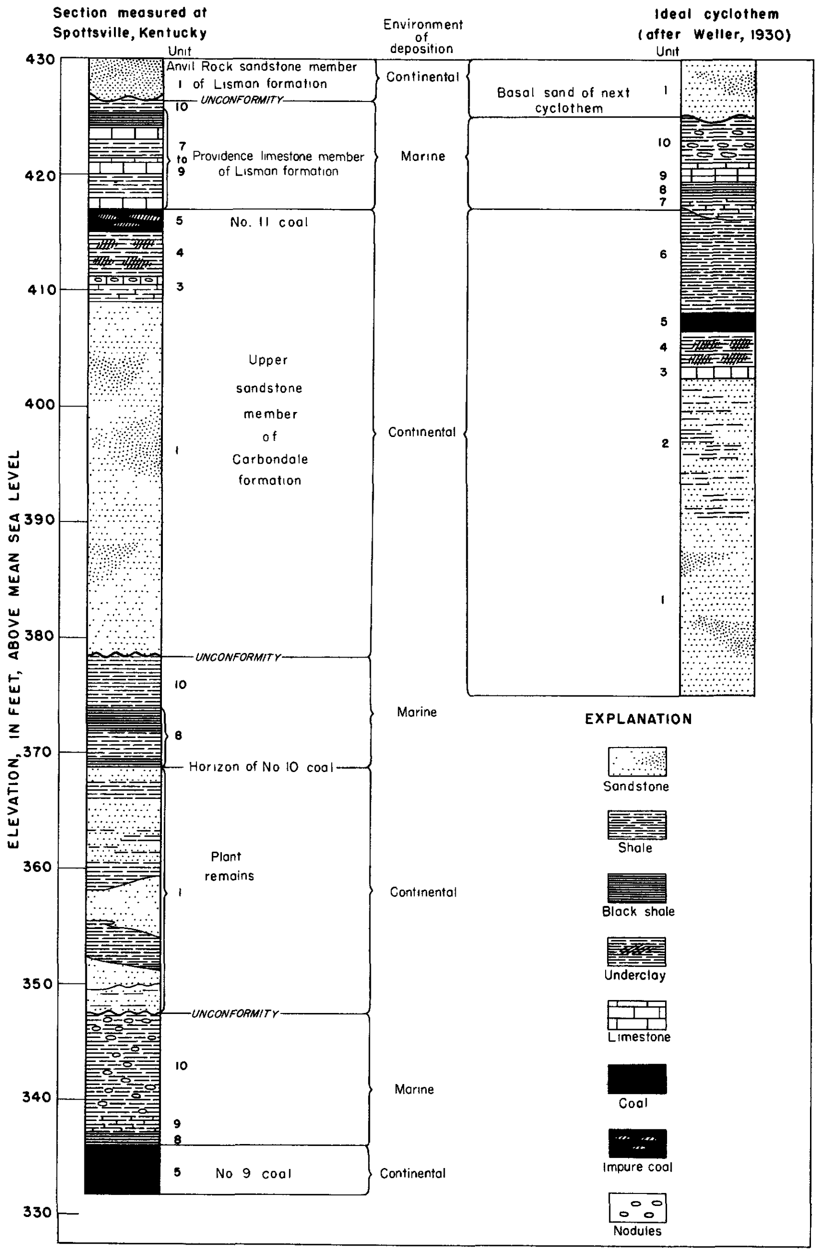

Figure 9.—Section showing cyclic deposition of Pennsylvanian strata in the Henderson area, Kentucky, compared with an ideal cyclothem.

300 to 400 feet in the area and is erratic in its development as to both thickness and character. Over much of the quadrangle it is very shaly and the sandstone phase usually attains a thickness of 10 to 15 feet at most. However, east of the city of Henderson, in a zone about 1 to 2 miles wide, the sandstone reaches a thickness close to 100 feet and can be traced east beyond the Green River. This unit is usually not all sandstone but ordinarily consists of alternating lenses of shale and sandstone. The sandstone is white to light gray, fine to medium grained, and generally it is fairly clean and rather loosely cemented where thick but hard and often calcareous where thin. The Pleasantview sandstone of Wanless apparently does not yield fresh water in the Henderson area.

The upper sandstone member occurring above the No. 9 coal is the important fresh-water-bearing sandstone of the Carbondale formation in the Henderson area. It lies below the surface everywhere in the area and is known only from sample studies of well cuttings. A good exposure of the sandstone occurs on the west bank of the Green River near Spottsville, 9 miles east of Henderson. Figure 9 gives the section at this locality measured from the No. 9 coal to the Lisman formation. The prominent sandstone occurring at this locality lies above the thin black shale that is approximately at the horizon of the No. 10 coal. In places the sandstone occupies most of the interval between the No. 9 and No. 11 coals; and in some places it is confined to the interval between the No. 9 and the No. 10 coals.

The sandstone both in outcrop and in well samples is light colored and of fine to medium grain. It contains some flakes of mica but otherwise is generally free from impurities. Usually, the upper beds are harder than the lower beds and are well cemented with calcium carbonate. Toward its upper and lower limits the sandstone contains more shaly beds, carbonaceous matter, mica, and pyrite, until it grades into sandy shale.

The contours on plate 8 show the elevation of the top of this sandstone above sea level, and the cross sections on plate 7 show its thickness, depth, and relationship to the other members of the Carbondale formation and the alluvium in the valley. Considering the area as a whole, the sandstone dips westward at about 17 feet to the mile. The many departures from simple westward dip are due to the gentle folding common to all the rocks of the area and also to the marked variations in thickness of the sandstone from place to place.

YIELD

The upper sandstone member of the Carbondale formation is the second most important bedrock aquifer in the area. The scant information available on yields from sandstones of the Carbondale formation below the No. 9 coal indicates that only small supplies of highly mineralized water will be encountered in deeper drilling in the Henderson area.

The contour map on plate 8 gives approximate boundaries between areas where supplies of water adequate for rural domestic use have been obtained, and areas where inadequate supplies occur. The boundary is drawn on the assumption that under normal use a supply of 1 gpm or more, or 60 gallons per hour, is considered adequate for rural domestic use.

The pattern formed by the areas of good and poor yields faintly resembles a stream pattern, and in the areas of good yields the sandstone is not as shaly as it is in the areas of poor yield. This indicates more washing of the sand as it was being deposited, and therefore a cleaner, more pervious deposit. From sample studies and interpretation of electric logs, it is clear that areas of adequate yields are usually located where 20 to 60 feet of sandstone exists. Wells of adequate yield invariably penetrate sandstone that has not previously been made impervious through the deposition of calcium carbonate. It has been found also that in many places where a bed of limestone, whether the Providence limestone member of the lower part of the Lisman formation or a stray limestone, overlies the sandstone the aquifer is a poor producer, and well cuttings of the sandstone contain considerable calcium carbonate. Thus, the thickness, calcium carbonate cement, and amount of clay and silt mixed with the sand are all important factors controlling the availability of water and yields of wells.

Wells in the suburban area northeast of Henderson yield 5 to 20 gpm, depending partly on whether the sandstone is totally penetrated. The sandstone in this area is about 60 to 90 feet thick. Many of the wells yielding only about 5 gpm are 80 to 100 feet deep, penetrating 25 to 30 feet of sandstone. The limestone is either missing in this area, or, where present, very thin. Beyond the suburban area, in the vicinity of the Audubon State Park, yields are much smaller, probably not exceeding one-half gpm. Along U. S. Highway 60 in the hilly area east of Henderson, wells 175 to 234 feet deep penetrate 55 to 70 feet of sandstone, the total thickness there, and the wells yield 4 to 10 gpm with intermittent use. In the area south of U. S. Highway 60 extending through the Graham Hills to Anthoston, the sandstone is 30 to 65 feet thick and calcareous, and the yields are usually greater than 1 gpm but less than 5 gpm. Well 8730–3745–18, located 3 miles southeast of Henderson on the Airline Road, is 118 feet deep, and the reported yield in a 30-minute bailing test was 54 gpm, considerably greater than any other reported yields from sandstone aquifers in the area.

West of Henderson along the river downstream from the mouth of Canoe Creek, a number of wells penetrating 30 to 50 feet of sandstone yield up to 10 gpm. Southwest of Henderson along U. S. Highway 41, near the southern boundary of the quadrangle, a few wells drilled into this aquifer yield up to 10 gpm from 33 to 49 feet of sandstone. One mile west of Geneva on Kentucky Highway 136, the yield of well 8740–3745–59 is reported to be 2 gpm, partly from sandy shale of this formation. As a whole, information on yields is scantier in the western and southern parts of the area than in the northeastern part because in the western and southern parts most wells obtain water from the overlying sandstone of the Lisman formation.

The best area for prospecting largely undeveloped supplies of water from the upper sandstone member of the Carbondale extends in a northwesterly direction through the south-central rectangle (shown on plate 8) to the Ohio River, where the aquifer ranges from 75 to 100 feet thick. Most of the wells in this area are less than 100 feet deep, but fresh-water-bearing sandstones will be encountered to a depth of 200 feet in the southern part and 250 feet in the northern part.

Areas where the possibilities are poor for obtaining an adequate water supply are also shown on plate 8. These are areas where shale and sandy shale take the place of sandstone, or the sandstone is very calcareous. Many wells have been drilled in the poor areas east and northeast of Henderson through the sandstone and sandy shale to the No. 9 coal or below. These wells have been unsuccessful, obtaining yields of less than one-half gpm usually from sandy shale or calcareous sandstone. The yield of well 8730–3750–29, although small, has been made adequate by installation of a deep-well cylinder pump operating for short periods of time through a 24-hour period. The pump discharge goes to a large storage tank, and a second pump fills a pressure tank that supplies the house. Probably other wells of small yield could be equipped in like manner.

RECHARGE AND DISCHARGE

Near the Ohio River the sandstone probably receives some recharge during the winter from the river through the alluvial deposits of the valley. It is known from drilling that the sandstone is, in places, in contact with the sand and gravel. Except near the river, recharge to the sandstone probably occurs mainly at the zone of outcrop to the east of the Henderson quadrangle.

The contour map of the piezometric surface on plate 9 shows a gradient from the southeast to the northwest and the Ohio River. The Ohio River influences the piezometric surface and its slope because a hydraulic connection exists between the river and the sandstone. The low area southeast of Henderson is probably due to pumping from this aquifer, which in many places is shaly or calcareous, so that wells have a low yield and a large drawdown.

The effect of pumping from an artesian aquifer of such low yield would be noticed at considerable distances from pumped wells. Because many of them are located throughout the area of depressed water levels, it is likely that static water levels in much of the area are low. The ground-water mound along the river is due to infiltration from the river during many previous flood seasons. The contours indicate flow into the low area from both the ground-water mound and the outcrop area.

The fluctuations of water levels in selected wells penetrating this sandstone are shown graphically on plate 13 and provide evidence of recharge from at least the two sources named above. Wells 8730–3750–142 and 143 (pl. 13), 0.2 to 0.3 mile from the river, show an average seasonal fluctuation of about 10 feet between the fall low and the spring high. Well 8730–3750–38 (pl. 13) is about 0.85 mile from the river and shows an average seasonal fluctuation of 6.5 feet. The seasonal fluctuations of the 2 wells closer to the river correlate with the hydrograph of a driven well 8730–3750–209 (pl. 13) in alluvium. This well, located about 600 feet from well 8730–3750–142, shows a seasonal variation of about 12 feet. This correlation and the difference in amplitude between well 8730–3750–38 and the other three probably indicate recharge from the river through the sand and gravel into the underlying sandstone. The recharge wave is dampened in well 8730–3750–38 because of its greater distance from the river.

Well 8730–3750–142 (pl. 13) is about centrally located in the area of domestic pumping, and owing to increased use of water in the summer months the water level in the fall may be a little lower than if natural discharge alone affected the well. However, because only domestic use is involved, the effect of additional

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summer pumping is small. Well 8730–3750–143 (pl. 13), located on the edge of the pumped areas, has about 1 foot more change in the seasonal cycle than well 8730–3750–142. It will be shown in the following section that the chemical character of the water in the wells in alluvium and the wells in bedrock close to the river is similar in many respects.

Recharge to wells farther from the river comes in large part from the outcrop area, which is east of the quadrangle in the Green River bluffs. On the Spottsville dome and in the structurally high area in the Zion pool about 8 to 10 miles east of Henderson, the sandstone lies beneath the loess and recharge is from precipitation. The hydrograph of well 8730–3745–1 (pl. 13) shows only 1.5 feet change from the low in the fall of 1949 to the high in the spring of 1950. The permeability of the sandstone is very low in the eastern part of the quadrangle, and beyond it at least as far as the Green River. It is probable that recharge from the outcrop area to the Henderson area is much smaller than recharge from the Ohio River.

CHEMICAL CHARACTER OF WATER

Water in the Carbondale formation is more highly mineralized than that in the younger rocks in the area. The upper sandstone member of the formation contains water that is mineralized but usable, its character depending to some extent on the distance to the source of recharge, whereas the deeper sandstones in the formation contain only highly mineralized water unfit for domestic consumption.

It is presumed that the Sebree sandstone of Glenn and Pleasantview sandstone of Wanless in the lower part of the Carbondale formation will furnish only highly mineralized water. Wells, 8730–3750–243, 8730–3745–48A, and a well about 4 miles east of Henderson on the J. C. Ellis farm on U. S. Highway 60, drilled to depths of 320 to 400 feet to penetrate the Pleasantview sandstone of Wanless encountered water of poor quality and were abandoned. Ten miles east of Henderson at Spottsville on the Green River, salty water was encountered in the Pleasantview sandstone of Wanless at a depth of 210 feet, considerably updip and closer to the outcrop area than the wells in the Henderson quadrangle. Electric logs indicate brackish water in these lower sandstones.

Water in the upper sandstone member, used widely in the area, is of two types: the soft sodium bicarbonate water in which the hardness is less than 60 ppm but the dissolved-solids content may be very large, and hard water in which the hardness is greater than 200 ppm but the dissolved-solids content is not as large as in the first type. All the wells but one, 8740—3745—59, in the first group are located northeast to southeast of Henderson. Some of the wells in the second group are near the river where a mixture with water from the alluvium occurs. The rest are due south of Henderson.

A comparison of water from the Carbondale formation with water from the younger aquifers is given in table 5, which shows that the main differences are in the bicarbonate, chloride, and fluoride contents which are generally higher in the Carbondale formation.

The lateral variation in the mineral content of the water is shown in figure 10 which includes 5 wells penetrating this aquifer in the area extending southeast from the Ohio River. The graphs show an increase in the sodium and bicarbonate contents of the water from the outcrop area east of the quadrangle toward the northwest. A maximum concentration of the two constituents was observed in the area about 2 miles east of Henderson in the vicinity of well 8730—3750—188, and a gradual decrease occurs from this area to the Ohio River. An increase in the hardness of the water occurs from well 8730—3750—193 to the river and from well 8730—3750—188 eastward to the outcrop area as indicated by the increase in calcium and magnesium contents.

The average sulfate content in 10 wells producing sodium bicarbonate water is 10 ppm. An analysis of untreated water from the Ohio River shows 63 ppm of sulfate (table 5, p. 38). Water from well 8730—3750—66, at the edge of the Ohio River, contains 45 ppm of sulfate, whereas well 8730—3750—73 shows only 10 ppm. The analyses of the water in wells 8730—3750—66 and 73 more nearly conform with the analyses of water derived from the alluvium than with analyses from the other 3 wells. It seems likely that water pumped from wells drilled into the sandstone in the terrace north of Henderson is a mixture of hard water from the alluvium and the sodium bicarbonate water from the sandstone as found in wells to the east.

The fluoride content in a few samples is above the recommended upper limit, 1.5 ppm (U. S. Pub. Health Service, 1946). This is in contrast to the fluoride content of the other aquifers in the area, which show in all cases less than 1 ppm. Of 23 analyses for this formation for which the fluoride content is available, 10 contain less than 1 ppm, 4 between 1 and 1.5 ppm, and 9 over 1.5 ppm. The 3 wells containing the largest amount lie on a north-south line through the Graham Hills 2 miles east of Henderson.

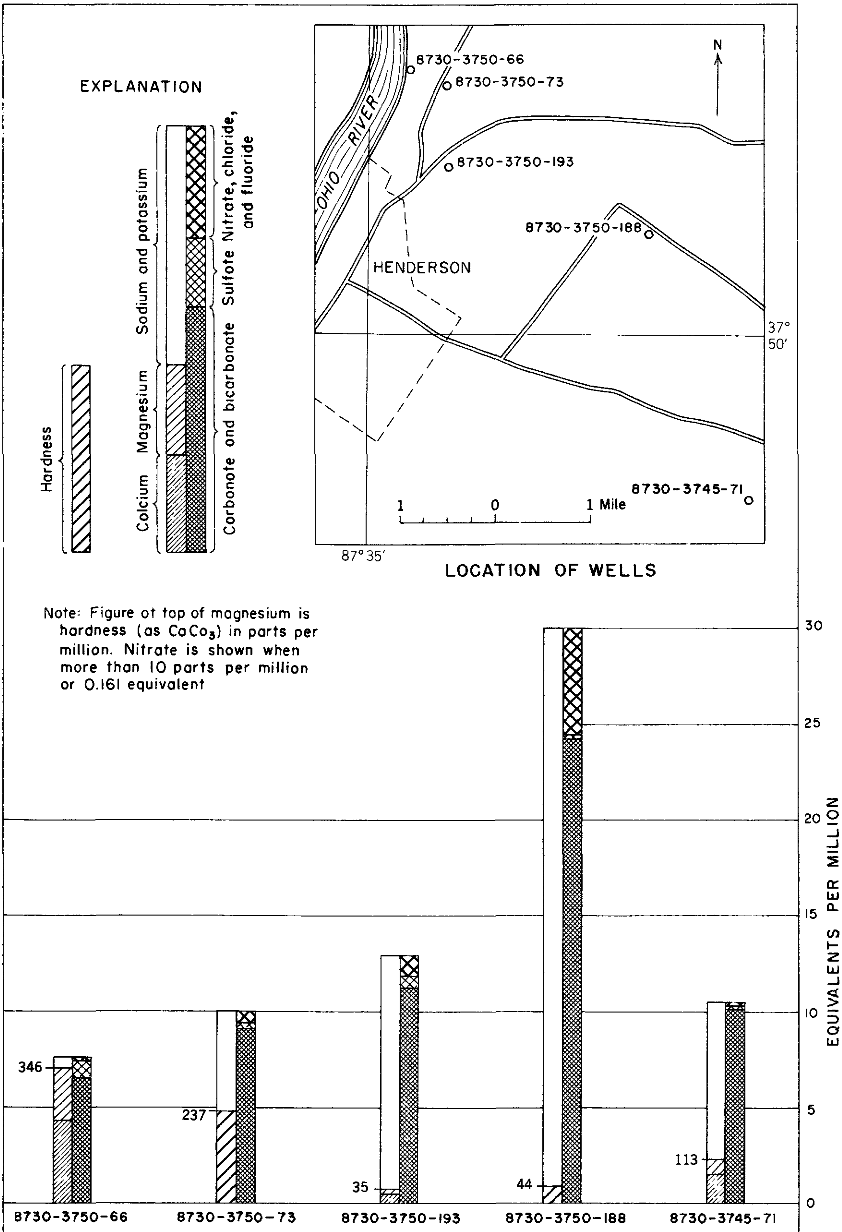

Figure 10.—Diagrams showing lateral variation in chemical quality of water in the upper sandstone member of the Carbondale formation.

The increased mineralization of the water along this line indicates the possibility of salt-water contamination from a deeper source. The section shown in figure 10 crosses the line of wells described in the table below. The following table shows the chemical characteristics of the 3 wells compared with median values of those characteristics for all the wells penetrating this aquifer.

Table 8.—*Comparison of the chemical quality of mineralized water and normal water from the upper sandstone member of the Carbondale formation in the Henderson area, Kentucky*

Depth of well: r, reported.

[Dissolved constituents given in parts per million]

Well no.	Depth of well (feet)	Bicarbonate (HCO_3)	Chloride (Cl)	Fluoride (F)	Hardness as $CaCO_3$
		Mineralized water			
8730-3745-14	r105	1,320	308	6.4	29
66	r220	1,330	181	4.6	8
8730-3750-188	r210	1,410	198	4.2	44
		Normal water			
Median values, 21 wells	153	618	20	0.6	193

The iron content in the sodium bicarbonate water is moderately low, ranging from 0.15 to 0.69 ppm, with one exception. The water from well 8740–3745–59, which obtains part of its water from a coal seam, contained 2.2 ppm of iron. The iron content in the hard-water group ranges from 0.33 to 5.3 ppm.

The chloride content is usually below 100 ppm, although it ranges as high as 830 ppm, increasing in a general way downdip to the west. The area southeast of Henderson where the fluoride content of the water is high is also notably high in chloride (table 8). Of 28 analyses from wells which probably obtain most of their water from this aquifer, only 3 contained more than 250 ppm, the allowable upper limit for drinking water recommended by the U. S. Public Health Service.

The nitrate content is usually very small, in practically every case less than 10 ppm. In a few wells where the content exceeds 10 ppm, it is probable that water is also being derived from a shallower source than the Carbondale.

LISMAN FORMATION

DESCRIPTION

The principal description of the Lisman formation in Kentucky is by Glenn (1912b) from exposures in Webster County, Ky. The formation is named for Lisman, a small town in that county. According to Glenn, the formation, where its whole thickness is present in Webster County, consists of 900 to 1,000 feet of shale including some sandy shale, sandstone, and several beds of limestone and coal.

In the Henderson area only the lower third of the formation is recognized. It consists of the members listed below (from the top down) which are present and normally separated from each other by shales and sandy shales:

Madisonville limestone member
Anvil Rock sandstone member
No. 12 coal
Providence limestone member

The base of the formation is hereby designated as at the top of the No. 11 coal underlying the Providence limestone. It had formerly been placed by Glenn (1922) at the base of the Anvil Rock sandstone member. In some localities the Anvil Rock sandstone member may form the base where the No. 12 coal and Providence limestone member have been eroded.

The Lisman formation is present in the upland area east and south of Henderson, although it is not preserved in its entirety. In the flood plains north of Henderson and in the flat area at the junction of Canoe Creek and the Ohio River, little or none of the Lisman formation remains. More of the formation is preserved toward the west, owing to the westward dip which carries the beds to greater depth beneath the surface.

The youngest member of the Lisman formation recognized in the Henderson area is the Madisonville limestone member, seen only in the bluffs along the river. Scattered outcrops of sandstone, sandy shale, and shale are found in the banks of creeks rising in the bluffs along the river and in the newer road cuts south of the city. Otherwise, the formation is almost entirely covered by alluvium and loess, so that additional data on the formation must be obtained from logs of drill holes or exposures outside the Henderson quadrangle.

The thickness of the Lisman formation in the eastern part of the area, from its base to the top of the Madisonville limestone member, is about 255 feet. In the western end of the quadrangle where the Madisonville is exposed in the hill slope just above the flood plain, about 30 to 40 feet of sandy shale overlies the Madisonville so that a maximum thickness of about 300 feet of the Lisman is indicated in the Henderson area. The formation is absent in some parts of the flood plain and the valley of Canoe Creek where it was eroded by the Ohio River.

PROVIDENCE LIMESTONE MEMBER

The Providence limestone member is the basal member of the formation. It is underlain by the No. 11 coal and overlain by shale, the No. 12 coal, or, in places, the Anvil Rock sandstone member. It was named by Glenn (1922) from exposures at Providence, Webster County, Ky. Although it is not everywhere present in the Henderson area, it is widely distributed and ranges in thickness from a featheredge to 10 feet. The limestone consists of gray fossiliferous strata that vary from massive and compact to thin and shaly. In the uplands the limestone is usually preserved, whereas it is generally eroded away in the filled valleys.

ANVIL ROCK SANDSTONE MEMBER

The most important bedrock aquifer in the area is the Anvil Rock sandstone member, which as an aquifer may include some younger beds of sandstone not included with this member at its type section. The sandstone is usually overlain by shale of the Lisman formation and underlain by the No. 12 coal, shale, or the Providence limestone member.

The sandstone was first described by Owen in 1856 at its type locality at a bluff known as the Anvil Rock, 3 miles southwest of Henshaw near the Ohio River in Union County, Ky. The name is derived from the resemblance of two masses of the rock to a large anvil. Its thickness as given by Owen in his measured section is 31 feet. In outcrop it consists of brown to red crossbedded sandstone of medium to coarse grain. Weathering has produced a honeycombed surface with laminae and rings of iron oxide standing out in relief.

In the Henderson quadrangle the sandstone is generally in the upland area of the east, south, and west. Plate 10 is a map with contours drawn on top of the sandstone. Elevations are referred to mean sea level. The Anvil Rock sandstone member is undoubtedly present in some places in the upland where it is not contoured, but it is generally shaly and of low permeability in those places.

The regional westward dip of the strata carries the sandstone from the surface in the southeastern part to 100 to 150 feet below the surface in the west. The aquifer, although thin, is preserved in its entirety in the western part of the area. Upwarping in the south-central rectangle brings the sandstone close to the surface, so that it is scarcely 20 feet deep in the upland areas.

In the Ohio River valley and along the tributary creeks little or none of the sandstone remains. In the suburban area northeast of Henderson the strata encountered beneath the alluvium at a depth of 70 to 80 feet may possibly be the Anvil Rock sandstone member, but the sandy strata from 80 to 170 feet depth should be referred to the upper sandstone member of the Carbondale formation. The Providence limestone member, usually separating the two sandstones, is absent in some wells drilled in that area, although thin laminae of coal in the sandstone may mark the horizon of the No. 11 or No. 12 coal.

The sandstone is generally absent through the city of Henderson to the village of Geneva west of Henderson. The strata dip rapidly west of the Wilson pool. (See fig. 5 and pls. 8 and 10.) The sandstone penetrated beneath the alluvium immediately east of Geneva is the upper sandstone member of the Carbondale formation. The sandstone penetrated in the vicinity of Geneva is the lower part of the Anvil Rock sandstone member, and the 4-foot coal lying beneath the sandstone is probably the No. 11 or No. 12 coal.

The Anvil Rock is usually less than 50 feet thick but in places is as much as 75 feet thick. The sandstone thins to a featheredge and disappears altogether in very short distances. There are two main reasons for these rapid variations in thickness. First, the Anvil Rock sandstone member was deposited on an irregular erosion surface where deltas were forming, in stream channels, and perhaps, according to Glenn (1922), as offshore bars. Figure 11 is a diagram of channel sandstones in the south-central rectangle of the Henderson quadrangle. The channel extends northward beyond the quadrangle. The sandstone is 75 feet thick in the channel and 10 to 40 feet thick on the margins. Second, cutting of the present stream valleys during the Pleistocene epoch also accounts for variations in thickness, so that in the upland as much as 50 feet of sandstone may by present, and in the adjacent stream valley 5 to 10 feet of sandstone may be all that remains.

The materials deposited at the time the Anvil Rock was formed consisted of sand, silt, and clay. The sand was deposited in the channels with some silt and clay, while silt and clay were being deposited primarily along the margins. Thus, the Anvil Rock

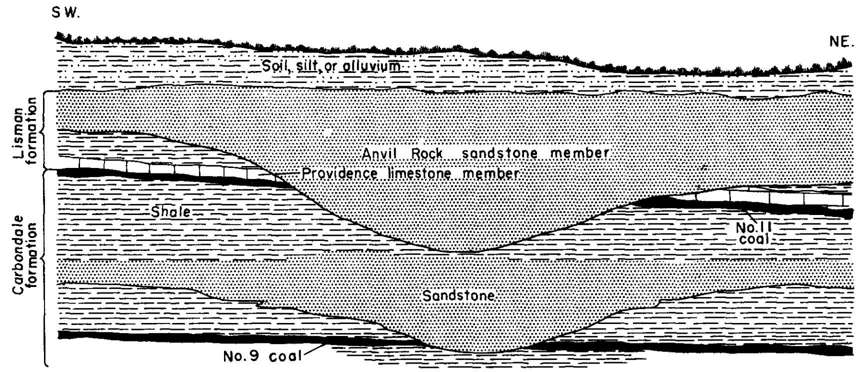

Figure 11. —Diagram of channel sandstones southwest of Henderson, Ky.

sandstone member may be massive or consist of lenses of sandstone and shale.

Massive exposures of sandstone, such as those occurring at the Rock House on the Green River 12 miles southeast of Henderson, are unknown in the Henderson quadrangle. The few exposures of shaly sandstone occurring in road cuts southeast of Henderson are thin bedded, consisting of poorly sorted sand having variable fine- to coarse-grained texture. Red and brown colors predominate, owing to the high content of iron oxide. Mica is abundant. The weathered sandstone imparts a deep red color to the soil, which contrasts with the light-brown hue of the overlying loess.

Well cuttings of the sandstone consist of yellow iron-stained poorly cemented sand of medium to coarse grain. Granules of white vein quartz are usually found through the entire sequence. Fragments of iron oxide concretions are abundant in some layers, and small spherical concretions are found in others. The iron content, present as limonite and hematite, is a variable constituent and is not always confined to the upper layers. A cleaner and much lighter colored sandstone is often found beneath the yellow or brown weathered strata before the coal and limestone sequence beneath is reached.

The shaly phases of the Anvil Rock contain thin laminae of coal and a few beds of limestone or calcareous shale. The sandstone is usually interbedded with shale, and individual beds of sandstone may range in thickness from 2 or 3 feet to 20 feet.

Several criteria useful in distinguishing the Anvil Rock sandstone member from the upper sandstone member of the Carbondale formation in well cuttings are the following:

1. The Anvil Rock sandstone member has a much coarser texture.
2. Red, yellow, and brown colors predominate in the Anvil Rock member in both fresh and weathered exposures and in well cuttings, whereas white to gray and light-tan colors predominate in the lower aquifer.
3. Iron cement is more abundant in the Anvil Rock sandstone member, whereas calcareous cement is abundant in the lower sandstone.
4. Well cuttings consist of individual grains in the Anvil Rock sandstone member, but aggregates of grains are the predominant type of cutting obtained from the lower sandstone.

MADISONVILLE LIMESTONE MEMBER

The Madisonville limestone member is the youngest consolidated rock exposed in the area and can be seen only on top of the higher hills in the eastern part of the quadrangle and near the foot of a ridge adjacent to the flood plain in the western part. About 4 feet of limestone is exposed in the east. At Rock Springs, west of Geneva, 2 beds of limestone with a total thickness of 15 feet are exposed. The limestone is gray, massive to shaly, and fossiliferous. The limestone is separated into upper and lower beds by 10 feet of shale and sandstone. It is presumed that the Madisonville limestone member was formerly present in much of the quadrangle; however, it has been removed by erosion in most of the area.

YIELD

PROVIDENCE LIMESTONE MEMBER

It is probable that in the extreme eastern part of the quadrangle where the Providence limestone member lies near the surface and is subject to solution, shallow dug wells may encounter an adequate supply of water in joints or bedding-plane openings. In general, however, if water is not obtained in the Anvil Rock sandstone member, it is necessary to go deeper to the sandstone in the Carbondale formation below. The wall of the shaft of the Wolf Hills Coal Co. (8730–3750–232) contains 5 feet of limestone, presumably the Providence, showing little or no solution effects along joints or bedding planes. Little water occurred in any of the strata penetrated in sinking the shaft.

ANVIL ROCK SANDSTONE MEMBER

The Anvil Rock sandstone member is the most widely developed aquifer in the rural areas. A boundary has been drawn on plate 10 separating poor areas from areas where larger domestic supplies are usually obtained. Supplies of 1 gpm or more are considered adequate for domestic use.

Although sufficient water is obtained from this aquifer, the water in some instances has been cased off. Where the sandstone is close to the surface, the upper part of the aquifer is thoroughly weathered so that the sand is poorly cemented, causing it to cave. However, because of the coarse texture of the sandstone, a screen or sand point can be set in the lower part of the aquifer, and the surface casing removed from the well allowing the caving sandstone to close in around the screen. In most cases, the water will stand high enough so that the well can be developed with a suction pump, removing the fine silt and sand and increasing the yield of the well.

Drilled wells yielding water from this aquifer in the favorable areas range in depth from 30 to 70 feet in the southeast and from 80 to 200 feet in the southwest. A summary of quantitative data is given in table 3. The wells for which these data are available are in the southern part of the area. The yields and specific capacities range considerably, depending on the permeability and thickness of the aquifer. The figures in the table serve for comparison of the yields of the aquifer in various localities.

None of the drilled wells penetrating the total thickness of the aquifer are pumped for periods exceeding a few minutes at a time or a total of a few hours in a day. Well owners generally reported adequate yields from wells equipped with electric pumps under such conditions of use. In most cases, yields should exceed 10 gpm with intermittent use but may be less than half that amount with continuous use.

A few wells in the favorable areas shown on plate 10 are deeper than the average well drilled into the Anvil Rock sandstone member, and these wells undoubtedly obtain water from the upper sandstone member of the Carbondale formation. This indicates that localized areas of low yield from the Anvil Rock exist in this southern part.

There are two promising areas for prospecting for additional supplies of water. One area embraces the southwestern part of the southeast rectangle. The area includes Anthoston and extends north to the southwest city limits of Henderson and to within half a mile of the Airline Road. It is bounded on the west in a general way by the Louisville & Nashville Railroad. The second area includes most of the upland in the south-central rectangle. It extends southwest and includes the upland area trending northeast along U. S. Highway 60 to the northern edge of the uplands.

In the area north of the boundary described, wells generally furnish insufficient water from this aquifer. Most of the older shallow wells dug by hand to rock encountered sandstone and obtained a small supply of water. However, these wells either go dry or the water levels fall to low levels in the late summer months. The only drilled well in this part of the area furnishing an adequate supply and equipped with an electric pump is 8730–3750–152, on U. S. Highway 60 about 1 mile northeast of Henderson. However, in the near vicinity of this well other wells are drilled to depths of 150 to 200 feet and obtain an ample supply. Springs in the uplands or near the foot of the uplands probably afford the best opportunity of obtaining an adequate supply at shallow depth.

MADISONVILLE LIMESTONE MEMBER

In the Henderson area are several springs issuing from bedding-plane and joint openings along which some solution has taken place. The maximum flow measured at spring 8730–3750–8, near Audubon Park, was 6 gpm in February 1950. The minimum is less than 0.25 gpm in the summer and fall months. The spring west of Geneva (8740–3745–223) has a maximum winter flow of approximately 10 gpm and a smaller flow during the rest of the year.

RECHARGE AND DISCHARGE

Seasonal changes in water levels are indicative of the amount of recharge to and discharge from the aquifer. During the winter months, a large amount of water is added to storage in the Anvil Rock sandstone member by precipitation both within the quadrangle and outside its boundaries. Water is discharged the year round, but in the growing season the discharge exceeds the recharge, so that an annual cycle is produced. This cyclic variation is shown in the hydrographs on plate 12.

The areas of recharge are indicated on the contour map by high water-level elevations, the discharge areas by low elevations. Water moves from high elevations to low elevations in a direction normal to the contour lines. The high areas conform in a general way to the upland areas, indicating recharge locally in each of the divide areas. Most of the upland area lies in the drainage basin of Canoe Creek and its tributaries. Ground water flows to those creeks and eventually to the valley of the Ohio River. However, in a small area in the southwestern corner of the southwest rectangle ground water flows to Highland Creek, which lies outside the quadrangle and joins the Ohio River downstream from the Henderson area.

Both water-table and artesian conditions exist in the Anvil Rock sandstone member. Conditions found in the aquifer are represented in figure 12, which is adapted from several well logs and

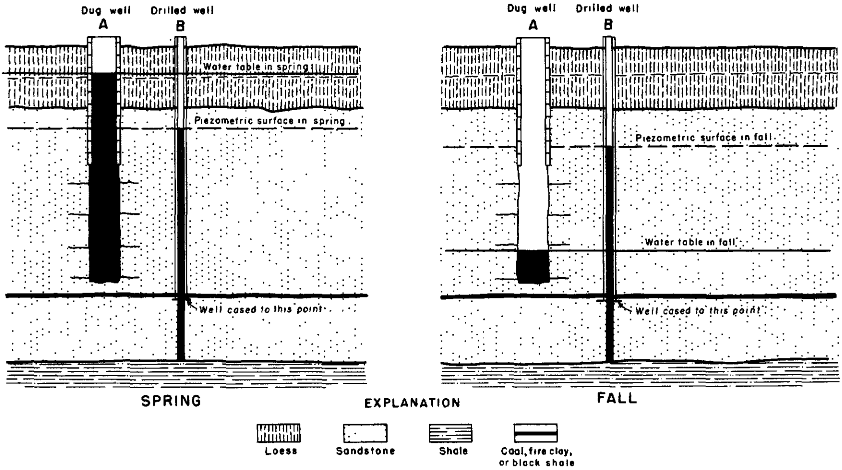

Figure 12. —Diagrams showing seasonal relations of water table and artesian-pressure surface in the Anvil Rock sandstone member.

periodic water-level measurements in many wells. Dug well *A* is representative of wells with brick or stone lining extending through the loess into the upper part of the sandstone, with the bare walls exposed in the remainder of the well. The water level rises and falls with the water table, and this seasonal fluctuation is large. The average fluctuation for 12 wells is 10 feet, with a range from 4.47 feet to 23.73 feet.

Drilled well *B* does not encounter much water until the white sandstone beneath the red sandstone is reached. Usually enough water with which to drill the hole occurs in the red sandstone and apparently water-table conditions exist. When the white sandstone is reached the well quickly fills owing to artesian pressure caused by a thin confining layer, which in some places is a thin coal bed. Where the coal is not present, it is difficult to determine from many logs what the nature of the confining layer may be. It is possible that fluctuation of the water table has leached the sandstone, carrying the oxidized iron downward and forming an impervious layer at the base of the red sandstone. In low-lying areas and on hill slopes the water rises to within 10 feet of the surface, whereas on hilltops the water rises to within 30 to 40 feet of the surface. The average seasonal fluctuation for 30 wells is 4.10 feet, with a range from 1 to 10 feet.

CHEMICAL CHARACTER OF WATER

The Anvil Rock sandstone member usually contains softer water having smaller concentrations of dissolved solids than the water in the other aquifers in the area. Analyses of water from selected wells are listed in table 4, and comparisons are given in table 5.

In the southeast, where wells sampled in and adjacent to the outcrop area range in depth from 48 to 91 feet, the hardness averages 75 ppm. In the south-central area the hardness is in general in the same range, although 2 of the analyses show a considerably higher value. In the southwest rectangle, where wells sampled range from 132 to 200 feet deep, the hardness averages 300 ppm. In general, hardness increases with increasing depth of the aquifer from east to west. The relatively long time during which the water is in contact with the rock minerals in the passage of water from the outcrop area to the discharge area and, to a limited extent, the higher pressure occurring at depth, cause increased mineralization of the water.

The iron content of the water varies from well to well and in many places is high enough to be objectionable. The range is from 0.16 to 6.80 ppm with a median value of 0.6 ppm. That the iron oxide content of the cement in the sandstone is high is borne out by sample studies and examination of outcrops. This is probably a source of part of the iron showing up in the analyses. Another source may be pyrite in the sandstone, which is decomposed by water containing oxygen and carbon dioxide. Pyrite in the thin coal often found above, in, or below the sandstone, especially where the coal is above the water table at times and below at other times, is oxidized, contributing to the total amount present. The rusty water obtained in many of the wells contains a considerable amount of precipitated iron oxide. The water obtained in other wells, which is clear when it is first pumped, also may contain considerable iron in solution. The iron precipitates when the water is exposed to the air.

The chloride content is nowhere objectionable. It ranges from 3.6 to 34 ppm with a median value of 10 for all the wells sampled. To the west a slight increase with depth should be expected, as indicated by the sample containing 22 ppm of chloride from 8740–3745–23, 200 feet deep, in the southwest rectangle. Similarly, the fluoride content is low in most of the wells, increasing to the west but generally not exceeding 0.5 ppm.

The range in nitrate content for 19 wells sampled and analysed by the Survey was from 1.1 to 72 ppm and the median was 15 ppm, in general considerably higher than the nitrate content for the other aquifers. Data were obtained from the Health Center in Henderson on 227 wells sampled in Henderson County. Figure 13 is a diagram showing that a little more than half the wells sampled

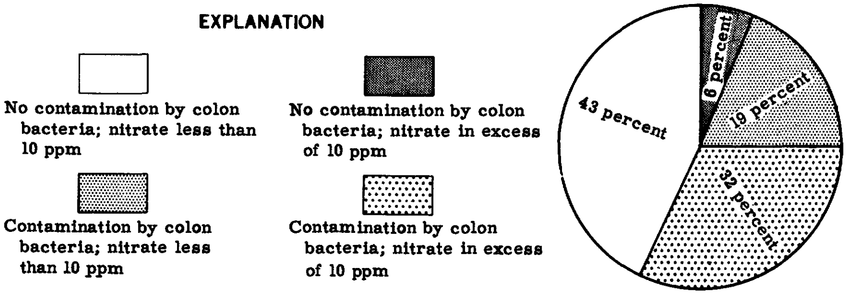

Figure 13.—Diagram showing percentage of wells contaminated with colon bacteria and with nitrate. (Data from 227 analyses by Kentucky State Department of Health.)

were contaminated, and the water in a substantial portion of the contaminated wells also had a high nitrate content. Thus, it seems that there may be a correlation between high nitrate content and pollution. The possibility of pollution should be investigated in places where the nitrate content is above 10 ppm, and if the nitrate content is above 45 ppm it is considered dangerous to use the water for infant feeding because of possible cyanosis (methemoglobinemia or "blue baby").

Rapid recharge to the aquifer in the outcrop area, as shown by the hydrograph of well 8730–3745–162 (pl. 12), enhances the possibility for contamination of the aquifer from surface sources, such as barnyard wastes. The log of well 8730–3745–80 (p. 203), is typical of other wells in which the nitrate content is above 10 ppm. The nitrate content in this well is 18 ppm.

An analysis of water from the spring (8730–3750–8) in the Madisonville limestone member at Audubon Park showed that the water is of the calcium bicarbonate type and has a total hardness of 440 ppm.

PLIOCENE AND PLEISTOCENE GRAVELS

The occurrence of gravel in the hills near the Ohio River has previously been discussed in the section on geologic history. It is not known that any wells in the quadrangle obtain water from beds of gravel hidden beneath the surface in the higher hills.

PLEISTOCENE DEPOSITS

Deposits formed in the Pleistocene epoch consist of unconsolidated materials covering bedrock. Sand and gravel were deposited in the Ohio River valley, while sand, silt, and clay were deposited in the tributary valleys. Loess forms a mantle covering the uplands, and dunes of fine sand lie along the south margin of the valley. The historical sequence of Pleistocene events was summarized in the section on geologic history.

ALLUVIUM

In all the valleys of the Western Coal Field, alluvial deposits were accumulated with the melting of the ice sheet. The source of much of the material lay to the north of Kentucky, but a portion of the material for the deposits was derived from the south. The present streams meander in broad, flat valleys, excavating materials laid down in former times. The alluvial deposits of the Ohio River are the source of the largest available supplies of ground water in the Western Coal Field.

DESCRIPTION

The extent of alluvial deposits in the Henderson area, typical of other areas bordering the Ohio River, is shown on plate 5. Two types of deposits occur in the area: the deposits of coarse material of the Ohio River valley, and the fine-grained deposits of the tributary valleys entering the Ohio River from the south. A mixture of these two types occurs along the margin of the valley. The distribution of the two types is shown on plate 5.

The sand and gravel deposits are thickest in the old channels of the Ohio River, thinning to a featheredge along the margins of the valley and in the tributaries. Contours on bedrock referenced to sea level are drawn on plate 5. Control points for contouring were obtained largely from oil tests drilled on the flood plain, and water wells, coal tests, and bridge borings drilled on the terrace and in the tributary valleys. The accuracy of much of the contouring in the central part of the valley depends on the reliability of oil-test data. The length of casing set through the surface material was not used to interpret the depth to bedrock because in some places casing was set as much as 40 feet into bedrock. These points would give an erroneous picture of the bedrock floor of the valley. Plate 6 presents three cross sections which begin at the valley wall on the south and extend into the flood plain. Section *A-A'* on plate 7 crosses the valley of Canoe Creek west of Henderson, and section *B-B'* ends on the flood plain northeast of Henderson.

The alluvial deposits of the main part of the valley are 115 to 130 feet thick except between old river channels where bedrock is high and the depth of alluvium is 100 feet or less. Such a high area is indicated on plate 5 northwest of Henderson, and probably others exist. In the marginal zone, on the terrace, the depth of alluvium increases from a featheredge at the valley wall to about 100 feet at the riverside edge of the terrace. In Henderson and the suburban area northeast of town the thickness is about 50 feet except at the Louisville & Nashville Railroad bridge, where the valley wall was apparently breached by a small stream and a small buried channel tributary to the Ohio River is located. Bedrock is exposed when the river is at pool stage along much of the waterfront from the city limits at the north almost to Henderson Island on the west. The thickness of deposits in the valley of Canoe Creek and its tributaries decreases from 70 feet where they merge with the marginal deposits of the main valley to nothing in the upper reaches of the tributary valleys.

Surface exposures on the flood plain, in the banks along the Ohio River, and in the banks of the ditches and tributaries indicate in a general way the nature of the materials penetrated at depth. Fine sand and silt of the upper part of the alluvial deposits are exposed on the flood plain, and coarse sand and gravel are exposed in the riverbanks. Bedded clay and silt ranging from light

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brown to dark bluish gray are exposed in the banks of tributary streams and drainage ditches away from the stronger currents of the main part of the valley. These exposures represent a composite section 70 feet thick, not all exposed in one place. If the original elevation reached by the valley fill was 400 feet (Leverett, 1929, p. 61) and bedrock is at about 240 feet in the deepest places, then the total accumulation of alluvial materials was 160 feet. There remains about 90 to 100 feet of alluvium unexposed between river pool stage (337 ft) and bedrock.

The alluvial deposits of the central part of the valley consist of sand and gravel interbedded with lenses of silt and clay. Sample studies of the alluvium obtained from oil tests show that the coarser materials make up more than 50 percent of the alluvium in some places and perhaps as little as 10 percent in others. The sand is predominantly quartz. The gravel consists mainly of chert and lesser amounts of quartz pebbles and fragments of igneous, metamorphic, and sedimentary rocks.

The alluvium of the tributaries is made up of clay, silt, a little fine sand, and in places a small amount of gravel. Colors are generally some shade of gray, but the upper part where oxidized is light to medium brown.

In the marginal zone are found the finer materials deposited by the Ohio River near the valley wall and the silt, clay, and fine sand brought in by the tributaries. Although there is a predominance of fine-grained material, usually a layer 1 to 10 feet thick of coarse sand and fine gravel occurs just above bedrock. The thickness of this layer decreases to nothing toward the valley wall.

YIELD

The three subdivisions of the alluvial area as shown on plate 5 are based on an estimate of the possibilities of developing water in large, medium, or small quantities. Knowledge of the present use of ground water and the probable yields based on geologic data from well logs formed the basis for determining the locations of the boundaries.

Only 7 existing wells in the Henderson area yield 50 gpm or more. Wells 8735–3745–6 and 7 and 8730–3750–125 and 210 are screened wells 65.5 to 110 feet deep yielding 50 to 325 gpm. Wells 8735–3745–8, 9, and 10 are collector-type wells 65 to 74 feet deep. Two of the collectors, 8735–3745–8 and 10, each yield 3,000 to more than 4,000 gpm. At times the yields may fall below these figures or exceed them. Optimum conditions for higher yields exist when the river stage is high and the water is warm—for example, during a late-spring or early-summer flood. Minimum conditions exist when the river is at pool stage and the water temperature is low. The yield of the center collector, 8735–3745–9, is less than that of either of the other two collectors. Although the collectors are equipped with siphons, these siphons are now seldom used to augment with river water the supply obtained from the ground.

The success of units developed near the river, such as the collectors just mentioned, depends on induced infiltration of water through the bed of the river to the well. Normally ground water flows toward the river, the area of ground-water discharge. This condition is shown by the upper position of the piezometric surface in figure 14. In order for water to be produced by induced infil-

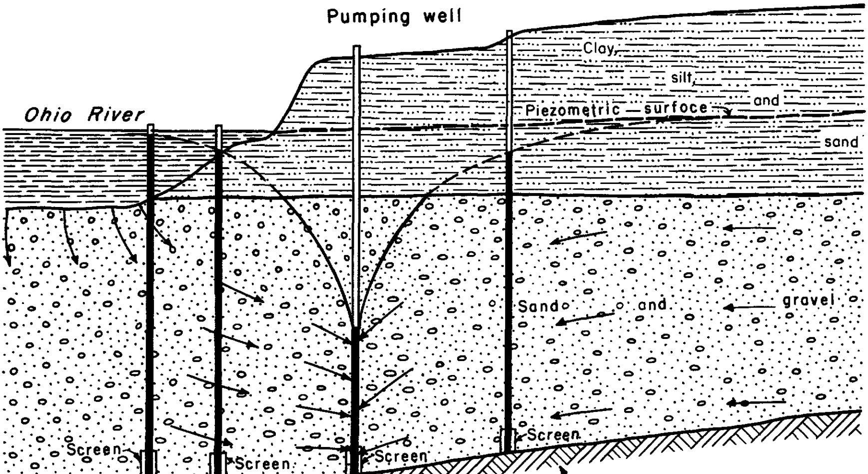

Figure 14.—Diagram showing changes in water level produced by pumping a well in alluvium near the Ohio River.

tration, the direction of ground-water flow must be reversed between the well and the surface source, in this area the Ohio River. The water table continues to slope from the landside to the well, but on the riverside the water table or piezometric surface slopes from the river toward the well. The drawdown due to pumping must be large enough so that the pumping level in the well lies below river level and a depression cone in the piezometric surface is developed and extends to or beyond the edge of the river. Most of the infiltration probably takes place over an area on the bed of the river as shown in figure 14. In order that water will flow from the river to the well a pressure gradient from the river to the well is necessary. This means that water levels in wells screened near the bottom of the aquifer will stand below river level and at greater depths as the pumped well is approached. The steepness of the cone on the riverside of the well depends on the effective distance to the source of recharge.

The rate of infiltration induced by such a well depends on five natural conditions: freedom of connection between the river and the aquifer penetrated by the well; distance to the source of recharge; area of infiltration on the bed of the river; temperature of the surface body of water as it affects the viscosity of water entering the aquifer; and difference in elevation, or head, between the surface body and the ground-water level at the well. These factors affecting river infiltration are treated in detail by Rorabaugh[3] in his discussion of aquifer-testing procedures and (1951) in his analysis of the operating characteristics of a collector-type well at Louisville, Ky.

Although lateral percolation along beds of clean sand or gravel may be rapid, clay layers at depth, such as those exposed in the riverbanks, may prevent the free vertical percolation of water and thus may control the amount of water feeding the well. Adequate testing of the alluvium is necessary to determine for each specific case and each locality what yields can be expected.

In the belt of marginal deposits northeast of Henderson, wells finished with sand points and equipped with $\frac{1}{2}$- to $\frac{3}{4}$-horsepower motor-driven jet or cylinder pumps yield as much as 15 gpm with intermittent use. It is likely that wells near the outer edge of the belt will yield 50 gpm or more, whereas wells near the inner margin will yield less than 15 gpm as the aquifer thins toward the uplands.

The belt of marginal deposits narrows along the river front in Henderson. Moderate to small supplies might be obtained near the river's edge at the extreme northeast end and the extreme southwest end of Henderson. As bedrock can be seen at the river's edge along much of the waterfront when the river is at pool stage (elevation 338 feet), the possibility is remote for developing a water supply from sand and gravel in Henderson.

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[3]Rorabaugh, M. I., 1948, Ground-water resources of the northeastern part of the Louisville area, Kentucky: 77 p., Louisville, Ky., Louisville Water Co. [Mimeo. rept.]

However, an old river channel may extend beneath the city of Henderson, leaving the river north of Henderson and joining the river again somewhere in the valley of Canoe Creek southwest of Henderson. Loess-covered hills mask the true nature of the bedrock surface beneath the city and alluvium may underlie some of the hills near the river. The only evidence for a suspected channel is the reported occurrence of $8\frac{1}{2}$ feet of loose sand and gravel beginning at a depth of 77 feet below the ground surface $1\frac{1}{2}$ miles inland from the river and 1 mile southwest of the Henderson city limits on the Illinois Central Railroad. Although several wells have been drilled in the city of Henderson, logs are available only for wells within 3 blocks of the river. Test drilling would be necessary to determine if such a channel exists.

Little is known concerning yields from the belt of marginal deposits southwest of Henderson. Two wells south of Geneva, 8740–3745–38 and 42, are completed in sand and finished with sand points. All other wells are either cased through the alluvium and completed in the underlying bedrock, or the casing extends nearly to bedrock and is left open in sand and gravel. In well 8740–3745–22, typical of others at Geneva, sand containing some pea gravel lies between depths of 70 and 90 feet. The well was cased to a depth of 92 feet and completed in sandstone. Undoubtedly water can be obtained in this area from a properly screened well finished in the sand and gravel. This area seems to be an excellent one in which to prospect for additional water.

In the third subdivision, the area south of the belt of marginal deposits, information on yields must be obtained from well logs. Although many dug wells ranging from 15 to 40 feet deep obtain part of their supply from the alluvium in the filled valley, the yields are not large. It is not known what proportion of the water is derived from the alluvium, as many of the wells penetrate bedrock. In the valley of Canoe Creek south of U. S. Highway 60, sample studies on several oil tests, such as 8735–3745–201 and 211, showed that a few feet of sand and gravel is present, and small water supplies should be available to properly developed screened wells. However, most of the material found in drilling in these tributary valleys is too fine grained to warrant an expectation of obtaining water supplies over 10 gpm.

It is suggested from well logs that the most likely area to prospect in the tributary valleys extends from the intersection of U. S. Highway 41A and 60 in an east-southeast direction to U. S. Highway 41 where it crosses the Elam ditch.

RECHARGE AND DISCHARGE

Water-level measurements in observation wells penetrating the alluvium indicate that recharge to the alluvium predominates in the winter and spring and discharge predominates through the summer and fall until November. Hydrographs of wells in the alluvium are shown on plate 13. The hydrographs are compared with graphs of rainfall and river stage. Wells 8730–3750–213 and 214 (pl. 13) and 8735–3750–4 (pl. 13) were originally cased into bedrock but the casings have rusted out so that ground water from the overlying alluvium enters the wells. Wells 8730–3750–142 and 143 (pl. 13) are cased into the sandstone beneath the alluvium.

Recharge by rainfall is derived in part by downward percolation of water through the soil of the flood plain, the terrace, and the filled valleys. Such recharge is indicated by analyses from two shallow driven wells, 8740–3750–3 and 4, which yield water having a hardness of 26 and 64 ppm respectively, in contrast to that of water from deeper wells in the alluvium, which reaches 300 ppm. Water is added to the aquifer also by discharge from underlying bedrock aquifers. This is indicated by the slope of the piezometric surface of the Anvil Rock sandstone member, plate 11. The piezometric surface slopes toward the Ohio River so that ground water is discharged into the alluvium before reaching the river, or directly into the river where alluvium is not present below river level.

Recharge to the alluvium from the river occurs in two ways. Flood waters standing on the flood plain and in the sloughs that cross the terrace recharge the alluvium by downward percolation. During long flood seasons, such as those of 1950 and 1951, the recharge is correspondingly greater. This is indicated in a comparison of the amount of recharge in 1950 and 1951 with 1952 for well 8730–3750–209, plate 13.

River infiltration into the alluvium probably occurs along much of the riverfront except where bedrock can be seen along the shore. The rainy season corresponds with the flood season; therefore it is impossible with the available data to determine how much of the rise in the winter season is due to river infiltration and how much is due to rainfall. However, in March 1952 a rise of about 10 feet in well 8735–3750–4 (pl. 13) correlated to the day with a river rise of 28 feet at a time when there was little rainfall in the area. The rise occurred with different time lags in other wells in the alluvium and in the sandstone beneath. Wells near the river show greater seasonal rises and falls, whereas wells farther from the river show less rise and fall. Distant from the river, the relative effect of rainfall is increased and the relative effect of the river is decreased, so that it is difficult to separate the two types of recharge. Time lags between flood crests and water-level crests in wells become greater at greater distances from the river.

The supply of water in the aquifer is replenished when the ground-water level in the land adjacent to the river is lower than the river. The normal flow of water to the river is reversed and water flows from the river into the aquifer. These two conditions were pointed out in the discussion of yield and in figure 14.

Water discharges from the alluvium to the river during the late spring, summer, and fall months. Discharge is represented on the hydrographs by the depletion curves between spring high water levels. Referring to well 8730–3750–209, plate 13, the normal depletion curve for the well may be similar to that portion of the hydrograph extending from April through November 1951. The corresponding portion of the hydrograph in 1950 is not so steep as normal, owing to the high river stages throughout that year. These generally higher river stages resulted in a lower ground-water gradient in the aquifer during much of that period. As a consequence the rate of discharge was lower. Although actual discharge cannot usually be seen, it is nevertheless a continuous natural process as long as water levels beneath the land surface are higher than river level. At places where bedrock is exposed when the river is at or below pool stage (338 feet above sea level) many contact springs issue from the alluvium. A line of small seeps may be found in the riverbanks northeast of Henderson well above bedrock and these probably represent discharge from small bodies of water-bearing sand perched on lenses of clay and silt. These perched beds probably are extremely variable in both extent and thickness. They are not thought important except as they affect the downward-percolating moisture, diverting it to the river before it reaches the main water table.

Both water-table and artesian conditions exist in the alluvium in the Henderson area. In the valley of Canoe Creek, blue clay overlies the water-bearing sand and gravel, and the ground water rises from the depth where it is encountered to about 12 to 20 feet below ground level. (See well 8735–3745–1, p. 130.) A pumping test made on wells 8735–3745–6 and 7 at the Farmers Tankage Co. indicated artesian conditions at that place. Northeast of Henderson, probably semiartesian conditions exist. Driven wells constructed in the summer and fall months strike water that rises only 1 to 2 feet above the point at which it is encountered. The rise is not immediate but occurs overnight. With a 10- to 12-foot rise in ground-water levels during the spring, any silty layer that may be encountered by rising ground-water levels will act as a confining layer, and artesian conditions will exist for a time. Probably, at the mouths of small northward-flowing tributaries such as Canoe Creek, where clay and silt beds are thicker and more widespread, artesian conditions will be more in evidence. In the flood plain proper, water-table conditions probably exist.

CHEMICAL CHARACTER OF WATER

Water produced from the alluvium is usually a hard to very hard calcium bicarbonate water. Water from deep wells is generally harder and more mineralized than water from shallow driven wells. This is due partly to the relatively long time the water has been in contact with the alluvium. Analyses of water from selected wells are given in table 4 and a comparison of the median amounts of the minerals in solution and hardness is given in table 5. Objectionable features of water from the alluvium are the hardness, which often makes water softening desirable, and the high iron content. Locally the nitrate content is excessive.

The hardness of water produced in the flood plain ranges from 26 to 564 ppm and on the average is a little less than that of water produced on the terrace and in the tributary valleys. Shallow wells (32 to 45 feet deep) northwest of Geneva furnish the softest water produced from the alluvium in this area, ranging in hardness from 26 to 64 ppm. Deep wells in the vicinity furnish very hard water having a hardness of as much as 446 ppm. Water pumped from collector 8735–3745–10 has a hardness of 181 ppm and more nearly conforms with river water. As the water produced by a collector depends on river infiltration, the hardness probably fluctuates generally with seasonal changes in the river.

The iron content has a range from 0.17 to 13 ppm. Eleven samples contained less than 1 ppm and 6 contained more than 1 ppm. No correlation with depth or location is apparent except for the 2 wells whose water contained more than 10 ppm (8735–3745–138 and 8740–3745–17). Part of the water obtained from these wells probably originates in the bedrock beneath the alluvium. In both areas where these wells are located the water is generally of poor quality.

The chloride content of the water is very low, with a range from 2.1 to 31 ppm, except for one polluted well that yields water containing 152 ppm. In general, chloride should be of little concern in development of water supplies in this area.

A characteristic of water from the alluvium is the sulfate content, which is generally greater than the amount found in either of the bedrock aquifers. It correlates with the sulfate content of untreated river water. Wells close to the river show a higher content than wells located in the valley of Canoe Creek. The high sulfate content, 273 and 131 ppm, of water from the 2 dug wells (8730–3750–178 and 205) penetrating alluvium to bedrock is unexplained.

A characteristic of water from the alluvium near the river is the rather consistent sulfate content. It correlates with the sulfate content of untreated river water and is greater than the amount found in either of the bedrock aquifers. Wells close to the river show a higher content than wells located in the valley of Canoe Creek. The high sulfate content, 273 and 131 ppm, found in the 2 dug wells (8730–3750–178 and 205) penetrating alluvium to bedrock is unexplained.

Figure 15 gives a comparison of untreated river water and ground water obtained from collector laterals extending parallel to the river and under the river. The graphs show that the water produced by the lateral under the river is very similar in

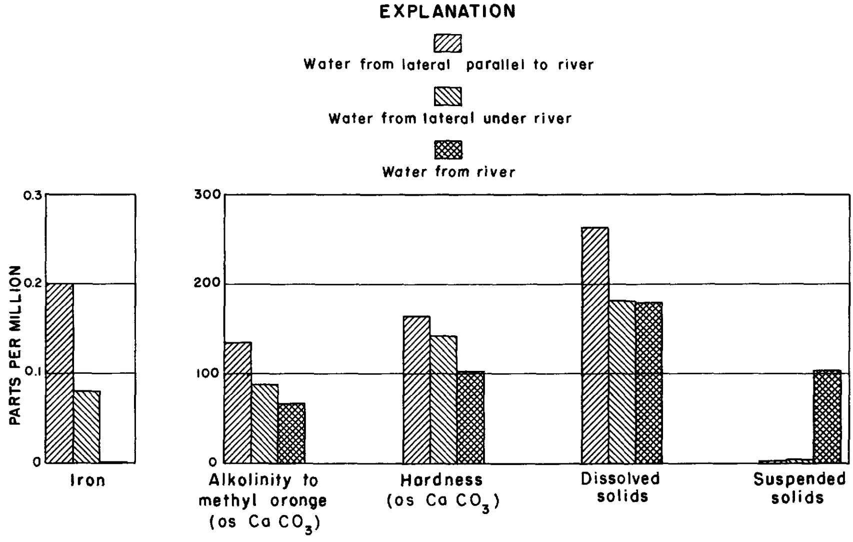

Figure 15.—Graphs comparing the chemical quality of untreated river water with ground water from a collector-type well. (Analyses by R. E. Powell for the Spencer Chemical Co., April 27, 1951.)

dissolved-solids content to the river water and is intermediate in other constituents between river water and water from the parallel lateral. The filtering action of the aquifer is indicated in the small amount of suspended solids in the water produced from the two

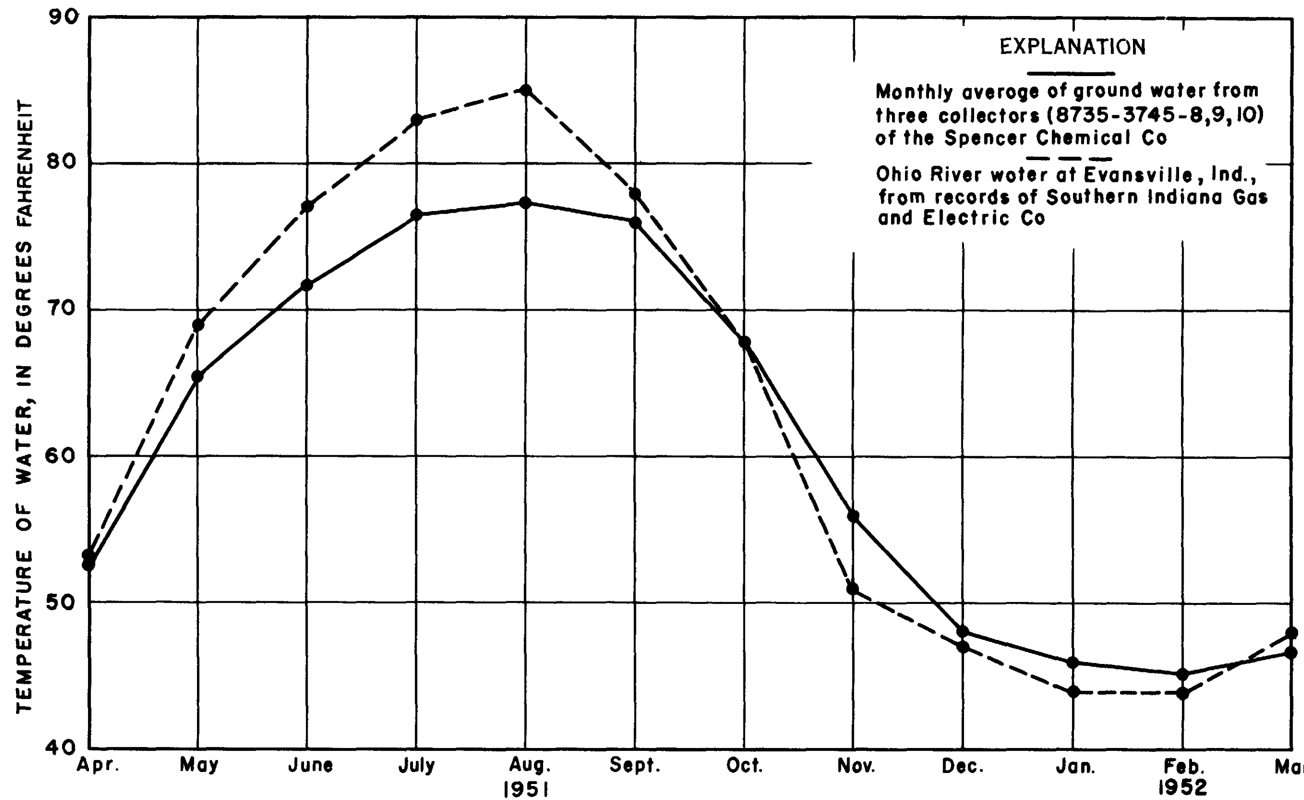

Figure 16.—Graphs comparing temperatures of river and ground water from collector-type well at Spencer Chemical Co. plant. (Temperature of river water from records of Southern Indiana Gas & Electric Co., Evansville, Ind.)

laterals in contrast to the larger amount in the untreated river water.

In wells not directly influenced by river infiltration, the temperature of the water varies little from season to season. The wells in which the temperature has been checked periodically show a range of 2° F, from 56° F to 58° F, with an average closer to 56° F. On the other hand, the temperature of the water produced by the collectors follows the river temperatures but does not reach the maximum and minimum of the river. Temperatures measured by the Spencer Chemical Co. are shown in the graph, figure 16. The graph represents the temperature of the water from the three collectors. At times, the supply to one of the collectors had been supplemented by river water fed directly to the well by means of a siphon. It is probable, however, that the shape of the graph is not materially affected by the water added through the siphon.

UNION FORMATION OF GLENN (1912b)

DESCRIPTION

The Union formation of Glenn (1912b) is an unconsolidated mantle of loess overlying and masking the alluvial deposits and bedrock in the area. The mantle is practically continuous over the entire upland surface, creating rolling hills and generally subdued relief. The thickness ranges from 2 to 3 feet to as much as 50 feet in the bluffs near the Ohio River. Along the Ohio River, the silt and fine sand of which the formation is composed has been heaped into dunes. Typical of these dunes is the hilly area north of Geneva on the flood plain. In road cuts the loess stands with nearly vertical banks because of its homogeneous character.

The loess consists largely of unstratified brown silt composed of small angular grains of quartz, mica, and other minerals. The calcium carbonate content varies from place to place and where the loess was observed in new road cuts calcium carbonate increases with depth. Concretions of iron oxide are abundant in the loess, whereas those of calcium carbonate are less common.

YIELD

A few wells that do not penetrate bedrock have been reported in the hills. They are shallow and furnish only small supplies, and the water levels become very low or wells go dry in the summer. Yields probably will not exceed one-tenth gallon per minute, whereas yields of wells in bedrock will generally exceed this figure.

RECHARGE AND DISCHARGE

Recharge to the loess is from rain and snow in the winter and spring months. Hydrographs of a selected number of dug wells in the uplands are shown on plate 12. Dug wells 8730–3750–21, 23, 158, and 192 and drilled wells 8730–3750–40 and 201 shown on plate 12 are in the same general area. The change in water levels in the dug wells from fall to spring is about double the change in the cased wells. The water added, or recharged, to the loess is probably considerable.

CHEMICAL CHARACTER OF WATER

It is clear from the well inventory that in the northern part of the area, where the loess is thick, dug wells furnish harder water than in the southern part of the area, where the loess is thin. In the northern part, 20 percent of the dug wells furnish soft to medium-hard water, whereas in the southern part 60 percent of the dug wells furnish soft water. The source of the hardness is indicated by the presence of considerable calcium carbonate in the unleached portion of the loess.

WATER UTILIZATION

A total of about 7,800 million gallons or 24,000 acre-feet of water is used annually in the Kentucky portion of the Henderson quadrangle. (An acre-foot of water is defined as the amount of water that will cover 1 acre to a depth of 1 foot.) Of this total, 17 percent is derived directly from the Ohio River, 82 percent of the water comes from ground-water reservoirs, and 1 percent comes from ponds. Table 9 below gives a tabulation of annual water use in the area, in millions of gallons.

Table 9.—*Annual use of water in the Henderson area, Kentucky*

Annual pumpage: e, estimated.

Use	Annual pumpage (million gallons)	Source
Industrial (private)	6,313	Alluvium of the Ohio River.
Municipal (all uses)	1,314	Ohio River.
Stock (rural)	e72	Ponds.
Domestic (rural)	e20	Alluvium of the Ohio River and Pennsylvanian sandstones.
Recreational facilities	e14	Alluvium of the Ohio River.
Stock (rural)	e8	Alluvium of the Ohio River and Pennsylvanian sandstones.
Total	7,741	

It is evident from the table that the aquifer of greatest importance is the alluvium of the Ohio River valley. The Pennsylvanian sandstones are, nevertheless, important. The farms in the areas where permeable alluvium is not available are entirely dependent on sandstone beds for their water supplies. This area amounts to about 60 percent of the total area in the Kentucky portion of the quadrangle.

The annual municipal pumpage was obtained from records of the municipal water company in Henderson for the year 1950. The average amount of water used daily by people in the city is 53 gallons per person, figured from meter readings and based on an average family of 3.5 persons. On the basis of total amount of water pumped from the Ohio River by the city of Henderson, the daily use in 197 gallons per person. However, this figure includes water not only for domestic use but also water for industrial and commercial establishments, municipal use, and loss due to leakage.

The amount of water used for domestic purposes in the rural areas was determined in part from the well inventory and in part from a separate determination of the quantity of water used on farms where hand pumps or buckets and windlasses are in use. The approximate total number of electric-pump installations, hand pumps, and buckets in use had been determined from the well inventory.

An inventory was made of 25 farms in various parts of the county to determine the rural per-capita use of water and the total amount of water used. The following figures, which are median values, were obtained:

Installation	*Per-capita use (gpd)*
Electrically driven pump	35
Hand pump	11.1
Bucket or bailer	5.1

The per-capita figures for wells equipped with hand pumps or buckets was based on a determination of the amount of water used on various days of the week and the size of the family. The per-capita use for each family was determined. The median per-capita value was arrived at by listing the values in order of size and selecting the number in the middle of the list. The total rural domestic use was then determined by taking the product of the per-capita use for each type of installation, the average size of family (3.5 persons), and the number of bucket, hand-pump, or electric-pump installations. This gave an annual domestic use of 20 million gallons in rural areas as shown in table 9.

Most of the stock is watered from ponds. It was the opinion of the county agent, A. A. Williams, and the writer that not more than 10 percent of the stock in the Henderson quadrangle is watered from wells. Of a total amount of 80 million gallons of water furnished to stock during a year, it is estimated that 8 million gallons is derived from ground-water sources. Factors for determining stock use of water were obtained from Public Health Service Publication 24 (Atkins and others, 1950).

PUMPING TESTS

A pumping test is usually carried out by pumping a well at a constant rate and measuring the depth to water at small intervals of time to determine the drawdown in the pumped well and one or more observation wells. The purpose in making a test is to determine the hydraulic constants of an aquifer—the coefficient of transmissibility or permeability and the coefficient of storage. Generally, measurements in at least one observation well are necessary to determine the coefficient of storage. After learning the values of these hydraulic constants for an aquifer, the drawdowns at different distances from the pumped well for different rates of pumping and different periods of time can be predicted. This is a measure of the interference that would be imposed by one pumped well on another and would aid in determining the well spacing necessary to insure, if possible, a continuous supply of water.

The field coefficient of permeability (Wenzel, 1942, p. 7) is defined as the number of gallons of water that will flow through a cross-sectional area of 1 square foot in 1 day under a hydraulic gradient of 1 foot per foot at the prevailing temperature of the ground water. As the permeability of an aquifer is usually not the same from top to bottom, the coefficient of transmissibility is more useful in the field; it is the product of the thickness of the aquifer, in feet, and the average field coefficient of permeability. The coefficient of transmissibility (Wenzel, 1942, p. 87) is usually defined as the number of gallons that will pass in 1 day through a column of the aquifer having a width of 1 foot and a height equal to the saturated thickness of the aquifer under a hydraulic gradient of 1 foot per foot and at prevailing temperature.

The coefficient of storage (Wenzel, 1942, p. 87) is the amount of water, expressed as a fraction of a cubic foot discharged from each vertical column of the aquifer with a base of 1 square foot as the water level falls 1 foot. For water-table conditions, this is essentially equal to the specific yield of the material unwatered during pumping. For artesian conditions, this represents the amount of water discharged by compression of a column of the aquifer (and expansion of the contained water) whose height is the thickness of the aquifer and whose base is 1 square foot as the water level falls 1 foot.

The results of three pumping tests are listed in table 10. Test 1 was made on collector 2 (8735–3745–9) of the Spencer Chemical

Table 10.—*Results of three pumping tests on an unconsolidated and a consolidated aquifer in the Henderson area, Kentucky*

Test	Aquifer	Character of material	Saturated thickness (feet)	Transmissibility (gpd per foot)	Permeability (gpd per square foot)	Storage coefficient
1	Alluvium	Sand and gravel	30	138,000	4,600	-----
2	do	do	4	1,960	490	0.0013
3	Upper sandstone member of Carbondale formation.	Sandstone	24	2,300	96	.00002

Co., 2 miles west of Henderson on the south bank of the Ohio River. Water-level measurements were made in the collector to determine drawdown. An observation well was not available, so the storage coefficient was not determined. River recharge was not proved by the test, although infiltration is indicated by the quality and temperature graphs, figures 15 and 16.

Test 2 was made on a vertical screened well (8735–3745–7) at the Farmer's Tankage Co., 1 mile west of Henderson and 0.2 mile south of the river. Drawdown measurements were made in an observation well nearby. The small coefficient of permeability obtained in test 2 is substantiated by records of drill holes in the valley of Canoe Creek. These records show an abundance of fine sand and silt in contrast to the greater thickness of coarse sand and gravel encountered farther down the Ohio River and in the more central parts of the flood plain. (Compare logs of wells 8735–3745–177 and 268, p. 213–218.) The large differences in permeability in tests 1 and 2 show that test drilling is especially necessary near the boundaries of the flood plain to prove the existence of a supply of water adequate for the intended use.

Test 3 was made on a pumped well with 1 observation well at the W. G. Duncan Coal Co. in Muhlenberg County, Ky. The aquifer is the upper sandstone member of the Carbondale formation which is also found east and northeast of Henderson between the No. 11 and No. 9 coals. It is probable that the transmissibility and storage coefficients would be in the same range in some parts of the Henderson area as in Muhlenberg County because of the similarity of rock types. However, the sandstone in the area north and east of Henderson is, in places, very much cemented with calcium carbonate, and the permeability and storage coefficients may be less than half the values obtained in test 3.

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BASE DATA

Table 11.—*Records of wells and test borings*

Location: For location of wells, see plates 1-4.
Altitude above sea level: a, aneroid; t, taken from topographic map.
Type of well: Cd, core drilled; Dn, driven; Dr, drilled; Du, dug; Rd, rotary drilled; Sh, shaft.
Depth of well: Measured unless noted; r, reported.
Geologic horizon: Al, alluvium; L, Lisman formation; Ca, Carbondale formation.

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8730-3745-1	1¾ miles southeast of Henderson.	Mrs. Z. C. Watson	J. D. Tucker	Sept. 2, 1949	a415	Dr
2	do	do	Stanton Sircy			Dr
3	do	W. W. Brackett				Dr
4	do	do				Dr
5	do	Dave Hart	Harvey Powell	1942		Dr
6	do	H. B. Clark and Oscar Duncan.	Stanton Sircy	1946	a440	Dr
7	do	Oscar Duncan	do	1941		Dr
8	do	do				Du
9	do	do				Du
10	2½ miles southeast of Henderson.	George Gabe	Devella Mills			Dr
11	do	do				Du
12	do	Clyde Atkins				Dr
13	do	do				Du
14	do	Eula Denton	Stanton Sircy		a393	Dr
15	do	do				Du
16	do	do				Du
17	do	Dr. S. D. Alexander				Du
18	do	Elmer Herron	Stanton Sircy		a397	Dr
19	3 miles southeast of Henderson.	do				Du
20	3½ miles southeast of Henderson.	Mrs. George Saunders.				Du
21	do	J. R. Hardin				Du
22	3¾ miles southeast of Henderson.	Charles Henn				Du
23	do	James F. Speaks				Du
24	do	do				Du
25	4 miles southeast of Henderson.	do		1944	a390	Dr
26	do	do		1946		Dr
27	do	Charles Henn			a408	Dr
28	do	do				Du
29	do	do				Du
30	4¼ miles southeast of Henderson.	R. F. Crafton				Dr

in the Henderson area, Kentucky

Below land surface: Measured unless noted; r, reported; b, above land surface.
Lift: Ba, bailer; Bu, bucket; Cy, cylinder; G, gasoline; J, jet; P, piston; Su, suction; Tu, turbine; W, windmill; figure indicates horsepower.
Use: A, abandoned; C, commercial; Ct, core or coal test; D, domestic; In, industrial; Ir, irrigation; O, observation well; Ot, oil test; P, public supply; S, stock; T, test well.

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed			Water level		Lift	Use	Remarks
		Depth to top of bed (feet)	Thickness (feet)	Geologic horizon	Below land surface (feet)	Date of measurement			
176	$6\frac{5}{8}$	136	36	Ca	84.5	Sept. 8, 1949	J, $\frac{1}{2}$	D, O	Log on page 203. Analysis available.
r126	6	----	----	Ca	r25	1940	Cy, $\frac{3}{4}$	D	Inadequate.
----	4 to 3	----	----	----	----	----	---	A	
r175	4	----	----	Ca	r25	----	Cy, $\frac{1}{2}$	D, S	Adequate.
r65	6	38	27	L	r37	1942	J, 1	D, S	Yield reported 12 gpm with 15-ft drawdown after $1\frac{1}{2}$ hr pumping in 1942. Log available.
r65	8	----	----	L	35	Sept. 6, 1949	Bu	D	
r52	8	13	39	L	r13	do	J, $\frac{3}{4}$	D, S	Yield reported 10 gpm after 5 hr pumping in 1941. Log available.
r12	36 to 60	----	----	----	r4	do	J, $\frac{1}{2}$	D, S	Estimated yield, 7 gpm.
r30	48	----	----	----	r27	----	---	---	Pumped dry at 50 gpm, recovered in $\frac{1}{2}$ day. Inadequate.
r80	6	----	----	Ca	----	----	Su, $\frac{1}{4}$	S	Temperature 55°F. Analysis available. Inadequate.
----	----	----	----	----	----	----	---	D	
r50±	3	----	----	----	----	----	Cy	---	
r20	36	----	----	----	r18	----	---	S	
r105	6	----	----	Ca	43.9	Mar. 21, 1952	J, $1\frac{1}{2}$	S	Temperature 55°F. Analysis available. Adequate.
r60	42	----	----	L	r20	Sept. 6, 1949	Cy	D, S	
r60	48	----	----	L	r20	do	Cy	D, S	
r65	48	----	----	L	r25	----	Bu	D	
r118	----	----	----	Ca	r78	Spring 1952	Cy, 1	---	Yield reported by driller 54 gpm on bailing test.
----	----	----	----	----	----	----	Cy, 1	---	
r36	60	----	----	----	r18	----	Cy	D, S	
29	60	----	----	----	20.4	Sept. 7, 1949	J, $\frac{1}{4}$	D	Adequate.
32	48	----	----	----	17.0	do	Bu	D	
29.7	30	----	----	----	13.3	do	Bu	D	
r24	48	----	----	----	r14	----	Su	D	
167	4	----	----	----	1.5	July 27, 1950	---	Ot	Originally flowed. Salty water. Reported plugged.
32	8	----	----	----	r17	Fall 1946	Bu	D	
46.5	6	----	----	----	21.5	Sept. 7, 1949	Bu	D	
55	60	----	----	----	12.0	do	Cy	D, S	
----	----	----	----	----	----	----	---	---	Filled.
----	----	----	----	----	----	----	---	A	Salty water.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8730-3745-31	4½ miles southeast of Henderson.	Mrs. Francis Priest				Du
32	do	do			a412	Dr
33	do	do				Dr
34	do	do				Du
35	4¾ miles southeast of Henderson.	E. B. Sigler	Stanton Sircy	1946		Dr
36	do	do				Du
37	1¼ miles east of Henderson.	Elmer Herron				Dr
38	4¾ miles southeast of Henderson.	Crafton and King				Du
39	do	do			a414	Dr
40	1 mile east of Anthoston.	Claude Homer				Du
41	½ mile east of Anthoston.	C. H. Roberts	McClellan	1943	t400	Dr
42	Anthoston	Penny Gish				Dr
43	do	Henry Thurby				Du
44	¾ mile east of Henderson.	A. I. Reisz	Stanton Sircy	June 1947		Dr
45	1 mile east of Henderson.	Finace Hayes	Finace Hayes	1930	a404	Dr
46	do	Mrs. Annie France				Du
47	do	do				Du
48A	½ mile southeast of Henderson.	M. L. Cooper	O'Nan	1947	a403	Dr
48B	do	do			a403	Du
49	¼ mile east of Henderson.	Edgar Pearrin				Dr
50	⅜ mile east of Henderson.	E. A. Farley	Roscoe Jenkins.		t400	Dr
51	½ mile east of Henderson.	E. Lewis	Stanton Sircy	1947		Dr
52	1 mile east of Henderson.	L. H. Robertson				Du
53	do	Owen Baskett				Du
54	1¼ miles east of Henderson.	Clifford Pruitt				Du
55	3½ miles east of Henderson.	Ewing Galloway				Du
56	2½ miles east of Henderson.	W. E. McClure				Du
57	2¼ miles east of Henderson.	Eugene Butler				Du
58	1 mile east of Henderson.	Hecht Lackey				Dr
59	1¼ miles east of Henderson.	H. E. Ferrill				Du
60	1½ miles east of Henderson.	W. D. Lambert				Dr
61	do	do		1934		Dr
62	do	do				Du

in the Henderson area, Kentucky—Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
23	36	----	----	----	14.0	Sept. 7, 1949	Bu	D	
r180	6	----	----	Ca	12	Apr. 5, 1951	Cy	D	Temperature 57° F. Analysis available.
90.6	6	----	----	Ca	4.6	Mar. 24, 1952	----	D, S	Yield reported good. Unused.
----	----	----	----	----	----	----	----	----	
r65	6	----	----	L?	r20	----	J, 1/4	D, S	Temperature 54° F. Analysis available. Adequate.
38	36	----	----	----	20.0	Sept. 7, 1949	----	S	
----	6	----	----	----	----	----	----	----	Plugged.
32.5	24	----	----	----	17.2	Sept. 7, 1949	Bu	----	
53	5	47	6	Ca	28.6	Sept. 8, 1949	Bu	D	Providence limestone reported at 39 ft. Log available.
36.7	24	----	----	----	27.5	do	Bu	D	
176	6	----	----	----	r22	1943	J, 3/4	S	Inadequate.
26.4	6	----	----	----	8.4	Sept. 8, 1949	Bu	D	
r18.5	24	----	----	L	14.5	do	Su	D	Providence limestone?
r130	6	----	----	Ca	----	----	J, 1	D	Inadequate.
85	6	----	----	Ca	12.8	Nov. 3, 1949	----	O	Do.
----	----	----	----	----	----	----	Cy, 1/2	D	Do.
----	----	----	----	----	----	----	Cy	----	Temperature 58° F.
r350	6	----	----	Ca	68.6	Nov. 4, 1949	----	O	Reported soda and salt water. 48A located within 48B.
30.5	30	----	----	----	5.3	do	----	O	
r95	6	----	----	Ca	24.0	Mar. 18, 1952	Cy	D	Analysis available.
r125	----	110	15	Ca	----	----	J, 1/2	D	Log available. Inadequate.
r135	----	----	----	Ca	r100	----	J, 1/2	D	Inadequate.
17	36	----	----	----	11.0	Nov. 4, 1949	Bu	S	
23.8	42	----	----	----	17.0	do	Bu	S	
28	48	----	----	----	11.8	do	Cy, 1/4	D	Adequate.
----	----	----	----	----	----	----	Cy	D	
r55	42	----	----	----	----	----	Su, 1/3	D	Inadequate.
r12	----	----	----	----	1.3	----	Su, 1/2	D, S	Do.
r200	6	----	----	Ca	r88	----	----	----	Drilled into abandoned No. 9 coal mine. Sulfurous water.
----	----	----	----	----	----	----	----	----	
r240	6	----	----	Ca	----	----	Cy, 3/4	D	Contains sodium-bicarbonate type water.
r240	6	----	----	Ca	----	----	Cy, 3/4	D	Temperature 57° F. Analysis available.
17.5	----	----	----	----	17.0	Nov. 9, 1949	----	----	

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8730-3745-63	1½ miles east of Henderson.	W. D. Lambert			a440	Du
64	do	G. O. Letcher Estate				Du
65	do	do				Du
66	1¾ miles east of Henderson.	E. C. Wood	Stanton Sircy	1940		Dr
67	do	G. V. Nelson				Du
68	do	Eugene Butler				Du
69	2¾ miles east of Henderson.	L. R. Bassett				Du
70	3 miles east of Henderson.	Mrs. W. J. Mills				Du
71	do	Dr. Youngblood			a403	Dr
72	3¼ miles east of Henderson.	Lannie Boswell				Du
73	do	Carlisle Cooper				Du
74	4 miles east of Henderson	E. B. Nelson				Du
75	1⅜ miles east of Henderson.	Sterling Jennings				Du
76	do	Elmer Herron	Stanton Sircy			Dr
77	do	do				Du
78	do	do	Stanton Sircy		a393	Dr
79	do	do	do			Dr
80	2¼ miles southeast of Henderson.	G. R. Vandiver	do		t425	Dr
81	do	do	Harvey Powell			Dr
82	do	do	do			Dr
83	do	do				Du
84	3 miles southeast of Henderson.	Mrs. Hattie Reichert				Dr
85	do	do				Du
86	2 miles southeast of Henderson.	P. H. Elam				Du
87	do	do				Du
88	1½ miles southeast of Henderson.	George Manion	Stanton Sircy			Dr
89	do	do				Du
90	¼ mile southeast of Henderson.	James Lewis				Dr
91	½ mile southeast of Henderson.	Melvin Hall				Du
92	¾ mile south of Henderson.	Mrs. Katie Hudson				Du
93	do	Mrs. W. M. Majors				Du
94	do	Robert Pinson				Dr
95	do	do				Du
96	¼ mile south of Henderson.	Elizabeth Underwood	J. D. Tucker			Dr
97	⅛ mile southeast of Henderson.	do				Du, Dr
98	¼ mile southeast of Henderson.	Mrs. Katie Hudson				Du
99	⅛ mile southeast of Henderson.	William Drury				Dr
100	¼ mile southeast of Henderson.	S. M. Overton				Du
101	do	do			a396	Dr

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed			Water level		Lift	Use	Remarks
		Depth to top of bed (feet)	Thickness (feet)	Geologic horizon	Below land surface (feet)	Date of measurement			
24.6	42	----	----	----	10.1	Nov. 9, 1949	----	O	
28.2	36	----	----	----	21.3	do	Bu	D	
13.9	42	----	----	----	6.8	do	----	D	
r220	6	----	----	Ca	----	----	Cy, $\frac{3}{4}$	D, S	Temperature 52° F. Analysis available. Adequate.
13.0	----	----	----	----	9.0	Nov. 9, 1949	Su	S	
14	24	----	----	----	3.2	do	----	----	
26.2	36	----	----	----	9.1	do	Bu	----	Temperature 58° F.
28.3	36	----	----	----	9.3	do	Bu	D	
80	8	----	----	Ca	21.1	Mar. 30, 1950	Cy	D	Temperature 58° F. Analysis available.
r20	48	----	----	----	----	----	Cy, $\frac{1}{4}$	D	Adequate.
----	----	----	----	----	----	----	Cy	D	
40	36	----	----	----	19.0	Nov. 9, 1949	----	S	
44	42	----	----	----	10.7	Nov. 10, 1949	----	----	
r127	6	----	----	Ca	----	----	Cy	D	Temperature 55° F. Analysis available.
r30	----	----	----	----	r20	----	Cy, 1	D	Adequate.
45	8	----	----	L	7.4	Nov. 10, 1949	----	S	
----	----	----	----	----	----	----	----	S	
r86	6	25	56	L	----	----	J, $\frac{1}{2}$	D, S	Temperature 50° F. Analysis available. Log on page 203. Adequate.
----	6	----	----	----	----	----	Cy, $\frac{3}{4}$	S	Adequate.
----	6	----	----	----	----	----	Cy	S	
r12	----	----	----	----	----	----	Su, $\frac{1}{4}$	D	
----	6	----	----	----	----	----	Cy	D	
----	36	----	----	----	----	----	Cy	S	
r41	36	----	----	----	r33	Summer 1949	----	D	Inadequate.
r42	36	----	----	----	----	----	----	----	
r100	----	----	----	----	----	----	----	A	Dry.
25.4	30	----	----	----	13.1	Nov. 10, 1949	J, 1	----	
r80	----	----	----	L?	----	----	J	D	
35.4	42	----	----	----	18.8	----	Cy	D	
13.2	30	----	----	----	1.5	----	----	D, S	
r62	60	----	----	----	42	----	Cy, $\frac{1}{2}$	D, S	Adequate.
r60	6	----	----	L	----	----	Cy, $\frac{1}{2}$	D, S	Adequate. Yield 10 gpm.
38.7	36	----	----	----	29.6	----	----	A	
r76	6	----	----	L	----	----	J, $\frac{1}{2}$	D	Adequate.
93	48 to 6	----	----	L	25.2	Nov. 15, 1949	Cy	D, S	Formerly a windmill.
45	30	----	----	----	37.2	do	Bu	D	Never dry. Temperature 58° F.
----	6	----	----	----	----	----	Cy, $\frac{1}{4}$	D	Adequate.
29.9	42	----	----	----	16.1	Nov. 15, 1949	Bu	D, S	Contaminated and condemned.
36.9	6	----	----	L	12.6	do	Su	S	

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8730-3745-102	½ mile southeast of Henderson.	Charles Baker	----	----	----	Dr
103	⅜ mile southeast of Henderson.	H. J. Kizer	----	----	----	Du
104	⅞ mile southeast of Henderson.	G. H. Klauder	----	----	----	Dr
105	do	do	----	----	----	Dr
106	3⅝ miles southeast of Henderson.	Alexander	----	----	----	---
107	⅞ mile southeast of Henderson.	G. H. Klauder	----	----	----	Du
108	¾ mile southeast of Henderson.	T. J. Cummins	----	----	----	Du
109	1¼ miles southeast of Henderson.	W. M. Rhea	----	----	----	Dr
110	do	Mrs. Marshall	----	----	----	Du
111	do	do	----	----	----	Du
112	1½ miles southeast of Henderson.	Henry Clark	----	----	----	Dr
113	2 miles southeast of Henderson.	W. M. Rhea	----	----	----	Du
114	2⅛ miles southeast of Henderson.	do	----	----	----	Dr
115	1¼ miles southeast of Henderson.	Mrs. Inez Rhea	----	----	----	Du
116	2⅛ miles southeast of Henderson.	A. R. Slaughter	----	----	----	Du
117	2½ miles southeast of Henderson.	Cohen West	----	----	----	Du
118	2⅝ miles southeast of Henderson.	L. Hagan	----	----	----	Du
119	⅞ mile southeast of Henderson.	Ollie Ferguson	----	Summer 1948	----	Dr
120	2½ miles southeast of Henderson.	A. M. Toy	----	1919	----	Du
121	do	do	----	----	a420	Du
122	2⅝ miles southeast of Henderson.	W. A. Toy	----	----	385	Dr
123	2½ miles southeast of Henderson.	A. M. Toy	----	----	----	Du
124	do	do	----	----	----	Du
125	do	do	----	----	----	Du
126	2⅞ miles southeast of Henderson.	C. E. Jones	----	----	----	Du
127	do	do	----	----	----	Du
128	do	do	----	----	----	Du
129	3¼ miles southeast of Henderson.	do	----	----	----	Du
130	do	Mrs. Sally Bunch	----	----	----	Du
131	3½ miles southeast of Henderson.	George Stanley	----	----	t440	Du
132	do	Joseph French	----	----	----	Du

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
----	6	----	----	----	10±	Nov. 15, 1949	----	----	Used for sewage disposal. Waste standing at -10 ft.
17.4	36	----	----	----	13.5	do	Cy	S	
r75	6	----	----	L	r10	do	Cy, ½	D	Adequate.
r50	6	----	----	L	r2-3	do	Cy, G, 2	S	Do.
----	----	----	----	----	----	----	----	Ot	Nash Redwine 1. Electric log available.
r15	24	----	----	----	r1.5	----	Cy	D	Reported ½ gpm flow in wet weather. Temperature 58°F.
20.6	24	----	----	----	10.8	----	Bu	D	
52.5	8	----	----	L	17.7	Nov. 15, 1949	Cy	D, S	
r50	48	----	----	----	----	----	Cy	D	
r30	48	----	----	----	----	----	Su	D	
----	----	----	----	L	----	----	Cy, G, 3	D, S	Adequate.
8.6	24	----	----	----	1.8	Nov. 15, 1949	Su	S	Down to rock, has flowed at surface. Temperature 56°F.
r40	8	----	----	L	r17	----	Cy	D	
r30	54	----	----	----	r27	----	Cy	----	Never dry before Elam Ditch was cleaned.
23.4	36	----	----	----	13.3	Nov. 15, 1949	Bu	D, S	Some seasonal variation in quality.
38.6	36	----	----	----	30.6	do	Bu	D	
24	----	----	----	----	16.0	do	J, ½	D	Can be pumped dry but refills rapidly.
22.7	6	----	----	----	12.2	Nov. 16, 1949	Bu	----	Not dry since drilled.
22	----	----	----	L	6.2	do	Cy, ¾	D, S	Not much fluctuation. Never dry. Adequate.
36.4	30	----	----	----	33.4	Dec. 7, 1949	Bu	D, O	Unused.
66	6	----	----	L	5.2	July 7, 1950	Su, ⅓	D, S	Sulfurous water. Adequate.
----	48	----	----	----	----	----	Cy	A	
23.1	36	----	----	----	22.3	Nov. 16, 1949	Bu	A	
r12	30	----	----	----	.8	do	Su	S	Reported to flow in wet weather. Foul odor.
21.8	42	----	----	----	8.7	do	Bu	D	Temperature 57°F.
21.9	36	----	----	----	5.7	do	----	D	Temperature 56°F.
42.6	36	----	----	L	33.0	do	----	D	
----	----	----	----	----	----	----	----	D, S	
25.4	36	----	----	L	20.7	Nov. 16, 1949	Bu	D	
32.0	36	----	----	L	28.0	do	Bu	D	Reported 2 ft into sandstone. Bedrock at 410 ft.
34.2	36	----	----	L	28.0	do	Bu	D, S	Dug 4 to 6 into sandstone. Reported never dry in past 50 yrs.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8730-3745-133	3⅝ miles southeast of Henderson.	Chester Watson	Stanton Sircy	1940		Dr
134	do	do	do			Dr
135	do	do	Huber and Mann.		a447	Dr
136	3¾ miles southeast of Henderson.	do	Stanton Sircy	1942		Dr
137	⅝ mile southeast of Henderson.	Mrs. Francis Hall		1910		Dr
138	¼ mile southeast of Henderson.	Melvin Hall				Dr
139	3⅝ miles southeast of Henderson.	L. C. McMullin				Dr
140	do	do				Du
141	3¾ miles southeast of Henderson.	Thomas Hicks	Duncan and Sircy			Dr Dr
142	Anthoston	W. L. Duncan	Stanton Sircy			Dr
143	do	do	Ashford Robards	June 1949		Dr
144	do	James Rash, Jr.				Dr
145	½ mile north of Anthoston.	do				Du
146	Anthoston	R. L. Edwards	Ashford Robards.	June 1949		Dr
147	do	do	do	do		Dr
148	do	John E. White	Stanton Sircy	April 1947		Dr
149	do	Carlos Cannon		1946		Dr
150	½ mile south of Anthoston.	Sam Thompson		1850?		Du
151	Anthoston	H. H. Hays				Du
152	do	Mrs. Honor Woods		1855		Du
153	do	Frank Poff		1946	a461	Dr
154	do	Homer Nantz				Dr
155	do	Tom Gatlin	Ashford Robards.	August 1949		Dr
156	do	do				Du
157	½ mile southeast of Anthoston.	John Golday	Stanton Sircy	1944		Dr
158	Anthoston	A. M. Wilson	do	1939		Dr
159	do	do	do			Dr
160	do	Nell Gish				Du
161	do	R. P. Gish	Ashford Robards.	1948		Dr
162	do	do			a458	Du
163	do	O. B. Smith				Dr
164	do	Tom Gatlin	J. E. Suggs	1947		Dr
165	⅝ mile east of Anthoston.	do				Du

in the Henderson area, Kentucky—Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
r91	6⅞	—	—	L?	r32	1940	J, ½	D	Temperature 59°F. Analysis available. Adequate.
r65	6⅞	50	12	L	—	—	Cy, ¼	S	Log available.
65	8	—	—	L	33.7	Nov. 23, 1949	Bu	D	Stratigraphic test.
70	6⅞	—	—	L	37.0	do	Bu	D	
r98	6	—	—	Ca	—	—	Cy	D	Reported to have cut 2 coal veins. Bottom in sandstone. Dry once.
r60	6	—	—	—	—	—	J, ½	D	Inadequate.
—	6	—	—	L	—	—	Cy	D	Drilled through Providence limestone.
20.1	36	—	—	—	4.4	Nov. 23, 1949	Bu	—	Fluctuates. Never dry. Unused.
r71	6	—	—	L	—	—	J, ¾	D, S	Never dry.
r71	6	—	—	L	—	—	J, ¾	D, S	Never dry.
r65	6	—	—	L	—	—	J, ¾	D, S	Some flow in winter. Hydrogen-sulfide odor.
61.2	8	—	—	L	29.4	Nov. 23, 1949	Bu	D	Often milky. Temperature 57°F, Nov. 23, 1949; 59°F, July 28, 1950. Analysis available.
r40	8	—	—	L	r6	—	Cy	D	
11.8	30	—	—	L	2.7	Nov. 23, 1949	—	—	Reported flows in wet weather.
45	6	—	—	L	14.7	do	J, ½	C	
45	6	—	—	L	22.3	do	Ba	D	Used by 2 families.
35.5	8	—	—	L	11.6	do	Su	D	Oily scum.
81.8	6	—	—	L	13.5	do	Ba	D	Temperature 59°F. Analysis available.
44	30	—	—	L	34.0	do	Bu	D	
24.2	36	—	—	L	14.6	do	Bu	D	
42.8	36	—	—	L	35.2	do	Bu	D	Inadequate.
69.5	6	—	—	L	33.5	do	Ba	D, S	Reported water level 33 ft in 1946.
r65	6	32	18	L	r30	—	J, ½	D, S	Pumped continuously ½ day.
r51	6	32	18	L	—	—	J, ½	D	
35.8	36	—	—	L	23.6	Nov. 29, 1949	J, ½	D	Never dry.
r41	8	36	5	L	17.0	Nov. 30 1949	J, ⅓	D	Yield 4½ gpm, May 15, 1951.
—	6	—	—	L	—	—	Cy	D	
70.6	6	67	1.5	L	32.1	Nov. 29, 1949	J, ½	D	Temperature 56°F. Analysis available.
38.2	36	—	—	L	28.1	do	Bu	D	Temperature 54°F.
r63	8	58	5	L	r38	1948	J, ½	D	Yield reported 6½ gpm.
40.6	36	—	—	L	31.7	Nov. 29, 1949	—	O	Inadequate.
—	6	—	—	—	—	—	—	D	
r55	8	—	—	L	—	—	J, 1	D, S	High iron content.
—	—	—	—	—	—	—	Su	A	

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8730-3745-166	Anthoston	Tom Gatlin				Du
167	do	do	Stanton Sircy	1946		Dr
168	do	Luther Sigler				Dr
169	do	Herman Wells				Du, Dr
170	do	A. B. Sugg				Du
171	do	Pauline Croft	Duncan and Sircy.	June 1948		Dr
172	do	Joe Funk	do	1948		Dr
173	do	Hubert Wilson		1929		Dr
174	do	P. E. Norment				Dr
175	do					Du
176	do	Mrs. H. R. Eads				Dr
177	do	do				Du
178	do	B. E. Gish				Du
179	¼ mile southeast of Anthoston.	C. F. Walker	McCollom	1945		Dr
180	do	Bellfield Baptist Church.	Ashford Robards.	June 1949		Dr
181	do	J. R. Crafton	Stanton Sircy	January 1946		Dr
182	do	Thomas A. Smith				Du
183	do	do				Dr
184	Anthoston	Milford Gish				Du
185	¾ mile southeast of Anthoston.	Bellfield Baptist Church.	Ashford Robards.	November 1949		Dr
186	do	H. L. Ligon	Stanton Sircy	Summer 1945		Dr
187	⅞ mile southeast of Anthoston.	C. A. Moore		Before 1900		Dr
188	1 mile southeast of Anthoston.	B. F. Higginson				Du
189	do	Milton Watkins				Du
190	do	do			a455	Dr
191	do	W. O. Toy	Stanton Sircy	1945		Dr
192	do	do				Du
193	1½ miles east of Anthoston.	Iley Parker				Du
194	do	do				Du
195	do	M. D. Chandler			a423	Dr
196	Anthoston	R. E. Watkins	Stanton Sircy			Dr
197	½ mile southwest of Anthoston.	L. B. O'Nan	Duncan and Sircy.		a455	Dr
198	½ mile north of Anthoston.	Mrs. Coleman Hicks	Stanton Sircy		a425	Dr
199	do	do				Du
200	do	do	Ellis Spencer			Dr
201	1 mile southwest of Anthoston.	Hillyer Norment				Du
202	¾ mile west of Anthoston.	Robert Pirtle				Du
203	do	do				Du
204	do	do				Du
205	1¼ miles west of Anthoston.	John Schutte				Du
206	1½ miles west of Anthoston.	Wright Waller				Du
207	1⅝ miles west of Anthoston.	Eugene Westerman				Du

in the Henderson area, Kentucky—Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
r40+	48				r25			A	
r127	6			Ca?				A	Inadequate. Oily scum.
60	6			L	31.2	Nov. 29, 1949	Ba	D	
r63				L				D	High iron content.
r42	36			L	r32	Nov. 29, 1949	Cy	D	
55	5	45	10	L	31.3	do	Ba	D	Temperature 57°F.
52.5	6			L	28.6	do	Ba	D	
44.5	6			L	28.7	do	Ba	D	
53.5	4			L	33.4	do	Ba	Ct	
42.6	30			L	34.6	do	Bu	D	
60	6			L	34.5	do	Ba	D	Inadequate.
43	36			L	37.3	do	Bu	D	Do.
34.2	30			L	23.7	do	Bu	A	
r90	8	30	r60?	L	r27	do	Ba	D	
58	10			L	21.5	do	Ba	D	Inadequate.
65.7	6			L	29.4	do	Ba	D	High iron content.
31.6	30			L	24.0	do	Bu	D	
r900±	6			L			Cy, ½	D, S	Stratigraphic test.
40	24			L	30.4	Nov. 30, 1949	Bu	D, S	Temperature 56°F.
47	4	23	23	L	r11	November 1949	J, ½	D	Yield reported 2½ gpm, 36 ft drawdown, Nov. 1949. Log available.
r80	6			L			J, ½	D	Contains iron.
33.6	6			L	19.3	Nov. 30, 1949	Ba	D	Reported 10 ft rise in winter.
40	30			L	30.5	do	Bu	D	
29.9	36			L	19.6	do	Su, ⅓	D, S	
46.4	8			L	31.9	do		S	Stratigraphic test.
r65	8	50	15	L			J, ½	D	
40.2	36				24.6	Nov. 30, 1949	Bu	D	
40.1	36			L	33.0	do	J, ½	D	
30.4	36			L	25.5	do	Bu	D	
31.8	6			L	5.6	do		A	Inadequate.
	6			L			J, ½	D	
74	6			L	34.0	Nov. 30, 1949	Bu	D	
39.9	6			L	17.1	Dec. 1, 1949		A, O	Contains iron.
10	30			L	1.5	do	Su, ½	D, S	Flows in winter and spring.
r40	6			L				A	Filled.
r55	36				r51	Fall 1949		D	
33	36				23.2	Dec. 1, 1949	Bu	D	
23.9	36				18.8	do	Bu	A	
34.2	36				28.0	do		A	
43	36				36.5	do	J, ½	D	
48	42				r40	October 1949	J, 1	D	
r28							J, ½	D	

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8730-3745-208	2 miles northwest of Anthoston.	W. C. Cooper				Du
209	do	L. P. Cooper				Du
210	do	do				Du
211	2¼ miles northwest of Anthoston.	Ed Gish				Du
212	do	Vera Clark				Du
213	do	Lee Taylor	Lee Taylor			Du
214	do	do				Dr
215	do	do				Du
216	do	do				Du
217	do	McCormick Heirs		1947		Du
218	do	do				Du
219	2½ miles southeast of Henderson.	R. R. Roberts	Stanton Sircy		a428	Du, Dr
220	do	do	do		a427	Dr
221	do	do	Carter Oil Co.		a433	Dr
222	do	do			a428	Du
223	2¼ miles southeast of Henderson.	C. G. Schuette				Du
224	do	do				Du
225	Anthoston	E. C. Gish	Stanton Sircy	Spring 1947		Dr
226	do	do				Du
227	¼ mile southeast of Henderson.	Justin Potter			381	Sh
228	Airline Road at city limits.	J. L. Nicholson		Before 1900	390	Cd
229	2½ miles southeast of Henderson.	Graham Hill Coal Co.		October 1909	469	Dr
230	2 miles southeast of Henderson.	R. A. Powell	E. F. Doudna		385	Dr
231	do	W. H. Stites	do	1922	470	Dr
232	Anthoston	Anthoston Coal Co.			448	Dr
233	¾ mile southeast of Henderson.	Southland Coal Co.			389	Cd
234	1¼ miles northwest of Anthoston.	Fred Grasty Heirs	Mecca Oil Co.	April 1938	t400	Dr
235	1 mile west of Anthoston.	W. M. Watkins	Basin Drilling Co.	Aug. 19, 1939	t415	Dr
236	1½ miles east of Anthoston.	Elliot Toy		June 1941	t430	Dr,
237	do	do		Mar. 13, 1942	419	Dr
238	¼ mile east of Henderson.	Mrs. Francis Hall		June 30, 1943	391	Dr
239	4 miles southeast of Henderson.	Jane White			402	Dr
240	do	do		Oct. 25, 1943	397	Dr
241	2 miles northeast of Anthoston.	G. C. Ginger			412	Dr
242	2 miles northwest of Anthoston.	McCormick Heirs		Oct. 2, 1944	383	Dr

in the Henderson area, Kentucky—Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
39	36	—	—	—	31.8	Dec. 5, 1949	J, ½	D	
37.6	36	—	—	—	30.2	do	J, ½	D	Used when ponds dry up.
17.6	36	—	—	—	12.5	do	Su	S	
40.4	30	—	—	—	36.8	do	Bu	D	Never dry in 30 yr.
21.6	36	—	—	—	15.2	do	Cy	D, S	
r27	36	—	—	—	—	—	—	A	Inadequate, quicksand.
r400	5	30	—	L	r6-8	—	J, ⅓	D, S	Temperature 45°F. Analysis available.
33.9	54	—	—	—	28.5	Dec. 5, 1949	Cy	—	Inadequate.
7.3	36	—	—	A1	1.0	do	—	S	
r11	48	—	—	—	r7	1947	—	A	Blue mud, no sand.
36.3	36	—	—	—	30.1	Dec. 5, 1949	Cy	—	Unused.
72	42 to 6	—	—	L	38.2	do	J, ¾	D, S, O	Temperature 48°F. Analysis available.
75	6	—	—	L	37.0	do	—	A, O	Temperature 52°F. Analysis available.
106	5	—	—	L	35.1	do	—	Ct, O	Reported 500 ft deep.
46.8	42	—	—	L	42.6	do	Cy	A, O	Inadequate.
28	48	23	5	L	—	—	Cy, ¼	D	
9	24	—	—	A1?	1.0	Dec. 7, 1949	—	S	
r52	8	—	—	L	r27	Spring 1947	J, ½	D	
—	—	—	—	—	—	—	—	S	Flows into pond in wet weather.
r176	—	—	—	—	—	—	—	—	Peoples Mine, No. 9 coal at 176 ft.
r888	—	74	40	Ca	—	—	—	Ct	Flowing salt water. Log available.
r250	—	161	65	Ca	—	—	—	Ct	Log available.
r85	—	—	—	L	—	—	—	A	Do.
r205	—	184	20	Ca	—	—	—	A	Do.
r197	—	32	18	L	—	—	—	Ct	Do.
r174	—	96	20	Ca	—	—	—	Ct	Do.
r744	—	67	10	Ca	—	—	—	Ot	Mecca Oil Co. 1. Log on page 203.
r2,414	—	35	21	L	—	—	—	Ot	Belmont Quadrangle Drilling Co. 1. Log available.
r950	—	—	—	—	—	—	—	Ot	Carter Oil Co. 1. Electric log available.
r2,595	—	—	—	—	—	—	—	Ot	Carter Oil Co. 2.
r2,350	—	—	—	—	—	—	—	Ot	Sun Oil Co. 1. Electric log available.
r2,515	—	—	—	—	—	—	—	Ot	Kingwood Oil Co. 1. Electric log available.
r495	—	—	—	—	—	—	—	Ot	Kingwood Oil Co. 2.
r2,564	10	—	—	—	—	—	—	Ot	Carter Oil Co. 1. Electric log available.
r2,504	10	71	62	Ca	—	—	—	Ot	Hagerman, Yingling, and others 1. Electric log available.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8730-3745-243	2 miles southeast of Henderson.	Oscar Duncan	Basin Drilling Co.	Oct. 2, 1947	405	Dr
244	1¾ miles east of Henderson.	Rash Heirs		Jan. 13, 1943	443	Dr
245	1½ miles southeast of Henderson.	State of Kentucky	Kentucky Dept. of Highways.		371.8	Dr
246	do	Louisville & Nashville Railroad Co.	Louisville & Nashville Railroad Co.		374	Dr
247	2¼ miles southeast of Henderson.	George Gabe	Stanton Sircy			Dr
248	⅗ mile southeast of Anthoston.	Moore		November 1945	436	Dr
249	South limits of Henderson.	Southland Coal Co	Sullivan Machinery Co.		395	Cd
250	½ mile northeast of Anthoston.	Rash Estate		Apr. 14, 1948	394	Dr
251	1¼ miles east of Anthoston.	Iley Parker		May 1950	407	Dr
252	2½ miles southeast of Henderson.	Oscar Abbott		June 1950	394	Dr
253	Anthoston	Tom Gatlin	Ashford Robards.	July 24, 1950	t440	Dr
254	1 mile northeast of Anthoston.	W. E. Roberts		October 1950	390	Dr
255	3¼ miles southeast of Henderson.	Reichert and others (communalized).			380	Dr
256	⅗ mile south of Anthoston.	B. E. Thomasson	Ashford Robards.	April 1951	a448	Dr
257	Anthoston	David O'Nan	do	Apr. 24, 1951	a432	Dr
258	do	Robert Hare	do	Apr. 25, 1951	t440+	Dr
259	do	R. L. Edwards	do	1950	t440+	Dr
260	¾ mile southeast of Henderson.	Drura Scott	J. D. Tucker	September 1951	a406	Dr
261	1⅛ miles east of Henderson.	Flamingo Oil Co	do	do	t410	Dr
262	2 miles east of Anthoston.	Iley Parker (McCandless Minerals).		May 1951	424	Dr
263	Anthoston	E. C. Gish		1951	421	Dr
264	3⅝ miles east of Henderson.	J. H. Nelson		June 1951	396	Dr
267	2½ miles east of Henderson, Graham Hills.	Alfred Jacobshagen	Heldt-Monroe Co.	November 1951	t470	Dr
268	3 miles east of Henderson.	R. D. Coffman		August 1951	420	Dr
269	3½ miles southeast of Henderson.	Henry Clark	Ashford Robards.	November 1952	t440	Dr
270	1¾ miles southeast of Henderson.	Sun Oil Co			381	Dr

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
r2,565	------	98	35	Ca	------	----------	----	Ot	Ashland Oil Co. 1. Electric log available.
r2,515	------	118	32	Ca	------	----------	----	Ot	Jarvis and Marcell 1. Electric log available.
43.3	------	-----	-----	-----	------	----------	----	----	1 of 6 bridge borings. Log available.
r76	------	51	7	L	------	----------	----	----	1 of 8 bridge borings. Log available.
r165	------	-----	-----	-----	------	----------	----	A	
r2,564	------	64	99	Ca	------	----------	----	Ot	W. F. Bilsky 1. Electric log available.
r1,445	------	89.5	4.5	Ca	------	----------	----	Ct	Log available.
r2,531	------	-----	-----	-----	------	----------	----	Ot	Carter Oil Co. 1. Electric log available.
r2,550	------	-----	-----	-----	------	----------	----	Ot	Coral-Engle-Slagter 1. Electric log available.
r2,479	------	70	25	Ca	------	----------	----	Ot	Sam Garfield 1. Log on page 204. Electric log available.
46.5	6	43	3.5	L	28.3	July 24, 1950	----	A	Contaminated. Unused. Log available.
r2,458	------	80	30	Ca	------	----------	----	Ot	Roche, Chandler, and Moran 1. Electric log available.
------	------	-----	-----	-----	------	----------	----	Ot	C. E. Skiles 1. Electric log available.
60	6	20	40	L	27.3	Apr. 25, 1951	Ba	D	Log on page 206. Yield reported. 15 gpm.
40	6	17	21	L	12.1	Apr. 24, 1951	Ba	D	Log on page 206. Yield 15 gpm.
46	6	20	25	L	25.1	Apr. 25, 1951	Ba	D	Log available.
52.3	6	-----	-----	L	19.8	----do-----	Ba	D	Yield 15 gpm.
87	10	18	19	L	14.6	Sept. 10, 1951	----	D	Log on page 206.
r211	6	-----	-----	-----	------	----------	----	A	Dry. Log on page 206.
r2,465	------	-----	-----	-----	------	----------	----	Ot	George Engle 1. Electric log available.
r2,549	------	-----	-----	-----	------	----------	----	Ot	D. Black and N. E. Marshall 1. Electric log available.
r2,384	------	-----	-----	-----	------	----------	----	Ot	W. F. Lacy 1. Electric log available.
r315	6	-----	-----	-----	------	----------	----	----	Dry. Log on page 207.
r2,503	------	-----	-----	-----	------	----------	----	Ot	G. L. Reasor 1. Electric log available.
71	5	30	41	L	r30	November 1952	----	D	Yield 15 gpm with 10 ft drawdown on 30-min bailing test.
------	------	52	10	L	------	----------	----	Ct	

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8730-3745-271	¾ mile southeast of Henderson.	Sun Oil Co			392	Dr
272	1½ miles southeast of Henderson.	do			430	Dr
8730-3750-1	4 miles east of Henderson.	George Givens	Stanton Sircy			Dr
2	4¼ miles east of Henderson.	George Brown				Du
3	3½ miles east of Henderson.	Benjamin Glunt				Dr
4	4 miles east of Henderson.	Joe Greenwell				Du
5	4¼ miles east of Henderson.	Roy Porter				Du
6	4 miles east of Henderson.	R. A. Hoffman				Du
7	do	Marvin Eblen				Du
9	do	Sherman Bowling				Du
10	do	do		June 1949		Du
11	3 miles east of Henderson.	James Ellis				Du
12	do	do	J. D. Tucker	August 1949		Dr
13	do	do	do	do		Dr
14	do	do	Stanton Sircy	1941	a416	Dr
15	do	do		do		Dr
16	do	do				Du
17	2½ miles northeast of Henderson.	W. G. Hodge				Du
18	1⅜ miles northeast of Henderson.	S. L. West	J. D. Tucker	Sept. 28, 1949	t410	Dr
19	2¾ miles northeast of Henderson.	Margaret Wathen				Du
20	3 miles northeast of Henderson.	Henderson Dairy				Dr
21	do	do				Du
22	4 miles northeast of Henderson.	Mann Bros	Palmer Drilling Co.	November 1939	371	Dr
23	3½ miles northeast of Henderson.	C. A. Dempewolf				Du
24	1¾ miles northeast of Henderson.	Malco Theater Co	J. D. Tucker	August 1949		Dr
25	1 mile northeast of Henderson.	Clarence Wood				Dr
26	do	S. C. Frields				Dr

in the Henderson area, Kentucky—Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
-----	-----	25	18	L	-----	-----	----	Ct	
-----	-----	25	50	L	-----	-----	----	Ct	
r140	-----	-----	-----	Ca	-----	-----	J, ½	D, S	Inadequate for stock. Soda water. Analysis available.
18	30	-----	-----	-----	12.3	Aug. 29, 1949	Su	D	Inadequate. Temperature 64°F.
20	6	-----	-----	-----	6.3	Sept. 9, 1949	Cy	D	Contaminated.
16.4	-----	-----	-----	-----	10.4	do	Su	D	Usually adequate.
r20	24	-----	-----	-----	8.0	do	Bu	D	
r12	-----	-----	-----	Al?	-----	-----	----	A	Gravel reported in bottom.
-----	-----	-----	-----	-----	-----	-----	Su	D	
16.1	-----	-----	-----	-----	-----	-----	----	----	Silt becoming sandy toward bottom. Dry.
11.6	-----	-----	-----	-----	-----	-----	----	----	Water-bearing bed reported at 9½ ft, cemented off. Dry.
39.5	30	-----	-----	-----	19.4	Sept. 12, 1949	Bu	D	Fills to 5 ft below surface in wet weather.
r155	6	-----	-----	Ca	r92	August 1949	Cy, ¾	----	Inadequate. Soda water. Temperature 51°F. Analysis available.
r155	6	-----	-----	Ca	r90	-----	Cy, ¾	D	Inadequate. Soda water.
142	4	-----	-----	Ca	78.1	Sept. 12, 1949	----	O	Inadequate.
r142	-----	-----	-----	Ca	-----	-----	Cy, ¾	----	Inadequate. Unused.
35	60	-----	-----	-----	15.9	Sept. 12, 1949	----	----	Unused.
r16	-----	13	3	L?	r5	-----	Su	D	Reported 6 gpm flow in winter. No flow when visited Sept. 12, 1949. Located below dam. Analysis does not indicate connection with pond. Log available.
103	6	70	33	Ca	r68.0	Sept. 28, 1949	J, ¼	D	Yield ½ gpm, 35 ft drawdown on 15-min test, Sept. 28, 1949. Log available.
37.6	30	-----	-----	-----	22.9	Oct. 7, 1949	Bu	D	
r60	6	-----	-----	L	-----	-----	J, ¼	S	Inadequate. Analysis available.
20.6	30	-----	-----	-----	14.4	Oct. 7, 1949	----	O	Unused.
r2,350	10¾	-----	-----	-----	b2	-----	----	Ot	J. L. Kenard and others 1. Small flow of salty water by gas lift.
27.4	30	-----	-----	-----	5.3	Oct. 7, 1949	----	O	Unused.
206	6	85	73	Ca	47.0	Oct. 11, 1949	Cy, 1	C	Yield reported 4 gpm. Log available.
r154	8	-----	-----	Ca	-----	-----	Cy, 1	D	Soda water?
r80	6	-----	-----	Ca?	-----	-----	Cy, ⅓	D, S	Inadequate.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8730-3750-27	$1\frac{3}{8}$ miles northeast of Henderson.	Givens Phelps	J. D. Tucker	----	a419	Dr
28	$1\frac{1}{2}$ miles northeast of Henderson.	John Priest	----	1915	----	Dr
29	$1\frac{3}{4}$ miles northeast of Henderson.	J. G. Sasse	Stanton Sircy	1943	----	Dr
30	$3\frac{3}{4}$ miles north of Henderson.	Raymond Brown	----	----	----	Dn
31	$1\frac{5}{8}$ miles northeast of Henderson.	J. A. DeKemper	J. A. DeKemper	----	----	Dn
32	1 mile northeast of Henderson.	Preston Brown	----	Before 1900	----	Dr
33	$1\frac{1}{4}$ miles northeast of Henderson.	Mrs. Charles Argue	E. F. Doudna	----	----	Dr
34	do	Frank Jenkins	----	----	----	Dr
35	$1\frac{3}{8}$ miles northeast of Henderson.	William Walker	J. D. Tucker	October 1949	----	Dr
36	$1\frac{3}{4}$ miles northeast of Henderson.	L. W. Brown	Stanton Sircy	October 1945	----	Dr
37	do	do	----	----	----	Du
38	do	Edith Collins	Stanton Sircy	----	a412	Dr
39	$2\frac{3}{4}$ miles northeast of Henderson.	Carolyn Wolf	----	----	----	Du, Dr
40	$2\frac{3}{4}$ miles northeast of Henderson in Audubon Park.	State of Kentucky, Division of Parks.	----	----	----	Dr
41	$3\frac{1}{2}$ miles northeast of Henderson.	Jenkins	----	----	----	Du
42	$3\frac{1}{4}$ miles northeast of Henderson.	Joe Tisserand	----	----	----	Dr
43	3 miles northeast of Henderson.	do	----	----	----	Du
44	$2\frac{1}{2}$ miles northeast of Henderson.	Joseph Hartfield	Stanton Sircy	1947	----	Dr
45	$2\frac{1}{4}$ miles northeast of Henderson.	do	----	----	----	Dn
46	$2\frac{1}{6}$ miles northeast of Henderson.	Jake King	----	----	----	Dn
47	$1\frac{3}{4}$ miles northeast of Henderson.	Tom Polk	----	----	----	Dn
48	do	Chester Loney	----	1944	----	Dn
49	do	Jake King	----	----	----	Dn
50	do	Chester Brown	----	----	----	Dn
51	do	Raymond Brown	----	----	----	Dn
52	do	Oscar Brackett	----	----	----	Dn
53	$1\frac{1}{2}$ miles northeast of Henderson.	H. M. Cunningham	----	----	----	Dn
54	do	Mrs. Charles Argue	----	----	a448	Dr
55	do	C. E. Robertson	----	1900	----	Du
56	$1\frac{3}{8}$ miles northeast of Henderson.	Home Oil Terminal Co.	W. H. Holliday	----	----	Dn
57	do	George DeKemper	George DeKemper.	----	----	Dn
58	do	Thomas Moss	----	----	----	Dn
59	do	A. Seiler	----	----	----	Dn
60	do	Paul Stroud	----	----	----	Dn
61	do	O. A. Kirsch	----	----	----	Dn
62	do	John Byron	----	----	----	Dn

in the Henderson area, Kentucky—Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed			Water level		Lift	Use	Remarks
		Depth to top of bed (feet)	Thickness (feet)	Geologic horizon	Below land surface (feet)	Date of measurement			
150	8	----	----	Ca	57.6	Oct. 11, 1949	Bu	D	
r360	6	----	----	Ca	r110	----	Cy, ¾	D	Soda water. Temperature 48° F. Analysis available.
r200	4	----	----	Ca	----	----	Cy, ¾	D	Soda water. Analysis available.
48	2	----	----	A1	r30	----	Cy	D	
50	2	41	9	A1	r41	----	Cy, ¾	D	Log available.
r110	6	----	----	Ca?	----	----	Cy, ½	D	Quality has improved with heavier pumping.
r54	6	----	----	L	----	----	J, ½	D	Inadequate.
----	6	----	----	----	----	----	Cy, ¾	D	
175	12	120	40	Ca	48.5	Nov. 28, 1949	J	C	Yield reported 5 gpm, Oct. 1949. Log available.
r120	10	----	----	Ca, L	r9	----	J, ¾	D	
10.2	24	----	----	----	1.6	Oct. 17, 1949	----	A	
147	8	----	----	Ca	65.0	do	----	O	Yield reported 10 gpm, 1940.
61	36 to 6	----	----	L	10.2	do	Su	D	
45	6	----	----	L	11.7	do	----	A, O	
16.4	24	----	----	----	5.1	do	Bu	A	
80.8	6	----	----	Ca?	75.5	do	Ba	D	Inadequate.
19.9	36	----	----	----	8.8	do	----	A	
r120	8	----	----	Ca	r80	1947	Cy, G, 3	D	Inadequate.
r45	1½	----	----	A1	r30	----	Cy	S	4-ft screen.
----	2	----	----	A1	----	----	Cy	D	
----	----	----	----	A1	----	----	Cy, 1	D	
r37	2	----	----	A1	r34	----	Cy	D	
r50	3	----	----	A1	----	----	Cy, ½	D, S	
r45	1½	----	----	A1	----	----	Cy, ½	D, S	
----	----	----	----	A1	----	----	Cy, ½	D, S	
r50	2	----	----	A1	----	----	Cy	D	
r50	----	----	----	A1	r30	----	Cy, ¾	D	
150	6	----	----	Ca	16.2	Nov. 2, 1949	----	O	Reported 285 ft deep. Sulfurous odor.
r32	36	----	----	L	r26	----	Cy	S	Temperature 57° F.
r73	3	64	9	A1	r22	----	Cy, ¼	D	Temperature 57° F. Analysis and log available.
r50	----	18	32	A1	r41	----	Cy, ½	D	Log available.
----	2	----	----	A1	----	----	Cy, 1	D	
r65	----	----	----	A1	----	----	J, 1	D	
r57	----	----	----	A1	----	----	J	D	
r57	----	----	----	A1	----	----	Cy	D	
r45	2	----	----	A1	----	----	Cy, ¾	D, S	

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8730-3750-63	1⅜ miles northeast of Henderson.	Wiley Tapp				Dn
64	1¼ miles northeast of Henderson.	W. M. Thomason				Dn
65	1 mile northeast of Henderson.	J. B. Groves				Dn
66	do	Dr. R. J. Davis				Dr
67	do	V. M. Coulson				Dn
68	do	James Barker				Dn
69	do	do				Dn
70	1⅛ miles northeast of Henderson.	Dr. R. E. Ruark				Dr
71	do	do				Dn
72	do	William Walker			398	Dr
73	do	do	Stanton Sircy			Dr
74	1⅜ miles northeast of Henderson.	George Toy		1932		Dn
75	do	Mrs. Laura Walker				Dn
76	do	Mrs. Cornelia Rettig.				Dr
77	1¼ miles northeast of Henderson.	Pat Quigley		July 1948		Dn
78	1⅛ miles northeast of Henderson.	do				Dn
79	do	Harry Haynes		1947		Dn
80	do	Mrs. M. H. Thorn				Dn
81	do	A. M. Evans				Dn
82	do	Fryer and Brown		1945		Dn
83	do	H. P. Laswell	Harvey Powell	1941		Dr
84	do	Paul Brown	do			Dr
85	do	Ernest Hulse	do			Dr
86	do	I. C. Richardson				Dr
87	do	Paul Mahoney				Dr
88	1 mile northeast of Henderson.	C. A. Williamson				Dr
89	do	Claude Campbell		1941		Dn
90	do	do		1944		Dr
91	do	I. C. Richardson				Dr
92	do	H. E. Richardson	I. C. Richardson			Dn
93	do	S. Z. Bernstein		1941		Dn
94	do	W. D. Johnson				Dn
95	⅞ mile northeast of Henderson.	Sam Wilson	Stanton Sircy	April 1945		Dr
96	do	Charles Gingel				Dn
97	do	H. E. Richardson				Dn
98	do	R. H. Richardson				Dn
99	do	Gus Springer				Dn
100	do	A. B. Cheaney				Dn
101	do	do				Dn
102	do	Bert Springer		1914		Dn
103	¾ mile northeast of Henderson.	Annie Rooney				Dn
104	do	John Rettig		1917		Dn
105	do	Lemuel Knight				Dn
106	do	I. J. Parker		1947		Dr

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
r65	4			A1			Cy, ½	D, S	
r70				A1			Cy, 1	D	
r70				A1			J, ½	D	
r125	6	105	20	Ca			J, ½	D	Yield 3½ gpm, Feb. 1947. Analysis available.
r55	3	40	15	A1	r40		J, ½	D	
r56	3			A1			J, ½	D, S	
r43	1½			A1			Cy		Standby well.
r96	6			Ca			Cy, ½	D	Yield reported 2 to 3 gpm, July 1950.
r60				A1				A	
165	6			Ca	41.7	Jan. 16, 1950	J, 1½	C	Inadequate.
r165	6			Ca			J, 1½	C	Inadequate. Temperature 58°F. Analysis available.
r56	2			A1			Cy, ½	D, S	
				A1			Cy	D	
40	6	53	7	A1	39.5	May 1, 1953		A	Civilian Conservation Corps, original owner. Probably screened well. Caved.
r51	2	47	4	A1	r14	July 1948	Cy, ½	D	
r56	3	54	2+	A1	r38		J, ½	D	
r55	2	53	2	A1	r30		J, ½	D	
r55				A1			Cy, ½	D	
r61	4	31	30?	A1			Cy, ¾	D	
r65	2			A1			Cy	D	
r96	6			Ca?			J, ¼	D	
r94				Ca			J, ¼	D	
r70	6			Ca?			J, ⅓	D	
r100	6			Ca				D	
r100	6			Ca			J, ½	D	Inadequate.
r65	6			L?			Cy	D	Originally driven. Drilled into rock.
r60				A1				D	Dry in summer.
r100				Ca?	r40	1944		D	
r100	8			Ca?			Cy, ¾	D	
r50	2			A1			Cy, ½	D	
r50	2			A1			Cy, ¾	D	
r52	2			A1			Cy, ½	D	
r95	6			Ca			Cy, ½	D	
r60	2			A1			Cy, ½	D	
				A1				D	
				A1				D	
r50+				A1				D	
r47	2	30	17	A1	42		J, ½	D	
r45	2			A1	r33	Fall 1949	J	C	
r55	2	35	20	A1	r30		Cy, ¼	D, S	
r55	2			A1			Cy, ¾	D, S	
r48	2			A1	r37		Cy, ½	D	Reported clay in bottom.
	2			A1			J, ½	D	
r70+				Ca?			J, ⅓	D	Temperature 47°F. Analysis available. Inadequate in summer.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8730-3750-107	¾ mile northeast of Henderson.	James Taylor				Dr
108	do	E. R. Doctorman				Dr
109	do	Gus Krause				Dn
110	do	Tom Day				Dn
111	⅞ mile northeast of Henderson.	F. L. Brown		1940		Dn
112	do	J. O. Huhlein	Heldt-Monroe Co.	1937		Dr
113	do	Dr. W. F. Winn	do			Dr
114	do	James Loney				Dn
115	2¼ miles northeast of Henderson.	J. C. Ligon				Dn
116	do	William Slaton				Dn
117	2⅛ miles northeast of Henderson.	Allen Wilson		October 1946		Dn
118	do	do		May 1949		Dn
119	2 miles northeast of Henderson.	L. B. Springer		August 1949		Dn
120	1⅞ miles northeast of Henderson.	R. K. Richards	Harvey Powell	1940		Dn
121	1¾ miles northeast of Henderson.	John Priest		September 1948		Dn
122	2 miles northeast of Henderson in Audubon Park.	State of Kentucky, Division of Parks.				Du
123	do	do	Heldt-Monroe Co.			Dr
124	do	do	do			Dr
125	2⅛ miles northeast of Henderson.	do	do	July 1938		Dr
126	2¼ miles northeast of Henderson.	Mrs. Stony Brown	Edward Krueger			Dr
127	do	do				Dr
128	do	W. M. Peak		1934		Dr
129	1¾ miles northeast of Henderson.	H. S. Sheffer		1942		Dr
130	do	Starling McClure	Stanton Sircy			Dr
131	1⅝ miles northeast of Henderson.	Joe King				Dn
132	1½ miles northeast of Henderson.	Joe King, Jr				Dn
133	do	Mrs. John Jenkins				Dr
134	1¼ miles northeast of Henderson.	Clarence Wood				Dn
135	1⅛ miles northeast of Henderson.	Wyatt Edwards				Dr
136	do	Harry Critser				Dr
137	1 mile northeast of Henderson.	Henry Payne				Dr
138	do	W. L. Finley				Dn
139	do	Mrs. John Fitzgerald.		March 1940		Dn
140	do	do	Stanton Sircy	1945		Dr
141	do	C. Overfield				Dn
142	do	do	Stanton Sircy		a391	Dr

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
----	----	----	----	Ca?	----	----	J, ½	D	
r75	6	----	----	Ca?	----	----	J, ⅓	D	
r48	2	----	----	Al	----	----	Cy	D	Reported down to rock.
r48	2	----	----	Al	r35	----	Cy, ¼	D	
r52	4	----	----	Al	r20	----	Cy, ½	D	
r75	----	----	----	Ca?	r55	----	Cy, ½	D	
----	----	----	----	Ca?	----	----	----	D	
----	2	----	----	Al	----	----	Cy	D	
r43	2	----	----	Al	----	----	Cy, ⅓	C	
----	----	----	----	Al	----	----	----	C	
r54	3	37	17	Al	r38	October 1946	Cy, ½	C	
r49	2	38	11	Al	r38	May 1949	Cy, ⅓	D	
r54	3	----	----	Al	----	----	Cy, 1	C	
----	----	43	----	Al	----	----	Cy, ½	C	
r42	3	----	----	Al	r29	September 1948	Cy, ½	C	
r40	144	----	----	----	----	----	----	A	Dry. Log available.
----	----	----	----	----	----	----	----	A	Dry.
----	----	----	----	----	----	----	----	A	Do.
r65.5	6¼	----	----	Al	r16	July 6, 1938	Tu, 5	D, P	Yield 50 gpm, against 225 ft total head, July 1938. Analysis available. 10-ft screen.
r90	----	----	----	Ca?	----	----	----	D	
47.3	4	----	----	----	44.9	Oct. 25, 1949	----	A	Reported 60 ft deep.
r90	----	----	----	Ca?	----	----	Cy, 1	C	
r110	----	----	----	Ca?	r60	----	Cy, ½	D	Inadequate.
r147	6	----	----	Ca	----	----	Cy, ⅓	D	
r60	2	----	----	Al	----	----	Cy, ¾	C	
r39	----	----	----	Al	----	----	Cy, 1½	C	Boundary flood plain and terrace.
r100	----	----	----	Ca?	----	----	Cy, ½	D	Supplies 6 houses. Soda water.
----	----	----	----	Al	----	----	----	D	
r90	----	----	----	Ca?	----	----	J, ½	D	
r100+	----	----	----	Ca?	----	----	J, ½	D	
r100	----	----	----	Ca?	r64	----	Cy, ½	D	
r60	----	----	----	Al	----	----	Cy, ½	D	
r55	----	----	----	Al	----	----	Cy, ¾	D	
r100+	----	----	----	Ca?	r35	----	J, ½	D	Standby well.
r54	----	----	----	Al	----	----	J, ½	D	Temperature 54°F. Analysis available.
85.6	6	----	----	Ca?	45.0	Dec. 6, 1949	----	O	Standby well.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8730-3750-143	¾ mile northeast of Henderson.	Audie Wilson			a397	Dr
144	do	Lee Pruitt				Dn
145	2¼ miles north of Henderson.	Norton Bauldauf				Dn
146	3 miles north of Henderson.	Joe King				Dn
147	1¼ miles northeast of Henderson.	do				Dn
148	3⅝ miles north of Henderson.	Albert DeKemper				Dn
149	do	do				Dn
150	1⅛ miles northeast of Henderson.	Robert Simpkins		November 1947		Dr
151	do	Irvin La Rue			a439	Dr
152	do	B. W. Springer				Dr
153	1⅜ miles northeast of Henderson.	Mrs. Charles Argue				Dr
154	do	do		1945		Dr
155	do	do		1940		Dr
156	2 miles east of Henderson.	Gene Warren	Stanton Sircy	Spring 1948		Dr
157	do	do				Du
158	do	do				Du
159	4⅜ miles northeast of Henderson.	J. C. Ellis				Dn
160	4⅝ miles northeast of Henderson.	Bedford Nugent				Dn
161	do	do				Dn
162	4⅞ miles northeast of Henderson in Indiana.	Ed Felker				Dn
163	4¾ miles northeast of Henderson.	Joe Wathen				Dn
164	⅞ mile northeast of Henderson.	J. R. Crane	Stanton Sircy	October 1947		Dr
165	4 miles northeast of Henderson.	Bedford Nugent				Dn
166	⅞ mile northeast of Henderson.	Robert Farrell	J. D. Tucker	June 1948		Dr
167	do	J. R. Crane	do	October 1948		Dr
168	do	Thomas F. Smith	Carl Garretson	do		Dr
169	do	Alvin Johnson	Stanton Sircy	1948		Dr
170	do	Vernon Nunn	do	do		Dr
171	3⅜ miles northeast of Henderson.	J. R. Crane	J. D. Tucker	do		Dr
173	3¾ miles east of Henderson.	Hillary Baskett				Du
174	3¼ miles east of Henderson.	Carl Pearson				Du

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
109.4	6	----	----	Ca?	40.1	Dec. 6, 1949	----	A, O	
r41	----	12	29	Al	----	----	Cy, ½	D	
r35	----	----	----	Al	r24	----	Cy	D	Temperature 56°F. Analysis available.
r45	3	30	15	Al	----	----	Cy, G	D, S	Do.
r48	----	----	----	Al	r20-30	----	Cy, ¾	D	
----	2	----	----	Al	----	----	Cy, G	D, S	
----	2	----	----	Al	----	----	Cy, G	S	
r132	8	127	5	Ca?	----	----	Cy	D	Probably 2 aquifers. Temperature 57°F.
40	6	----	----	----	6.2	Oct. 31, 1949	Su	----	Unused. Reported 200 ft deep.
r48	6	----	----	L	----	----	J, ½	D, S	Pumped ½ day.
59	6	----	----	L	21.6	Oct. 31, 1949	Cy	D	
r20	4	----	----	L	----	----	Cy	D	
r325	----	----	----	Ca	----	----	J	D, Ir	Soda water. Softner used. Temperature 48°F. Analysis available.
r150	6	----	----	Ca	106.3	Mar. 27, 1952	Cy, ½	D, S	Analysis available. Reported depth to water 70 ft, spring 1948.
30.4	36	----	----	----	15.6	Nov. 2, 1949	----	----	
30.1	36	----	----	----	11.4	---do----	Cy, W	O, S	
r45	2	20	25	Al	----	----	Cy	C	1 of 26 wells located in Dade Park.
r40	1¼	----	----	Al	----	----	Su	D	
r35	1¼	----	----	Al	----	----	Cy	----	Unused.
r35	1¼	----	----	Al	----	----	Cy	D	
r35	1¼	----	----	Al	----	----	Cy	D	
r155	6	----	----	Ca	r80	October 1947	J, 1	D	
r40	3	----	----	Al	----	----	Cy	----	Unused.
r145	6	----	----	Ca	----	----	J, ¾	D	
r150	6	----	----	Ca	----	----	Cy, 1	D	
r125	6	----	----	Ca	r60	----	J, ½	D	Inadequate. Log available.
r145	6	----	----	----	r70	1948	J, 1	D	
r140	6	----	----	----	r70	---do----	J, ½	D	
r80	6	----	----	L	r40	1949	J, 1	D	Yield reported 3 gpm, 1949. Softner used. Temperature 58°F. Analysis available.
12	60	----	----	----	11.3	Nov. 2, 1949	Cy	A	
11.8	120	----	----	----	6.8	---do----	----	----	

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8730-3750-175	3 miles east of Henderson.	Ben Rash				Du
176	1¾ miles east of Henderson.	Mrs. Harriet A. Kimsey.				Du
177	1½ miles east of Henderson.	do				Du
178	1⅜ miles east of Henderson.	Soaper Estate				Du
179	1⅛ miles east of Henderson.	do				Du
180	do	do				Du
181	¾ mile east of Henderson.	King and Dempewolf.				Du
182	do	do				Du, Dr
183	¼ mile east of Henderson.	H. L. Hickey			a389	Dr
184	⅞ mile east of Henderson.	Mrs. Harriet A. Kimsey.				Du
185	do	W. E. McClure				Du
186	2⅜ miles east of Henderson.	Ewing Galloway	Schmidt			Dr
187	do	do	Heldt-Monroe Co.	Apr. 1, 1940		Dr
188	do	do	do	Mar. 10, 1940	a412	Dr
189	do	do	Schmidt			Dr
190	do	do				Dr
191	1⅞ miles east of Henderson.	do				Du
192	2⅜ miles east of Henderson.	do				Du
193	½ mile northeast of Henderson.	Mrs. H. B. Barrett.	E. F. Doudna	1907		Dr
194	do	do	do	1907?		Dr
195	¾ mile northeast of Henderson.	H. L. Austrew	Tri-State Plumbing Co.	1929		Dr
196	do	do				Du
197	1⅜ miles northeast of Henderson.	T. C. Brown	J. D. Tucker	Nov. 7, 1949	390	Dr
198	3⅛ miles east of Henderson.	O. W. Rash				Du
199	do	do				Du
200	do	do				Du
201	do	Ben Rash	Carter Oil Co?		a425	Dr
202	do	James R. Rash, Jr.				Du
203	3 miles northeast of Henderson.	Joe Tisserand				Dr
204	1⅝ miles northeast of Henderson.	J. C. Warren				Du

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
58.4	30	----	----	----	16.3	Nov. 2, 1949	Bu	D	
34	96	----	----	----	21.8	Nov. 3, 1949	Cy, W	S	
31.5	96	----	----	----	4.6	___do_____	Cy	S	Temperature 53°F.
r30	48	----	----	Al?	r20	----------	Cy, ½	D	Inadequate. Temperature 54°F. Analysis available.
r30	48	----	----	----	----	----------	Cy	D	
r30	48	----	----	----	----	----------	Cy	D	
25	42	----	----	----	4.0	Nov. 3, 1949	----	A	
----	----	----	----	----	4.5	___do_____	Cy	D	Inadequate.
66	6	----	----	L?	10.8	Aug. 17, 1950	Cy	S	Reported 128 ft deep. Yield 7.5 gpm, 16 ft drawdown in 4 min, Aug. 17, 1950.
27.5	36	----	----	----	9.4	Nov. 3, 1949	Bu	D, S	Temperature 58°F.
22	42	----	----	----	11.9	___do_____	Su	S	Unused.
r125	6	----	----	Ca	----	----------	Cy, 1½	D	
r375	6	140	7	Ca	r80	Apr. 1, 1940	----	A	Yield reported 2 gpm. Log available.
r210	6	165	20	Ca	74.5	Mar. 27, 1952	Cy, 1½	D	Yield reported 1¼ gpm. Soda water. Temperature 53°F. Analysis available. Log on page 207.
r125	6	----	----	Ca	----	----------	Cy, 1½	D, S	
r125	6	----	----	Ca	----	----------	Cy, 1½	S	
r12	----	----	----	----	----	----------	Cy	D	
48.8	42	----	----	----	7.4	Nov. 7, 1949	Cy, ¾	O, S	Unused.
r285	4	----	----	Ca	----	----------	Cy, 5	D, S	Adequate. Soda water. Temperature 48°F. Analysis available.
r200±	----	----	----	Ca	----	----------	----	A	Reported not substantial. Buried.
r112	6	----	----	Ca	r96	1929	J, 1	D	
r30	60	----	----	----	----	----------	----	----	Dry.
105	6	71	34	Ca	46.3	Nov. 8, 1949	J, ½	C	Yield 4 gpm, 60 ft drawdown on 10-min test, Nov. 7, 1949. Log available.
20.2	48	----	----	----	7.7	Nov. 7, 1949	----	S	Unused.
28.8	42	----	----	----	14.0	___do_____	----	D	Do.
15.2	60	----	----	----	4.0	___do_____	----	D	Do.
76	4	----	----	L?	14.1	___do_____	----	Ct, O	
43.7	60	----	----	----	33.0	___do_____	J, ¾	D	Inadequate.
25	6	----	----	----	11.1	Nov. 21, 1949	----	A	Reported 100 ft deep.
35	36	----	----	----	r20 to 22	----------	Cy, W	S	

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8730-3750-205	1 5/8 miles northeast of Henderson.	J. C. Warren				Du
206	do	do				Du
207	2½ miles east of Henderson.	W. G. Hodge				Du
208	3 1/8 miles northeast of Henderson.	Henderson Dairy	Stanton Sircy			Dr
209	1 1/8 miles northeast of Henderson.	James Barker				Dn
210	4 miles north of Henderson.	Clarence Wood	Heldt-Monroe Co.	July 2, 1949		Dr
211	4 miles north of Henderson in Dade Park.	James C. Ellis				Dn
212	1 5/8 miles northeast of Henderson.	E. R. Duncan	Heldt-Monroe Co.			Dr
213	Henderson in Atkinson Park.	City of Henderson				Dr
214	do	do			a391	Dr
215	do	do			440	Dr
216	Ohio River near Atkinson Park, Henderson.	Methodist Hospital		October 1949	417	Dr
217	2½ miles east of Henderson.	W. G. Hodge		1940		Dr
218	do	do		do		Dr
219	1 mile northeast of Henderson.	City of Henderson	E. F. Doudna	1913	390	Dr
220	do	do	do	do		Dr
221	Alkinson Park, Henderson.	do	E. F. Doudna?			Dr
222	2½ miles northeast of Henderson in Audubon Park.	Annie K. Major	E. F. Doudna	1911		Dr
223	2½ miles east of Henderson.	William Holloway		1850?	a441	Dr
224	2¼ miles northeast of Henderson in Audubon Park.	State of Kentucky	Duncan and Spencer.	April 1935	500.5	Dr
225	do	do	do	1935?	387	Dr
226	4 miles east of Henderson.	L. H. & W. Mine			425	Dr
227	Second and Priest Sts., Henderson.	Kravers Distillery			382	Dr
228	2 5/8 miles east of Henderson.	Rash Heirs		June 7, 1943	410	Dr
229	2¼ miles north of Henderson.	Bauldauf Bros		Oct. 19, 1943	367	Dr

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
r30	30	____	____	A1?	r22	____	Cy	D, S	Temperature 55°F. Analysis available.
40	36	____	____	____	20 to 25	____	Su	D	
40	48	____	____	____	7.3	Nov. 21, 1949	____	O	Inadequate.
r225	____	____	____	____	____	____	____	____	Dry.
55	3	____	____	A1	38.3	Feb. 6, 1950	Cy	O	
r78	10	32	46	A1	r32.5	July 2, 1949	Tu, 10	C	Yield reported 325 gpm with 12 ft drawdown on 4-hr test, July 2, 1949. Temperature 58°F, July 19, 1951; 57°F, Dec. 30, 1949. Analysis available.
____	1¼	____	____	A1	____	____	Cy	S	
199	____	____	____	Ca	____	____	____	D	Soda water.
75	6	____	____	____	27.9	Jan. 25, 1950	Cy	A, O	
80	6	____	____	____	28.5	____do____	Cy	A, O	
r230	6	170	60	Ca	____	____	____	T	Test for locating city supply. Log available.
r2,500+	____	____	____	____	____	____	____	Ot	J. V. Canterbury 1. Log and electric log available.
r275	6	____	____	____	____	____	____	A	Dry.
r275	6	____	____	____	____	____	____	A	Do.
r82	____	51	20	A1	____	____	____	A, T	Log available.
r71	____	45	26	A1	____	____	____	A, T	Do.
____	____	____	____	____	____	____	____	A, T	
r351	____	____	____	____	____	____	____	A, Ct	Do.
r1,024	____	90	46	Ca	____	____	____	A	Reported drilled in 1850 for brine to manufacture salt. Log on page 207.
r250	____	____	____	____	____	____	____	A, T	Dry.
r150	____	____	____	____	____	____	____	A, T	Do.
r207.3	____	110	65	Ca	____	____	____	Ct	Log on page 208.
r207.5	____	55	100?	Ca	____	____	____	A, T	Do.
r2,555	____	78	56	Ca	____	____	____	Ot	Kingwood Oil Co. 1. Electric log available.
r1,886	____	____	____	____	____	____	____	Ot	H. P. Meyer 1. Electric log available.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8730-3750-230	$1\frac{3}{4}$ miles northeast of Henderson.	C. E. Robertson	Standard Drilling Co.	Mar. 30, 1944	456	Dr
231	$2\frac{3}{4}$ miles northeast of Henderson.	W. G. Hodge		May 15, 1944	441	Dr
232	$3\frac{1}{2}$ miles northeast of Henderson.	Wolfe Hills Coal Co.			a391	Du
233	$4\frac{1}{4}$ miles northeast of Henderson.	W. H. Dempewolf	Basin Drilling Co.	July 3, 1949	517	Dr
234	$3\frac{5}{8}$ miles east of Henderson.	R. E. Givens		May 21, 1948	427	Dr
235	$\frac{3}{4}$ mile east of Henderson.	W. H. Dempewolf	Delta Drilling Co.		389	Dr
236	4 miles north of Henderson.	Clarence Wood	Heldt-Monroe Co.		380	Dn
237	$\frac{5}{8}$ mile northeast of Henderson.	Shaws Flowers	Stanton Sircy		400	Dr
238	$1\frac{1}{4}$ miles northeast of Henderson.	Clarence Wood	do			Dr
239	East end of 9th St., Henderson.	Henderson Mining Co.			a405	Du
240	$\frac{1}{2}$ mile northeast of Henderson.	Cecil Barrett	J. F. Balderson	Apr. 27, 1950	444	Dr
241	$3\frac{1}{4}$ miles northeast of Henderson.	J. R. Crane	J. D. Tucker	May 1950		Dr
242	$1\frac{5}{8}$ miles northeast of Henderson.	T. W. Lambert		1940		Dr
243	do	do				Dr
244	2 miles northeast of Henderson.	C. M. Katterjohn	Heldt-Monroe Co.	September 1949	a454	Dr
245	South side of 1st St. between North Holloway and North Alvasia, Henderson.	City of Henderson	E. F. Doudna		a388	Dr
246	$\frac{3}{4}$ mile northeast of Henderson.	J. A. Smith	J. D. Tucker	June 1950	390	Dr
247	$1\frac{1}{8}$ miles northeast of Henderson.	I. C. Richardson	do	do		Dr
248	1 mile northeast of Henderson.	Spaulding Hotel	Harvey Powell	Aug. 25, 1950		Dn
249	$1\frac{3}{8}$ miles northeast of Henderson.	Clarence Griffin	J. D. Tucker	Sept. 19, 1950		Dr
250	do	Clarence Wood				Dr
251	3 miles northeast of Henderson.	State of Kentucky	Kentucky Dept. of Highways.	May 1928		Dr
252	do	do				
253	do	do				
254	do	do				
255	do	do				
256	do	do				

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
r2,570	—	150	60	Ca	—	—	—	Ot	National Associated Petroleum Corp. 1. Electric log available.
r2,504	—	146	8	Ca	—	—	—	Ot	Producers Pipe Line Co. 1. Electric log available.
r175	—	—	—	—	—	—	—	—	Dry mine. Log on page 209.
r2,540	—	198	50	Ca	—	—	—	Ot	Basin Drilling Co. 1. Electric log available.
r1,665	—	114	60	Ca	—	—	—	Ot	Kingwood Oil Co. 1. Electric log available.
r2,540	—	120	38	Ca	—	—	—	Ot	Delta Drilling Co. 1. Electric log available.
r60	3	30	30	Al	—	—	Cy, 1½	D	Temperature 59°F. Analysis available.
r160	—	120	40	Ca	—	—	Cy, ¾	Ir	
r190	—	130	60	Ca	—	—	—	D	
r216	—	159	37	Ca	—	—	—	A	Coal mine. Reported continuous pumping at 250 gpm. Only wet mine in Henderson County. Log on page 209.
r2,594	8¾	175	65	Ca	—	—	—	Ot	J. V. Canterbury 1. Log on page 210. Electric log available.
r145	6	—	—	—	—	—	—	—	Dry. Log available.
r80	—	—	—	Ca	—	—	—	D	Inadequate.
r400	—	—	—	—	—	—	—	—	Dry.
r100	8	—	—	—	r31	—	Cy	—	Water reported at top of shale at 49 ft; yield 50 gpm. Reported contaminated. Log available.
—	—	—	—	—	46.2	Mar. 27, 1952	Cy	A	
r100	6	56	44	Ca?	—	—	J, ½	D	Log available.
—	—	—	—	Ca	—	—	—	D	
r37	2	—	—	Al	r12.5	Aug. 28, 1950	Cy	A	Bedrock at 45 ft.
r140	6	—	—	Ca	r70	—	J, ½	D	
r170	—	—	—	Ca	—	—	—	D	Inadequate.
—	—	—	—	—	—	—	—	T	Test boring for bridge foundations.
—	—	—	—	—	—	—	—	T	Do.
—	—	—	—	—	—	—	—	T	Do.
—	—	—	—	—	—	—	—	T	Do.
—	—	—	—	—	—	—	—	T	Do.
—	—	—	—	—	—	—	—	T	Do.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8730-3750-257	3 miles northeast of Henderson.	State of Kentucky				
258	do	do				
259	do	do				
260	do	do				
261	do	do				
262	do	do				
263	do	do				
264	do	do				
265	3 miles northeast of Henderson, Ohio River bridge.	do	Kentucky Dept. of Highways.	May 1928		
266	3 miles northeast of Henderson.	do				
267	do	do				
268	do	do				
269	do	do				
270	do	do				
271	do	do				
272	do	do				
273	do	do				
274	do	do				
275	do	do				
276	do	do				
277	do	do				
278	do	do				
279	do	do				
280	do	do				
281	do	do				
282	do	do				
283	2 miles east of Henderson.	Kimsey Estate	George and Wrather.			Dr
284	2¾ miles northeast of Henderson.	F. M. Wolf	Excelsior Drilling & Prospecting Co.	1872 or 1888	494	Dr
285	Second and Priest Sts., Henderson	State of Kentucky	Kentucky Dept. of Highways.			
286	3½ miles east of Henderson.	Ben Rash			414	Dr
287	1¼ miles northeast of Henderson.	M. H. Miller	J. D. Tucker	June 26, 1951	a463	Dr
288	1⅛ miles northeast of Henderson.	L. Massey	Roscoe Jenkins	June 1951	441	Dr
289	1 mile northeast of Henderson.	City of Henderson	Ranney Methods	August 1952	a393	Dr
290	1¼ miles northeast of Henderson.	do	do	do	338	Dr
291	1¾ miles northeast of Henderson.	do	do	October 1952		Dr
292	1 mile northeast of Henderson.	Spaulding Hotel	Harvey Powell			Dn
293	do	do	J. D. Tucker		390	Dr
294	do	Thomas Lynn	Harvey Powell			Dn
295	do	H. H. Pinson	do	Spring 1951		Dn
296	do	Gilbert Powell	A. P. Fulkerson	1950		Dn

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
-----	-----	-----	-----	-----	-----	-----	-----	T	Test boring for bridge foundations.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	T	Do.
-----	-----	-----	-----	-----	-----	-----	-----	Ot	George and Wrather 1. Electric log available.
r916	-----	-----	-----	-----	-----	-----	-----	-----	Moses and Lilly 1. Reported best quality water at 600 ft. Log available.
-----	-----	-----	-----	-----	-----	-----	-----	T	1 of 8 bridge test borings. Log available.
-----	-----	78	56	Ca	-----	-----	-----	-----	H. L. Wirick 1. Log and electric log available.
234	6	160	70	Ca	113.8	June 26, 1951	Tu, ½	D	Soda water. Log available.
168	6	125	43	Ca	97.3	June 27, 1951	-----	D	Yield reported 4 gpm. Soda water. Log available.
61.5	6	60	9.3	Al	43.4	Aug. 26, 1952	-----	T	Log available. Reported 69.3 ft depth.
27	6	13	14	Al	.1	----do-----	-----	T	Do.
70	12	56.5	13.5	Al	25.2	October 1952	Tu	-----	Yield 200 gpm, 40 ft drawdown on 24-hr test. Temperature 58° F. Log available.
47	3	-----	-----	Al	29.7	Mar. 5, 1951	J, ½	A	
170	9	55	112	Ca	35.9	Mar. 22, 1951	J, 2	C, D	Yield reported 10 gpm, Mar. 19, 1951. Log on page 212.
r47	2	-----	-----	Al	-----	-----	J, ½	D	
-----	2	-----	-----	Al	-----	-----	J, ½	D	
r41	2	-----	-----	Al	r35	July 10, 1950	Cy, ½	D	Yield 70 gpd, owner's estimate.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8730-3750-297	1 mile northeast of Henderson.	W. H. Crafton	Harvey Powell	1951		Dn
298	do	Pete Harkowitz	I. C. Richardson	do		Dn
299	do	Floyd Grant	do	July 1951		Dn
300	do	John Meuth	John Meuth	do		Dn
301	do	M. Forman		April 1950		Dn
302	do	Herman Hussel		July 1951		Dn
303	do	C. E. Weldon		August 1951		Dn
304	do	Al Fulkerson	J. D. Tucker	do		Dr
305	do	J. R. Crane	do	do		Dr
306	do	do	do	do		Dr
307	do	do	do	do		Dr
308	do	do	A. P. Fulkerson	July 1951		Dn
309	do	H. S. Utley		September 1951		Dn
310	do	Price Green	Price Green	June 1950		Dn
311	do	Joe Shimwell		December 1949		Dn
312	do	M. E. Jones		June 1951		Dn
313	$1\frac{1}{2}$ miles northeast of Henderson.	D. E. Tolbert	D. E. Tolbert			Dn
314	do	LeRoy Boyd	LeRoy Boyd			Dn
315	4 miles east of Henderson.	Alma Hoffman				Du
316	$3\frac{1}{2}$ miles north of Henderson.	Bauldauf	Walker Drilling Co.		363	Dr
317	4 miles northeast of Henderson.	Wolf Estate			461	Dr
319	Henderson					
8730-3755-1	$4\frac{1}{2}$ miles northeast of Henderson.	Art Bridges	Heldt-Monroe Co.			Dn
2	4 miles northeast of Henderson.	Clarence Wood	Harvey Powell			Dn
3	$4\frac{5}{8}$ miles northeast of Henderson.	James L. Cheatum				Dr
4	5 miles north of Henderson.	Clarence Wood	Heldt-Monroe Co.			Dn
5	$5\frac{1}{4}$ miles northeast of Henderson.	James C. Ellis	Jess Roy			Dn
6	$4\frac{7}{8}$ miles northeast of Henderson.	Lockett Heirs	Lohman & Johnson Drilling Co.		367	Dr

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
r47	2	-----	-----	Al	r32	1951?	J, ½	D	
r40	2	-----	-----	Al	-----	-----	-----	D	Reported deepened to 50 ft.
r40	2	-----	-----	Al	r38	July 1951	Cy, ½	---	Driven to 50 ft fall of 1951.
r55	2	-----	-----	Al	r34	----do-----	J, ½	D	
r45	2½	-----	-----	Al	r38	November 1949	J, ½	D	
r46	2½	-----	-----	Al	r36	July 1951	J, ½	C	
r44	2	-----	-----	Al	r31	August 1951	-----	D	Not in use yet.
103	6	60	43	Ca	48.1	Sept. 12, 1951	J, ½	D	Yield reported 3½ gpm, Aug. 1951. Log available.
104	6	60	44	Ca	50.4	----do-----	-----	D	Pump-test data available.
102	6	59	43	Ca	48.6	----do-----	-----	D	
101	6	-----	-----	Ca	49.3	----do-----	-----	D	
r51	2	-----	-----	Al	r38	July 1951	-----	A	3 wells. Pumped sand through 80-mesh screen.
r49	2	-----	-----	Al	r37	Sept. 13, 1951	J, ½	D	
-----	-----	-----	-----	Al	-----	-----	-----	D	
-----	-----	-----	-----	Al	-----	-----	-----	D	
-----	-----	-----	-----	Al	-----	-----	-----	D	
r45	-----	-----	-----	Al	-----	-----	Cy	D	
r48	1½	35	13	Al	r36	September 1950	Cy, ¼	D	
41.5	30	-----	-----	-----	24.0	Sept. 9, 1949	Bu	D	Inadequate. Water added from city supplies.
r2,568	8¾	26	89	Al	-----	-----	-----	Ot	J. R. Grandin and others 1. Log on page 212. Electric log available.
r2,519	8¾	156	35	Ca	-----	-----	-----	Ot	Magnolia Oil Co. 1. Electric log available.
-----	-----	-----	-----	-----	-----	-----	-----	T	Ohio River test boring. Bedrock elevation at 324.4 ft above mean sea level.
r50	3	-----	-----	Al	-----	-----	Cy, 1	D, C	
r48	1¼	-----	-----	Al	-----	-----	Cy, ½	D	
-----	4	-----	-----	-----	-----	-----	Cy	Ot	
r80	3	40	40	Al	-----	-----	Cy, 5	C	
55.8	1¼	-----	-----	Al	11.3	Jan. 9, 1950	Cy	O, S	
r2,413	-----	38	80	Al	-----	-----	-----	Ot	Clarence Wood 1. Electric log available.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8730-3755-7	7 miles north of Henderson in Indiana.	City of Evansville	Diehl Pump & Supply Co.	August 1950	------	Dr
8	---do---	---do---	---do---	--do---	------	Dr
9	---do---	---do---	---do---	--do---	361.4	Dr
10	5½ miles north of Henderson in Indiana.	S. L. Bryan	Johnston Drilling Co.	------	------	Dr
11	7 miles north of Henderson in Indiana.	City of Evansville	Heldt-Monroe Co.	June 1942	------	Dr
12	5 miles northeast of Henderson in Dade Park.	J. C. Ellis	---do---	------	------	Dn
13	---do---	---do---	---do---	------	------	Dn
14	---do---	---do---	---do---	------	------	Dn
8735-3745-1	2⅝ miles southwest of Henderson.	W. C. Caton	J. D. Tucker	Sept. 5, 1949	a385	Dr
2	3⅜ miles southwest of Henderson.	A. D. Melton	------	------	------	Du
3	---do---	A. B. Eblen	------	------	a436	Dr
4	3¼ miles southwest of Henderson.	C. L. Posey	------	------	------	Du
5	---do---	H. E. Bredhold	Harvey Powell	------	------	Dr
6	⅞ mile southwest of Henderson.	Farmers Tankage Co.	Heldt-Monroe Co.	Jan. 17, 1947	385	Dr
7	---do---	---do---	---do---	January 1947	346	Dr
8	2 miles west of Henderson.	Spencer Chemical Co.	Ranney Water Collector Co.	------	365	Dn
9	---do---	---do---	---do---	------	365	Dn
10	---do---	---do---	---do---	------	355.8	Dn
11	---do---	---do---	---do---	------	355.8	Dr
12	---do---	---do---	---do---	------	368.7	Dr
13	---do---	---do---	---do---	------	------	Dr

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
131	6	75	56	Al	42.5	Sept. 15, 1950	----	T	Test well 3, water company. Log available.
120	6	65	55	Al	31.3	do	----	T	Test well 1, water company. Log available.
105	6	42	63	Al	28.0	do	----	T	Test well 2, water company. Log on page 212.
----	----	----	----	----	----	----	----	Ot	Johnston Drilling Co. 1. Electric log availabl
127	12	65	62	Al	37.0	July 1942	----	T	Test well 1. Yield reported 1,080 gpm, 25 ft drawdown.
r45	2½	----	----	Al	r15	----	Su	C	Wells 8730-3750-289, 290, and 291 located within 10 ft of each other. Rated capacity 29 gpm.
r45	3	----	----	Al	r15	----	Su	C	Temperature 59°F, May 15, 1951.
----	3	----	----	Al	r15	----	Su	C	Rated capacity 44 gpm.
54	4	47	2	Al	19.8	Sept. 5, 1949	----	D, O	Yield reported 6 gpm with no drawdown. Unscreened. Log available.
40.9	36	----	----	----	31.6	Oct. 13, 1949	J, ½	D	
----	6	----	----	----	9.4	Mar. 19, 1952	Cy	D	Temperature 58°F.
31.6	30	----	----	----	21.9	Oct. 13, 1949	Bu	D	
r85	6	----	----	----	----	----	Cy	D	Reported unable to bail dry when cleaned.
r110	8	106	4	Al	52.9	Jan. 17, 1947	Tu	In	Yield 215 gpm with 43.7 ft drawdown on 4-hr test, Jan. 17, 1947. Rated capacity 250 gpm. Temperature 56°F. Analysis and log available.
r110	8	106	4	Al	56.5	January 1947	Tu	In	Yield 215 gpm with 24.5 ft drawdown on 4-hr test, Jan. 1947. Rated capacity 250 gpm.
r65	8	----	----	Al	----	----	Tu	In	Collector. Owner's 1. (Total yield reported from ground water and river, 3 collectors equipped with siphons, 15 mgd, Nov. 1949. Analysis available.)
r74	8	----	----	Al	----	----	Tu	In, O	Collector. Owner's 2.
r71	8	----	----	Al	----	----	Tu	In	Collector. Owner's 3.
68	6⅝	----	----	Al	6.5	Nov. 8, 1949	----	T	Test well 11. Reported 100 ft deep. Plugged.
86	6⅝	----	----	Al	12.4	do	----	T	Test well 15. Reported 100 ft deep. Plugged.
42	6⅝	----	----	Al	33.8	do	----	T	Test well 2. Reported 100 ft deep. Plugged.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8735-3745-15	1⅛ miles south of Henderson.	G. H. Klauder			a384	Dr
16	2⅛ miles south of Henderson.	Mary Duncan				Dr
17	3⅛ miles south of Henderson.	G. M. Mattingly				Du
18	3⅜ miles south of Henderson.	Shelby La Rue				Du
19	do	John Duckworth				Du
20	do	Claude Brown				Dr
21	3⅝ miles south of Henderson.	Frank Street				Dr
22	¼ mile south of Henderson.	Dr. R. Rhem				Du
23	do	do				Du
24	do	J. B. Slaughter				Dr
25	⅝ mile south of Henderson.	A. L. Brooks				Du
26	do	Charles Sasse		1910	a388	Dr
27	do					Du
28	do	Fryer and Brown				Du
29	1⅛ miles south of Henderson.	Will Suggs				Du
30	1 mile south of Henderson.	A. S. Henderson				Dr
31	do	do				Dr
32	1⅛ miles south of Henderson.	Z. E. French				Du
33	do	A. H. Gropp	Stanton Sircy		a384	Dr
34	do	do				Du
35	1¼ miles south of Henderson.	Lucian Turner				Du
36	do	Sales Loney				Du
37	1½ miles south of Henderson.	Elliot Cates	Duncan and Spencer.			Dr
38	1¾ miles south of Henderson.	Luther Tate	J. D. Sugg			Dr
39	do	do				Du
40	do	Claude Brown				Du
41	1⅞ miles south of Henderson.	A. M. Gabe				Du
42	3 miles south of Henderson.	C. E. King				Du
43	do	do				Du
44	3⅜ miles south of Henderson.	do			a409	Dr
45	4¾ miles south of Henderson.					Du
46	4 miles south of Henderson.	J. R. Floyd				Du
47	do					Du
48	do	John Konsler				Dr
49	do	do				Du

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
54.6	6	----	----	L?	11.9	Dec. 8, 1949	Su	D	
r109	----	----	----	----	----	----	Cy	D	
----	----	----	----	----	----	----	Su	D	
24.8	36	----	----	----	10.8	Dec. 7, 1949	Bu	D	
22.8	36	----	----	----	13.6	do	Cy	D	
r200	6	----	----	Ca	----	----	Cy, 1	S	Yield 6¼ gpm, Dec. 7, 1949. Pumped constantly ½ day. Analysis available.
r410±	----	----	----	----	----	----	Cy	D, S	
30.5	48	----	----	----	21.6	Dec. 8, 1949	Cy	D	
34.0	42	----	----	----	25.6	do	Cy, G, 5	----	
r60	6	----	----	----	----	----	Cy	D	
18.6	36	----	----	----	7.6	Dec. 8, 1949	Cy	S	
r150	6	----	----	Ca	r8	1929	Cy, ¾	S	Temperature 56°F. Analysis available.
15.4	30	----	----	----	7.6	Dec. 8, 1949	Cy	S	
45.2	36	----	----	----	9.2	do	Cy	D	
48	30	----	----	----	8.1	do	Bu	D	
38	10	----	----	----	19.4	do	Su	D	
35	6	----	----	----	9.4	do	Bu	D	
r60	----	----	----	----	----	----	Cy	D	Adequate for past 20 yr.
152	8	58	----	Ca	8.9	Dec. 8, 1949	Cy	D, S	Temperature 56°F. Analysis available.
46.5	36	----	----	----	8.6	do	----	O	
15.7	30	----	----	----	6.6	do	Bu	D	
20	48	----	----	----	11.3	do	----	----	
r124	6	----	----	Ca	r6 to 8	----	J, ½	D	3 ft of quicksand and gravel cased off at 50 ft. Never dry. Temperature 56°F. Analysis available.
r65	6	----	----	L	r8 to 10	----	Su	D, S	
26.4	30	----	----	----	15.8	Dec. 8, 1949	Bu	D	
24.3	36	----	----	----	5.2	do	Su	----	
r30	60	----	----	----	----	----	Bu	S	
30.9	42	----	----	----	22.4	Dec. 9, 1949	Cy, ⅓	D, S	Adequate supply for past 30 yr.
30.1	30	----	----	----	21.9	do	----	D	
64.6	6	----	----	L	21.9	Sept. 9, 1949	Cy	D	
10.2	30	----	----	----	2.0	do	----	----	
12.0	96	----	----	----	3.3	do	Su	D	
37.0	36	----	----	----	30.9	do	Bu	----	
r60	6	----	----	L	----	----	J, ½	D, S	
----	36	----	----	----	----	----	----	S	Inadequate.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8735-3745-50	4 miles south of Henderson.	John Konsler				Du
51	3⅜ miles south of Henderson.	Bryant Konsler				Du
52	3⅝ miles south of Henderson.	R. J. Caroll				Du
53	3⅞ miles southwest of Henderson.	Annie Gudgell				Du
54	do	do				Du
55	3½ miles southwest of Henderson.	Bryant Konsler	Spencer			Dr
56	do	Frank Dennis	Stanton Sircy			Dr
57	1⅞ miles southwest of Henderson.	Jane E. Compton	Duncan and Spencer.	1919		Dr
58	do	do		1900		Dr
59	2⅛ miles southwest of Henderson.	Delbert Winchell				Du
60	2⅜ miles southwest of Henderson.	do				Du
61	2½ miles southwest of Henderson.	Halsey Harwood				Du
62	do	Thomas Heirs				Du
63	3 miles southwest of Henderson.	G. M. Mattingly	Stanton Sircy			Dr
64	do	do				Du
65	do	do	Carter Oil Co			Dr
66	do	do	do			Dr
67	2¾ miles southwest of Henderson.	Mrs. James Bates				Du
68	3 miles southwest of Henderson.	Coleman Overfield.				Dr
69	do	Florence Suggs				Du
70	3¼ miles southwest of Henderson.	Harry Lindenberg				Du
71	3½ miles southwest of Henderson.	Kasey Bros				Du, Dr
72	3¾ miles southwest of Henderson.	A. B. Eblen	Stanton Sircy			Dr
73	do	do				Du
74	do	W. C. Dickens		1921		Dr
75	do	Robert Konsler				Dr
76	4 miles southwest of Henderson.	Aubry Wood				Du
77	4⅛ miles southwest of Henderson.	Frank Street			a444	Dr
78	do	do				Dr
79	5 miles southwest of Henderson.	Nell Hoge				Du
80	4⅝ miles southwest of Henderson.	Randall McClure				Du
81	do	do				Dr

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
----	30	----	----	----	----	----	Su	----	Watered stock in dry year, 1936.
----	----	----	----	----	----	----	Cy	D	
r28	42	----	----	----	----	----	Cy	D	
33.4	42	----	----	----	15.3	Dec. 9, 1949	Bu	D	
34.4	36	----	----	----	21.3	do	Bu	D	
r155	6	----	----	Ca	r105	----	Cy, ¾	D, S	Analysis available.
r40	8	28	----	L?	r8	----	J, ¾	D	Can be pumped dry in 30 min, recovers in ½ hr.
r100+	8	----	----	Ca?	r8	----	J, ½	S	Ran 16 hr without failing.
r100+	8	----	----	Ca?	r10	----	Cy	D	Adequate since drilled.
r45	48	----	----	----	----	----	Su	D	
r55	48	----	----	----	----	----	J	D	
26.5	48	----	----	----	16.7	Dec. 14, 1949	Bu	S	
43.5	30	----	----	----	33.2	do	Bu	----	
r72	----	60	12	L	r16	----	J, ½	D, S	Supplies 2 houses. Temperature 60°F. Analysis available.
18	36	----	----	----	.8	Dec. 14, 1949	Su	S	Could be pumped dry in 2 hr in 1937.
r165	4	----	----	----	0	do	----	----	0.1 gpm flow on Dec. 14, 1949. Partly plugged at 20 ft.
----	4	----	----	----	----	----	----	----	Reported small flow when drilled. Buried.
r35	36	----	----	----	----	----	Su, ¼	D, S	
r135	8	----	----	Ca	r15 to 20	----	Cy	D	Never dry in 20 yr. Temperature 58°F.
34.5	----	----	----	----	19.7	Dec. 14, 1949	Bu	D	
r12	36	----	----	----	0	----	Su	----	
r45	36 to 6	----	----	----	----	----	Bu	D	
r156	4	140	16	Ca	r70	----	Cy, ½	D, S	Pumped steadily ½ day. Never dry. Temperature 60°F.
37	36	----	----	----	29.9	Dec. 19, 1949	----	----	
r60+	6	----	----	L	----	----	Cy	D, S	Adequate for 30 yr.
28.8	6	----	----	L	3.5	Dec. 19, 1949	Su	D	
32.4	42	24	6	L	24.5	do	J, ½	D	Adequate since installation of electric pump.
r209	6	----	----	L	----	----	Cy, ¾	----	Yield reported 8 gpm. Furnished 5 houses. Temperature 55°F. Analysis available.
----	6	----	----	----	----	----	Cy	A	
----	----	----	----	----	----	----	Cy	S	Adequate supply for past 30 yr.
30.8	48	----	----	----	16.7	Dec. 19, 1949	Bu	D	
r48	4	----	----	L	----	----	Cy	S	Can be pumped down.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8735-3745-82	$4\frac{1}{2}$ miles southwest of Henderson.	T. R. Bartley	Stanton Sircy			Dr
83	$4\frac{5}{8}$ miles southwest of Henderson.	B. G. Bartley	do		a435	Dr
84	$4\frac{1}{2}$ miles southwest of Henderson.	do			a425	Dr
85	$4\frac{5}{8}$ miles southwest of Henderson.	do				Du
86	$4\frac{7}{8}$ miles southwest of Henderson.	Pete Walker	R. A. Toombs			Dr
87	do	do				Du
88	$4\frac{1}{4}$ miles southwest of Henderson.	Randall McClure				Du
89	do	do				Du
90	$4\frac{3}{8}$ miles southwest of Henderson.	Hub Hare			a441	Dr
91	4 miles southwest of Henderson.	Frank Street				Du
92	$4\frac{1}{4}$ miles southwest of Henderson.	W. L. Swope				Du
93	do	do				Du
94	$4\frac{3}{8}$ miles southwest of Henderson.	do				Du
95	$4\frac{1}{8}$ miles southwest of Henderson.	do				Du
96	4 miles southwest of Henderson.	Mrs. Frank Carrol				Du
97	$3\frac{3}{4}$ miles southwest of Henderson.	Joseph Marstall				Du
98	$4\frac{3}{8}$ miles southwest of Henderson.	W. L. Swope				Du
99	$4\frac{1}{4}$ miles southwest of Henderson.	Ed Hopkins				Du
100	$4\frac{1}{2}$ miles southwest of Henderson.	Mrs. Selvey Jacobs.	E. F. Doudna			Dr
101	Wilson	Mrs. Della Lovelace.				Du
102	do	Mrs. J. M. Patmore.				Du
103	$1\frac{1}{4}$ miles southwest of Henderson.	Henderson Union REA.			a386	Dr
104	2 miles southwest of Henderson.	Harris				Du
105	$1\frac{7}{8}$ miles southwest of Henderson.	Mrs. E. A. Sellers				Du
106	do	do				Dr
107	do	do	Stanton Sircy			Dr
108	do	do				Du
109	$2\frac{3}{8}$ miles southwest of Henderson.	Claude Brown				Dr
110	5 miles southwest of Henderson.	Sam Cates				Du
111	$5\frac{1}{8}$ miles southwest of Henderson.	Joe Miller			a447	Dr
112	$5\frac{1}{4}$ miles southwest of Henderson.	do				Du
113	$5\frac{1}{2}$ miles southwest of Henderson.	Charles Whitledge.				Dr

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
r45	6	—	—	L	r20	Dec. 19, 1949	Su	D	Temperature 57°F.
r65	6	—	—	L	r30	—	Cy	D	Drilled through 2 1-ft coal seams. Temperature 58°F. Analysis available.
171	4	—	—	Ca, L	5.3	Dec. 20, 1949	—	O	Reported 7 ft of coal. Stratigraphic test.
r30	—	—	—	—	—	—	—	—	Dry.
r35	6	—	—	L	—	—	Cy	S	Inadequate.
25	36	—	—	—	16.8	Dec. 20, 1949	Cy	—	
20	36	—	—	—	4	do	Bu	D	
36.9	36	—	—	—	29.9	do	Bu	D	
36.1	10	—	—	L	25.2	do	Bu	D	
23.3	42	—	—	—	15.1	do	—	O	
r80	—	—	—	—	r76	—	—	A	
23	36	—	—	—	12.3	Dec. 20, 1949	—	—	
30.1	36	—	—	—	4.6	do	—	—	
32.3	30	—	—	—	25.4	do	Bu	D	
—	36	—	—	—	—	—	Cy	D	Lower in summer now than before 1940.
r30	30	—	—	—	r24.0	1949	J	D, S	
38.6	30	—	—	—	21.7	Dec. 20, 1949	Bu	D	
30.4	36	—	—	—	20.8	do	—	—	
r35	6	—	—	L	—	—	J, $\frac{3}{4}$	D, S	Temperature 63°F. Analysis available.
—	—	—	—	—	—	—	Su	—	
r30	30	—	—	—	—	—	J, $\frac{1}{4}$	—	
185.5	6	—	—	Ca	37	Dec. 23, 1949	Cy	A, C, O	Could be pumped dry in 2 hr.
20.1	36	—	—	—	1.2	do	—	—	
44	—	29	15	L	29.2	Jan. 11, 1950	Bu	D	
r140	6	—	—	Ca	—	—	Cy, $\frac{1}{3}$	S	Temperature 58°F. Analysis available. Ran steadily 1 week.
r55	6	—	—	L	—	—	Cy	D	Yield reported 8$\frac{1}{3}$ gpm.
29.3	36	—	—	—	20	Jan 11, 1950	—	—	
r80	—	—	—	L?	—	—	J	D, S	
r26.8	36	—	—	—	4.7	Jan. 11, 1950	Bu	S	
r86	6	—	—	L	31.7	do	Bu	—	
—	—	—	—	—	—	—	Su	D	
—	6	—	—	—	—	—	J, $\frac{1}{2}$	D	

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8735-3745-114	5 5/8 miles southwest of Henderson.	J. C. Sellars Estate.				Du
115	5 3/4 miles southwest of Henderson.	do				Du
116	5 5/8 miles southwest of Henderson.	Mrs. Mary Raypray.				Du, Dr
117	5 7/8 miles southwest of Henderson.	Charles Whitledge.				Du
118	6 miles southwest of Henderson.	do				Dr
119	do	do	Carter Oil Co.		a443	Dr
120	2 miles southwest of Henderson.	G. H. Collins				Dr
121	do	Everett Gibson				Du
122	5/8 mile southwest of Henderson.	Henderson Country Club.				Du
123	5 1/4 miles southwest of Henderson.	W. T. Argabrite	J. D. Tucker			Dr
124	do	do				Dr
125	do	do				Dr
126	6 miles southwest of Henderson.	Enoch Fellows				Du
127	do	do				Dr
128	do	Larkin Jacobs				Du
129	do	Golden Poniard				Du
130	5 5/8 miles southwest of Henderson.	Ozzie Mirt				Du
131	5 miles southwest of Henderson.	Mrs. Sallie Munster.	Stanton Sircy			Dr
132	do	do				Du
133	do	do			a412	Dr
134	1 3/8 miles west of Henderson.	G. L. Carter				Dr
135	2 miles west of Henderson.	Edgar Sutton	J. D. Tucker		a385	Dr
136	do	Walter Miller				Dr
137	do	E. B. Raymond				Dr
138	do	Robert Todd			a391	Dr
139	do	Carl Rideout				Dr
140	2 1/2 miles southwest of Henderson.	A. G. Pritchett				Dr
141	2 1/4 miles southwest of Henderson.	do	Stanton Sircy			Dr
142	2 1/2 miles southwest of Henderson.	do	do		a409	Dr
143	2 3/4 miles southwest of Henderson.	Jennings Tillotson.	do			Dr
144	do	do	do			Dr
145	do	do	do			Dr
146	3 1/8 miles southwest of Henderson.	Clarence Posey				Du
147	3 5/8 miles southwest of Henderson.	E. S. Elam	Stanton Sircy			Dr

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
34.8	36	----	----	----	25.7	Jan. 11, 1950	Bu	D	
----	----	----	----	----	----	----	Cy	S	
95.2	36 to 6	----	----	L	4.1	Jan. 11, 1950	Bu	D	
15.8	----	----	----	----	.5	do	Bu	D, S	
r100	6	----	----	----	r20	July 1949	Cy, $\frac{1}{4}$	D, S	Yield 3 gpm, June 2, 1951. Temperature 58°F.
r300	4	----	----	----	13	Jan. 17, 1950	Cy	O	Unused.
----	----	----	----	----	----	----	Cy	----	
r50	----	----	----	----	----	----	----	----	
r6	24	----	----	----	----	----	Su	A, D, S	Reported continual flow. Filled.
r125	8	----	----	L, Ca	----	----	J, $\frac{1}{2}$	S	Never dry, pumped 4 to 5 hr. Temperature 60°F.
----	8	----	----	L, Ca	----	----	J, $\frac{1}{2}$	S	
----	8	----	----	L, Ca	----	----	J, $\frac{1}{2}$	D	
33.3	42	----	----	----	13.7	Jan. 17, 1950	Bu	D	
r102	6	----	----	L	----	----	Cy	D, S	
30	36	29	1	----	4.7	Jan. 17, 1950	Su	D	
33.2	36	----	----	----	15.5	do	Bu	D	Dry only in summer of 1937.
26.5	30	----	----	----	2.4	do	Bu	----	
r90+	6	----	----	L	----	----	Cy	D	
35.4	36	----	----	----	25.8	Jan. 17, 1950	Cy	----	
64	6	----	----	L	6.8	do	----	O	Reported 100 ft deep.
----	----	----	----	----	----	----	Cy, $\frac{1}{2}$	D	
r57	6	48	9	Al	----	----	J, $\frac{1}{2}$	D	Unscreened. Log available.
r56	6	----	----	Al	----	----	J, $\frac{1}{4}$	D	Unscreened.
----	6	----	----	Al	----	----	J, $\frac{1}{2}$	D	Do.
r60	6	----	----	Al	----	----	----	C	Unscreened. Temperature 56°F. Analysis available.
----	----	----	----	Al	----	----	----	D	Inadequate. Reported well flows in winter. Unscreened.
----	6	----	----	----	----	----	Cy	D	
53	6	----	----	L	19.5	Jan. 24, 1950	Bu	D	Recovered in 1 day after being bailed dry.
43	6	----	----	L	28	do	Bu	----	
r40	6	----	----	L	r32	----	----	----	Caved and abandoned.
r59	6	----	----	L	r32	----	----	A	Yield reported 10 gpm.
64	6	----	----	L	r2	----	Su	D, O	Reported 80 ft deep.
44.1	48	----	----	----	34.6	Jan. 24, 1950	Bu	D	Never dry in 70 yr.
r180	----	----	----	Ca	----	----	----	D, S	Pumped 8 to 10 hr without failing.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8735-3745-148	3¾ miles southwest of Henderson.	Louis Hayes	Stanton Sircy			Dr
149	do	E. S. Elam				Du
150	3⅞ miles southwest of Henderson.	Louis Hayes	Stanton Sircy		a383	Dr
151	Wilson	Vogel Spencer				Dr
152	do	Mrs. A. Shead				Du
153	do	Louis Hayes	Stanton Sircy			Dr
154	do	do				Du
155	do	A. W. Beals				Du
156	do	do	Stanton Sircy			Dr
157	do	A. Y. Clay				Du
158	3 miles west of Henderson.	Mrs. John Bagley				Dr
159	3⅛ miles southwest of Henderson.	A. E. Keach & Son.				Du
160	3¾ miles southwest of Henderson.	do	Stanton Sircy		a428	Dr
161	4⅛ miles southwest of Henderson.	do	do			Dr
162	do	do	do			Dr
163	3¼ miles southwest of Henderson.	do	do			Dr
164	2⅙ miles west of Henderson.	do	E. F. Doudna	1900 or 1910		Dr
165	3⅜ miles west of Henderson.	William Walker			a388	Dr
166	3¼ miles west of Henderson.	do	Stanton Sircy		400+	Dr
167	3⅜ miles west of Henderson.	Mamie Washburn	J. D. Tucker			Dr
168	4¼ miles southwest of Henderson.	Dan Heft	Boatman			Dr
169	4 miles southwest of Henderson.	B. G. Williams	Stanton Sircy			Dr
170	do	Louia Gish				Du
171	¾ mile west of Henderson.	Henderson Country Club.	Iley Browning			Dr
172	1¾ miles southwest of Henderson.	Kasey Bros				Dr
173	Wilson Station	J. T. Wilson				Dr
174	3⅜ miles south of Henderson.				393	Dr
175	3½ miles southwest of Henderson.	W. L. Hughes	Sullivan Machinery Co.		410	Cd

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
r60	----	----	----	L	----	----	J, ½	D, S	
----	----	----	----	----	----	----	Bu	D	
----	----	----	----	----	0	Jan. 24, 1950	Cy	D	Some small flow year round.
----	6	----	----	----	----	----	P, 1/6	----	
----	----	----	----	----	----	----	Cy	D	Can be pumped down.
r57	6	----	----	L	----	----	J, ½	D	
32	36	----	----	L	9.3	Jan. 24, 1950	Bu	D	Inadequate.
r20	36	----	----	----	r10	----	Su	D	
r44	8	----	----	L	----	----	Cy	D	
r20	36	----	----	----	----	----	Su	D	
r135	6	----	----	Ca	----	----	Cy	S	
r56	36	----	----	L	----	----	J, 1	D	Supplies large dairy. Adequate.
r70	10	----	----	L	r20	----	J, 1	D, S	Supplies large dairy. Adequate. Temperature 58°F. Analysis available.
r70	8	----	----	L	r20	----	Cy	D	
r70	8	----	----	L	----	----	Cy	D	
r70	8	----	----	L	----	----	Cy	D	
r175	----	----	----	Ca	----	----	----	A	
100	6	----	----	Ca?	23.1	Feb. 7, 1950	Cy	D	
r130	6	----	----	Ca	----	----	J, 2	D, S	Pumped down once. Temperature 54°F. Analysis available.
r104	6	----	----	Ca?	r69	Summer 1949	Cy, 1/3	S	Alluvium reported to 100 ft.
r80	6	----	----	L	----	----	J, 2	D, S	Has used 10,000 gpd for orchard spraying.
r54	6 5/8	----	----	L	r16	----	J, ½	D	
38	36	----	----	----	22.3	Feb. 7, 1950	Bu	D	
31.2	8	0	80+	Al	16.1	Feb. 28, 1950	----	A	Depth reported 80 to 120 ft, probably 90 ft. Finish: Slotted casing; pumped sand.
r105	6	----	----	----	----	----	----	A, O	Quicksand to bottom.
r1,775	----	50	25	L	----	----	----	Ot	Imperial Oil & Gas Co. 1. Log available.
209.7	----	121	10	Ca	----	----	----	Ct	Log available.
258.8	----	28	15	L	----	----	----	Ct	Log on page 213.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8735-3745-176	3 5/8 miles southwest of Henderson.	John Barrett	Hughes-Henderson.		410	
177	5/8 mile west of Henderson.	L. P. Kleiderer			395	Dr
178	1¾ miles west of Henderson.	do			390	Dr
179	1 mile southwest of Henderson.	do			390	Dr
180	2 miles west of Henderson.	do			380	
181	2 7/8 miles southwest of Henderson.	do			380	Dr
182	do	Peabody-Kleiderer.				Dr
183	2½ miles southwest of Henderson.	do			375	Dr
184	1 mile southwest of Henderson.	do			390	Dr
185	2⅜ miles southwest of Henderson.	L. P. Kleiderer			373	Dr
186	3⅜ miles southwest of Henderson.	W. L. Hughes	Sullivan Machinery Co.		410	Cd
187	3¾ miles southwest of Henderson.	John Barrett			415	Dr
188	2¾ miles south of Henderson.	E. Hodge	Hupp and Hume Drilling Co.			Dr
189	3 5/8 miles southwest of Henderson.	Mary Carroll				Dr
190	do	Ohio Valley Trust Co.				Dr
191	4½ miles southwest of Henderson.	B. G. Bartley				Dr
192	5½ miles southwest of Henderson.	L. K. Jacobs				Dr
193	Southwest limits of Henderson.	S. Grant			414	Dr
194	⅜ mile south of Henderson.	William Garrett	J. D. Tucker	Mar. 21, 1950	a403	Dr
195	1¼ miles west of Henderson.	Kasey Bros	Basin Drilling Co.	November 1945	372	Dr
196	do	do	do	February 1946	383	Dr
197	do	do	do		383	Dr
198	do	Mattingly	do	July 1946	370	Dr
199	do	Carl Smith	do		388	Dr
200	do	do	do		390	Dr
201	do	do	do		382	Dr
202	do	do	do	February 1946	386	Dr
203	do	do	do		383	Dr
204	do	do	do	October 1946	389	Dr

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
r269	-------	30	22	L	----	----------	----	Ct	Hughes-Henderson 3. Log available.
192.3	-------	89	2	Al	----	----------	----	Ct	Log on page 213.
r161	-------	51	2	Al	----	----------	----	Ct	Log available.
r431	-------	----	----	----	----	----------	----	Ct	Do.
r167	-------	75	8	Al	----	----------	----	Ct	Do.
r159	-------	74	1	Al	----	----------	----	Ct	Do.
r263	-------	177	35	Ca	----	----------	----	----	Do.
r308	-------	----	----	----	----	----------	----	----	Owner's 2. Log available.
r267	-------	----	----	----	----	----------	----	----	Log available.
r230	-------	----	----	----	----	----------	----	----	Log on page 214.
r252.6	-------	31	35	L	----	----------	----	----	Log available.
r2,296	-------	25	40	L	----	----------	----	Ot	Imperial Oil &Gas Co. 1. Log available.
r2,451	-------	----	----	----	----	----------	----	Ot	Sun Oil Co. 1. Log available.
r2,729	-------	----	----	----	----	----------	----	Ot	Carter Oil Co. 1. Electric log available.
r2,715	-------	----	----	----	----	----------	----	Ot	Do.
r2,789	-------	----	----	----	----	----------	----	Ot	Sohio Petroleum Co. 1. Electric log available.
r2,726	-------	----	----	----	----	----------	----	Ot	National Associated Petroleum Co. 1. Electric log available.
r2,696	-------	----	----	----	----	----------	----	Ot	Carter Oil Co. 1. Electric log available.
82	6	15	25	L	73.5	Mar. 21, 1950	Bu	D	Yield reported 15 to 20 gpm. Water at 37 ft. Cased off. Sandstone with poor yield at 81 ft. Log on page 214.
r2,470	-------	36	30	Al	----	----------	----	Ot	Basin Drilling Co. 1. Log and electric log available.
r2,458	-------	47	47	Al	----	----------	----	Ot	Basin Drilling Co. 2. Electric log available.
-------	-------	25	63	Al	----	----------	----	Ot	Basin Drilling Co. 3. Electric log available.
r2,628	-------	26	50	Al	----	----------	----	Ot	Basin Drilling Co. 1. Log and electric log available.
r2,550	-------	----	----	----	----	----------	----	Ot	Do.
-------	-------	30	40	Al	----	----------	----		Basin Drilling Co. 1A. Electric log available.
1,636	-------	51	5	Al	----	----------	----	Ot	Basin Drilling Co. 3. Log and electric log available.
r1,634	-------	----	----	----	----	----------	----	Ot	Basin Drilling Co. 4. Electric log available.
-------	-------	30	40	Al	----	----------	----	Ot	Basin Drilling Co. 5. Electric log available.
r2,459	-------	30	60	Al	----	----------	----	Ot	Basin Drilling Co. 6. Electric log available.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8735-3745-205	1¼ miles west of Henderson.	Carl Smith	Basin Drilling Co.	October 1946	386	Dr
206	do	do	do	October 1947	386	Dr
207	3¾ miles west of Henderson.	Mrs. Mary Neal		May 1946	387	Dr
208	do	Mamie Washburn	Basin Drilling Co.	February 1946	387	Dr
209	3½ miles west of Henderson.	do	do	February 1947	393	Dr
210	3¾ miles west of Henderson.	William Walker	do		385	Dr
211	1¼ miles west of Henderson.	City of Henderson.	do		383	Dr
212	1⅝ miles west of Henderson.	Arvin		September 1945	385	Dr
213	1¾ miles southwest of Henderson.	H. E. Ferrell	Basin Drilling Co.	December 1945	386	Dr
214	do	do	do		374	Dr
215	2⅞ miles southwest of Henderson.	H. H. Farmer	do	June 1947	384	Dr
216	2⅜ miles southwest of Henderson.	do	do	January 1948	411	Dr
217	2¼ miles southwest of Henderson.	F. W. Vogel		January 1946	398	Dr
218	2¾ miles southwest of Henderson.	G. M. Mattingly		May 1947	406	Dr
219	4 miles south of Henderson.	Marion Barrett		December 1946	408	Dr
220	4½ miles southwest of Henderson.	Henry P. Barrett		May 1946	425	Dr
221	5⅛ miles southwest of Henderson.	E. Rapier			421	Dr
222	1½ miles west of Henderson.	Gordon Konsler			385	Dr
223	Wilson Station	Wilson Station Church.	J. D. Tucker	April 1950	a400	Dr
224	Green and Plum Sts., Henderson.	City of Henderson.	E. F. Doudna		415±	Dr
225	Dixon and Alvasia Sts., Henderson.	do	do		420±	Dr
226	6 miles southwest of Henderson.	Enoch Fellows	Walker Drilling Co.	May 1950	452	Dr
227	2 miles south of Henderson.	Elliot Cates	West Drilling Co.	September 1950	377	Dr
228	3⅛ miles south of Henderson.	G. M. Mattingly	do	do	384	Dr
229	⅜ mile south of Henderson.	P. N. Gish				Du
230	1⅜ miles south of Henderson.	Walter Poole				Dr
231	2 miles southwest of Henderson.	John Korf				Du

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
r2,460	——	26	57	Al	——	——	——	Ot	Basin Drilling Co. 7. Electric log available.
r2,536	——	25	50	Al	——	——	——	Ot	Basin Drilling Co. 8. Electric log available.
r2,703	——	——	——	——	——	——	——	Ot	Calstar Petroleum Co. 1. Electric log available.
r2,703	——	——	——	——	——	——	——	Ot	Basin Drilling Co. 1. Electric log available.
r2,710	——	——	——	——	——	——	——	Ot	Basin Drilling Co. 2. Electric log available.
r2,577	——	——	——	——	——	——	——	Ot	Sun Oil Co. 1. Electric log available.
r2,610	——	46	50	Al	——	——	——	Ot	Basin Drilling Co. 1. Log on page 215. Electric log available.
r2,628	——	60	40	Al	——	——	——	Ot	Gulf Refining Co. 1. Log and electric log available.
r2,455	——	——	——	——	——	——	——	Ot	Basin Drilling Co. 1. Electric log available.
r2,507	——	——	——	——	——	——	——	Ot	Basin Drilling Co. 2. Electric log available.
r2,642	——	——	——	——	——	——	——	Ot	Ashland Oil & Refining Co. and Basin Drilling Co. 1. Electric log available.
r2,628	——	——	——	——	——	——	——	Ot	Ashland Oil & Refining Co. and Basin Drilling Co. 2. Electric log available.
r2,489	——	——	——	——	——	——	——	Ot	Otis Blankenburg 1. Electric log available.
r2,646	——	——	——	——	——	——	——	Ot	Carter Oil Co. 1. Electric log available.
r2,670	——	——	——	——	——	——	——	Ot	Do.
r2,662	——	——	——	——	——	——	——	Ot	R. W. Slemaker 1. Electric log available.
r2,715	——	——	——	——	——	——	——	Ot	Carter Oil Co. 1. Electric log available.
r200	6	——	——	Ca	21.7	Mar. 27, 1952	Cy, $\frac{1}{2}$	D, S	
60	6	40	20	L	11.2	April 26, 1950	——	——	Yield reported 15 gpm, 10-min test, April 1950. Log available.
——	6	——	——	——	——	——	——	A	Filled.
——	6	——	——	——	——	——	——	A	Do.
2,766	——	40	60	L	——	——	——	Ot	Barron Kidd 1. Log on page 215.
——	——	——	——	——	——	——	——	Ot	G. L. Reasor 1. Log available.
r2,654	——	20	81	L	——	——	——	Ot	G. L. Reasor 1. Log on page 216.
——	——	——	——	——	——	——	Cy	S	
——	6	——	——	——	——	——	Cy, $\frac{1}{3}$	D, S	
r30	36	——	——	——	——	——	Cy	S	

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8735-3745-232	4¾ miles southwest of Henderson.	W. T. Posey				Du
233	do	do				Du
234	4⅞ miles southwest of Henderson.	C. F. Hopkins				Du
235	do	do				Dr
236	5 miles southwest of Henderson.	F. J. Sigler				Dr
237	do	do				Du
238	2⅝ miles southwest of Henderson.	Herman Hoffman				Du
239	2⅜ miles southwest of Henderson.	Hoffman	Basin Drilling Co.		384	Dr
240	2¼ miles west of Henderson.	Steve Roberts	Roscoe Jenkins	June 1951	390	Dr
241	1½ miles south of Henderson.	V. J. Boardman		Sept. 27, 1951	+385	Dr
242	⅝ mile west of Henderson.	Farmers Tankage Co.	Heldt-Monroe Co.	January 1947	390±	Dr
243	¼ mile southwest of Henderson.	Hogue Estate				Dr
244	4⅛ miles southwest of Henderson.	Alex Posey	Flamingo Oil Co.	August 1951	411	Dr
245	3¼ miles southwest of Henderson.	W. T. Posey Estate.	do	do	381	Dr
246	4 miles southwest of Henderson.	Alex Posey			449	Dr
247	do	do			429	Dr
248	do	do			426	Dr
249	do	do			428	Dr
250	do	W. L. Swope			423	Dr
251	do	George Danheiser.			417	Dr
252	3⅞ miles southwest of Henderson.	Sallie Hopkins			407	Dr
253	do	do			394	Dr
254	3½ miles southwest of Henderson.	McCollom & Ohio Valley Bank.			379	Dr
255	Henderson	U. S. Government.	U. S. Corps of Engineers.			
257	2 miles west of Henderson.	Spencer Chemical Co.	Ranney Water Collector Co.			Dr
258	do	do	do			Dr
259	do	do	do			Dr
260	do	do	do		365	Dr
261	do	do	do			Dr
262	do	do	do		365	Dr
263	do	do	do			Dr

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed			Water level		Lift	Use	Remarks
		Depth to top of bed (feet)	Thickness (feet)	Geologic horizon	Below land surface (feet)	Date of measurement			
37	30				31.7	Oct. 5, 1950		A	
11.2	30				.2	do			Never dry in 60 yr.
34	36				24.2	do	Bu		
	6						Cy		
	6						Cy	D	
31.5	42				24.5	Oct. 5, 1950		A	
r7					r6			S	
								Ot	Basin Drilling Co. 1. Electric log available.
112	6	90	4	Ca?	11.6	June 25, 1951	J, ½	D	Log on page 217.
126	8	117	3	Ca	7.8	Sept. 27, 1951		D	Log on page 218.
r68				Al				A	Well site abandoned.
r180							Cy	A	Adequate when used for dairy.
r1,709		60	40	L				Ot	George Engle 1. Electric log available.
		138	68	Ca				Ot	Do.
r1,739		99	81	Ca, L				Ot	George Engle 2. Electric log available.
r1,726		110	45	Ca				Ot	George Engle 3. Electric log available.
r1,724		66	40	L				Ot	George Engle 4. Electric log available.
		110	40	Ca				Ot	George Engle 5. Electric log available.
r2,660		62	108	Ca, L				Ot	Superior Oil Co. 1. Electric log available.
r1,710		101	51	Ca				Ot	Do.
								Ot	Carter Oil Co. 1. Electric log available.
r1,689								Ot	Carter Oil Co. 2. Electric log available.
		93	91	Ca				Ot	George Engle 1. Electric log available.
								T	Ohio River test boring. Bedrock at 324.6 ft above mean sea level.
r89	6	58	28	Al				T	Test well 1 at collector site 1.
r76	6	64	11	Al				T	Test well 2 at collector site 1. Log available.
r45	6							T	Test well 4 at collector site 1, 1,100 ft inland. Log available.
r85	6	39	31	Al				T	Test well 6, 1,000 ft northeast of collector 2. Log available.
r92.6	6	55.6	37	Al				T	Test well 3, 2,300 ft northeast of collector 2.
r69	6	40.5	24	Al				T	75 ft inland from test well 9.
r68	6	39	29	Al				T	Test well 7, 1,100 ft northeast of collector 2.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8735-3745-264	2 miles west of Henderson.	Spencer Chemical Co.	Ranney Water Collector Co.	------	------	Dr
265	---do---	---do---	---do---	------	------	Dr
266	---do---	---do---	---do---	------	------	Dr
267	---do---	---do---	---do---	------	------	Dr
268	---do---	---do---	---do---	------	365	Dr
269	---do---	---do---	---do---	------	------	Dr
270	1½ miles south of Henderson.	State of Kentucky.	------	------	383	----
8735-3750-1	4 miles north of Henderson.	King and Dempewolf.	------	------	------	Dn
2	---do---	W. F. Polk---	------	------	------	Dn
3	Central Park, Henderson.	City of Henderson.	E. F. Doudna--	1910?	390	Dr
4	Sunset Park, Henderson.	---do---	---do---	1910?	a382	Dr
5	317 Second St., Henderson.	H. Boog---	---do---	1913	a403	Dr
6	Ohio River near Atkinson Park, Henderson.	Henderson Coal Co.	------	------	387?	----
7	Henderson---	U. S. Government.	U. S. Corps of Engineers.	------	------	----
8	4 ¼ miles north of Henderson in Horseshoe Bend.	Mrs. Virginia Starke.	------	Aug. 22, 1943	368	Dr
9	4½ miles north of Henderson in Horseshoe Bend.	John Priest---	------	------	------	Dr
10	2 miles northwest of Henderson in Indiana.	C. L. Keuster--	------	------	365	Dr
11	3 miles northwest of Henderson in Indiana.	Dana S. Butterfield---	------	------	360	Dr
12	2 miles northwest of Henderson in Indiana.	W. W. Simmons.	Delta Drilling Co.	------	363	Dr
13	3 miles west of Henderson in Indiana.	L. H. Carroll---	------	------	360	Dr
14	4 miles northwest of Henderson in Indiana.	Joseph Schenk--	------	------	361	Dr
15	3 miles northwest of Henderson in Indiana.	L. S. Nurrenburn and L. K. Nurrenburn.	------	------	359	Dr
16	2 miles west of Henderson in Indiana.	H. Simmons---	------	------	------	Dr
17	4 miles north of Henderson in Indiana.	Adcock Unit---	------	------	362	Dr
18	3 miles northwest of Henderson in Indiana.	A. H. Lutterbach.	------	------	362	Dr

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Prinicpal water-bearing bed			Water level		Lift	Use	Remarks
		Depth to top of bed (feet)	Thickness (feet)	Geologic horizon	Below land surface (feet)	Date of measurement			
r69	6	39	28	Al	-----	-----	-----	T	Test well 9, 1,200 ft northeast of collector 2.
r72	6	38	26	Al	-----	-----	-----	T	Test well 5, 1,350 ft northeast of collector 2.
r71.7	-----	37	25.5	Al	-----	-----	-----	T	Test well 2, 1,500 ft northeast of collector 2.
-----	-----	37	25	Al	-----	-----	-----	T	Test well 1, 2,000 ft northeast of collector 2.
r71.7	-----	34	29.4	Al	-----	-----	-----	T	Test well 4, 2,600 ft northeast of collector 2. Log on page 218.
r55	-----	-----	-----	-----	-----	-----	-----	T	Test well 8, 3,000 ft northeast of collector 2.
-----	-----	-----	-----	-----	-----	-----	-----	T	Test boring for bridge on Old Madisonville Road at Seller's Ditch. Bedrock at 75 ft.
-----	2	-----	-----	Al	-----	-----	Cy, G	D, S	
-----	-----	-----	-----	Al, Ca	-----	-----	Cy	A	
r313	6	89	24	Ca	-----	-----	Cy	-----	Log on page 218.
r180	6	-----	-----	Ca	37.2	June 2, 1950	Cy	O	
r182	6	95	86	Ca	48.5	Mar. 27, 1952	Cy, 1½	C	Inadequate. Log on page 219.
r459	-----	-----	-----	-----	-----	-----	-----	-----	Location and elevation uncertain. Coal shaft or coal test? Log available.
-----	-----	-----	-----	-----	-----	-----	-----	T	Ohio River test boring. Bedrock elevation 327.4 ft above mean sea level.
r2,540	10	30	80	Al	-----	-----	-----	Ot	Cherry and Kidd 1. Electric log available.
r2,428	-----	-----	-----	-----	-----	-----	-----	Ot	J. W. Carter and others 1. Electric log available.
-----	-----	-----	-----	-----	-----	-----	-----	Ot	C. E. O'Neil 1. Log and electric log available.
-----	-----	21	76	Al	-----	-----	-----	Ot	J. A. Talbot 1. Log and electric log available.
-----	-----	28	43	Al	-----	-----	-----	Ot	Calvert Willis and Delta 1. Log and electric log available.
-----	-----	26	95	Al	-----	-----	-----	Ot	Sun Oil Co. 1. Log and electric log available.
2,630	-----	16	100	Al	-----	-----	-----	Ot	Texas Co. 1. Log on page 219. Electric log available.
-----	-----	-----	-----	-----	-----	-----	-----	Ot	D. Shendall 1. Electric log available.
-----	-----	-----	-----	-----	-----	-----	-----	Ot	Sinclair Oil Co. 1. Electric log available.
-----	-----	21	99	Al	-----	-----	-----	Ot	Sun Oil Co. 1. Log and electric log available.
-----	-----	-----	-----	-----	-----	-----	-----	Ot	Sun Oil Co. 1. Electric log available.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8735-3750-19	3½ miles northwest of Henderson in Indiana.	Frank Mesker			358	Dr
20	2 miles north of Henderson in Indiana.	Mable Preston			367	Dr
21	5 miles northwest of Henderson in Indiana.	C. J. Hahn			363	Dr
22	4 miles northwest of Henderson in Indiana.	C. E. Zimmerman.				Dr
23	5 miles northwest of Henderson in Indiana.	Donald Kolb			362	Dr
24	do	do			370	Dr
25	do	do			360	Dr
26	do	do				Dr
27	4 miles northwest of Henderson in Indiana.	C. E. Zimmerman.				Dr
28	5 miles northwest of Henderson in Indiana.	E. Lichtenberg			361	Dr
29	do	do			364	Dr
30	do	H. J. Hendricks.			364	Dr
31	6 miles northwest of Henderson in Indiana.	W. M. Gerlach			368	Dr
32	do	F. Seibert	Delta Drilling Co.		369	Dr
33	5½ miles northwest of Henderson in Indiana.	G. Huffnagel	do		369	Dr
34	do	Brose-Kamp Communitized.			366	Dr
35	do	Happe-Kamp Unit.			361	Dr
36	do	do			366	Dr
37	do	Brose-Kamp Communitized.			365	Dr
38	do	Kamp-Happe			367	Dr
39	do	Sirkle Communitized.			372	Dr
40	do	Brose-Kamp Communitized.			364	Dr
41	4 miles north of Henderson.	Sarah Hart			368	

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed			Water level		Lift	Use	Remarks
		Depth to top of bed (feet)	Thickness (feet)	Geologic horizon	Below land surface (feet)	Date of measurement			
-----	-----	-----	-----	-----	-----	-----	-----	Ot	Brinkerhoff Drilling Co. 1. Electric log available.
-----	-----	26	90	Al	-----	-----	-----	Ot	Gulf Refining Co. 1. Log and electric log available.
-----	-----	38	87	Al	-----	-----	-----	Ot	Ashland Oil & Refining Co. 1. Log and electric log available.
-----	-----	-----	-----	-----	-----	-----	-----	Ot	Sam Jarvis 1. Log and electric log available.
-----	-----	30	90	Al	-----	-----	-----	Ot	Sam Jarvis 2. Log and electric log available.
-----	-----	-----	-----	-----	-----	-----	-----	Ot	Sam Jarvis 1. Log and electric log available.
-----	-----	26	90	Al	-----	-----	-----	Ot	Sam Jarvis 3. Log and electric log available.
-----	-----	30	92	Al	-----	-----	-----	Ot	Sam Jarvis 4. Log and electric log available.
-----	-----	-----	-----	-----	-----	-----	-----	Ot	J. C. Barnett and others 1. Log and electric log available.
-----	-----	28	92	Al	-----	-----	-----	Ot	Sam Jarvis 2. Log and electric log available.
-----	-----	30	95	Al	-----	-----	-----	Ot	Sam Jarvis 1. Log and electric log available.
-----	-----	20	111	Al	-----	-----	-----	Ot	Ashland Oil & Refining Co. 1. Log and electric log available.
-----	-----	26	50	Al	-----	-----	-----	Ot	Sam Yingling 1. Log and electric log available.
-----	-----	26	39	Al	-----	-----	-----	Ot	Delta Drilling Co. 1. Log and electric log available.
-----	-----	30	65	Al	-----	-----	-----	Ot	Delta Drilling Co. I. Log and electric log available.
-----	-----	30	90	Al	-----	-----	-----	Ot	Lynch Oil Co. 1. Log available.
-----	-----	26	60	Al	-----	-----	-----	Ot	Sun Oil Co. 1. Electric log available.
-----	-----	-----	-----	-----	-----	-----	-----	Ot	Sun Oil Co. 2. Bedrock at 101 ft? Electric log available.
-----	-----	-----	-----	-----	-----	-----	-----	Ot	Lynch Oil Co. 3. Bedrock at 120 ft? Log available.
-----	-----	-----	-----	-----	-----	-----	-----	Ot	Lynch Oil Co. 1. Bedrock at 129 ft? Electric log available.
-----	-----	-----	-----	-----	-----	-----	-----	Ot	Lynch Oil Co. 2. Log available.
-----	-----	30	90	Al	-----	-----	-----	Ot	Do.
2,571	10	30	91	Al	-----	-----	-----	Ot	Barron Kidd 1. Log on page 219. Electric log available.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8735-3750-42	Bank of Ohio River, downtown Henderson.	City of Henderson.	Burns and McDonnell.	______	397.6	Dr
43	3½ miles northwest of Henderson in Indiana.	Hutchinson Co.	______	______	______	Dr
44	3 miles northwest of Henderson in Indiana.	Adam Burgdorf	______	______	364	Dr
45	5th and Water Sts., Henderson.	Henderson Ice & Storage Co.	E. F. Doudna?	1900?	______	Dr
46	4th and Water Sts., Henderson.	Louisville & Nashville Railroad Co.	______	______	367	Dr
47	North bank of Ohio River in Indiana.	____do	______	______	356	Dr
48	11th and Water Sts., Henderson.	R. D. Burbank	______	______	______	____
49	1 mile northwest of Henderson in Indiana.	Anthony	______	______	364	Dr
50	4½ miles northwest of Henderson in Indiana.	E. H. Burgdorf	______	______	______	Dr
51	3½ miles northwest of Henderson in Indiana.	C. E. Zimmerman.	______	______	______	Dr
52	Henderson	U. S. Government.	U. S. Corps of Engineers.	______	______	____
8735-3755-1	5⅝ miles north of Henderson in Horseshoe Bend.	Louis Rettig	______	______	______	Dn
2	4 miles north of Henderson in Horseshoe Bend.	Jake King	______	______	______	Dn
3	4½ miles north of Henderson in Horseshoe Bend.	____do	______	______	______	Dn
4	5¾ miles north of Henderson in Horseshoe Bend.	H. H. Mann	______	______	______	Dn
5	3⅞ miles north of Henderson in Horseshoe Bend.	Joe King	______	______	______	Dn
6	5 miles north of Henderson in Horseshoe Bend.	Albert DeKemper.	______	______	______	Dn
7	6¾ miles north of Henderson in Horseshoe Bend.	Marie Rankin	______	______	______	Dn
8	6⅝ miles north of Henderson in Horseshoe Bend.	C. D. Burbank	______	______	______	Dn
9	4¾ miles north of Henderson in Horseshoe Bend.	Charles Rettig	______	______	______	Dn
10	____do	C. D. Burbank	______	August 1947	372	Dr
11	____do	____do	______	October 1950	363	Dr
12	4¼ miles north of Henderson in Horseshoe Bend.	H. D. Posey	______	March 1944	367	Dr

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed			Water level		Lift	Use	Remarks
		Depth to top of bed (feet)	Thickness (feet)	Geologic horizon	Below land surface (feet)	Date of measurement			
r92.5	---	87.6	2.8	Al	---	---	---	T	Test borings for Municipal Light Plant foundations. Average of 5 holes. Log available.
---	---	---	---	---	---	---	---	Ot	Case Pomeroy 1. Electric log available.
---	---	26	70	Al	---	---	---	Ot	Calvert Drilling Co. 1. Log and electric log available.
70	8	---	---	---	---	---	---	A	Reported 150+ ft deep and inadequate. Dry.
r103	---	57	5	Al	---	---	---	T	1 of 18 bridge borings.
r83	---	26	20	Al	---	---	---	T	Do.
r1,600+	---	160	---	---	---	---	---	---	Drilled for salt in 1857. Abundant water reported at 160 ft.
---	---	19	47	Al	---	---	---	Ot	Benedum & Trees 1. Log and electric log available.
---	---	---	---	---	---	---	---	Ot	C. E. Skiles 1. Log and electric log available.
---	---	---	---	---	---	---	---	Ot	Barron Kidd 1. Log and electric log available.
---	---	---	---	---	---	---	---	T	Ohio River test boring. Bedrock elevation 322.5 ft above mean sea level.
r34	2	22	12	Al	---	---	Cy	D	
r43	2	---	---	Al	---	---	Cy	D	
r40	2	---	---	Al	---	---	Cy, G, 5	D, S	
r50	2	---	---	Al	r40	---	Cy, G, 5	D, S	
r28	2	---	---	Al	---	---	Cy	A	
---	2	---	---	Al	---	---	Cy	D	
r40	3	---	---	Al	---	---	Cy, G, 5	D, S	
r72	2	---	---	Al	r60	---	Cy	D	
---	2	---	---	Al	---	---	Cy	A	
r2,574	---	---	---	---	---	---	---	Ot	C. D. Burbank 1. Log and electric log available.
r2,543	---	---	---	---	---	---	---	Ot	C. D. Burbank 2. Log and electric log available.
r2,518	---	12	104	Al	---	---	---	Ot	Kingwood Oil Co. 1. Log and electric log available.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8735-3755-13	7 miles north of Henderson in Horseshoe Bend.	M. S. Rankin		August 1944	368	Dr
14	4 miles north of Henderson in Horseshoe Bend.	M. H. Mann	Delta Drilling Co.	1943	367	Dr
15	do	do	do	November 1943	367	Dr
16	do	A. B. Mann and H. Mann.	do		363	Dr
17	3⅞ miles north of Henderson in Horseshoe Bend.	A. H. Mann Estate.	E. L. Johnston		368	Dr
18	5¾ miles north of Henderson in Horseshoe Bend.	J. E. Rankin				Dr
19	6 miles northwest of Henderson in Indiana.	Varner-Edmond			371	Dr
20	do	B. Edmonds			367	Dr
21	6½ miles northwest of Henderson in Indiana.	F. W. Tieman			369	Dr
22	do	do			362	Dr
23	do	L. J. Nurrenbern			368	Dr
24	6 miles northwest of Henderson in Indiana.	S. Brose, E. Brose, and others.			365	Dr
25	do	Mahrenholz			366	Dr
26	6½ miles northwest of Henderson in Indiana.	H. L. Hahn			363	Dr
8740-3745-1	⅝ mile southwest of Geneva.	J. C. Jones				Du
2	1⅝ miles southwest of Geneva.	Lorene Baskett	Standard Oil Co.	1941		Dr
3	1½ miles southwest of Geneva.	Riley Hooper				Du
4	2 miles southwest of Geneva.	do				Du
5	do	do				Du
6	2⅛ miles southwest of Geneva.	George Trigg				Du
7	do	do				Du
8	2¼ miles southwest of Geneva.	R. H. Trigg				Du
9	do	George Trigg				Du
10	2⅝ miles south of Geneva.	J. B. Guthrie				Du
11	2⅛ miles south of Geneva.	J. E. Samples	Stanton Sircy			Dr
12	1¾ miles south of Geneva.	Shirley Pritchett	do			Dr
13	1⅝ miles south of Geneva.	Pritchett Bros				Du
14	do	do	Roscoe Jenkins.			Dr
15	do	do				Du
16	1 mile east of Geneva	Richard Abbott				Du

in the Henderson area, Kentucky—Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
r2,505	------	10	111	Al	------	------	------	Ot	Kingwood Oil Co. 1. Log and electric log available.
r2,546	------	53	53	Al	------	------	------	Ot	A. L. Cochran 1. Log and electric log available.
r2,159	------	46	63	Al	------	------	------	Ot	A. L. Cochran 2. Log and electric log available.
r2,525	------	103?	8?	Al	------	------	------	Ot	A. L. Cochran 3. Log and electric log available.
r2,452	------	------	------	------	------	------	------	Ot	E. L. Johnston 1. Electric log available.
r2,171	------	------	------	------	------	------	------	------	A. A. Douglass and others 1.
------	------	30?	55?	Al	------	------	------	------	Aurora Gasoline Co. 1. Electric log available.
------	------	26	35	Al	------	------	------	------	Joe Reznik 1. Electric log available.
------	------	30	40	Al	------	------	------	------	Ashland Oil & Refining Co. 2. Log available.
------	------	40	39	Al	------	------	------	------	Ashland Oil &Refining Co. 1. Log available.
------	------	35	35	Al	------	------	------	------	Do.
------	------	20	33	Al	------	------	------	------	Do.
------	------	------	------	------	------	------	------	Ot	Potter and Reeves 2. Electric log available.
------	------	------	------	------	------	------	------	Ot	Bayer Petroleum Co. 1. Electric log avialable.
52.7	36	------	------	------	17.4	Oct. 13, 1949	Bu	D	Temperature 58°F.
r360	------	------	------	------	r6	------	------	A	Stratigraphic test. Filled.
31.4	60	------	------	Al	9.3	Oct. 13, 1949	Bu	D	Temperature 64°F.
25.1	------	------	------	Al	9.7	do	------	S	Inadequate.
13.5	30	------	------	------	5.7	do	------	D, S	
51.6	30	------	------	------	2.0	do	------	D	Inadequate.
30	30	------	------	------	24.6	do	------	------	Inadequate. Unused.
44.2	36	------	------	------	25.0	do	Bu	------	Temperature 59°F.
22.8	30	------	------	------	7.1	do	Su	S	Do.
43.2	------	33	10	L	15.5	do	Bu	D	Temperature 57°F.
50.4	6	------	------	L	15.0	Oct. 6, 1950	J, ¼	D	
r64	6	------	------	L	------	------	Cy	D	
30.5	36	------	------	------	18.6	Oct. 13, 1949	------	A	
76	6	60	16	L	21.5	------	Su	D	
r18	------	------	------	------	------	------	Su	S	Adequate.
------	------	------	------	------	------	------	Su	------	

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8740-3745-17	5/8 mile east of Geneva.	Richard Abbott	Doudna and Butts.	1910?		Dr
18	3/8 mile east of Geneva	Ellen B. Amiet				Dr
19	1 1/4 mile north of Geneva.	U. L. Averitt	J. D. Tucker			Dr, Dn
20	1 3/4 miles southeast of Geneva.	Kost	Stanton Sircy			Dr
21	Geneva	Lorene Baskett				Dr
22	do	Geneva Baptist Parsonage.	R. A. Toombs.	July 25, 1950		Dr
23	3 3/4 miles southwest of Geneva.	Powell Heirs	do			Dr
24	2 5/8 miles south of Geneva.	George Trigg	E. F. Doudna	1920		Dr
25	1 3/4 miles southeast of Geneva.	Floyd Jenkins	do	1910 or 1920		Dr
26	Geneva	Village of Geneva.	do	1914	387	Dr
27	1 1/4 miles southeast of Geneva.	Flo Washburn	Basin Drilling Co.	1948	387	Dr
28	7/8 mile east of Geneva.	R. H. Abbott	do	Aug. 20, 1947	393	Dr
29	2 1/4 miles southwest of Geneva.	Trigg Heirs	F. W. Cox	October 1928	454	Dr
30	2 1/4 miles south of Geneva.	Ashley Pritchett		December 1949	430	Dr
31	3/8 mile north of Geneva.	Shelby Grossman				Dr
32	3/8 mile east of Geneva.	Dr. H. W. Pruitt.				Dr
33	Geneva	J. A. Sandefur				Du
34	do	Robert Nichols				Dr
35	do	do				Du
36	do	J. A. Sandefur				Du
37	do	do				Dr
38	1/2 mile south of Geneva.	Ed Shuck	Ed Shuck			Dn
39	1/4 mile south of Geneva.	G. E. Shuck	do			Dr
40	do	Amos Martin, Jr.				Dr
41	do	G. E. Shuck	Ed Shuck			Dr
42	3/8 mile south of Geneva.	Huston Ginger				Dn
43	2 miles northwest of Geneva.	Lorene Baskett	Ed Shuck			Dn
44	1/4 mile south of Geneva.	Ruth Robertson				Du
45	1/2 mile south of Geneva.	C. E. Jones				Dr
46	do	H. E. Ginger		March 1948		Dr
47	3/4 mile south of Geneva.	John Pearce			a412	Dr
48	7/8 mile south of Geneva.	do	E. F. Doudna	1910 or 1920		Dr

in the Henderson area, Kentucky—Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed			Water level		Lift	Use	Remarks
		Depth to top of bed (feet)	Thickness (feet)	Geologic horizon	Below land surface (feet)	Date of measurement			
r96	6	86	9?	Al	—	—	J, ¾	D, S	Yield reported 15 gpm. Temperature 48°F. Analysis available.
r100	6	—	—	—	—	—	Cy, ¾	D, S	Inadequate.
r121	3 to 1¼	—	—	Al	—	—	Cy, ½	S	Orginally 87 ft deep. Temperature 57°F. Analysis available.
60	8	—	—	L	12.2	Feb. 7, 1950	Su, ¼	D	
r175	—	—	—	Ca	—	—	—	—	Reported salt water.
95	6	70	20	Al	36.1	July 25, 1950	J, ½	D	Yield reported 30 gpm, 15-min test, July 25, 1950. Log available.
r200	6	—	—	L	—	—	Cy, ¾	D, S	Temperature 54°F, July 28, 1950; 63°F, July 18, 1951. Analysis available.
r132	6	—	—	L	—	—	Cy, ¾	D, S	Temperature 60°F. Analysis available.
87	6	—	—	L	40	—	J, ½	D, S	Substantial well.
r157	—	100	15	L	—	—	—	A	Filled. Log on page 219.
r2,571	—	51	40	Al	—	—	—	Ot	Basin Drilling Co. 3. Log and electric log available.
r1,718	—	40	55	Al	—	—	—	Ot	Ashland Oil & Refining Co. 3. Log and electric log available.
r781	—	76	24	L	—	—	—	Ot	Miller and Dameron 1. Log on page 220.
r2,753	—	—	—	—	—	—	—	Ot	Carter Oil Co. 2. Electric log available.
r90±	6	—	—	L?	—	—	Cy, ½	S	
r120	6	—	—	—	—	—	J, 1	D	Can be pumped dry.
35	36	—	—	Al	6.0	Aug. 16, 1950	J, ½	D	Adequate supply.
r93	6	—	—	L	—	—	J, ⅓	D	
36	36	—	—	Al	5.9	Aug. 16, 1950	Su	C	
29	30	—	—	Al	5.4	do	—	A	
r90	6	—	—	L	—	—	Cy	A	Inadequate.
65	2 to 1¼	63	2	Al	24	1936	Cy, ⅓	D, S	Log available. Reported pumped 60 hr.
r93	—	—	—	L	—	—	—	—	Incomplete. Log available.
r93	6	—	—	L	—	—	—	D	Inadequate.
r127	—	—	—	L?	—	—	—	—	Dry.
r70	6 to 1¼	—	—	Al	—	—	Cy, ½	D	
r42	2½ to 1¼	—	—	Al	26	Fall 1948	Cy, ¾	D,S	
38	36	—	—	Al	7.1	Aug. 16, 1950	Su	D	
76	6	—	—	L	19.9	do	Cy	—	Filled to 80 ft. Orginally deeper. Now plugged. Soda water.
r76±	8	—	—	L	r40	March 1948	J, ⅓	D, S	Pumped ½ day.
57	8	—	—	L	7.5	Aug. 16, 1950	Cy	D	
80	6	—	—	L	—	—	J, ½	D, S	Can be pumped down in ½ day. Chlorinated.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8740-3745-49	⅞ mile south of Geneva.	Jack H. Pearce				Du
50	Geneva	Mrs. Lydia Amiet.				Du
51	¼ mile west of Geneva.	Gobel Parker				Du
52	⅜ mile west of Geneva.	Joseph Amiet				Du
53	½ mile west of Geneva.	W. S. Williams				Du
54	⅝ mile west of Geneva.	James M. Byrd, Sr.	Stanton Sircy	Fall 1946		Dr
55	¾ mile west of Geneva.	J. W. Slaughter		1910		Dr
56	1 mile west of Geneva	Robert Alley				Du
57	1⅛ miles west of Geneva.	Hattie Knight		1900		Dr
58	1⅜ miles west of Geneva.	Trent				Du
59	1⅝ miles west of Geneva.	H. L. Cooper			t385	Dr
60	do	do				Dr
61	2⅛ miles west of Geneva.	J. E. Martin				Du
62	2½ miles west of Geneva.	Otto Kloke				Du
63	do	do				Du
64	2⅜ miles west of Geneva.	J. T. Dossett				Du
65	2⅝ miles west of Geneva.	Andrew Meuth Estate.	E. F. Doudna	1906		Dr
66	1⅞ miles west of Geneva.	Charles Meuth				Dr
67	2⅜ miles southwest of Geneva.	J. W. Meuth				Du
68	3 miles southwest of Geneva.	C. W. Bishop				Du
69	do	do				Du
70	3¼ miles southwest of Geneva.	Ansel White				Du
71	3½ miles southwest of Geneva.	W. P. Cooper				Du
72	2⅝ miles southwest of Geneva.	Fred Meuth	Stanton Sircy			Dr
73	3¼ miles southwest of Geneva.	Elmer Lewis				Du
74	do	R. E. Pruitt, Jr				Du
75	3⅞ miles southwest of Geneva.	Ruby Keelen				Du
76	3¼ miles southwest of Geneva.	H. L. Cooper				Du
77	3¾ miles southwest of Geneva.					Du
78	do	Wickliffe Farm				Du
79	4¼ miles southwest of Geneva.	Charles Trigg				Du
80	3¾ miles southwest of Geneva.	Wickliffe Farm				Du, Dr

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed			Water level		Lift	Use	Remarks
		Depth to top of bed (feet)	Thickness (feet)	Geologic horizon	Below land surface (feet)	Date of measurement			
r37	—	—	—	L	r27	—	Bu	D, S	
34.5	36	—	—	Al	5.2	Aug. 17, 1950	Bu	—	
25	30	—	—	Al	4.4	do	Bu	C	
28	36	—	—	Al	8.6	do	Bu	D	
25	36	—	—	Al	13.8	do	Su, ½	C	
r98	10	—	—	Al	r68	—	Cy, ½	D	Inadequate. Alluvium cased off.
r98	6	—	—	Al	r30	—	Cy, ⅓	D, S	Adequate.
—	—	—	—	Al	—	—	Su	D, S	Inadequate.
—	6	—	—	—	—	—	Cy	D	
—	—	—	—	Al	—	—	—	—	
r233	6	140	6	Ca	63.2	Mar. 27, 1952	Cy, ½	D, S	Adequate. Soda water. Analysis available. Log on page 221.
r130	6	—	—	—	—	—	—	A	Reported salt water.
r55	30	—	—	Al	—	—	Bu	D	
r60	36	—	—	Al	—	—	—	—	
r40	48	—	—	Al	—	—	Cy, ¼	S	
27	42	—	—	Al	5.3	Aug. 21, 1950	Su	D	
r118	6	—	—	—	—	—	Cy	S	Inadequate.
r118	—	—	—	—	—	—	—	A	Salty water.
r58	42	—	—	L	37.7	Aug. 21, 1950	Cy	S	Has watered a large herd in past. Yield reported 20 gpm.
46	36	—	—	L	10.5	do	Bu	D	
20	—	—	—	Al	6.8	do	Bu	S	
18	42	—	—	—	r10	—	Su	S	
—	36	—	—	—	—	—	Cy	S	
140	—	—	—	—	—	—	—	A	Dry.
35	36	—	—	—	8.3	Aug. 22, 1950	Su	D	
—	—	—	—	—	—	—	Cy	D, S	
35	30	—	—	—	16.2	Aug. 22, 1950	Bu	D	
22	36	—	—	—	9.5	do	Cy	D	
40	48	—	—	—	15.7	do	Bu	D	
30	42	—	—	—	17.5	do	Bu	D	
52	36	—	—	—	16.2	do	Bu	D, S	Good supply in 1936, drought year.
r130	36 to 6	—	—	—	r80-85	—	J, ¾	In	Contaminated. Over 10 ppm nitrate, August 13, 1951.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8740-3745-81	3½ miles southwest of Geneva.	Bernie Quinn	----------	-----	-------	Du
82	3¼ miles southwest of Geneva.	Gobel Duncan	Griffin	1946	a420	Dr
83	4 miles south of Geneva.	Glenn Wilson	Roscoe Jenkins.	Aug. 23, 1950	a448	Dr
84	3½ miles south of Geneva.	Owen Kavanaugh	do	------	a447	Dr
85	do	do	----------	------	------	Du
86	4 miles southwest of Geneva.	George Crawford	----------	------	------	Du
87	do	do	----------	------	------	Du
88	3¼ miles southwest of Geneva.	Gardner Abbott	Sullivan Machinery Co.	1910	------	Cd
89	1¼ miles east of Geneva.	J. A. Clore	----------	November 1946	391	Rd
90	1⅛ miles east of Geneva.	do	----------	October 1946	397	Rd
91	1 mile east of Geneva	W. H. Alves	----------	September 1946	396	Rd
92	1¼ miles east of Geneva.	J. A. Clore	----------	December 1946	389	Rd
93	⅞ mile east of Geneva.	Richard Abbott	Basin Drilling Co.	October 1946	393	Rd
94	1¼ miles east of Geneva.	Flo Washburn	do	November 1946	394	Rd
95	1⅛ miles east of Geneva.	do	do	October 1946	390	Rd
96	1 mile east of Geneva	Richard Abbott	do	July 1946	395	Rd
97	2¼ miles south of Geneva.	George Trigg	H & H Drilling Co.	Feb. 11, 1939	471	Dr
98	2⅜ miles southwest of Geneva.	Trigg Estate	Basin Drilling Co.	July 21, 1947	402	Dr
99	4 miles south of Geneva.	A. Ball	----------	October 1946	394	Dr
100	1⅜ miles south of Geneva.	H. L. King	----------	October 1942	408	Dr
101	½ mile southwest of Geneva.	Dotty Jones	----------	August 1945	386	Dr
102	⅞ mile southeast of Geneva.	J. H. Pierce	----------	October 1944	386	Dr
103	2¼ miles west of Geneva.	U. M. Dossett	----------	do	386	Dr
104	1⅛ miles north of Geneva.	U. Averitt	----------	December 1947	398	Dr
105	⅝ mile northeast of Geneva.	George Kloke	----------	June 1943	385	Dr
106	2⅞ miles south of Geneva.	R. H. Trigg	----------	October 1942	410	Dr
107	3⅜ miles south of Geneva.	George Crawford	----------	December 1943	470	Dr

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
40	42	----	----	----	16.0	Aug. 22, 1950	Bu	D	Dry in 1936.
65	6	----	----	L	31.3	---do----	Ba	D	Reported drilled through 8 ft coal. Yield reported 11 gpm.
137	6	98	52	L	29.1	Aug. 27, 1950	J, ½	D	Plugged back from 141 ft. Dry sand in bottom. Log on page 221.
85	6	70	15	L	16.0	Aug. 23, 1950	Cy	D	
35	36	----	----	----	11.1	---do----	Bu	D	
43	42	----	----	----	16.9	---do----	Bu	D	Inadequate.
r193	----	----	----	----	----	----	----	Ct	Log available.
r1,710	----	----	----	----	----	----	----	Ot	Superior Oil Co. 2. Electric log available.
r1,714	----	----	----	----	----	----	----	Ot	Superior Oil Co. 1. Electric log available.
r2,705	----	----	----	----	----	----	----	Ot	Sun Oil Co. 1. Electric log available.
r2,630	----	----	----	----	----	----	----	Ot	Superior Oil Co. 3. Electric log available.
r1,711	----	----	----	----	----	----	----	Ot	Basin Drilling Co. 2. Electric log available.
r1,715	----	----	----	----	----	----	----	Ot	Do.
r1,716	----	61	40	Al	----	----	----	Ot	Basin Drilling Co. 1. Electric log available.
r1,714	----	----	----	----	----	----	----	Ot	Do.
r2,605	----	120	10	L	----	----	----	----	Sun Oil Co. and Kentucky Natural Gas Co. 1. Log on page 221. Electric log available.
r2,720	----	200	8	Ca	----	----	----	----	C. R. Craft and Basin Drilling Co. 1. Electric log available.
r2,741	----	172	8	L	----	----	----	----	Sun Oil Co. 1. Electric log available.
r2,652	----	68	22+	L	----	----	----	----	Do.
r2,701	----	150	42	Ca	----	----	----	----	R. O. Gould Co. 1. Electric log available.
r2,645	----	150	10	Ca	----	----	----	----	Do.
r2,788	----	150	50	L	----	----	----	----	Ohio Oil Co. 1. Electric log available.
r2,621	----	----	----	Al	----	----	----	----	Clarence Wood 1. Electric log available.
r2,593	----	----	----	Al	----	----	----	----	Calstar Petroleum Co. 1. Electric log available.
r2,655	----	66	60+	L	----	----	----	----	Sun Oil Co. 2. Electric log available.
r2,733	----	108	75+	L	----	----	----	----	Sun Oil Co. 1. Electric log available.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8740-3745-108	1 7/8 miles south of Geneva.	Ashley Pritchett	------	September 1948	411	Dr
109	3 5/8 miles southwest of Geneva.	William Wickliffe.	------	------	443	Dr
110	1 3/8 miles west of Geneva.	J. H. Trent	------	August 1914	t390	Dr
111	1 1/2 miles southeast of Geneva.	William Barrett	------	------	t420	Dr
112	3 7/8 miles southwest of Geneva.	Max Galbraith	------	------	430	Dr
113	3 1/2 miles south of Geneva.	Mrs. Sudy Powell.	------	------	458.4	Dr
114	2 1/2 miles south of Geneva.	Shirley Pritchett	------	------	411	------
115	2 3/4 miles southwest of Geneva.	R. H. Trigg Estate.	Miller and Shiarella.	Aug. 21, 1938	426	------
116	4 miles southeast of Geneva.	Forrest Cates	------	------	437	------
117	2 3/8 miles southwest of Geneva.	George Trigg	------	------	458	------
118	2 1/4 miles southwest of Geneva.	Corydon Unit	H & H Drilling Co.	May 11, 1939	447	------
119	2 miles south of Geneva.	King-Pritchett	Parker Drilling Co.	May 12, 1939	------	------
120	2 1/4 miles southwest of Geneva.	George Trigg	H & H Drilling Co.	September 1939	460	------
121	2 1/8 miles southwest of Geneva.	Corydon Unit	do	------	450	Dr
122	2 3/8 miles southwest of Geneva.	George Trigg	------	March 1940	468	Dr
123	2 1/8 miles southwest of Geneva.	Corydon Unit	H & H Drilling Co.	May 1940	427	Dr
124	3 5/8 miles south of Geneva.	R. Thomas	------	------	417	Dr
125	3 1/4 miles south of Geneva.	R. Thomas Heirs	------	------	------	Dr
126	1 1/4 miles southeast of Geneva.	W. B. Neal	------	------	------	Dr
127	3/4 mile south of Geneva.	J. H. Pierce	------	------	------	Dr
128	1 5/8 miles northwest of Geneva.	Bessie Grabbe?	------	------	------	Dr
129	4 5/8 miles southwest of Geneva.	Mildred Hancock	------	------	------	Dr
130	2 7/8 miles south of Geneva.	Randolph Kavanaugh.	West	------	------	Dr
131	3 5/8 miles southeast of Geneva.	Thomas Fellows	------	------	------	Du
132	do	Mrs. Sallie Munster.	------	------	------	Du
133	3 1/4 miles southeast of Geneva.	Sam Wilson	Stanton Sircy	------	------	Dr
134	do	do	------	------	------	Du
135	do	W. W. Wilson	------	------	------	Du

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
r2,740	------	----	----	----	----	----------	---	---	Carter Oil Co. 1. Log available.
r1,029	------	----	----	----	----	----------	---	---	Miller & Dameron 1. Log available.
r209	------	95	5	L	----	----------	---	A	Log on page 222.
r805	------	18	70	L	----	----------	---	---	Creek Drilling Co. 1. Log on page 222.
r330	------	100	7	L	----	----------	---	---	Sun Oil Co. Stratigraphic test.
r240	------	70	70	L	----	----------	---	---	Do.
r280	------	20	72	L	----	----------	---	---	Do.
r2,780	------	48	41	L	----	----------	---	Ot	Sun Oil Co. and Kentucky Natural Gas Co. 1. Log available.
r2,742	------	77	28	L	----	----------	---	Ot	Sohio Oil Co. 1. Electric log available.
r2,631	------	77	38+	L	----	----------	---	Ot	Sun Oil Co. and Kentucky Natural Gas Co. A-1. Electric log available.
r2,723	------	----	----	L	----	----------	---	Ot	Sun Oil Co. and Kentucky Natural Gas Co. 2. Log available.
r2,663	------	----	----	----	----	----------	---	Ot	Carter Oil Co. 1. Electric log available.
r2,613	------	----	----	----	----	----------	---	Ot	Sun Oil Co. and Kentucky Natural Gas Co. 2. Electric log available.
r2,603	------	----	----	----	----	----------	---	---	Sun Oil Co. and Kentucky Natural Gas Co. 3. Electric log available.
r2,629	------	----	----	----	----	----------	---	---	Do.
r2,752	------	----	----	----	----	----------	---	---	Sun Oil Co. and Kentucky Natural Gas Co. 4. Electric log available.
r2,703	------	----	----	----	----	----------	---	---	Sohio Producing Co. 1.
------	------	----	----	----	----	----------	---	---	Sohio Producing Co.
r2,551	------	----	----	----	----	----------	---	Ot	Ashland Oil & Refining Co. 1. Electric log available.
------	------	----	----	----	----	----------	---	Ct	Carter Oil Co? Electric log available.
r2,710	------	----	----	----	----	----------	---	---	W. E. Hupp? 1.
------	------	----	----	----	----	----------	---	Ct	Sun Oil Co. 1.
r135	6	----	----	L	r70	1941	J, ½	D	Adequate supply.
21	36	----	----	----	13.2	Oct. 5, 1950	Bu	D, S	
41	36	----	----	----	15.7	---do---	Bu	D	
r65	6	----	----	L	----	----------	Cy	D	
r30	36	----	----	----	----	----------	---	---	Unused.
32	30	----	----	----	14.0	Oct. 5, 1950	Bu	---	Do.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8740-3745-136	$3\frac{5}{8}$ miles southeast of Geneva.	W. W. Wilson				Du
137	$4\frac{1}{8}$ miles southeast of Geneva.	Forrest Cates	J. D. Tucker	March 1950	a438	Dr
138	do	do				Du
139	$3\frac{7}{8}$ miles southeast of Geneva.	Hal Cates				Du
140	$3\frac{7}{8}$ miles southeast of Geneva.	G. W. Denton				Du
141	do	do				Du
142	$3\frac{3}{8}$ miles south of Geneva.	W. W. Wilson	J. D. Tucker	Spring 1949		Dr
143	$3\frac{5}{8}$ miles south of Geneva.	do	do		a403	Dr
144	$3\frac{1}{2}$ miles south of Geneva.	do				Dr
145	$1\frac{1}{2}$ miles south of Geneva.	Harvey King				Du
146	$2\frac{1}{8}$ miles south of Geneva.	do				Du
147	$1\frac{1}{2}$ miles south of Geneva.	do		Before 1920		Dr
148	do	do				Dr
149	$2\frac{1}{8}$ miles south of Geneva.	George Trigg			a472	Dr
150	$2\frac{1}{4}$ miles south of Geneva.	Maceo Cole				Du
151	do					Du
152	3 miles southeast of Geneva.	A. H. Posey				Du
153	$2\frac{3}{4}$ miles southeast of Geneva.	S. T. Posey				Dr
154	do	do	Stanton Sircy			Dr
155	do	do	do			Dr
156	do	C. F. Posey	West	1931		
157	do	do				Du
158	$2\frac{3}{8}$ miles southeast of Geneva.	T. J. Tapp	Stanton Sircy	1946		Dr
159	do	do				Du
160	$2\frac{1}{8}$ miles southeast of Geneva.	do				Du
161	$2\frac{3}{8}$ miles southeast of Geneva.	J. E. Samples				Du
162	$1\frac{3}{4}$ miles southeast of Geneva.	Hannah T. McCollom.				Dr
163	do	do				Dr
164	do	do				Dr
165	$1\frac{7}{8}$ miles southeast of Geneva.	W. T. Posey				Du
166	do	J. A. Wilson	E. F. Doudna			Dr
167	$2\frac{1}{4}$ miles southeast of Geneva.	do	J. D. Tucker			Du, Dr
168	$4\frac{5}{8}$ miles southwest of Geneva.	Pritchett Bros				Du
169	$3\frac{1}{2}$ miles south of Geneva.	Elden Kavanaugh				Du
170	$3\frac{1}{4}$ miles southwest of Geneva.	L. P. Son	West	1940		Dr

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed			Water level		Lift	Use	Remarks
		Depth to top of bed (feet)	Thickness (feet)	Geologic horizon	Below land surface (feet)	Date of measurement			
31	36				9.5	Oct. 5, 1950	Bu		Unused.
98	8	70	28	L	20.3	July 23, 1951	J, 1	D	Yield reported 10 gpm, March 1950. Log on page 222.
r40					r20		Bu		Unused.
r40							Bu		Do.
r50	36						Cy	D	Adequate.
r35	30						Bu	S	Do.
r75	6			L			J, 1	D	Yield reported 25 gpm. Adequate.
118	8	75		L	6.8	Oct. 16, 1950		O	Water supply for rotary drilling rig.
12	4				7.1	do		A, Ct	Carter Oil Co. Reported 250 ft deep. Plugged.
							Bu		
							Bu		
	6						Cy	S	
	4							A, Ct	Plugged.
61	6			L	21.5	Oct. 6, 1950	Ba	D	
31	36				17.2	do	Bu	D	
34.5	42				13.8	do		A	
35	42				15.4	do	Bu	D	Temperature 61° F.
r315	4				r18		J, $\frac{1}{2}$	D,S	Carter Oil Co. Core test, now used for water. Adequate.
r90	6	30	50	L	r18		J, $\frac{1}{2}$	D,S	Adequate.
r92	8			L	r18		J, $\frac{1}{2}$	D,S	Do.
r108	6						Cy, 1	D,S	Do.
29					24.9	Oct. 6, 1950			Dry in 1931. Unused.
	6							D	Adequate.
							Bu	S	Used little.
r20							Su	D	Reported water level at surface in wet weather.
r89	6			L	r50		J, $\frac{3}{4}$	C	
r89	6			L	r50		Cy, $\frac{3}{4}$	C, Ir	
r60	6						Cy	D	
r50	36				r40		J, $\frac{1}{2}$	D	Water softner used.
r60								D	Inadequate.
r40	36 to 6				r5	1950	Bu	D	Reported good since cleaned.
							Cy	D	5 abandoned wells on farm.
10	36				5.8	Oct. 9, 1950	Su	S	
r65				L			Cy, $\frac{1}{4}$	D,S	

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8740-3745-171	2 7/8 miles south of Geneva.	George Trigg, Jr	--------	1945	--------	Dr
172	3 1/8 miles southwest of Geneva.	George Trigg	--------	--------	--------	Du
173	3 miles southwest of Geneva.	R. H. Trigg Estate.	--------	December 1939	410	Dr
174	2 5/8 miles south of Geneva.	R. Kavanaugh	--------	1935	--------	Du
175	2 3/4 miles south of Geneva.	George Trigg	--------	--------	--------	Du
176	3 5/8 miles south of Geneva.	W. W. Wilson	--------	--------	--------	Du
177	do	Mrs. Sudy Powell	E. F. Doudna.	1910?	--------	Dr
178	2 miles southeast of Geneva.	Aubrey Buckman	J. D. Tucker	Fall 1948	--------	Dr
179	1 1/8 miles northeast of Geneva.	W. H. Alves	--------	--------	--------	Dn
180	1 1/8 miles east of Geneva.	George Delker	--------	--------	--------	Dr
181	do	Flo Washburn	--------	--------	--------	Du
182	1 1/4 miles east of Geneva.	do	--------	--------	--------	Du
183	1 mile east of Geneva.	Richard Abbott	--------	--------	--------	Dr
184	do	M. M. Alves	--------	--------	--------	Du
185	3 7/8 miles southwest of Geneva.	Lizzie Trigg	--------	--------	--------	Du
186	3 3/4 miles southwest of Geneva.	R. B. Alves	--------	--------	a438	Dr
187	do	do	--------	--------	--------	Du
188	do	Mac Galbraith	--------	--------	--------	Du
189	do	do	--------	--------	--------	Du
190	1 3/4 miles south of Geneva.	Pritchett Bros	--------	--------	--------	Du
191	3 1/2 miles south of Geneva.	George Denton	--------	--------	424	Dr
192	2 1/8 miles southeast of Geneva.	J. A. Wilson	--------	--------	428	Dr
193	3 1/2 miles southwest of Geneva.	Roberta Son	--------	--------	457	Dr
194	1/4 mile northwest of Geneva.	John Dalton	R. A. Toombs.	June 1951	--------	Dr
195	3 5/8 mile southwest of Geneva.	L. P. Son	Roscoe Jenkins.	July 1951	a439	Dr
196	1 7/8 miles southeast of Geneva.	Ashley Pritchett	do	Aug. 21, 1951	a427	Dr
197	1 3/4 miles southeast of Geneva.	F. B. Hargis	do	July 2, 1951	a429	Dr
198	1 mile north of Geneva.	C. Mackey	--------	--------	--------	Dn
199	1/8 mile north of Geneva.	Raymond Green	R. A. Toombs.	June 1951	--------	Dr
200	1/4 mile north of Geneva.	Orville Bentley	--------	--------	--------	Du
201	1/8 mile northeast of Geneva.	Nate Duncan	--------	--------	--------	Du

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
r125	------	------	------	L	------	------	J, ½	D	
r93	------	------	------	------	------	------	------	A	
r2,710	------	------	------	------	------	------	------	Ot	Sun Oil Co. and Kentucky Natural Gas Co. 2. Log available.
146	36	------	------	------	3.6	Oct. 16, 1950	Cy	S	
72	48	------	------	------	18.9	do	------	------	Dry twice.
r30	------	20	10	L	------	------	------	D	
r147	6	------	------	------	------	------	J, ¾	D, S	
r115	6	87	28	L	r40	------	J, ½	D	Log available.
r85	------	70±	15	Al	------	------	Cy	D	
r110	6 to 2	------	------	Al	------	------	Cy, ¾	D, S	Pumped 24 hr.
r16	36	------	------	Al	r14	------	Bu	D, S	Dry in dry weather.
30	------	------	------	Al	11.2	Oct. 23, 1950	Bu	S	Do.
------	8	------	------	------	------	------	J, 1	D	
21	30	------	------	Al	6.8	Oct. 23, 1950	------	------	
45	42	------	------	------	23.5	do	Bu	D, S	Soft before oil drilling activities began.
200	6	------	------	L	23.1	do	------	O	Never used.
33	36	------	------	------	23.1	do	Bu	D	Never dry since well 8740-3745-186 was drilled 4 ft away.
40	36	------	------	------	23.1	do	------	------	Dry in 1936.
64	48	------	------	------	18.0	do	Cy, G, 3	S	Cannot be pumped down.
20	42	------	------	------	13.4	do	------	------	
------	------	100-	22+	L	------	------	------	Ot	National Associated Petroleum Co. 1. Electric log available.
r2,743	------	69	19	L	------	------	------	Ot	Frank Murta 1. Electric log available.
r2,813	------	57	77	L	------	------	------	Ot	G. L. Reasor 1. Electric log available.
96	6 to 2	------	------	Al	43	June 25, 1951	Cy, ½	D, S	Redrilled. Screened June 1951.
94	6	70	20	L	30.6	July 9, 1951	------	D	Log on page 223.
90	6	70	20	L	15.7	Aug. 22, 1951	------	------	Reported upper water sand at 25 ft cased off. Water level at -7.00 ft.
70	6	40	30	L	17.4	July 3, 1951	------	------	
r64	3 to 1¼	------	------	Al	47	------	J	D, S	
72	8	------	------	Al	47	June 1951	J, ¾	D	Pumps dry in 10 to 15 min. Softener installed.
29.6	30	------	------	Al	15.0	Sept. 18, 1951	Bu	D	Dry in 1941.
33.6	30	------	------	Al	15.0	do	Bu	D	

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8740-3745-202	⅛ mile northeast of Geneva.	William Binnel				Du
203	1⅛ mile northeast of Geneva.	Fred Todd				Dn
204	⅝ mile northeast of Geneva.	Shelby Grossman				Dn
205	1⅛ miles northwest of Geneva.	Long Bros		Winter 1949		Dn
206	1 mile northwest of Geneva.	J. A. Sandefur				Dn
207	1⅜ miles northwest of Geneva.	Long Bros				Dn
208	1¼ miles northwest of Geneva.	Mrs. Alvie Abbott				Dn
209	1⅜ miles northwest of Geneva.	William Abbott		1946		Dn
210	1½ miles northwest of Geneva.	J. A. Sandefur				Dn
211	1¾ miles southeast of Geneva.	Al Kadner	J. D. Tucker			Dr
224	1⅝ miles northwest of Geneva.	Clarence Wood		1920		Dn
225	1 mile southeast of Geneva.	M. M. Alves				Dr
226	4⅛ miles southwest of Geneva.	Mac Galbraith			383	Dr
227	2¼ miles west of Geneva.	Lorine Baskett			382	Dr
228	1½ miles south of Geneva.	S. P. Randolph			398	Dr
229	4¼ miles southeast of Geneva.	Forrest Cates			430	Dr
230	1⅜ miles southwest of Geneva.	Riley Hooper			383	Dr
231	¾ miles northwest of Geneva.	G. W. Kloke			384	Dr
232	1¾ miles southeast of Geneva.	Al Kadner	Kenneth Childress.	Sept. 30, 1952	t420	Dr
8740-3750-1	4 miles northwest of Geneva.	C. W. Kavanaugh	Basin Drilling Co.	Jan. 13, 1949	360	Dr
2	5½ miles northwest of Geneva.	J. E. Bower and others.		November 1949	362	Dr
3	3⅞ miles northwest of Geneva.	C. W. Kavanaugh				Dn
4	3¾ miles north of Geneva.	Mildred Crutchfield.				Dn
5	4⅛ miles north of Geneva.	Anna McGhee	E. F. Moran	August 1950	360	Dr
6	3½ miles northwest of Geneva.	Mrs. G. Bauldauf		September 1944	367	Dr
7	4⅛ miles northwest of Geneva.	do		December 1943	365	Dr
8	do	do		January 1944	363	Dr
9	4¼ miles northwest of Geneva.	Mrs. J. A. Clore		December 1943	365	Dr
10	4⅛ miles northwest of Geneva.	do		do	362	Dr

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed			Water level		Lift	Use	Remarks
		Depth to top of bed (feet)	Thickness (feet)	Geologic horizon	Below land surface (feet)	Date of measurement			
----	----	----	----	Al	----	----	Bu	D	Dry in 1946.
r60	2 to $1\frac{1}{4}$	55	5+	Al	30	Spring 1946	Cy, G,3	D, S	Temperature 58°F.
r80	3 to $1\frac{1}{4}$	----	----	Al	72 to 74	----	Cy	---	Unused.
r112	3	----	----	Al	----	----	Cy	D, S	Temperature 59°F.
----	----	----	----	Al	----	----	Cy, $\frac{1}{4}$	D, S	
r70	----	----	----	Al	----	----	Cy	D	Temperature 59°F.
r108	----	100+	----	Al	100	----	Cy, $\frac{1}{4}$	D	
r42	3 to $1\frac{1}{4}$	39	3+	Al	33 to 34	September 1946	Cy, $\frac{1}{4}$	D, S	Temperature 58°F.
----	----	----	----	Al	----	----	Cy, $\frac{1}{4}$	D, S	
r53	6	----	----	L	----	----	J, $\frac{1}{4}$	---	Breaks suction.
----	3	----	----	----	----	----	Cy, $\frac{1}{2}$	D, S	
----	----	----	----	----	----	----	---	Ot	Sun Oil Co. 1. Electric log available.
r2,731	----	----	----	----	----	----	---	Ot	Sam Lewis 1. Electric log available.
----	----	----	----	----	----	----	---	Ot	Kingwood Oil Co. 1. Electric log available.
r2,702	----	62	53	L	----	----	---	Ot	Delta Drilling Co. 1. Electric log available.
r2,221	----	----	----	----	----	----	---	Ot	Joe Bander, Jr., 1. Electric log available.
r2,680	----	----	----	----	----	----	---	Ot	J. L. Crawford 1. Electric log available.
----	----	----	----	----	----	----	---	Ot	Superior Oil Co. 1. Electric log available.
95	6	77	13	L	30.4	Oct. 2, 1952	---	---	Bailing test: 15.5 gpm for 30 min with 24.5 ft drawdown. Log on page 223.
r1,923	----	15	112	Al	----	----	---	Ot	Basin Drilling Co. 3. Log and electric log available.
r2,629	----	----	----	Al	----	----	---	Ot	Nash Redwine 2. Electric log available.
r32	2	----	----	Al	----	----	Su, $\frac{1}{3}$	D, S	Temperature 54°F. Analysis available.
r45	$2\frac{1}{2}$ to $1\frac{1}{4}$	35	10+	Al	----	----	Cy, G,2	D, S	Temperature 56°F. Analysis available.
r2,637	----	26	90	Al	----	----	---	Ot	E. F. Moran 1. Log on page 223. Electric log available.
r2,700	----	.25	100±	Al	----	----	---	Ot	Sun Oil Co. 1. Electric log available.
r1,864	----	----	----	Al	----	----	---	Ot	Clarence Wood 5. Electric log available.
r2,265	----	----	----	Al	----	----	---	Ot	Clarence Wood 6. Electric log available.
r1,869	----	25	105	Al	----	----	---	Ot	W. F. Lacy 2. Electric log available.
r1,853	----	25	104	Al	----	----	---	Ot	W. F. Lacy 3. Electric log available.

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8740-3750-11	4 miles northwest of Geneva.	I. J. Cavanaugh and C. W. Cavanaugh.	Basin Drilling Co.	June 1948	365	Dr
12	$4\frac{1}{4}$ miles northwest of Geneva.	Mrs. G. Bauldauf		November 1943	365	Dr
13	$4\frac{3}{8}$ miles northwest of Geneva.	do		do	369	Dr
14	$4\frac{1}{4}$ miles northwest of Geneva.	do		December 1943		Dr
15	$3\frac{3}{8}$ miles northwest of Geneva.	Reichert		July 1945	365	Dr
16	$2\frac{3}{8}$ miles northwest of Geneva.	Anna McGhee		February 1945	361	Dr
17	$2\frac{7}{8}$ miles northwest of Geneva.	Julius Fohs		December 1943	367	Dr
18	$2\frac{3}{8}$ miles northwest of Geneva.	A. Reichert Estate.	Flamingo Oil Co.	September 1949	368	Dr
19	$5\frac{1}{8}$ miles northwest of Geneva.	J. E. Bower	do	October 1949	364	Dr
20	$4\frac{1}{4}$ miles northwest of Geneva.	W. Sauer		June 1949	360	Dr
21	$5\frac{1}{4}$ miles northwest of Geneva.	J. E. Bower		October 1949	361	Dr
22	4 miles northwest of Geneva.	I. J. Cavanaugh and C. W. Cavanaugh.		May 1948	363	Dr
23	$4\frac{1}{2}$ miles northwest of Geneva.	Wood Fee		October 1948	364	Dr
24	$4\frac{5}{8}$ miles north of Geneva.	Mildred Crutchfield.		October 1949	359	Dr
25	$4\frac{1}{2}$ miles northwest of Geneva.	Wood Fee		April 1949	363	Dr
26	$3\frac{1}{4}$ miles northwest of Geneva.	J. E. Willett			364	Dr
27	$2\frac{7}{8}$ miles northwest of Geneva.	J. Reichert Estate.			369	Dr
28	$3\frac{3}{4}$ miles northwest of Geneva.	W. A. Sauer			366	Dr
29	$3\frac{1}{4}$ miles northwest of Geneva	O. W. Rash Estate.				Dr
30	$5\frac{1}{4}$ miles northwest of Geneva.	Bower Bros				Dr
31	$5\frac{1}{8}$ miles northwest of Geneva.	do			364	Dr
32	$4\frac{7}{8}$ miles northeast of Geneva.	John Pierce				Dr
33	$4\frac{1}{2}$ miles north of Geneva.	Sherrill Heirs			361	Dr
34	$4\frac{1}{4}$ miles northwest of Geneva.	C. Wood			359	Dr
35	$4\frac{3}{8}$ miles northwest of Geneva.	do			366	Dr
36	$1\frac{3}{8}$ miles north of Geneva.	W. H. Knight				Dn
37	$1\frac{1}{2}$ miles north of Geneva.	O. W. Grossman				Dn
38	$1\frac{5}{8}$ miles north of Geneva.	Julius Fohs				Dn
39	$2\frac{1}{4}$ miles north of Geneva.	A. I. Reisz				Dn
40	$3\frac{3}{8}$ miles north of Geneva.	Gentry				Dn
41	$3\frac{1}{2}$ miles north of Geneva.	J. Turner				Dn

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed			Water level		Lift	Use	Remarks
		Depth to top of bed (feet)	Thickness (feet)	Geologic horizon	Below land surface (feet)	Date of measurement			
r2,684	-------	----	------	Al	------	----------	----	Ot	Basin Drilling Co. 2. Electric log available.
r1,864	-------	-----	------	Al	------	----------	---	Ot	Clarence Wood 3. Electric log available.
r1,867	-------	-----	------	Al	------	----------	---	Ot	Clarence Wood 2. Electric log available.
r1,862	-------	-----	------	Al	------	----------	---	Ot	Clarence Wood 4. Electric log available.
r2,687	-------	-----	------	Al	------	----------	---	Ot	Clarence Wood 1. Electric log available.
r2,674	-------	21	88	Al	------	----------	---	Ot	Do.
r2,675	-------	21.	96	Al	------	----------	---	Ot	Sun Oil Co. 1. Electric log available.
r2,699	-------	-----	------	Al	------	----------	---	Ot	George Engle 1. Electric log available.
r2,571	-------	25	95	Al	------	----------	---	Ot	Do.
r2,686	-------	-----	------	Al	------	----------	---	Ot	Clarence Wood 1. Electric log available.
r2,650	-------	-----	------	Al	------	----------	---	Ot	Nash Redwine 1. Electric log available.
r1,921	-------	-----	------	Al	------	----------	---	Ot	Basin Drilling Co. 1. Electric log available.
r1,855	-------	-----	------	Al	------	----------	---	Ot	Clarence Wood 14. Electric log available.
r2,657	-------	-----	------	Al	------	----------	---	Ot	George Engle 1. Electric log available.
r1,869	-------	28	98	Al	------	----------	---	Ot	Clarence Wood 16. Electric log available.
r2,630	-------	-----	------	Al	------	----------	---	Ot	Sun Oil Co. 1. Electric log available.
r2,355	-------	-----	------	Al	------	----------	---	Ot	Clarence Wood 2. Electric log available.
r2,701	-------	21	87	Al	------	----------	---	Ot	Clarence Wood 1. Electric log available.
r2,750	-------	-----	------	Al	------	----------	---	Ot	Trans-Texas Producing Co. 1.
r2,588	-------	-----	------	Al	------	----------	---	Ot	Nash Redwine 3. Electric log available.
r2,586	-------	21	95	Al	------	----------	---	Ot	George Engle 2. Electric log available.
r2,549	-------	-----	------	Al	------	----------	---	Ot	Clarence Wood 1. Electric log available.
r2,541	-------	7?	111?	Al	------	----------	---	Ot	W. F. Lacy 1. Electric log available.
r2,303	-------	21	84+	Al	------	----------	---	Ot	W. F. Lacy 8. Electric log available.
------	-------	25	75?	Al	------	----------	---	Ot	W. F. Lacy 3.
r111	2	----	------	Al	------	----------	Cy, 1	D, S	
------	-------	----	------	----	------	----------	---	---	
r60	------	----	------	Al	------	----------	Cy, ½	D, S	
r50	2	----	------	Al	35	----------	Cy, ½	D, S	
r45	4 to 1¼	----	------	Al	30	----------	J, ¾	D, S	
r40	2½	----	------	Al	19	----------	Cy, G, ½	D, S	

See footnote at end of table.

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Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8740-3750-42	3½ miles northwest of Geneva.	Larkin Cook	------	------	------	Dn
43	4⅛ miles northwest of Geneva.	W. A. Sauer	------	------	------	Dn
44	4⅜ miles northwest of Geneva.	Ashby	------	------	------	Dn
45	1½ miles northwest of Geneva.	J. A. Sandefur	------	------	------	Dn
46	1⅝ miles northwest of Geneva.	Ben Logsdon	------	------	------	Dn
47	3½ miles northwest of Geneva.	C. W. Cavanaugh	------	------	------	Dn
48	do	do	------	------	------	Dn
49	3⅜ miles northwest of Geneva.	------	------	------	------	Dn
50	3⅛ miles northwest of Geneva.	F. Julius Fohs	------	------	------	Dn
51	3 miles northwest of Geneva.	Charles Greene	------	------	------	Dn
52	2⅞ miles northwest of Geneva.	Glenn Alvis	------	------	------	Dn
53	2½ miles northwest of Geneva.	Reichert Estate	------	------	------	Dn
54	2⅜ miles northwest of Geneva.	C. G. McFarron	------	------	------	Dn
55	2 miles northwest of Geneva.	Mrs. Mattie Rosser	------	------	------	Dn
56	1⅞ miles northwest of Geneva.	Nesbitt Bros	------	------	------	Dn
57	1¾ miles northwest of Geneva.	do	------	------	------	Dn
58	do	Ben McGhee	------	1900	------	Dn
59	do	do	------	------	------	Dn
60	do	do	------	1948	------	Dn
61	4⅛ miles northwest of Geneva.	Clore	------	------	365	Dr
62	4⅜ miles northwest of Geneva.	C. Wood	------	------	366	Dr
63	4¼ miles northwest of Geneva.	do	------	------	366	Dr
64	4½ miles northwest of Geneva.	do	------	------	366	Dr
65	do	do	------	------	------	Dr
66	do	do	------	------	------	Dr
67	4⅜ miles northwest of Geneva.	Bauldauf	------	------	------	Dr
68	3¾ miles northwest of Geneva.	Kavanaugh	------	1951	365	Dr
69	Ohio River near Indiana bank.	------	------	------	------	---
70	do	------	------	------	------	---
71	3 miles north of Geneva.	Sun Oil Co	------	------	362	Dr
72	3⅛ miles north of Geneva.	do	------	------	371	Dr

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed: Depth to top of bed (feet)	Principal water-bearing bed: Thickness (feet)	Principal water-bearing bed: Geologic horizon	Water level: Below land surface (feet)	Water level: Date of measurement	Lift	Use	Remarks
r60	2	----	----	Al	20	----	Cy	D, S	
----	----	----	----	Al	----	----	Cy, ½	D, S	
----	----	----	----	Al	----	----	Cy	D, S	
----	----	----	----	Al	----	----	Cy, ½	D	
r60	----	----	----	Al	----	----	Cy, G, 3	S	
r25	1¼	----	----	Al	12 to 14	----	Su	D	
r20	1¼	18	2+	Al	12	----	Cy	S	
----	----	----	----	Al	----	----	Cy	A	
r30	1½	25	5+	Al	20	----	Cy, 1½	D	7 driven stock wells on farm.
r84	3 to 1¼	----	----	Al	66	----	Cy, ½	D, S	
r30	1¼	----	----	Al	16	January 1951	Su, ½	D, S	
r34	1¼	----	----	Al	20	----	Su, ½	D, S	
r34	1¼	----	----	Al	20	----	Cy	D	
r53	----	----	----	Al	16	----	Cy, ½	D, S	
r48	1¼	----	----	Al	----	----	Su	D	Temperature 58° F.
----	3 to 1¼	----	----	Al	----	----	Cy	D, S	
r50	3 to 1¼	----	----	Al	----	----	Cy, ½	D, S	Temperature 57° F.
----	----	----	----	Al	----	----	Cy	S	
r37	----	----	----	Al	27	Fall 1948	Cy, G, 1½	S	
----	----	25	97	Al	----	----	----	Ot	W. F. Lacy 4. Electric log available.
----	----	30	92	Al	----	----	----	Ot	Do.
----	----	30	90+	Al	----	----	----	Ot	W. F. Lacy 5. Electric log available.
----	----	30	90	Al	----	----	----	Ot	W. F. Lacy 6. Electric log available.
----	----	15	110	Al	----	----	----	Ot	W. F. Lacy 7. Electric log available.
----	----	----	----	----	----	----	----	Ot	W. F. Lacy 15. Electric log available.
----	----	----	----	----	----	----	----	Ot	Clarence Wood and W. F. Lacy 1. Electric log available.
----	----	25	92	Al	----	----	----	Ot	Basin Drilling Co. 4. Log on page 224. Electric log available.
----	----	----	----	----	----	----	----	T	Ohio River test boring. Bedrock elevation 319.2 ft above mean sea level.
----	----	----	----	----	----	----	----	T	Ohio River test boring. Bedrock elevation 317.2 ft above mean sea level.
----	----	15	90	Al	----	----	----	Ct	
----	----	----	----	Al	----	----	----	Ct	

See footnote at end of table.

Table 11.—*Records of wells and test borings*

Well no.	Location	Owner or name	Driller	Date completed	Altitude of land surface above sea level (feet)	Type of well
8740-3750-73	3⅜ miles northwest of Geneva.	Sun Oil Co.	----------	------	372	Dr
74	5⅜ miles northwest of Geneva.	---do.	----------	------	365	Dr
8740-3755-1	7¼ miles north of Geneva in Indiana.	J. Y. Welborn	----------	------	365	---

in the Henderson area, Kentucky— Continued

Depth of well (feet)	Diameter of well[1] (inches)	Principal water-bearing bed			Water level		Lift	Use	Remarks
		Depth to top of bed (feet)	Thickness (feet)	Geologic horizon	Below land surface (feet)	Date of measurement			
------	-------	----	------	Al	-----	----------	---	Ct	
------	-------	-----	------	Al	-----	----------	---	Ct	
------	-------	140	50	L	-----	----------	---	Ot	A. S. Mims 1. Electric log available.

[1]Diameter of well may differ with depth. Figures given in order, with depth starting at ground surface.

Table 12.—*Records of springs in*

Spring no: For location of springs, see plates 1–4.
Geologic horizon: L, Lisman formation; P, Pleistocene deposits.

Spring no.	Location	Owner or name	Type of spring	Topographic situation	Principal water-bearing bed	
					Character of material	Geologic horizon
8730-3745-265	2 miles southeast of Henderson in Graham Hills.	Leneher	Seepage	Upland	Sandstone	L
266	do	C. C. Crafton	do	do	Shaly sandstone.	L
8730-3750-8	2 miles northeast of Henderson.	Carolyn Wolf	Fracture	do	Limestone	L
172	3⅜ miles east of Henderson.	Hillary Baskett	Seepage	do	Sandstone	L
318	2 miles northeast of Henderson.	Carolyn Wolf	do	do	Loess	P
320	Atkinson Park	Henderson Boat Club.	Contact	River-bank.	Alluvium	L
8735-3745-14	2⅞ miles southwest of Henderson.	Jennings Tillotson.	do	Terrace	Sandstone	L
256	2½ miles southwest of Henderson.	A. G. Pritchett	do	do	do	L
8740-3745-212	⅞ mile southeast of Geneva.	H. E. Ginger	Seepage	Upland	Limestone	L
213	2½ miles southwest of Geneva.	Fred Meuth	do	do		L
214	3⅜ miles southwest of Geneva.	H. L. Cooper	do	do		L
215	3¼ miles southwest of Geneva.	Ewing Williams	do	do	Sandstone	L
216	do	do	do	do		L
217	3⅝ miles southwest of Geneva.	Wickliffe Farm	do	do		L
218	3½ miles southwest of Geneva.	Bernie Quinn	do	do		L
219	1⅛ miles southeast of Geneva.	Charles Doriott	do	Terrace		L
220	2⅞ miles southeast of Geneva.	George Trigg	do.	Upland		L
221	1⅛ miles southeast of Geneva.	Douglas Gemmel.	do	Terrace		L
222	3⅜ miles southeast of Geneva.	Lizzie Trigg	do	Upland	Sandstone	L
223	3 miles northwest of Geneva.	Charles Dudley	Fracture	Terrace	Limestone	L

the Henderson area, Kentucky

Rate of flow: e, estimated; m, measured; r, reported.
Use: A, abandoned; D, domestic; S, stock.

Yield				Use	Remarks
Fluctuation	Dependability	Rate of flow (gallons per minute)	Date of measurement		
Small flow in wet season.	Reported never fails.	-------	----------	---	Brick lining to 12 ft depth. Water level 0.80 ft below surface, Nov. 7, 1951. Temperature 59°F.
Unknown	Unknown	-------	----------	S	Small flow from disturbed shale beds. Small deposit of iron oxide. Flows into pond.
Little flow in dry weather.	Never dry	m 0.25 m 6.0	Oct. 27, 1950 Feb. 17, 1950	D	Tile set in ground 3 ft, concrete and stone curbing above surface. Chemical analysis in table 4.
Smaller flow in dry weather.	do	r 10	----------	D, S	Brick lining to sandstone at about 6 ft, diameter 60 in., depth 12 ft. Water level 2.5 ft below surface, Nov. 2, 1949. Equipped with 1 hp electric pump. Chemical analysis in table 4.
Unknown	Unknown	r 6	Winter and spring.	A	Seepage into creek.
do	do	e 75	July 21, 1952	---	Springs at contact of alluvium and sandstone; can only be seen when river is in pool. Temperature 57°F. Chemical analysis in table 4.
Little seasonal variation.	Never fails	m 4	May 29, 1950	D, S	Tile set 12 ft in ground. Electric pump installed in well house over tile. Chemical analysis in table 4.
Smaller flow in dry weather.	do	m 3	Jan. 24, 1950	S	Tile set 9.5 ft in ground. Overflow pipe carries water to pool. Temperature 56°F.
Smaller flow in dry years.	----------	-------	----------	---	Brick lining total depth. Water level 2 ft below surface, Oct. 22, 1951.
Smaller flow in summer.	----------	r 2	----------	S	Square brick well 11 ft deep. No flow when visited Aug. 22, 1950.
----------	Dry in fall	r 1	----------	S	Tile set in ground. No flow when visited Aug. 22, 1950.
----------	Never dry	r.1	----------	D, S	Brick-lined well with concrete curbing above surface. Electric pump installed. No visible flow when visited Aug. 22, 1950.
----------	----------	r 5	----------	S	Discharges into pond.
----------	Never dry	-------	----------	S	Do.
----------	do	-------	----------	A	Filled.
----------	do	-------	----------	---	Brick lining. Equipped with windmill. Water level never stands less than 1 ft below surface.
----------	do	-------	----------	---	Brick lining 5 ft diameter; concrete top. No flow when visited Oct. 16, 1950.
----------	----------	m 2	Oct. 23, 1950	D	Tile set in ground.
No flow in dry weath weather.	Never dry	-------	----------	S	No flow, fall of 1950. "Indian Spring."
----------	----------	e 10	April 23, 1950	S	Two visible openings at intersection of joints and bedding planes. "Rock Springs."

Table 13.—*Water levels in observation wells in the Henderson area, Kentucky*

[All water levels given in feet below land-surface datum. For description of wells, see table 11. Water levels are tape measurements except for daily readings from recorder graphs]

Well 8730-3745-1. Owner: Mrs. Zaneda Watson

Date	Water level	Date	Water level	Date	Water level
Sept. 6, 1949	[a]28.50	Feb. 3, 1950	88.45	Apr. 14, 1950	87.63
8	84.50	17	88.22	28	87.52
Nov. 10	85.74	Mar. 6	87.88	May 15	87.18
Dec. 6	88.41	17	87.70	29	87.28
Jan. 10, 1950	88.61	31	87.74	June 9[b]	87.34

[a] Casing slipped; drilled deeper. [b] Measurement discontinued.

Well 8730-3745-45. Owner: Finace Hayes

Date	Water level	Date	Water level	Date	Water level
Nov. 3, 1949	12.25	May 11, 1950	9.30	Oct. 23, 1950	9.54
Dec. 6,	11.50	29	9.48	Nov. 13	9.29
Jan. 5, 1950	10.41	June 9	9.60	Dec. 1	9.00
18	10.12	23	9.66	15	8.72
Feb. 3	9.80	July 7	9.84	Jan. 1, 1951	8.56
17	9.53	24	10.01	17	8.35
Mar. 6	9.37	Aug. 8	10.06	Feb. 8	8.12
17	9.28	Sept. 1	9.96	Mar. 1	8.14
31	9.20	29	9.69	21	8.21
Apr. 14	9.07	Oct. 13	9.65	Apr. 5[b]	8.29
28	9.37				

[b] Measurement discontinued.

Well 8730-3745-48A. Owner: M. L. Cooper. Water level, 1949: Nov. 4, 70.42; Dec. 6, 70.39

Noon daily water level from recorder graph, 1950

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	------	------	------	------	------	------	------	------	70.49	70.76	70.73	70.58
2	------	------	------	------	------	------	------	------	70.55	70.77	70.69	70.48
3	------	[c,d]47.12	------	------	------	------	------	[c]70.71	70.57	70.77	70.70	------
4	------	------	------	------	------	------	------	70.71	70.62	70.77	70.65	------
5	[c,d] 2.35	------	------	------	------	------	------	70.72	70.68	70.76	70.70	------
6	------	------	[c]69.94	------	------	------	------	------	70.72	70.72	70.72	------
7	------	------	------	------	------	------	[c]70.79	------	70.68	70.70	70.77	------
8	------	------	------	------	------	------	------	------	70.56	70.64	70.64	48.75
9	------	------	------	------	------	[c]70.71	------	------	70.50	70.61	70.61	53.63
10	------	------	------	------	------	------	------	70.75	70.47	70.65	70.77	46.29
11	------	------	------	------	[c,d]65.45	------	------	70.75	70.48	70.65	70.84	54.11
12	------	------	------	------	------	------	------	70.79	70.52	70.66	70.85	58.49
13	------	------	------	------	------	------	------	70.79	70.57	70.76	70.84	58.30
14	------	------	------	[c]70.29	------	------	------	70.77	70.62	70.74	70.83	47.44
15	------	------	------	------	------	------	------	70.75	70.62	70.75	70.78	46.45
16	------	------	------	------	------	------	------	70.76	70.61	70.81	70.69	------
17	------	[c,d]59.12	[c,d]54.08	------	------	------	------	70.76	70.67	70.85	70.78	------
18	[c,d]51.21	------	------	------	------	------	------	70.70	70.74	70.83	70.71	------
19	------	------	------	------	------	------	------	70.71	70.73	70.73	70.55	------
20	------	------	------	------	------	------	------	70.75	70.71	70.69	51.70	------
21	------	------	------	------	------	------	70.72	70.78	70.64	70.68	58.14	------
22	------	------	------	------	------	------	70.74	70.77	70.59	70.49	67.24	70.54
23	------	------	------	------	------	[c]70.62	70.71	70.79	70.60	70.60	69.70	70.61
24	------	------	------	------	------	------	70.74	70.82	70.70	70.70	70.37	70.60
25	------	------	------	------	------	------	70.78	70.80	70.77	70.74	70.46	70.68
26	------	------	------	------	------	------	70.71	70.79	70.77	70.75	70.34	70.63
27	------	------	------	------	------	------	70.70	70.79	70.76	70.69	70.36	70.83
28	------	------	------	[c]70.56	------	------	70.68	70.79	70.76	70.65	70.51	------
29	------		------	------	[c]70.50	------	70.67	70.74	70.77	70.73	70.59	70.74
30	------		------	------	------	------	70.66	70.69	70.76	70.76	70.53	70.78
31	------		[c]70.22		------		------	70.61		70.76		70.84

[c] Tape measurement [d] Surface seepage entering well.

Table 13.—*Water levels in observation wells in the Henderson area, Kentucky*—Con.

Well 8730-3745-48A—Continued

Noon daily water level from recorder graph, 1951

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	70.86	-----	-----	-----	69.53	-----	-----	71.13	71.17	71.28	71.28	71.15
2	70.78	c70.46	-----	-----	69.69	-----	-----	71.13	71.19	71.27	71.35	71.11
3	-----	-----	-----	-----	69.72	-----	70.92	71.14	71.25	71.21	71.37	70.94
4	cd34.36	-----	-----	-----	69.71	-----	70.93	71.16	71.28	71.19	71.33	70.81
5	-----	-----	-----	-----	69.73	-----	70.97	71.21	71.28	71.24	71.44	70.83
6	-----	-----	-----	-----	69.88	-----	71.00	71.22	71.29	71.31	71.35	70.83
7	-----	-----	-----	-----	70.03	-----	71.01	71.18	71.25	71.28	71.23	70.84
8	-----	-----	-----	-----	70.15	-----	71.00	71.17	71.25	71.39	71.32	71.00
9	-----	cd57.00	cd56.90	-----	70.16	-----	71.00	71.14	71.23	71.41	71.35	71.02
10	-----	-----	-----	-----	70.12	-----	71.00	71.18	71.25	71.41	71.35	71.10
11	-----	-----	-----	-----	70.15	-----	71.00	71.20	71.30	71.40	71.35	c70.99
12	d40.19	-----	-----	-----	70.25	-----	71.00	71.23	71.30	71.42	71.25	-----
13	d39.60	-----	-----	-----	70.38	-----	71.02	71.26	71.30	71.45	71.06	-----
14	d39.60	-----	-----	-----	70.49	-----	71.04	71.27	71.30	71.46	70.93	-----
15	d39.60	-----	-----	-----	70.55	-----	71.04	71.29	71.31	71.43	71.04	-----
16	d39.60	cd.80	cd21.37	-----	70.55	-----	71.06	71.26	71.31	71.40	71.09	-----
17	d39.60	-----	-----	-----	70.53	-----	71.06	71.23	71.31	71.40	71.25	-----
18	d41.50	-----	-----	-----	70.53	-----	71.07	71.19	c71.31	71.43	71.32	-----
19	d49.14	-----	-----	-----	70.54	-----	71.07	71.15	-----	71.46	71.35	-----
20	-----	-----	-----	c69.15	70.53	-----	71.08	71.14	-----	71.43	c71.37	70.72
21	-----	-----	-----	-----	70.53	-----	71.09	71.11	-----	71.38	-----	70.68
22	-----	-----	-----	-----	70.52	-----	71.11	71.13	-----	71.37	-----	70.89
23	-----	-----	-----	cd8.07	70.52	-----	71.14	71.19	-----	71.36	-----	70.92
24	-----	-----	-----	-----	70.56	-----	71.15	71.19	-----	71.34	-----	71.03
25	-----	-----	-----	-----	70.57	-----	71.15	71.21	71.29	71.44	-----	70.87
26	c69.92	-----	-----	-----	70.56	c70.97	71.14	71.20	71.24	71.44	-----	71.00
27	-----	-----	-----	-----	70.55	c70.97	71.15	71.16	71.20	71.40	c71.17	71.16
28	-----	-----	-----	-----	c70.56	-----	71.15	71.14	71.31	71.32	-----	71.05
29	-----		-----	-----	-----	-----	71.13	71.16	71.36	71.33	-----	-----
30	-----		-----	c69.34	-----	-----	71.13	71.18	71.33	71.30	-----	-----
31	-----		-----		-----		71.13	71.18		71.33		c70.74

cTape measurement. dSurface seepage entering well.

Well 8730-3745-48A—Continued

Date	Water level	Date	Water level	Date	Water level
Jan. 5, 1952	d5.22	July 29, 1952	70.46	Nov. 12, 1952	70.13
Apr. 16	d45.50	Sept. 3	70.45	Dec. 8	69.78
May 1	70.03	Oct. 8	70.29	29b	69.78
June 25	70.42				

bMeasurement discontinued. dSurface seepage entering well.

Well 8730-3745-48B. Owner: M. L. Cooper

Nov. 4, 1949	7.15	June 9, 1950	3.83	July 10, 1951	8.55
Dec. 6	8.34	23	3.98	17	9.09
Jan. 5, 1950	2.22	July 7	5.62	Aug. 7	12.02
18	2.04	Oct. 20	7.60	14	12.79
Feb. 3	2.19	Dec. 1	2.62	21	13.67
17	2.15	Jan. 12, 1951	1.85	Sept. 4	14.38
Mar. 6	2.90	26	2.28	11	14.64
17	2.23	Feb. 16	.80	18	14.00
31	2.48	Apr. 30	3.00	Oct. 2	15.36
Apr. 14	3.03	May 1	3.15	9	15.61
28	3.78	15	4.15	16	15.86
May 11	2.34	June 27	7.64	30	16.30
29	4.09	July 2	7.76		

Table 13.—*Water levels in observation wells in the Henderson area, Kentucky*—Con.

Well 8730-3745-48B—Continued

Date		Water level	Date		Water level	Date		Water level
Nov.	13, 1951	16.19	Jan.	5, 1952	1.87	Sept.	3, 1952	14.84
	20	16.62	Mar.	14	1.93	Oct.	8	16.14
	27	17.57	Apr.	16	1.96	Nov.	12	17.13
Dec.	4	16.51	May	1	3.23	Dec.	8	17.45
	11	15.61	June	25	7.15		29[b]	17.49
	31	6.20	July	29	12.69			

[b]Measurement discontinued.

Well 8730-3745-63. Owner: W. D. Lambert

Date		Water level	Date		Water level	Date		Water level
Nov.	9, 1949	10.10	Oct.	13, 1950	10.96	Dec.	20, 1951	6.10
Dec.	6	10.76		27	11.34	Jan.	8, 1952	4.77
Jan.	6, 1950	3.51	Nov.	13	10.65		25	6.60
	18	4.19	Dec.	1	8.60	Feb.	14	6.14
Feb.	3	4.45		15	7.16		28	6.38
	17	4.48	Jan.	1, 1951	9.00	Mar.	14	5.16
Mar.	6	5.54		17	4.66		28	6.17
	31	5.48	Feb.	8	6.82	Apr.	16	5.95
Apr.	14	5.61	Mar.	1	5.57	May	1	7.68
	28	6.96		21	4.49		14	8.50
May	11	6.35	Apr.	5	5.86	June	25	10.17
	29	8.03		20	6.59	July	29	11.46
June	9	8.57	May	10	7.94	Sept.	3	11.83
	23	8.89	June	27	10.80	Oct.	8	12.34
July	7	9.90	Aug.	1	11.40	Nov.	12	12.28
	24	10.71		30	12.04	Dec.	9	11.64
Aug.	8	10.82	Oct.	8	12.29		29[b]	11.53
Sept.	1	9.34		31	12.08			
	29	10.17	Nov.	30	8.70			

[b]Measurement discontinued.

Well 8730-3745-121. Owner: A. M. Toy

Date		Water level	Date		Water level	Date		Water level
Dec.	7, 1949	30.95	May	11, 1950	26.82	Oct.	27, 1950	29.44
Jan.	5, 1950	30.63		29	26.60	Dec.	1	29.52
	18	29.32	June	9	27.02		15	29.30
Feb.	3	28.94		23	27.26	Jan.	1, 1951	29.15
	17	28.14	July	7	27.74		17	28.58
Mar.	6	27.33		24	28.20	Feb.	8	28.25
	17	27.10	Aug.	8	28.49	Mar.	1	27.20
	31	27.10	Sept.	1	28.89		21	26.17
Apr.	14	26.48		29	29.25	Apr.	5[b]	24.41
	28	26.58						

[b]Measurement discontinued.

Well 8730-3745-162. Owner: R. P. Gish

Date		Water level	Date		Water level	Date		Water level
Nov.	29, 1949	31.74	June	9, 1950	14.77	July	28, 1950	[e]25.38
Jan.	6, 1950	5.53		23	18.15		29	[e]25.44
	18	5.36	July	7	21.60		30	[e]25.49
Feb.	3	5.98		19	24.11		31	[e]25.55
	17	5.05		20	[e]24.22	Aug.	1	[e]25.26
Mar.	6	8.65		21	[e]24.45		2	[e]25.19
	17	7.70		22	[e]24.65		3	[e]25.18
	31	7.09		23	[e]24.79		4	[e]25.22
Apr.	14	7.50		24	[e]24.92		5	[e]25.25
	28	10.39		25	[e]25.06		6	[e]25.31
May	15	10.50		26	[e]25.16		7	[e]25.37
	29	13.06		27	[e]25.31		8	[e]25.43

[e]Noon daily water level from recorder graph.

Table 13.— *Water levels in observation wells in the Henderson area, Kentucky*— Con.

Well 8730-3745-162—Continued

Date	Water level	Date	Water level	Date	Water level
Aug. 9, 1950	[e]25.43	Aug. 27, 1950	[e]26.90	Sept. 14, 1950	[c]26.39
10	[e]25.49	28	[e]26.94	15	26.28
11	[e]25.58	29	[e]26.95	29	26.45
12	[e]25.73	30	[e]26.94	Oct. 13	27.45
13	[e]25.87	31	[e]26.92	27	27.98
14	[e]25.98	Sept. 1	[e]26.80	Nov. 13	28.71
15	[e]26.06	2	[e]26.82	Dec. 1	22.93
16	[e]26.15	3	[e]26.88	15	17.23
17	[e]26.25	4	[e]26.97	22	17.96
18	[e]26.29	5	[e]27.07	23	[e]17.93
19	[e]26.35	6	[e]27.17	24	[e]17.83
20	[e]26.44	7	[e]27.15	25	[e]18.06
21	[e]26.54	8	[e]27.02	26	[e]17.88
22	[e]26.61	9	[e]26.85	27	[e]18.41
23	[e]26.69	10	[e]26.67	28	[e]18.42
24	[e]26.78	11	[e]26.53	29	[e]18.36
25	[e]26.82	12	[e]26.47	30	[e]18.53
26	[e]26.86	13	[e]26.42	31	[e]18.81

[e]Noon daily water level from recorder graph.

Well 8730-3745-162--Continued

Noon daily water level from recorder graph, 1951

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	18.98	11.44	7.48	5.64	8.06	13.18	18.64	22.28	25.44	27.13	27.95	28.80
2	18.94	11.90	7.56	5.93	8.32	13.31	18.52	22.47	25.50	[c]27.09	28.04	28.70
3	18.47	11.91	-----	6.21	8.43	13.48	18.37	22.58	25.73	-----	28.08	28.57
4	18.35	11.80	7.64	6.47	8.53	13.67	18.23	22.81	25.78	-----	28.08	24.44
5	18.11	12.01	7.49	6.78	8.76	13.87	18.45	23.04	25.85	-----	28.18	19.26
6	17.45	11.90	7.42	6.94	8.98	14.00	18.70	23.19	25.90	-----	28.22	17.19
7	16.98	11.32	7.54	7.01	9.25	14.10	18.83	23.19	25.97	-----	28.15	13.24
8	16.57	10.91	7.80	7.09	9.43	14.23	18.88	23.21	26.08	-----	28.22	12.09
9	16.45	10.73	8.20	7.06	9.55	14.47	18.96	23.31	26.13	27.35	28.31	11.09
10	16.15	10.81	8.38	7.04	9.58	14.84	19.20	23.48	26.10	27.44	28.36	10.89
11	15.97	10.74	8.43	6.92	9.78	15.17	19.45	23.60	26.13	27.48	28.42	10.96
12	15.33	10.62	7.99	6.80	10.03	15.43	19.48	23.90	26.17	27.53	28.39	11.44
13	14.35	10.53	6.84	6.70	10.22	15.68	19.54	24.08	26.18	27.63	[c]28.28	12.17
14	3.74	10.39	6.44	6.64	10.48	16.03	19.55	24.21	26.29	27.69	-----	12.14
15	3.84	9.95	6.49	6.72	10.66	[c]16.27	19.58	24.30	26.37	27.72	-----	10.70
16	-----	9.44	6.40	6.92	10.73	-----	19.66	24.36	26.48	27.71	-----	10.75
17	-----	8.42	6.47	7.19	10.81	-----	19.79	24.41	26.55	27.74	-----	10.95
18	-----	8.14	3.14	7.29	10.98	-----	19.94	24.55	26.58	27.77	-----	11.15
19	7.32	8.18	3.75	7.56	11.14	[c]17.04	20.04	24.66	26.62	-----	-----	11.73
20	7.84	7.70	3.91	7.89	11.26	17.15	20.19	24.75	26.65	-----	28.74	11.68
21	-----	3.68	4.26	7.96	11.43	17.41	20.38	24.80	26.50	-----	28.76	10.35
22	-----	4.40	-----	6.98	11.59	17.53	20.56	24.93	26.70	-----	28.76	10.10
23	-----	5.11	4.95	6.56	11.79	17.79	20.77	25.07	26.76	[c]27.76	28.72	10.21
24	-----	5.68	5.45	6.42	11.93	18.09	20.98	25.20	26.82	27.78	28.72	10.72
25	-----	6.06	5.53	6.51	12.03	18.39	21.20	25.27	26.82	27.89	28.77	10.71
26	10.44	6.42	5.99	6.86	12.06	18.47	21.40	25.30	26.84	27.95	28.75	9.61
27	10.50	6.94	6.16	7.10	12.26	18.60	21.55	25.29	26.83	27.96	28.83	9.47
28	10.87	7.18	6.22	7.27	12.45	18.80	21.64	25.30	26.96	27.81	28.84	9.30
29	11.31		6.00	7.43	12.67	18.92	21.76	25.38	27.10	27.92	28.85	9.36
30	11.49		5.15	7.72	12.87	18.83	21.97	25.40	27.14	27.89	28.85	9.59
31	11.34		5.42		13.07		22.14	25.43		27.92		10.03

[c]Tape measurement.

Table 13.—*Water levels in observation wells in the Henderson area, Kentucky*—Con.

Well 8730-3745-162—Continued

Noon daily water level from recorder graph, 1952

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	10.50	9.00	8.88	7.12	9.57	14.00	20.57	24.59	26.33	27.50	28.66	29.76
2	10.60	8.30	8.90	7.47	9.72	14.18	20.84	24.63	26.31	27.48	28.66	29.73
3	6.30	5.14	8.89	7.71	9.93	14.30	21.08	24.66	26.42	27.58	28.70	29.75
4	3.50	4.16	8.92	7.68	10.09	14.52	21.31	24.68	26.55	27.64	28.79	29.73
5	3.91	4.64	9.05	7.85	10.21	14.68	21.54	24.77	26.65	27.65	28.76	29.69
6	4.82	5.20	8.98	7.97	10.41	14.97	21.72	24.88	26.72	27.72	28.71	29.68
7	5.54	5.76	8.96	8.00	10.58	15.23	21.83	24.97	26.77	27.82	28.78	29.67
8	5.74	5.86	8.90	7.99	10.63	------	21.90	25.03	26.85	27.88	28.83	29.65
9	6.33	6.42	8.75	8.06	10.72	c15.79	22.05	25.04	26.91	27.87	28.83	29.61
10	7.04	6.63	8.55	8.25	10.91	------	22.22	25.08	26.96	27.88	28.84	29.56
11	7.46	6.98	8.21	8.36	11.10	------	22.40	25.16	26.98	27.94	28.87	29.60
12	7.68	7.30	8.78	8.22	11.25	------	22.63	25.20	26.99	27.97	28.92	29.62
13	7.85	7.49	9.24	7.92	11.45	------	22.80	25.33	27.00	27.96	28.95	29.69
14	8.09	7.81	----	7.52	11.57	------	22.90	25.43	27.03	27.96	28.95	29.75
15	8.50	8.10	----	7.48	11.60	------	22.95	25.48	27.05	27.99	28.89	29.81
16	8.79	8.15	----	7.58	11.83	------	23.08	25.47	27.06	28.05	28.96	29.87
17	8.82	8.40	6.21	7.67	12.05	17.60	23.25	25.55	27.02	28.10	29.00	29.90
18	9.29	8.60	6.20	7.70	12.24	17.94	23.39	25.64	26.97	28.18	29.01	29.92
19	9.15	8.52	6.32	7.76	12.30	18.13	23.50	25.72	26.97	28.21	29.00	29.96
20	9.48	8.44	6.20	7.92	12.31	18.33	23.55	25.77	27.06	28.28	29.01	29.92
21	9.67	8.21	6.28	8.09	12.52	18.48	23.62	25.81	27.17	28.43	29.05	29.93
22	9.46	7.98	3.46	8.22	12.63	18.70	23.69	25.90	27.25	28.50	29.06	29.94
23	9.99	7.85	3.94	8.35	12.69	18.96	23.80	26.01	27.31	28.53	29.13	29.90
24	10.24	7.91	4.47	8.50	12.79	19.15	23.93	26.08	27.39	28.53	29.25	29.96
25	10.01	8.17	4.96	8.67	12.90	19.30	24.05	26.18	27.45	28.53	29.24	30.05
26	9.86	8.21	5.53	8.80	13.19	19.51	24.14	26.25	27.46	28.54	29.18	30.13
27	9.80	8.30	5.90	8.95	13.28	19.74	24.22	26.31	27.45	28.53	29.31	30.17
28	9.10	8.24	6.23	9.10	13.43	19.99	24.26	26.32	27.46	28.52	29.47	30.24
29	8.94	8.43	6.51	9.27	13.55	20.19	24.28	26.33	27.50	28.61	29.59	30.25
30	8.99		6.80	9.46	13.65	20.32	24.37	26.34	27.53	28.67	29.68	30.20
31	9.02		6.89		13.77		24.47	26.33		28.67		30.12

[c]Tape measurement.

Well 8730-3745-162—Continued

Date	Water level	Date	Water level	Date	Water level
Jan. 1, 1953	e30.16	Jan. 6, 1953	e30.15	Jan. 11, 1953	e30.15
2	e30.12	7	e30.18	12	e30.29
3	e30.06	8	e30.16	13	e30.35
4	e30.07	9	e30.16	14[b]	30.38
5	e30.08	10	e30.13		

[b]Measurement discontinued.

[e]Noon daily water level from recorder graph.

Table 13.—*Water levels in observation wells in the Henderson area, Kentucky*—Con.

Well 8730-3745-198. Owner: Mrs. Coleman Hicks, Sr. Water level, 1949: Dec. 1, 17.06

Noon daily water level from recorder graph, 1950

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	----	----	----	----	----	----	----	----	15.97	15.35	16.07	14.32
2	----	----	----	----	----	----	----	----	15.98	15.38	16.03	14.16
3	----	[c]11.97	----	----	----	----	----	----	15.98	15.41	16.08	14.07
4	----	----	----	----	----	----	----	----	15.96	15.43	16.03	13.97
5	----	----	----	----	----	----	----	----	16.00	15.45	16.12	13.98
6	[c]12.77	----	[c]12.41	----	----	----	----	----	16.00	15.45	16.14	13.90
7	----	----	----	----	----	----	[c]15.05	----	15.93	15.48	16.21	----
8	----	----	----	----	----	----	----	[c]15.67	15.80	15.44	16.14	13.69
9	----	----	----	----	----	[c]13.93	----	----	15.68	15.46	16.02	13.64
10	----	----	----	----	----	----	----	----	15.53	15.54	16.03	13.56
11	----	----	----	----	----	----	----	----	15.45	15.58	16.01	13.53
12	----	----	----	----	----	----	----	----	15.45	15.69	15.96	13.46
13	----	----	----	----	----	----	----	----	15.45	15.81	15.91	13.53
14	----	----	----	[c]12.49	----	----	----	[c]15.67	15.43	15.81	15.83	13.53
15	----	----	----	----	[c]12.98	----	----	15.66	15.38	15.88	15.74	13.50
16	----	----	----	----	----	----	----	15.71	15.33	16.01	15.58	13.56
17	----	[c]11.76	[c]12.23	----	----	----	----	15.74	15.36	16.09	15.54	13.58
18	[c]11.78	----	----	----	----	----	----	15.71	15.37	16.09	15.35	13.63
19	----	----	----	----	----	----	----	15.77	15.33	15.96	15.14	13.64
20	----	----	----	----	----	----	----	15.86	15.29	15.93	14.95	13.70
21	----	----	----	----	----	----	----	15.92	15.19	15.93	14.95	13.77
22	----	----	----	----	----	----	----	16.00	15.13	15.91	14.73	13.72
23	----	----	----	----	----	[c]14.32	----	16.07	15.14	15.88	14.64	13.74
24	----	----	----	----	----	----	[c]15.92	16.16	15.30	15.97	14.67	13.69
25	----	----	----	----	----	----	----	16.19	15.32	16.04	14.56	13.77
26	----	----	----	----	----	----	----	16.27	15.36	16.06	14.31	13.66
27	----	----	----	----	----	----	----	16.34	15.35	15.97	14.35	----
28	----	----	----	[c]13.34	----	----	----	16.38	15.35	15.99	14.42	----
29	----		----	----	[c]13.68	----	----	16.40	15.36	16.07	14.44	13.84
30	----		----	----	----	----	----	16.38	15.35	16.11	14.36	13.87
31	----		[c]12.59		----			16.33		16.10		----

Noon daily water level from recorder graph, 1951

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	14.00	12.91	12.25	12.05	12.96	14.45	15.13	15.90	17.43	18.69	19.16	----
2	13.97	13.18	12.31	12.08	13.05	14.46	15.20	15.92	17.52	18.63	19.20	----
3	13.72	13.20	12.19	12.17	13.05	14.47	15.26	15.93	17.57	18.58	19.20	----
4	13.55	13.09	12.23	12.23	13.02	14.52	15.21	16.06	17.74	18.63	19.20	----
5	13.58	13.18	12.27	12.36	13.06	14.61	15.35	16.14	17.80	18.74	19.21	15.84
6	13.54	13.11	12.29	12.38	13.17	14.61	15.41	16.14	17.81	18.84	19.09	15.71
7	13.53	13.05	12.29	12.31	13.32	14.58	15.41	16.13	17.94	18.84	18.94	----
8	13.52	13.07	12.35	12.24	13.39	14.57	15.39	16.17	18.02	18.97	19.05	----
9	13.51	13.06	12.66	12.24	13.38	14.62	15.39	16.18	18.03	19.01	19.07	----
10	13.46	13.08	12.67	----	13.34	14.73	15.45	16.23	17.95	19.03	19.06	----
11	13.32	13.00	12.62	----	13.34	14.74	15.49	16.30	[c]18.07	19.02	19.05	14.99
12	13.27	12.85	12.36	----	13.50	14.74	15.42	16.37	----	19.05	18.93	14.87
13	13.20	12.79	12.15	12.23	13.62	14.76	15.45	16.45	18.03	19.09	18.75	14.95
14	12.80	12.89	12.12	12.28	13.70	14.85	15.60	16.55	18.09	19.10	18.61	14.70
15	12.56	12.85	12.16	12.40	[c]13.76	14.85	15.51	16.56	18.17	19.08	18.65	14.73
16	12.57	12.58	[c]12.22	12.54	13.75	14.83	15.50	16.57	18.25	19.05	18.68	14.81
17	12.41	12.53	12.23	12.67	13.72	14.85	15.49	16.63	18.28	19.13	18.72	14.65
18	12.38	12.48	12.06	12.67	13.76	14.95	15.47	16.69	18.29	19.15	18.87	[c]14.43
19	12.41	12.38	12.06	12.66	13.79	14.96	15.47	16.77	18.36	19.18	18.85	----
20	12.42	12.30	12.03	12.82	13.80	14.98	15.51	16.80	18.39	19.13	18.87	14.33
21	12.75	12.15	11.94	12.88	13.83	15.05	15.56	16.82	18.45	19.06	18.74	----
22	12.79	12.21	11.91	12.74	13.91	15.05	15.61	16.96	18.42	19.10	18.65	----
23	12.65	12.22	11.79	12.74	13.93	15.11	15.64	17.07	18.54	19.11	18.43	----
24	12.71	12.22	11.96	12.66	13.99	15.20	15.67	17.09	18.52	19.14	18.00	[c]14.33
25	----	12.16	12.00	12.59	14.01	15.28	15.70	17.14	18.46	19.23	17.58	----
26	12.87	12.11	12.14	12.67	13.99	15.29	15.77	17.15	18.45	19.21	17.20	----
27	12.77	12.22	12.12	12.73	14.06	15.27	15.77	17.15	18.48	19.16	[c]17.12	----
28	12.85	12.24	12.00	12.72	14.15	15.34	15.71	17.22	18.70	19.06	----	----
29	12.91		11.93	12.74	14.26	15.29	15.75	17.28	18.75	19.12	----	----
30	13.02		11.91	12.83	14.36	15.25	15.82	17.33	18.72	19.14	----	----
31	12.92		12.05		14.45		15.83	17.36				[c]13.77

[c]Tape measurement.

Table 13.— *Water levels in observation wells in the Henderson area, Kentucky*— Con.

Well 8730-3745-198—Continued

Noon daily water level from recorder graph, 1952

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	—	13.25	13.20	13.04	13.87	14.99	16.70	—	—	—	—	—
2	—	12.91	13.21	13.21	13.89	15.05	16.82	—	—	—	—	—
3	—	12.69	13.11	13.28	13.99	15.05	16.86	—	[c]19.91	—	—	—
4	—	12.45	12.96	13.16	14.05	15.09	16.92	—	—	—	—	—
5	—	12.56	13.25	13.08	14.03	15.11	17.03	—	—	—	—	—
6	—	12.58	13.29	13.15	14.06	15.18	17.09	—	—	—	—	—
7	13.03	12.68	13.33	13.20	14.15	15.25	17.15	—	—	—	—	—
8	12.82	12.55	13.31	13.21	14.11	15.26	17.21	—	—	[c]20.59	—	—
9	12.89	12.75	13.19	13.26	14.09	15.29	17.26	—	—	—	—	—
10	13.14	12.73	[c]13.07	13.33	14.12	15.32	17.33	—	—	—	—	[c]20.30
11	13.27	12.79	—	13.39	14.23	15.39	17.41	—	—	—	—	—
12	13.21	12.89	—	13.21	14.30	15.40	17.56	—	—	—	[c]21.00	—
13	13.17	12.87	12.54	12.95	14.42	15.44	17.59	—	—	—	—	—
14	13.14	12.87	12.76	12.95	14.42	15.51	17.63	—	—	—	—	—
15	13.25	12.95	12.82	13.10	14.34	15.56	17.63	—	—	—	—	—
16	13.35	12.91	12.89	13.24	14.41	15.59	17.72	—	—	—	—	—
17	13.23	12.97	[c]12.91	13.30	14.49	15.63	17.81	—	—	—	—	—
18	13.40	13.02	—	13.31	14.57	15.78	17.88	—	—	—	—	—
19	13.27	12.94	—	13.32	14.49	15.80	17.91	—	—	—	—	—
20	13.37	12.83	—	13.39	14.47	15.85	17.91	—	—	—	—	—
21	13.49	12.86	—	13.48	14.57	15.90	18.00	—	—	—	—	—
22	13.25	12.93	—	13.51	14.62	16.00	18.07	—	—	—	—	—
23	13.49	12.88	—	13.52	14.65	16.12	18.14	—	—	—	—	—
24	13.65	12.88	12.62	15.55	14.63	16.19	18.27	—	—	—	—	—
25	13.49	13.00	12.66	13.60	14.64	16.21	18.32	—	—	—	—	—
26	13.31	13.01	12.82	13.63	14.78	16.33	18.37	—	—	—	—	—
27	13.20	13.00	12.90	13.68	14.82	16.41	18.47	—	—	—	—	—
28	13.15	12.90	12.94	13.72	14.86	16.53	18.46	—	—	—	—	—
29	13.27	13.01	12.97	13.78	14.92	16.57	18.51	—	—	—	—	[bc]20.20
30	13.36		13.06	13.86	14.88	16.62	[c]18.58	—	—	—	—	—
31	13.36		13.03		14.89		—	—	—	—	—	—

[b]Measurement discontinued. [c]Tape measurement.

Well 8730-3745-219. Owner: R. R. Roberts

Date	Water level	Date	Water level	Date	Water level
Dec. 5, 1949	38.18	Oct. 13, 1950	36.86	Oct. 31, 1951	37.26
Feb. 3 1950	34.73	27	37.11	Jan. 8, 1952	34.59
17	34.55	Nov. 13	37.57	25	36.01
Mar. 6	36.90	Dec. 1	37.20	Feb. 14	35.39
17	35.25	15	36.38	28	34.56
31	34.65	Jan. 1, 1951	37.37	Apr. 2	34.15
Apr. 14	35.30	17	34.56	16	33.30
28	35.72	Feb. 8	32.85	May 1	35.26
May 15	35.65	Mar. 1	32.66	14	34.94
29	36.72	21	34.77	June 25	35.50
June 9	36.38	Apr. 5	34.08	July 29	35.83
23	36.10	23	34.46	Sept. 3	36.71
July 7	36.85	May 10	34.48	Oct. 8	36.96
24	36.58	June 26	38.64	Nov. 12	37.66
Aug. 3	36.50	Aug. 1	37.57	Dec. 8	37.13
Sept. 1	37.08	30	37.38	29[b]	37.74
14	37.28	Oct. 8	37.86		

[b]Measurement discontinued.

Table 13.— *Water levels in observation wells in the Henderson area, Kentucky*— Con.

Well 8730-3745-220. Owner: R. R. Roberts

Date	Water level	Date	Water level	Date	Water level
Dec. 5, 1949	37.04	Sept. 14, 1950	34.10	Oct. 8, 1951	34.27
Jan. 6, 1950	29.24	Oct. 13	35.43	31	34.30
18	31.52	27	35.36	Jan. 1, 1952	28.20
Feb. 3	31.65	Nov. 13	35.70	25	32.46
17	30.97	Dec. 1	33.41	Feb. 14	31.29
Mar. 6	31.52	15	32.83	28	29.38
17	31.12	Jan. 1, 1951	33.79	Apr. 2	29.99
31	30.98	17	29.22	16	28.96
Apr. 14	31.85	Feb. 2	25.95	May 1	31.23
28	33.26	Mar. 1	30.40	14	33.06
May 15	32.05	21	28.83	June 25	34.15
29	33.16	Apr. 5	29.84	July 29	34.50
June 9	34.17	23	28.15	Sept. 3	35.20
23	34.23	May 10	30.90	Oct. 8	35.42
July 7	34.44	June 26	34.17	Nov. 12	35.87
24	35.08	Aug. 1	34.29	Dec. 8	35.82
Aug. 3	34.70	30	33.66	29[b]	36.16
Sept. 1	34.37				

[b]Measurement discontinued.

Well 8730-3745-221. Owner: R. R. Roberts. Water level, 1949: Dec. 5, 34.59

Noon daily water level from recorder graph, 1950

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	----	----	----	----	----	----	----	32.58	----	----	32.83	32.75
2	----	----	----	----	----	----	----	32.54	----	----	32.88	32.58
3	----	[c]33.47	----	----	----	----	----	32.54	----	----	32.88	32.72
4	----	----	----	----	----	----	----	32.55	----	----	32.82	32.84
5	----	----	----	----	----	----	----	32.55	----	----	32.98	32.92
6	[c]34.05	----	[c]32.24	----	----	----	----	32.58	----	32.71	33.05	32.70
7	----	----	----	----	----	----	[c]32.12	32.57	[c]32.71	32.68	33.04	32.75
8	----	----	----	----	----	----	----	32.44	----	32.54	32.82	32.98
9	----	----	----	----	----	[c]32.03	----	32.39	----	32.60	33.05	32.71
10	----	----	----	----	----	----	----	32.48	----	32.71	33.38	32.76
11	----	----	----	----	----	----	----	32.48	----	32.64	33.36	32.63
12	----	----	----	----	----	----	----	32.55	----	32.83	33.25	32.53
13	----	----	----	----	----	----	----	32.58	----	32.88	33.20	32.64
14	----	----	----	[c]32.17	----	----	----	32.50	32.73	32.80	33.07	32.64
15	----	----	----	----	[c]31.68	----	----	32.46	32.73	32.94	32.97	32.71
16	----	----	----	----	----	----	----	32.54	32.82	33.04	32.94	32.83
17	----	[c]32.80	[c]31.95	----	----	----	----	32.49	32.89	33.07	33.12	32.87
18	[c]33.50	----	----	----	----	----	----	32.36	32.79	32.89	32.86	32.91
19	----	----	----	----	----	----	----	32.49	32.64	32.73	32.59	32.71
20	----	----	----	----	----	----	----	32.58	32.48	32.72	33.06	32.92
21	----	----	----	----	----	----	[c]32.39	32.56	32.49	32.68	33.10	32.92
22	----	----	----	----	----	----	32.35	32.58	[c]32.51	32.69	32.88	32.61
23	----	----	----	----	----	[c]32.03	32.29	32.64	----	32.87	32.92	32.50
24	----	----	----	----	----	----	32.36	32.64	----	32.94	33.20	32.49
25	----	----	----	----	----	----	32.44	32.57	----	33.02	32.90	32.46
26	----	----	----	----	----	----	32.43	32.60	----	32.95	32.52	32.51
27	----	----	----	----	----	----	32.44	32.59	----	32.74	32.77	32.77
28	----	----	----	[c]31.89	----	----	32.49	32.52	----	32.87	33.00	32.46
29	----		----	----	[c]31.85	----	32.52	32.54	[c]32.83	33.01	32.94	32.39
30	----		----	----	----	----	32.54	32.50	----	32.98	32.78	32.43
31	----		[c]32.24		----		32.56	[c]32.24		32.95		32.62

[c]Tape measurement.

Table 13.— *Water levels in observation wells in the Henderson area, Kentucky*— Con.

Well 8730-3745-221—Continued

Noon daily water level from recorder graph, 1951

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	32.54	_____	31.52	30.78	30.88	31.28	31.56	31.93	32.24	32.60	33.17	33.26
2	32.26	[c]32.43	31.44	30.84	30.90	31.24	31.66	31.93	32.36	32.45	33.20	33.21
3	32.02	32.29	31.03	30.94	30.63	31.24	31.53	31.90	32.48	32.44	32.97	33.03
4	32.55	31.86	31.45	30.94	30.46	31.34	31.48	32.09	32.54	32.57	33.29	33.03
5	32.62	32.03	31.49	31.02	30.61	31.45	31.79	32.12	32.39	32.77	33.44	32.74
6	32.58	31.67	31.33	30.77	30.78	31.31	31.81	_____	32.39	32.78	32.64	32.90
7	32.60	32.11	_____	_____	31.01	31.11	31.69	31.83	32.55	32.90	33.02	33.16
8	32.56	32.26	31.41	_____	31.01	31.13	31.57	31.79	32.56	33.03	33.35	33.28
9	32.43	32.19	31.78	_____	30.92	31.23	31.59	31.98	32.33	32.96	33.32	33.48
10	32.23	32.16	31.68	_____	30.58	31.37	31.69	32.09	32.24	32.97	33.29	33.32
11	32.54	31.83	31.43	_____	30.77	_____	31.71	32.12	32.54	32.93	33.29	32.89
12	32.49	31.61	31.23	_____	30.96	31.21	31.73	32.19	32.40	33.04	32.91	32.90
13	32.35	31.91	30.90	[c]31.13	31.17	31.36	31.74	32.11	32.50	33.07	32.59	32.75
14	31.87	32.29	30.86	_____	31.30	31.45	31.76	32.13	32.62	33.03	32.96	32.83
15	31.92	32.05	31.14	_____	31.35	31.38	31.74	[c]32.16	32.63	32.93	33.19	32.24
16	32.47	[c]31.78	31.30	_____	31.14	31.26	31.75	32.09	32.65	32.88	33.40	32.10
17	32.02	31.85	31.17	_____	30.99	31.33	31.78	32.13	32.55	32.96	33.62	_____
18	32.00	31.73	31.22	_____	30.98	31.41	31.78	32.16	32.55	32.94	33.55	32.89
19	31.96	31.66	31.41	_____	30.93	31.38	31.73	32.22	32.59	33.07	33.55	32.96
20	31.88	31.38	31.43	30.93	30.83	31.36	31.79	32.15	32.58	32.74	33.50	32.32
21	31.60	31.70	31.36	30.75	30.86	31.41	31.80	32.17	32.60	32.73	33.27	32.69
22	_____	31.89	31.22	30.90	30.81	31.35	31.81	32.32	32.50	32.83	33.21	32.95
23	_____	31.92	30.80	31.23	30.99	31.46	31.88	32.41	32.79	32.81	33.14	32.89
24	_____	31.78	31.32	30.96	31.00	31.60	31.84	32.34	32.63	33.16	33.19	33.16
25	_____	31.46	31.18	30.74	30.94	31.65	31.87	32.28	32.63	33.25	33.15	_____
26	32.10	31.24	31.42	30.93	30.76	31.39	31.88	32.09	32.60	33.08	33.39	_____
27	32.82	31.51	31.10	31.01	30.86	31.41	31.86	32.10	32.72	32.90	33.43	_____
28	33.02	31.32	30.78	30.86	31.00	31.46	31.81	32.23	33.02	32.87	33.31	_____
29	33.41		30.68	30.69	31.15	31.49	31.84	32.29	32.91	32.96	33.40	_____
30	33.47		30.73	30.76	31.26	31.38	31.91	32.21	32.66	32.75	33.36	_____
31	32.98		30.84		31.30		31.85	32.19		33.20		[c]33.31

Noon daily water level from recorder graph, 1952

1	32.69	32.12	31.43	30.98	30.92	31.44	31.73	32.23	32.43	_____	33.32	33.65
2	_____	31.95	31.40	31.14	30.89	31.42	31.83	32.09	32.60	[c]33.09	33.35	33.65
3	_____	31.44	[c]31.23	31.14	31.12	_____	31.82	32.09	32.85	33.23	33.69	33.80
4	_____	_____	_____	30.60	31.10	_____	31.88	32.13	32.88	32.96	33.40	33.55
5	_____	_____	_____	31.11	30.94	_____	31.90	32.29	32.81	33.10	33.12	33.72
6	_____	_____	_____	31.32	31.02	_____	31.87	32.34	32.76	33.21	33.43	33.72
7	32.68	_____	[c]31.43	31.35	31.09	_____	31.80	32.26	32.78	33.22	33.70	33.75
8	32.04	_____	_____	31.22	30.91	_____	31.70	32.20	32.81	32.97	33.45	33.64
9	32.26	_____	_____	31.15	30.70	31.39	31.85	32.14	32.82	32.95	33.39	33.65
10	32.77	_____	_____	31.34	30.89	31.39	31.85	32.26	32.78	33.12	33.51	33.78
11	32.77	31.86	_____	31.34	31.02	31.48	31.95	32.26	32.76	33.20	33.54	33.89
12	32.53	31.76	_____	30.96	31.18	31.32	32.09	32.36	32.73	33.04	33.57	33.96
13	32.30	31.58	_____	30.96	31.33	31.45	31.99	32.47	32.79	33.05	33.51	33.88
14	32.07	31.51	_____	30.89	31.22	31.49	31.90	32.39	32.79	33.08	33.39	33.94
15	32.29	31.71	_____	31.16	31.01	31.46	31.92	32.25	32.83	33.29	33.50	33.93
16	32.35	31.56	_____	31.38	31.10	31.40	32.01	32.24	32.75	33.29	33.63	33.94
17	31.92	31.76	31.39	31.36	31.21	31.42	32.06	32.48	32.57	33.27	33.59	33.82
18	32.41	31.91	31.14	31.25	31.31	31.60	32.07	32.51	32.62	33.40	33.51	33.96
19	31.83	31.65	31.13	31.13	31.21	31.51	31.97	32.45	32.91	33.15	33.51	33.88
20	32.23	31.64	31.04	31.12	31.12	31.47	31.89	32.43	33.04	33.60	33.56	33.69
21	32.20	31.88	31.12	31.14	31.32	31.49	31.95	32.48	33.06	33.57	33.65	33.94
22	31.72	31.90	31.25	31.05	31.31	31.58	32.05	32.60	32.93	33.35	33.57	33.76
23	32.44	31.73	31.22	30.92	31.22	31.65	32.07	32.63	33.04	33.26	33.87	33.90
24	32.61	31.66	[c]31.19	30.93	31.17	31.55	32.22	32.61	33.08	33.24	33.79	34.13
25	32.10	31.84	31.03	30.98	31.19	31.53	32.16	32.62	32.96	33.26	33.37	34.07
26	31.85	31.63	31.30	30.93	31.38	31.61	32.16	32.63	32.86	33.28	33.74	34.04
27	32.07	31.49	31.30	30.92	31.40	31.66	32.12	32.55	32.91	33.10	34.02	34.05
28	32.08	31.02	31.28	30.89	31.43	31.72	32.00	32.47	32.96	33.43	34.06	34.04
29	32.32	31.04	31.24	30.93	31.42	31.67	32.08	32.55	33.03	33.62	33.79	33.84
30	32.44		31.22	31.01	31.27	31.61	32.15	32.46	_____	33.39	34.01	33.80
31	32.28		30.99		31.24		32.29	32.47		33.26		33.85

[c]Tape measurement.

Table 13.—*Water levels in observation wells in the Henderson area, Kentucky*—Con.

Well 8730-3745-222. Owner: R. R. Roberts

Date	Water level	Date	Water level	Date	Water level
Dec. 5, 1949	42.62	July 24, 1950	40.55	Feb. 8, 1951	38.78
Feb. 17, 1950	35.06	Aug. 3	40.64	Mar. 1	36.25
Mar. 6	36.90	Sept. 1	40.46	21	33.84
17	36.42	14	40.82	Apr. 5	35.73
31	36.75	Oct. 13	40.95	June 26	39.56
Apr. 14	36.85	27	40.86	Aug. 1	39.88
28	38.20	Nov. 13	41.29	30	40.07
May 15	37.70	Dec. 1	40.95	Oct. 8	40.78
29	39.11	15	40.85	31	40.31
June 9	39.87	Jan. 1, 1951	40.55	Feb. 14, 1952	36.08
23	40.17	17	37.77	28[b]	35.57
July 7	40.46				

[b]Measurement discontinued.

Well 8730-3750-14. Owner: J. C. Ellis

Sept. 12, 1949	[f]78.10	Nov. 13, 1950	[f]94.25	Mar. 14, 1952	75.58
Nov. 21	[f]92.35	Dec. 1	[f]91.17	Apr. 2	74.80
Dec. 22	[f]92.40	15	[f]90.59	16	74.43
Jan. 5, 1950	[f]88.85	Jan. 1, 1951	[f]90.24	30	74.30
18	[f]85.37	17	[f]89.70	May 14	74.80
Feb. 3	[f]87.50	Feb. 8	[f]89.94	June 25	74.35
17	[f]91.53	Mar. 1	[f]89.51	July 29	74.09
Mar. 6	[f]92.10	21	[f]88.47	Sept. 3	73.83
17	[f]92.40	Apr. 5	[f]89.16	Oct. 8	73.54
31	[f]92.85	20	[f]89.23	Nov. 12	73.24
Apr. 14	[f]93.10	May 10	[f]88.74	Dec. 9	72.75
28	[f]93.11	June 26	[f]88.59	29	72.74
May 11	[f]93.25	Aug. 1	[f]88.55	Jan. 15, 1953	72.54
29	[f]93.20	30	[f]88.47	28	71.82
June 9	[f]93.42	Oct. 8	[f]88.67	Feb. 11	71.70
23	[f]93.39	31	87.12	Mar. 5	70.97
July 7	[f]93.63	Nov. 30	82.57	18	70.39
24	[f]93.70	Dec. 20	80.30	Apr. 10	70.14
Aug. 8	[f]93.73	Jan. 8, 1952	79.03	28	69.88
Sept. 1	[f]93.47	25	78.45	May 20	69.65
29	[f]94.00	Feb. 14	77.23	June 23	70.67
Oct. 13	[f]94.04	28	76.44	July 20	70.81
27	[f]93.84				

[f]Nearby well being pumped.

Well 8730-3750-21. Owner: Henderson Creamery

Oct. 7, 1949	14.40	Feb. 17, 1950	5.12	Apr. 28, 1950	8.88
Nov. 21	14.07	Mar. 6	7.42	May 11	9.55
Dec. 22	13.05	31	7.81	26	9.83
Jan. 5, 1950	7.73	Apr. 14	7.78	July 11[b]	11.98
Feb. 3	5.07				

[b]Measurement discontinued.

Table 13.—*Water levels in observation wells in the Henderson area, Kentucky*—Con.

Well 8730-3750-23. Owner: C. A. Dempewolf

Date	Water level	Date	Water level	Date	Water level
Oct. 7, 1949	5.30	Feb. 3, 1950	2.22	Apr. 14, 1950	3.30
Nov. 21	6.39	17	2.41	28	4.00
Dec. 22	4.40	Mar. 6	3.39	May 11	1.02
Jan. 5, 1950	1.61	17	3.12	26	4.03
18	2.48	31	3.13	July 11[b]	4.89

[b]Measurement discontinued.

Well 8730-3750-38. Owner: Mrs. Edith Collins

Date	Water level	Date	Water level	Date	Water level
Oct. 17, 1949	65.00	Mar. 31, 1950	59.20	Aug. 8, 1950	63.25
Nov. 21	65.01	Apr. 14	59.45	Sept. 1	63.34
Dec. 22	64.65	28	59.34	29	64.26
Jan. 5, 1950	64.47	May 11	59.60	Oct. 13	64.84
18	63.26	26	59.85	27	64.10
Feb. 3	61.99	June 9	60.64	Nov. 13	64.27
17	60.69	23	61.97	Dec. 1	63.68
Mar. 6	58.93	July 7	63.27	15	63.59
17	58.87				

Well 8730-3750-38—Continued

Noon daily water level from recorder graph, 1951

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	[c]62.59	------	[c]59.29	------	------	60.61	------	64.57	65.55	65.65	65.46	64.99
2	------	------	------	------	------	60.61	------	64.52	65.72	65.68	65.48	64.86
3	------	------	------	------	------	60.93	62.33	64.39	65.75	65.75	65.44	64.69
4	------	------	------	------	------	61.25	62.48	64.41	65.75	65.79	65.64	64.54
5	------	------	------	[c]57.65	------	61.32	62.75	64.26	65.74	65.80	65.86	64.45
6	------	------	------	------	------	61.22	62.82	64.16	66.04	65.81	65.55	64.57
7	------	------	------	------	------	61.07	62.77	64.03	66.21	65.79	65.57	64.74
8	------	[c]60.90	------	------	------	60.96	62.76	64.15	66.22	65.92	65.55	64.76
9	------	------	------	------	------	60.87	62.85	64.21	66.09	65.89	65.44	64.70
10	------	------	------	------	[c]59.00	60.87	62.90	64.28	66.04	65.84	65.33	64.60
11	------	------	------	------	------	60.78	62.80	64.26	66.03	65.72	65.29	64.37
12	------	------	------	------	------	60.75	62.83	64.32	65.89	65.68	65.09	64.34
13	------	------	------	------	------	60.78	62.75	64.39	65.77	65.61	64.88	64.44
14	------	------	------	------	------	60.79	62.73	64.42	65.70	65.68	64.96	64.01
15	------	------	------	------	------	60.79	62.78	64.43	65.56	65.83	65.02	64.29
16	------	------	------	------	------	60.77	62.88	64.53	65.57	66.10	64.99	64.21
17	[c]61.90	------	------	------	------	60.94	62.93	64.70	65.59	66.25	65.03	64.08
18	------	------	------	------	------	61.08	62.99	64.75	65.69	66.30	64.94	63.98
19	------	------	------	------	------	61.23	63.06	64.81	65.84	66.39	64.94	64.14
20	------	------	------	[c]58.38	------	61.35	63.20	64.83	65.80	66.16	64.98	63.78
21	------	------	[c]58.29	------	------	61.58	63.23	64.93	65.73	66.03	65.10	63.83
22	------	------	------	------	------	61.54	63.24	65.16	65.61	66.03	65.17	63.92
23	------	------	------	------	59.72	61.61	63.20	65.31	65.75	65.92	65.15	63.97
24	------	------	------	------	59.89	61.67	63.34	65.29	------	65.98	65.25	64.22
25	------	------	------	------	59.81	61.76	------	65.30	[c]65.83	65.91	65.13	64.01
26	------	------	------	------	59.66	61.78	------	65.25	65.82	65.78	65.21	64.20
27	------	------	------	------	59.67	62.03	------	65.28	65.80	65.59	65.27	64.23
28	------	------	------	------	59.90	62.16	------	65.39	65.94	65.45	65.26	63.82
29	------		------	------	60.19	62.12	------	65.42	65.76	65.47	65.31	63.57
30	------		------	------	60.42	61.95	------	65.39	65.60	65.43	65.19	63.50
31	------		------		60.58		64.17	65.40		65.53		63.54

[c]Tape measurement.

Table 13.— *Water levels in observation wells in the Henderson area, Kentucky*— Con.

Well 8730-3750-38—Continued

Noon daily water level from recorder graph, 1952

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	63.70	61.89	60.27	59.53	59.78	60.42	63.89	66.43	66.45	66.13	66.95	66.37
2	63.73	61.68	60.12	59.56	59.81	60.71	64.11	66.28	66.62	66.31	67.08	66.35
3	63.89	61.42	59.97	59.51	60.17	60.80	64.19	66.20	66.72	66.49	67.31	66.40
4	63.64	61.41	60.10	59.33	60.33	60.95	64.25	66.09	66.60	66.33	67.25	66.21
5	63.67	61.57	60.35	59.59	60.40	61.00	64.26	66.06	66.44	66.36	67.03	66.18
6	63.61	61.55	60.31	59.73	60.47	61.14	64.32	65.92	66.28	66.60	67.11	66.13
7	63.52	61.64	60.34	59.73	60.46	61.18	64.37	65.72	66.11	66.64	67.29	66.14
8	63.15	61.47	60.29	59.54	60.25	61.32	64.35	65.57	66.03	66.52	67.13	65.99
9	63.18	61.54	60.15	59.32	60.07	61.43	64.43	65.51	65.95	66.53	66.99	66.02
10	63.29	61.36	59.91	59.29	60.05	61.80	64.32	65.60	66.02	66.67	67.08	65.98
11	63.26	61.36	59.93	59.28	60.10	62.10	64.39	65.70	66.05	66.73	67.12	66.01
12	63.11	61.30	59.96	58.74	60.12	62.06	64.50	65.71	66.13	66.69	67.17	66.09
13	63.02	61.14	59.74	58.66	60.08	62.03	64.65	65.70	66.22	66.80	67.09	66.16
14	62.97	61.21	59.97	58.94	59.88	62.02	64.73	65.66	66.27	67.05	66.99	66.23
15	63.03	61.15	59.97	59.30	59.79	62.06	64.76	65.66	66.36	67.08	66.95	66.31
16	63.10	60.87	59.97	59.34	59.78	62.25	64.86	65.61	66.36	66.98	66.87	66.38
17	62.88	60.83	59.98	59.26	59.78	62.36	64.82	65.76	66.22	66.86	66.78	66.33
18	63.05	60.91	59.76	59.18	59.89	62.47	64.74	65.80	66.14	66.84	66.74	66.34
19	62.79	60.77	59.79	59.01	59.81	62.44	64.69	65.77	66.24	66.70	66.63	66.34
20	62.95	60.72	59.77	59.02	59.81	62.39	64.65	65.72	66.30	66.84	66.58	66.15
21	62.85	60.79	59.89	59.18	59.89	62.36	64.67	65.75	66.33	66.92	66.55	66.26
22	62.51	60.75	59.69	59.27	59.91	62.61	64.77	66.08	66.30	66.91	66.29	66.18
23	62.78	60.66	59.83	59.31	60.01	63.03	64.84	66.23	66.34	66.79	66.25	66.30
24	62.87	60.64	59.81	59.45	59.96	62.98	65.23	66.33	66.35	66.69	66.03	66.54
25	62.62	60.70	59.76	59.49	59.96	62.84	65.45	66.32	66.19	66.67	65.63	66.60
26	62.38	60.51	59.88	59.47	60.18	62.83	65.57	66.28	66.05	66.69	65.66	66.69
27	62.37	60.36	59.79	59.52	60.17	63.02	65.72	66.21	66.03	66.63	65.90	66.78
28	62.22	60.12	59.80	59.33	60.14	63.31	65.79	66.15	66.04	66.74	66.17	66.90
29	62.20	60.10	59.75	59.56	60.07	63.47	66.00	66.28	66.10	66.82	66.23	66.90
30	62.20		59.66	59.77	59.99	63.60	66.24	66.36	66.14	66.83	66.41	66.98
31	62.06		59.51		60.05		66.44	66.42		66.85		67.00

Well 8730-3750-38—Continued

Date	Water level	Date	Water level	Date	Water level
Jan. 1, 1953	e67.20	Jan. 9, 1953	e67.06	Mar. 18, 1953	65.64
2	e66.94	10	e67.05	Apr. 10	66.07
3	e67.01	11	e67.21	28	66.03
4	e67.03	12	e67.46	May 20	66.06
5	e67.01	13	e67.24	June 23	67.61
6	e67.03	14	67.19	July 20	67.30
7	e67.05	Feb. 12	66.20	Aug. 11	68.10
8	e66.96	Mar. 4	66.55	21	69.25

eNoon daily water level from recorder graph.

Well 8730-3750-40. Owner: State of Kentucky

Oct. 17, 1949	11.70	Apr. 28, 1950	8.50	Oct. 27, 1950	10.84
Nov. 21	11.56	May 11	8.24	Nov. 13	10.81
Dec. 22	10.98	26	8.70	Dec. 1	10.48
Jan. 5, 1950	10.18	June 9	8.87	15	10.19
18	8.98	23	9.20	Jan. 1, 1951	10.22
Feb. 3	8.65	July 7	9.70	17	9.30
17	8.12	24	10.06	Feb. 8	9.56
Mar. 6	8.50	Aug. 8	10.30	Mar. 1	8.97
17	8.28	Sept. 1	10.19	21	8.54
31	8.09	29	10.55	Apr. 5b	8.14
Apr. 14	8.06	Oct. 13	10.79		

bMeasurement discontinued.

Table 13.—*Water levels in observation wells in the Henderson area, Kentucky*—Con.

Well 8730-3750-54. Owner: Mrs. Charles Argue

Date	Water level	Date	Water level	Date	Water level
Nov. 2, 1949	16.20	Sept. 1, 1950	14.18	Oct. 31, 1951	18.73
21	17.88	29	14.82	Nov. 30	14.40
Dec. 22	15.80	Oct. 13	15.74	Dec. 20	13.42
Jan. 5, 1950	13.62	27	15.79	Jan. 8, 1952	10.76
18	11.83	Nov. 13	14.72	25	11.85
Feb. 3	11.00	Dec. 1	13.71	Feb. 14	11.30
17	10.48	15	12.72	28	11.02
Mar. 6	11.16	Jan. 1, 1951	13.72	Mar. 14	10.98
17	10.68	17	10.95	Apr. 2	11.25
31	10.49	Feb. 8	11.36	16	10.67
Apr. 14	10.53	Mar. 1	9.49	30	11.84
28	11.46	21	8.84	May 14	12.76
May 11	10.66	Apr. 5	9.76	June 25	14.79
26	11.77	20	10.22	July 29	17.22
June 9	11.93	May 10	11.15	Sept. 3	19.00
23	12.53	June 26	11.87	Oct. 8	20.37
July 7	13.75	Aug. 1	15.29	Nov. 12	21.44
24	14.83	30	17.12	Dec. 9	21.00
Aug. 8	14.47	Oct. 8	18.10	29[b]	20.82

[b]Measurement discontinued.

Well 8730-3750-142. Owner: C. Overfield. Water level, 1949: Dec. 6, 44.95; Dec. 22, 45.40

Noon daily water level from recorder graph, 1950

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	----	----	----	----	----	----	----	38.22	39.52	40.54	41.24	41.74
2	----	----	----	----	----	----	----	38.23	39.58	40.60	41.31	41.78
3	----	[c]41.68	----	----	----	----	----	38.29	39.60	40.61	41.32	41.80
4	----	----	----	----	----	----	----	38.30	39.69	40.61	41.36	41.76
5	[c]45.05	----	----	----	----	----	----	38.37	39.78	----	41.38	41.74
6	----	----	[c]35.50	----	----	----	----	38.43	39.73	40.59	41.48	41.68
7	----	----	----	----	----	----	[c]37.25	38.48	39.74	40.57	41.44	41.70
8	----	----	----	----	----	----	----	38.51	39.80	40.60	41.45	41.71
9	----	----	----	----	----	[c]36.50	----	38.59	39.84	40.66	41.54	41.61
10	----	----	----	----	----	----	----	38.63	39.86	40.72	41.56	41.74
11	----	----	----	----	[c]35.40	----	----	38.68	39.90	40.71	41.59	41.61
12	----	----	----	----	----	----	----	38.79	39.99	40.81	41.58	41.59
13	----	----	----	----	----	----	----	38.77	40.07	40.80	41.61	41.54
14	----	----	----	[c]35.23	----	----	----	38.79	40.08	40.85	41.61	41.52
15	----	----	----	----	----	----	----	38.86	40.14	40.86	41.62	41.51
16	----	----	----	----	----	----	----	38.88	40.15	40.86	41.68	41.40
17	----	[c]38.64	[c]35.18	----	----	----	----	38.90	40.21	40.88	41.73	41.33
18	[c]44.38	----	----	----	----	----	----	38.96	40.24	40.96	41.65	41.27
19	----	----	----	----	----	----	37.64	39.00	40.23	----	41.69	41.15
20	----	----	----	----	----	----	37.73	39.03	40.25	40.89	41.90	41.13
21	----	----	----	----	----	----	37.75	39.01	40.26	40.97	41.67	41.00
22	----	----	----	----	----	----	37.81	39.07	40.32	41.02	41.72	40.95
23	----	----	----	----	----	[c]37.00	37.80	39.13	40.35	41.07	41.78	40.88
24	----	----	----	----	----	----	37.93	39.14	40.41	----	41.79	40.84
25	----	----	----	----	----	----	37.94	39.19	40.44	----	41.73	40.68
26	----	----	----	----	----	----	37.98	39.26	40.45	----	41.80	40.73
27	----	----	----	----	----	----	38.08	39.30	40.46	41.09	41.84	40.56
28	----	----	----	[c]34.98	----	----	38.09	39.36	40.49	----	41.82	40.44
29	----		----	----	[c]36.05	----	38.15	39.37	40.50	----	41.76	40.38
30	----		----	----	----	----	38.21	39.45	40.49	41.22	41.83	40.33
31	----		[c]35.37		----		38.20	39.43		41.26		40.26

[c]Tape measurement.

Table 13.—*Water levels in observation wells in the Henderson area, Kentucky*—Con.

Well 8730-3750-142—Continued

Noon daily water level from recorder graph, 1951

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	40.17	38.85	36.56	34.37	33.75	34.97	----	----	----	----	----	----
2	40.07	38.76	36.36	34.28	33.72	35.09	----	----	----	----	----	----
3	40.03	38.61	36.31	34.25	33.61	35.23	----	----	----	----	----	----
4	40.06	38.55	36.27	34.21	33.65	35.30	----	----	----	----	----	----
5	39.93	38.52	36.15	34.22	33.75	35.36	----	----	----	----	----	----
6	39.95	38.28	36.01	34.05	33.80	[c]35.39	----	----	----	----	----	----
7	39.99	38.38	35.94	34.09	33.85	----	----	----	----	----	----	----
8	39.93	38.25	35.97	34.07	33.87	----	----	----	----	[c]41.77	----	----
9	39.84	38.18	35.83	34.02	33.85	----	----	----	----	----	----	----
10	39.80	38.08	35.70	33.96	33.83	----	----	----	----	----	----	----
11	39.92	37.99	35.57	33.72	33.92	----	----	----	----	----	----	----
12	39.78	37.88	35.47	33.82	33.98	----	----	----	----	----	----	----
13	39.77	37.91	35.40	33.84	34.07	----	----	----	----	----	----	----
14	39.50	37.81	35.34	33.82	34.07	----	----	----	----	----	----	----
15	39.71	37.63	35.37	33.94	34.10	----	----	----	----	----	----	----
16	----	37.59	35.29	33.87	34.09	----	----	----	----	----	----	----
17	----	37.53	35.13	33.78	34.13	----	----	----	----	----	----	----
18	39.59	37.40	35.19	33.86	34.22	----	----	----	----	----	----	----
19	39.58	37.43	35.09	33.80	34.21	----	----	----	----	----	----	----
20	39.58	37.10	35.04	33.77	34.29	----	----	----	----	----	----	[c]42.83
21	39.65	37.40	35.02	33.67	34.37	----	----	----	----	----	----	----
22	39.45	37.18	34.88	33.94	34.36	----	----	----	----	----	----	----
23	39.43	37.10	34.80	33.79	34.46	----	----	----	----	----	----	----
24	39.36	36.96	34.85	33.64	34.45	----	----	----	----	----	----	----
25	39.39	36.81	34.65	33.65	34.47	----	----	----	----	----	----	----
26	39.24	36.78	34.69	33.71	34.57	----	----	----	----	----	----	----
27	39.24	36.71	34.62	33.62	34.63	[c]36.75	----	----	----	----	----	----
28	39.18	36.49	34.46	33.61	34.77	----	----	----	----	----	----	----
29	39.09		34.43	33.62	34.80	----	----	----	----	----	----	----
30	38.94		34.52	33.69	34.84	----	----	[c]40.28	----	----	[c]43.15	----
31	38.80		34.38		34.86		----	----		----		----

[c]Tape measurement.

Well 8730-3750-142—Continued

Date	Water level	Date	Water level	Date	Water level
Jan. 8, 1952	41.88	Apr. 3, 1952	37.11	Sept. 3, 1952	41.94
25	40.26	16	36.19	Oct. 16	43.38
Feb. 14	38.56	30	36.19	Nov. 12	44.02
28	37.10	May 14	36.35	Dec. 9	44.58
Mar. 14	37.28	June 25	38.28	29[b]	45.00

[b]Measurement discontinued.

Well 8730-3750-143. Owner: Audie Wilson

Dec. 6, 1949	39.56	Apr. 3, 1950	29.04	July 7, 1950	32.46
22	39.45	14	28.88	24	33.22
Jan. 5, 1950	39.00	21	28.72	Aug. 8	33.90
18	37.72	24	28.80	Sept. 1	34.89
Feb. 3	32.21	28	29.16	29	35.56
17	29.05	May 10	30.12	Oct. 13	35.84
Mar. 7	27.12	18	30.57	27	36.18
9	27.35	26	30.94	Nov. 13	36.59
14	27.65	June 2	31.26	Dec. 1	36.47
17	27.80	9	31.63	15	35.86
28	28.85	23	32.18		

Table 13.—*Water levels in observation wells in the Henderson area, Kentucky*—Con.

Well 8730-3750-143—Continued

Noon daily water level from recorder graph, 1951

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	c33.79	-----	c30.91	-----	-----	-----	32.88	34.46	35.82	36.69	37.51	37.88
2	-----	-----	-----	-----	-----	-----	32.90	34.52	35.83	36.70	37.52	37.88
3	-----	-----	-----	-----	-----	-----	32.97	34.59	35.86	36.74	37.51	37.83
4	-----	-----	-----	-----	-----	-----	33.02	34.67	35.89	36.77	37.57	37.84
5	-----	-----	-----	c28.29	-----	-----	33.09	34.68	35.92	36.84	37.60	37.77
6	-----	-----	-----	-----	-----	-----	33.14	34.72	35.92	36.87	37.54	37.77
7	-----	-----	-----	-----	-----	-----	33.16	34.76	36.01	36.89	37.62	37.77
8	-----	c31.56	-----	-----	-----	31.30	33.21	34.80	35.99	36.90	37.65	37.72
9	-----	-----	c29.23	-----	c29.04	31.41	33.24	34.85	36.01	36.91	37.67	37.76
10	-----	-----	-----	-----	-----	31.51	33.31	34.92	36.04	36.94	37.68	37.70
11	-----	-----	-----	-----	-----	32.56	33.36	34.94	36.09	36.98	37.71	37.61
12	-----	-----	-----	-----	-----	31.64	33.42	35.02	36.10	37.00	37.71	37.59
13	-----	-----	-----	-----	-----	31.74	33.47	35.03	36.17	37.03	37.72	37.59
14	-----	-----	-----	-----	-----	31.84	33.54	35.06	36.17	37.05	37.77	37.46
15	-----	-----	-----	-----	-----	31.88	33.59	35.09	36.20	37.07	37.79	37.56
16	-----	-----	c28.87	-----	-----	31.98	-----	35.15	36.25	37.09	37.83	37.50
17	c33.52	-----	-----	-----	-----	32.04	33.69	35.20	36.27	37.13	37.84	37.42
18	-----	-----	-----	-----	-----	32.08	33.71	35.26	36.30	37.16	37.84	37.42
19	-----	-----	-----	-----	-----	32.15	33.78	35.27	36.39	37.19	37.86	37.34
20	-----	-----	-----	c28.44	-----	32.24	33.85	35.33	36.41	37.20	37.86	37.28
21	-----	-----	c28.72	-----	-----	32.28	33.89	35.36	36.41	37.23	37.85	37.29
22	-----	-----	-----	-----	c29.98	32.35	33.94	35.45	36.46	37.26	37.86	37.23
23	-----	-----	c28.61	-----	-----	32.41	33.99	35.48	36.47	c37.27	37.88	37.19
24	-----	-----	-----	-----	-----	32.48	34.06	35.51	36.44	-----	37.92	37.08
25	-----	-----	-----	-----	-----	32.52	34.10	35.56	36.50	-----	37.89	37.01
26	-----	-----	-----	-----	-----	32.57	34.16	35.60	36.51	37.35	37.94	37.02
27	-----	-----	-----	-----	-----	32.63	34.21	35.62	36.60	37.36	37.92	36.97
28	-----	-----	-----	-----	-----	32.73	34.24	35.64	36.62	37.39	37.91	36.80
29	-----		-----	-----	-----	32.77	34.33	35.68	36.62	37.42	37.92	36.71
30	-----		c28.38	-----	-----	32.74	34.31	35.72	36.65	37.46	37.89	36.63
31	-----		-----		-----		34.37	35.78		37.50		c36.58

cTape measurement.

Noon daily water level from recorder graph, 1952

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	36.50	33.42	30.71	30.90	30.68	32.41	34.00	35.74	36.92	37.73	38.49	39.05
2	36.39	33.33	30.67	30.84	30.72	32.40	34.07	35.77	36.94	37.76	38.49	39.08
3	36.31	33.21	30.70	30.71	30.79	32.41	34.14	35.81	36.97	37.78	38.53	39.10
4	36.16	33.19	30.86	30.55	30.82	32.46	34.20	35.84	37.01	37.80	38.52	39.10
5	36.12	33.07	30.93	30.52	30.83	32.49	34.27	35.89	37.02	37.86	38.53	39.13
6	36.03	33.00	30.99	30.43	30.89	32.54	34.35	35.92	37.04	37.88	38.57	39.16
7	35.91	32.86	31.05	30.29	30.93	32.57	34.40	35.98	37.09	37.91	38.60	39.16
8	35.76	32.74	31.08	30.20	30.97	32.65	34.47	36.01	37.11	37.93	38.61	39.16
9	35.69	32.56	31.13	30.12	30.99	32.68	34.51	36.03	37.14	37.96	38.64	39.18
10	35.60	32.37	31.09	30.10	31.08	32.72	34.58	36.11	37.21	37.99	38.66	39.20
11	35.46	32.23	-----	30.03	31.15	32.80	34.63	36.15	37.23	38.00	38.67	39.21
12	35.35	32.02	-----	29.95	31.23	32.81	34.70	36.20	37.23	38.03	38.70	39.23
13	35.21	31.83	-----	29.92	31.28	32.87	34.73	36.23	37.26	38.05	38.71	39.25
14	35.07	31.68	-----	29.98	31.29	32.94	34.78	36.28	37.29	38.07	38.72	39.29
15	34.97	31.50	-----	30.02	31.37	32.99	34.82	36.28	37.31	38.12	38.77	39.28
16	34.85	31.29	-----	30.06	31.42	33.04	34.87	36.34	37.32	g38.14	38.79	39.28
17	34.71	31.17	31.52	30.07	31.48	33.11	34.91	36.38	37.35	g38.16	38.79	39.29
18	34.61	31.01	31.47	30.09	31.54	33.16	34.96	36.40	37.37	38.17	38.80	39.30
19	34.42	30.86	31.57	30.11	31.60	33.21	35.01	36.44	37.43	38.19	38.83	39.30
20	34.37	30.77	31.56	30.18	31.66	33.27	35.07	36.49	37.50	38.23	38.87	39.33
21	34.22	30.73	31.56	30.21	31.74	33.34	35.12	36.53	37.48	38.24	38.88	39.35
22	34.10	30.63	31.49	30.25	31.80	33.40	35.18	36.57	37.50	38.25	38.90	39.35
23	34.07	30.57	31.53	30.30	31.86	33.45	35.27	36.60	37.54	38.27	38.93	39.38
24	33.96	30.57	31.47	30.36	31.92	33.51	35.32	36.65	37.55	38.29	38.92	39.39
25	33.87	30.58	31.41	30.41	31.98	33.59	35.37	36.66	37.59	38.31	38.91	39.41
26	33.78	30.52	31.39	30.45	32.08	33.68	35.42	36.70	37.59	38.35	38.98	39.41
27	33.75	30.53	31.33	30.51	32.13	33.75	35.45	36.74	37.63	38.34	38.99	39.44
28	33.67	30.50	31.26	30.54	32.20	33.81	35.52	36.77	37.66	38.40	39.00	39.45
29	33.62	30.54	31.19	30.59	32.22	33.89	35.58	36.81	37.68	38.42	39.02	39.46
30	33.58		31.09	30.66	32.25	33.94	35.64	36.83	37.70	38.44	39.06	39.45
31	33.50		30.98		32.32		35.70	36.90		38.45		39.48

gEstimated.

Table 13.—*Water levels in observation wells in the Henderson area, Kentucky*—Con.

Well 8730-3750-158. Owner: Gene Warren

Date	Water level	Date	Water level	Date	Water level
Oct. 31, 1949	11.35	Feb. 3, 1950	2.99	Apr. 14, 1950	6.32
Nov. 21	11.52	17	3.55	May 11	8.74
Dec. 22	9.54	Mar. 6	6.37	26	9.24
Jan. 5, 1950	3.32	31	5.64	July 11[b]	12.15
18	3.11				

[b]Measurement discontinued.

Well 8730-3750-192. Owner: Ewing Galloway

Date	Water level	Date	Water level	Date	Water level
Nov. 3, 1949	7.40	Feb. 3, 1950	2.74	Apr. 14, 1950	5.43
21	7.71	17	3.30	28	6.35
Dec. 22	4.63	Mar. 6	5.33	May 15	4.69
Jan. 5, 1950	2.09	17	4.33	29	6.18
18	2.86	31	4.97	June 9[b]	6.27

[b]Measurement discontinued.

Well 8730-3750-201. Owner: Ben Rash

Date	Water level	Date	Water level	Date	Water level
Nov. 7, 1949	14.10	Apr. 28, 1950	11.21	Oct. 13, 1950	13.57
21	14.26	May 11	11.54	27	13.69
Dec. 22	12.93	29	11.39	Nov. 13	13.68
Jan. 5, 1950	10.87	June 9	11.73	Dec. 15	10.82
18	9.99	23	12.01	Jan. 1, 1951	10.84
Feb. 3	9.89	July 7	12.57	17	10.16
17	9.74	24	13.07	Feb. 8	10.49
Mar. 6	10.16	Aug. 8	13.39	Mar. 1	10.26
17	10.37	Sept. 1	13.60	21	10.08
31	10.50	29	13.56	Apr. 5[b]	10.18
Apr. 14	10.44				

[b]Measurement discontinued.

Well 8730-3750-207. Owner: W. G. Hodge

Date	Water level	Date	Water level	Date	Water level
Nov. 21, 1949	7.30	Apr. 28, 1950	5.56	Oct. 27, 1950	6.72
Dec. 22	5.96	May 11	5.28	Dec. 15	5.66
Jan. 5, 1950	2.02	29	5.78	Jan. 17, 1951	2.90
18	3.30	June 9	5.88	Feb. 8	5.22
Feb. 3	3.23	23	6.05	Mar. 1	4.66
17	3.57	July 7	6.62	21	4.59
Mar. 6	5.35	Aug. 8	6.79	Apr. 5	4.52
31	5.10	Sept. 29	6.49	Mar. 14, 1952[b]	4.46
Apr. 14	5.15				

[b]Measurement discontinued.

Well 8730-3750-209. Owner: James Barker

Date	Water level	Date	Water level	Date	Water level
Feb. 6, 1950	38.28	Mar. 6, 1950	33.78	May 10, 1950	35.06
7	38.60	8	33.25	18	35.77
9	38.10	10	33.25	26	36.14
10	37.83	14	33.40	June 2	36.48
13	36.92	17	33.70	9	36.94
15	36.56	28	34.30	23	37.38
17	36.14	Apr. 3	34.33	July 7	37.63
21	35.05	14	34.28	24	38.50
23	34.96	21	33.78	Aug. 8	38.51
27	34.16	24	33.70	Sept. 1	40.61
Mar. 1	33.87	28	34.09	29	42.04
2	33.78			Oct. 13	42.12

Table 13.—*Water levels in observation wells in the Henderson area, Kentucky*— Con.

Well 8730-3750-209—Continued

Date	Water level	Date	Water level	Date	Water level
Oct. 27, 1950	42.60	May 22, 1951	34.10	Mar. 26, 1952	36.34
Nov. 13	43.36	June 27	37.83	27	36.37
Dec. 1	43.25	Aug. 1	40.12	28	36.41
15	42.46	30	41.87	29	36.53
Jan. 1, 1951	39.70	Oct. 8	43.61	30	36.52
17	39.54	31	44.37	31	36.51
Mar. 1	35.08	Nov. 30	44.91	Apr. 1	36.43
9	34.27	Dec. 20	44.13	3	36.20
16	33.66	Jan. 8, 1952	41.97	9	35.45
21	33.39	25	39.76	16	34.96
23	33.25	Feb. 14	37.51	30	35.38
30	32.88	28	35.55	Nov. 17	46.21
Apr. 5	32.68	Mar. 14	35.87	Dec. 9	46.70
20	32.64	25	36.26	29	46.89
May 9	33.19				

Well 8730-3750-213. Owner: City of Henderson

Date	Water level	Date	Water level	Date	Water level
Jan. 25, 1950	27.66	Oct. 27, 1950	38.66	Feb. 14, 1952	24.58
Feb. 3	27.85	Nov. 13	36.69	28	29.92
17	25.30	Dec. 1	34.82	Mar. 14	29.35
Mar. 2	28.60	15	28.50	25	[h]26.88
6	28.94	Jan. 1, 1951	34.54	26	[h]26.55
9	30.79	17	28.57	27	[h]26.01
14	32.78	Feb. 2	27.59	28	[h]25.63
17	31.94	Mar. 1	24.57	29	[h]25.19
28	31.35	9	25.85	30	[h]24.90
Apr. 3	30.20	16	25.88	31	[h]24.49
14	28.92	21	25.57	Apr. 1	[h]24.41
21	32.55	23	25.04	2	[h]24.42
28	34.80	30	25.29	3	24.56
May 10	33.32	Apr. 5	26.87	9	27.76
18	34.29	May 9	29.63	16	29.25
26	35.65	22	32.37	30	30.18
June 2	35.86	June 27	35.43	May 14	32.37
9	35.09	Aug. 1	37.72	June 25	35.35
23	36.22	30	38.90	July 29	37.31
July 7	36.91	Oct. 8	37.99	Sept. 3	38.21
24	37.43	31	37.85	Oct. 8	38.46
Aug. 8	37.79	Nov. 30	35.83	Nov. 12	38.68
Sept. 1	38.79	Dec. 20	32.26	Dec. 9	38.54
29	35.20	Jan. 8, 1952	29.11	29[b]	38.79
Oct. 13	38.67	25	36.75		

[b]Measurement discontinued. [h]Affected by river rise.

Well 8730-3750-214. Owner: City of Henderson

Date	Water level	Date	Water level	Date	Water level
Jan. 25, 1950	[d]28.46	May 18, 1950	[d]34.99	Jan. 1, 1951	46.74
Feb. 3	[d]30.27	26	[d]34.99	17	[d]29.05
17	[d]27.98	June 2	[d]35.00	Feb. 8	[d]29.10
Mar. 2	34.07	9	43.45	Mar. 1	[d]26.55
6	35.05	23	43.98	9	[d]28.72
9	35.00	July 7	50.50	16	31.30
14	47.04	24	49.87	21	31.06
17	[d]44.52	Aug. 8	50.50	23	[d]29.08
28	[d]35.01	Sept. 1	50.95	30	30.63
Apr. 3	38.57	29	[d]42.00	Apr. 5	33.82
14	[d]35.03	Oct. 13	50.40	May 9	35.10
21	[d]35.04	27	50.30	22	44.39
24	[d]35.01	Nov. 13	[d]43.85	June 27	46.93
28	[d]35.00	Dec. 1	[d]35.00	Aug. 1	48.93
May 10	[d]34.98	15	[d]27.20	30	[d]35.00

[d]Surface seepage entering well.

Table 13.—*Water levels in observation wells in the Henderson area, Kentucky*—Con.

Well 8730-3750-214—Continued

Date	Water level	Date	Water level	Date	Water level
Oct. 8, 1951	40.72	Mar. 26, 1952	[h]28.46	Apr. 16, 1952	38.53
31	49.08	27	[h]27.14	30	39.68
Nov. 30	[d]42.22	28	[h]26.45	May 14	44.87
Dec. 20	[d]35.14	29	[h]25.64	June 25	47.68
Jan. 8, 1952	[d]29.40	30	[h]25.32	July 29	48.76
25	34.77	31	[h]25.06	Sept. 3	49.03
Feb. 14	[d]26.26	Apr. 1	[h]25.25	Oct. 8	49.39
28	40.41	2	[h]25.74	Nov. 12	49.14
Mar. 14	[d]34.59	3	[h]26.76	Dec. 9	48.69
25	[h]29.55	9	35.76	29[b]	48.91

[b]Measurement discontinued.
[d]Surface seepage entering well.
[h]Affected by river rise.

Well 8730-3755-5. Owner: J. C. Ellis

Date	Water level	Date	Water level	Date	Water level
Jan. 9, 1950	8.28	Feb. 3, 1950	2.43	Apr. 28, 1950	11.94
10	6.35	6	1.17	May 10	11.47
11	5.20	28	4.73	18	11.96
12	3.99	Mar. 2	5.86	26	13.72
13	3.15	6	7.71	June 2	14.72
15	2.26	8	8.28	9	14.74
16	1.93	10	8.83	23	15.82
17	1.62	13	9.15	July 7	16.35
18	1.46	17	9.98	Oct. 2, 1951	25.64
19	1.38	21	10.52	8	25.87
21	1.33	28	9.68	15	26.08
23	1.67	Apr. 3	9.10	17	26.15
25	2.33	14	8.12	18	26.15
28	3.23	21	10.33	19	26.21
31	3.34	24	10.98	20[b]	25.68

[b]Measurement discontinued.

Well 8735-3745-1. Owner: W. C. Caton

Date	Water level	Date	Water level	Date	Water level
Sept. 5, 1949	19.80	Apr. 14, 1950	11.75	Aug. 8, 1950	14.33
Feb. 17, 1950	11.35	21	12.22	Sept. 1	16.10
23	11.00	24	12.75	23	16.59
24	10.80	28	12.90	Oct. 13	15.50
27	12.27	May 10	12.22	27	15.92
28	12.40	15	11.85	Nov. 7	[e]15.70
Mar. 2	12.34	18	11.78	8	[e]15.90
6	12.46	29	11.92	9	[e]15.80
9	13.10	June 2	12.24	10	15.78
14	12.87	8	13.26	17	15.55
20	12.45	23	14.64	Dec. 1	14.56
28	12.79	July 7	14.99	15	14.63
Apr. 3	12.25	25	15.23	29	14.24

[e]Noon daily water level from recorder graph.

Table 13.—*Water levels in observation wells in the Henderson area, Kentucky*—Con.

Well 8735-3745-1—Continued

Noon daily water level from recorder graph, 1951

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	-----	-----	13.41	-----	13.60	15.89	17.75	16.16	17.78	-----	19.87	17.74
2	-----	c14.00	12.98	-----	13.47	15.77	16.81	16.25	17.77	-----	19.94	17.56
3	-----	-----	-----	-----	13.24	-----	16.31	16.27	17.47	-----	19.97	17.25
4	-----	-----	-----	-----	-----	-----	16.52	16.18	17.65	-----	19.99	17.25
5	-----	-----	12.33	-----	13.20	20.57	16.08	16.17	17.74	-----	19.77	17.29
6	-----	-----	-----	c13.54	13.35	18.89	16.80	16.15	17.76	-----	19.68	17.00
7	-----	-----	13.08	13.64	-----	17.92	16.83	16.28	17.82	-----	19.69	16.85
8	-----	-----	13.07	13.40	c13.21	18.12	16.62	16.23	17.88	-----	19.71	16.91
9	-----	c14.52	c13.02	13.40	13.59	17.37	16.06	16.20	17.83	-----	19.75	16.69
10	-----	-----	12.90	13.27	13.35	17.02	16.92	16.35	17.66	-----	19.79	16.20
11	-----	-----	12.73	13.06	13.33	16.55	17.99	16.42	17.82	-----	19.84	16.05
12	c14.59	-----	12.60	13.30	13.38	16.42	18.35	16.56	17.91	-----	19.73	16.00
13	14.42	-----	12.91	13.16	13.55	16.36	17.90	16.43	17.93	-----	19.77	15.76
14	14.13	-----	13.12	13.85	13.62	-----	18.07	16.92	17.93	-----	20.04	15.45
15	13.53	-----	13.15	13.44	16.65	16.80	18.37	16.91	18.18	-----	20.23	15.25
16	13.65	c18.72	13.98	13.45	15.14	16.63	17.97	16.85	18.34	19.91	20.29	15.15
17	13.61	16.95	14.21	13.24	16.51	16.25	18.32	-----	18.05	19.94	20.33	-----
18	13.60	16.02	13.65	13.33	15.90	15.88	17.69	-----	18.23	19.96	20.35	15.10
19	13.47	15.36	13.28	-----	15.51	15.71	17.24	-----	-----	20.04	19.90	15.10
20	14.07	14.72	13.08	c13.24	15.47	15.81	16.98	-----	-----	-----	19.79	14.95
21	13.73	14.22	12.92	13.41	15.12	15.52	16.94	c16.85	-----	-----	19.73	14.86
22	13.30	14.09	13.18	13.41	15.29	15.75	16.92	16.91	-----	-----	19.44	14.87
23	13.43	13.18	13.80	13.34	14.80	15.60	16.56	17.07	-----	20.47	19.02	14.54
24	-----	13.60	14.67	13.34	14.76	15.59	16.51	17.04	-----	20.39	19.00	14.29
25	12.98	13.39	15.78	13.22	14.75	15.95	16.50	17.24	-----	20.39	18.93	14.03
26	13.20	13.02	-----	13.15	14.85	15.97	16.30	17.15	-----	20.37	18.54	13.92
27	13.28	12.92	-----	12.90	16.52	15.66	16.15	17.01	-----	20.23	18.55	14.20
28	-----	12.83	-----	13.01	15.57	15.66	16.30	18.19	-----	20.13	18.29	14.54
29	-----		-----	13.41	15.34	15.54	16.21	18.45	-----	19.86	18.10	14.77
30	-----		c13.29	13.41	15.35	15.68	16.19	17.95	-----	19.81	18.01	-----
31	-----		13.16		15.37		16.05	17.81		19.80		c14.07

Noon daily water level from recorder graph, 1952

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	14.18	-----	-----	11.67	13.82	13.92	14.76	-----	-----	-----	-----	-----
2	13.97	-----	-----	11.91	13.88	13.94	14.79	-----	-----	-----	-----	-----
3	14.05	-----	-----	12.05	13.69	13.96	14.83	-----	-----	-----	-----	-----
4	14.26	-----	-----	12.05	13.76	13.97	14.92	-----	-----	-----	-----	-----
5	13.85	-----	-----	12.05	13.55	13.98	14.99	-----	-----	-----	-----	-----
6	14.07	-----	-----	12.05	13.52	13.96	15.04	-----	-----	-----	-----	-----
7	13.56	-----	-----	12.55	13.57	14.00	15.08	-----	-----	-----	-----	-----
8	14.20	-----	-----	13.14	13.51	14.03	15.23	-----	-----	-----	-----	c21.40
9	14.03	-----	-----	13.31	13.55	13.99	15.34	-----	-----	-----	-----	-----
10	13.74	-----	12.50	13.48	13.54	13.93	15.43	-----	-----	-----	-----	-----
11	13.86	11.39	12.42	13.34	13.55	13.87	15.53	-----	-----	-----	-----	-----
12	13.74	11.55	12.53	13.12	13.25	13.83	15.63	-----	-----	-----	c21.58	-----
13	13.44	11.60	12.59	12.84	12.35	13.88	15.76	-----	-----	-----	-----	-----
14	13.11	11.25	12.71	12.68	13.41	14.01	15.90	-----	-----	-----	-----	-----
15	13.12	11.25	12.48	12.78	13.45	14.08	15.97	-----	-----	-----	-----	-----
16	13.23	11.25	12.35	13.04	13.45	14.09	16.03	-----	-----	-----	-----	-----
17	13.05	11.25	12.04	12.80	13.47	14.01	16.08	-----	-----	-----	-----	-----
18	13.11	12.01	-----	12.83	13.48	14.07	16.15	-----	-----	-----	-----	-----
19	13.16	12.33	-----	13.43	13.23	14.16	16.24	-----	-----	-----	-----	-----
20	13.25	12.27	-----	13.62	13.25	14.21	16.35	-----	-----	-----	-----	-----
21	13.00	12.23	-----	12.92	13.29	14.23	16.46	-----	-----	-----	-----	-----
22	12.95	12.32	-----	13.17	13.33	14.27	16.56	-----	-----	-----	-----	-----
23	13.06	12.44	-----	13.35	13.35	14.37	16.69	-----	-----	-----	-----	-----
24	13.20	12.60	11.49	13.50	13.43	14.42	16.80	-----	-----	-----	-----	-----
25	13.35	c12.25	11.59	13.95	13.49	14.44	16.90	-----	-----	-----	-----	-----
26	13.39	-----	11.80	13.88	13.33	14.52	17.01	-----	-----	-----	-----	-----
27	13.22	-----	11.84	14.13	13.35	14.57	17.14	-----	-----	-----	-----	-----
28	c12.58	-----	11.71	c13.83	13.40	14.62	17.36	-----	-----	-----	-----	-----
29	-----	-----	11.50	13.98	13.54	14.71	17.53	-----	-----	-----	-----	c20.39
30	-----		11.63	13.93	13.63	14.73	17.66	-----	-----	-----	-----	-----
31	-----		11.70		13.80		17.75	-----		-----		-----

cTape measurement.

Table 13.—*Water levels in observation wells in the Henderson area, Kentucky*—Con.

Well 8735-3745-9. Owner: Spencer Chemical Co.

Date	Water level	Date	Water level	Date	Water level
Sept. 15, 1950	23.97	Feb. 23, 1951	[i]38.70	Mar. 16, 1951	50.47
18	25.80	Mar. 2	[i]47.10	17	e [i]51.60
19	26.11	3	e [i]47.91	18	e [i]51.45
20	26.11	4	e [i]48.40	19	e [i]50.42
21	26.51	5	e [i]49.58	20	e [i]49.95
22	[i]37.30	6	e [i]49.70	23	[i]51.18
23	24.28	7	e [i]50.37	24	e [i]50.90
Nov. 1	26.32	8	e [i]50.37	25	e [i]51.57
2	26.02	9	[i]50.05	26	e [i]52.25
3	25.83	10	e [i]49.60	27	e [i]52.35
3	[i]51.10	11	e [i]49.70	28	e [i]52.25
Feb. 19, 1951	[i]39.65	12	e [i]49.57	29	e [i]51.95
20	e [i]39.32	13	e [i]49.51	30[b]	e [i]52.60
21	e [i]39.85	15	e [i]49.00		

[b]Measurement discontinued. [i]Pumping.
[e]Noon daily water level from recorder graph.

Well 8735-3745-34. Owner: A. H. Gropp

Date	Water level	Date	Water level	Date	Water level
Dec. 8, 1949	8.64	May 15, 1950	1.97	Oct. 27, 1950	6.95
Jan. 6, 1950	1.41	29	3.52	Nov. 13	6.60
18	1.75	June 9	3.76	Dec. 1	4.29
Feb. 3	1.68	23	3.08	15	2.60
17	1.75	July 7	5.26	Jan. 1, 1951	3.77
Mar. 6	2.11	25	6.97	17	1.66
17	1.70	Aug. 8	6.60	Feb. 8	1.72
31	1.91	Sept. 1	3.98	Mar. 1	1.65
Apr. 14	2.19	29	6.15	21	1.56
28	3.20	Oct. 13	6.85	Apr. 5[b]	2.04

[b]Measurement discontinued.

Well 8735-3745-84. Owner: B. G. Bartley

Date	Water level	Date	Water level	Date	Water level
Dec. 19, 1949	5.28	Nov. 13, 1950	5.22	Jan. 25, 1952	3.37
Jan. 6, 1950	3.71	Jan. 1, 1951	3.94	Feb. 14	2.76
18	3.19	17	2.59	28	2.44
Feb. 3	2.97	Mar. 1	2.40	Mar. 14	2.53
17	2.60	21	2.55	Apr. 2	2.75
Mar. 6	2.64	Apr. 5	3.07	16	2.79
17	2.29	23	2.59	May 1	3.00
31	2.75	June 26	4.47	14	3.60
Apr. 14	2.91	Aug. 1	5.45	June 25	5.10
28	3.24	30	6.63	July 29	6.95
May 29	3.53	Oct. 8	7.77	Sept. 3	8.15
June 23	3.79	31	7.89	Oct. 8	8.83
July 25	5.26	Nov. 30	6.40	Nov. 12	9.01
Sept. 1	5.29	Dec. 20	4.38	Dec. 8	8.44
29	5.14	Jan. 8, 1952	3.11	29[b]	8.34
Oct. 27	5.13				

[b]Measurement discontinued.

Well 8735-3745-91. Owner: Frank Street

Date	Water level	Date	Water level	Date	Water level
Dec. 20, 1949	15.09	Mar. 17, 1950	6.95	June 9, 1950	9.04
Jan. 6, 1950	13.58	31	6.13	23	9.88
18	12.12	Apr. 14	5.60	July 7	11.04
Feb. 3	11.30	28	6.95	25	12.49
17	8.64	May 15	7.37	Aug. 8	13.12
Mar. 6	7.52	29	8.44	Sept. 1	13.87

Table 13.—*Water levels in observation wells in the Henderson area, Kentucky*—Con.

Well 8735-3745-91—Continued

Date	Water level	Date	Water level	Date	Water level
Oct. 13, 1950	14.31	Dec. 9, 1950	[e]13.36	Dec. 21, 1950	[e]13.49
27	14.53	10	[e]13.32	22	[e]13.50
Nov. 13	14.56	11	[e]13.30	23	[e]13.50
30	13.91	12	[e]13.28	24	[e]13.49
Dec. 1	[e]13.91	13	[e]13.29	25	[e]13.51
2	[e]13.87	14	[e]13.30	26	[e]13.48
3	[e]13.76	15	13.28	27	[e]13.52
4	[e]13.70	16	[e]13.30	28	[e]13.54
5	[e]13.66	17	[e]13.33	29	[e]13.53
6	[e]13.59	18	[e]13.37	30	[e]13.53
7	[e]13.48	19	[e]13.40	31	[e]13.55
8	[e]13.39	20	[e]13.44		

[e]Noon daily water level from recorder graph.

Well 8735-3745-91—Continued

Noon daily water level from recorder graph, 1951

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	13.56	11.40	9.10	5.60	6.22	9.30	11.15	12.98	14.38	15.24	15.94	14.76
2	13.56	11.40	9.04	5.62	6.36	9.38	11.20	13.05	14.40	15.27	15.95	14.76
3	13.40	11.36	8.90	5.67	6.44	9.46	11.25	13.11	14.44	15.28	15.97	14.70
4	13.28	11.26	8.89	5.71	6.50	9.55	11.27	13.19	14.48	15.30	15.98	14.40
5	13.22	11.23	8.84	5.79	6.66	9.63	11.36	13.27	14.51	15.33	16.00	14.27
6	13.17	11.13	8.73	5.79	6.83	9.67	11.46	13.33	14.55	15.36	15.99	14.15
7	13.14	11.06	8.66	5.72	7.02	9.71	11.50	13.37	14.60	15.38	15.97	13.86
8	13.12	11.06	8.62	5.75	7.10	9.75	11.54	13.41	14.65	15.42	15.97	13.85
9	13.10	11.02	8.65	5.82	7.18	9.83	11.60	13.44	14.70	15.46	15.97	13.76
10	13.03	10.98	8.59	5.91	7.10	9.91	11.59	13.49	14.71	15.49	15.97	13.72
11	12.93	10.90	8.49	5.89	7.29	9.98	11.65	13.54	14.74	15.52	15.97	13.66
12	12.86	10.80	8.39	5.85	7.44	10.05	11.67	13.59	14.78	15.54	15.95	13.61
13	12.79	10.75	8.25	5.86	7.59	10.13	11.75	13.64	14.72	15.58	15.86	13.65
14	-----	10.76	8.14	5.89	7.71	10.23	11.81	13.68	14.73	15.60	15.67	13.66
15	-----	10.70	8.08	5.91	7.81	10.28	11.86	13.71	14.77	15.63	15.59	13.61
16	-----	10.55	7.99	6.00	7.86	10.33	11.91	13.75	14.81	15.67	15.53	13.67
17	-----	10.48	7.85	6.08	7.92	10.35	11.99	13.79	-----	15.70	15.55	13.70
18	-----	10.39	7.54	6.05	8.02	10.46	12.04	13.83	14.88	15.73	15.57	13.66
19	[c]12.95	10.30	7.32	6.09	8.13	10.51	12.10	13.87	14.89	15.76	15.59	13.70
20	-----	10.02	6.98	6.26	8.21	10.57	12.18	13.92	14.92	15.78	15.61	13.62
21	-----	9.87	6.60	6.27	8.31	10.65	12.27	13.96	14.95	15.80	15.61	13.47
22	-----	9.85	6.30	6.04	8.40	10.71	12.34	13.99	14.98	15.82	15.60	13.46
23	11.92	9.73	5.99	6.06	8.50	10.81	12.43	14.05	15.03	15.82	15.43	13.45
24	11.87	9.59	5.98	5.90	8.57	10.88	12.48	14.09	15.04	15.82	15.25	13.49
25	11.82	9.44	5.91	5.79	8.65	10.96	12.53	14.14	15.06	15.85	15.09	13.37
26	11.77	9.29	5.95	5.85	8.69	11.00	12.61	14.17	15.08	15.87	14.90	13.34
27	11.67	9.25	5.86	5.91	8.79	11.04	12.66	14.21	15.10	15.89	14.83	13.35
28	11.62	9.15	5.76	5.93	8.90	11.13	12.72	14.27	15.14	15.90	14.77	13.31
29	11.61		5.70	5.95	9.03	11.13	12.78	14.30	15.19	15.91	14.76	13.22
30	11.57		5.66	6.06	9.13	11.13	12.86	14.33	15.21	15.93	14.76	13.16
31	11.47		5.68		9.23		12.92	14.35		15.94		13.13

[c]Tape measurement.

Table 13.—*Water levels in observation wells in the Henderson area, Kentucky*—Con.

Well 8735-3745-91—Continued

Noon daily water level from recorder graph, 1952

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	13.15	11.44	9.28	6.32	7.55	9.86	12.49	14.46	----	----	----	----
2	13.17	11.32	9.23	6.48	7.62	9.95	12.60	14.51	----	----	----	----
3	13.02	11.20	9.14	6.57	7.76	10.01	12.68	14.56	[c]15.97	----	----	----
4	12.68	11.09	9.12	6.51	7.85	10.09	12.77	14.59	----	----	----	----
5	12.60	11.04	9.20	6.62	7.90	10.16	12.86	14.65	----	----	----	----
6	12.51	10.94	9.16	6.72	8.00	10.25	12.93	14.70	----	----	----	----
7	12.50	10.86	9.10	6.76	8.13	10.33	13.01	14.76	----	----	----	----
8	12.47	10.69	9.01	6.75	8.17	10.41	13.08	14.81	----	[c]16.89	----	[c]16.28
9	12.40	10.61	8.90	6.77	8.22	10.50	13.15	14.86	----	----	----	----
10	12.45	10.48	[c]8.75	6.84	8.31	10.56	13.22	14.91	----	----	----	----
11	12.49	10.38	----	6.94	8.42	10.64	13.29	14.97	----	----	----	----
12	12.47	10.30	----	6.84	8.49	10.70	13.36	14.93	----	----	[c]17.04	----
13	12.42	10.20	----	6.65	8.59	10.76	13.42	14.98	----	----	----	----
14	12.38	10.15	----	6.65	8.64	10.85	13.46	15.03	----	----	----	----
15	12.33	10.13	----	6.70	8.67	10.92	13.51	15.07	----	----	----	----
16	12.33	10.05	----	6.76	8.78	10.99	13.58	15.10	----	----	----	----
17	12.28	10.01	7.49	6.78	----	11.08	13.63	15.15	----	----	----	----
18	12.26	10.00	7.30	6.75	----	11.18	13.68	15.22	----	----	----	----
19	12.21	9.92	7.24	6.74	9.00	11.26	13.73	15.27	----	----	----	----
20	12.16	9.82	7.19	6.78	9.01	11.35	13.79	15.32	----	----	----	----
21	12.14	9.80	7.14	6.85	9.10	11.44	13.84	15.37	----	----	----	----
22	12.02	9.74	6.86	6.89	9.16	11.55	13.90	15.43	----	----	----	----
23	12.01	9.63	6.66	6.90	9.22	11.64	13.95	15.49	----	----	----	----
24	12.01	9.54	6.37	6.97	9.26	11.73	14.02	15.54	----	----	----	----
25	11.93	9.51	6.18	7.06	9.30	11.83	14.08	15.60	----	----	----	----
26	11.80	9.42	6.16	7.12	9.41	11.94	14.13	----	----	----	----	----
27	11.73	9.35	6.17	7.18	9.48	12.06	14.19	----	----	----	----	----
28	11.69	9.24	6.20	7.27	9.55	12.18	14.24	----	----	----	----	----
29	11.67	9.23	6.23	7.37	9.62	12.29	14.29	----	----	----	----	[c]16.15
30	11.64		6.31	7.48	9.68	12.38	14.34	----	----	----	----	----
31	11.59		6.28		9.75		14.40	----		----		----

[c]Tape measurement.

Water level, 1953: July 20, 15.21. Measurement discontinued July 20, 1953.

Well 8735-3745-103. Owner; Henderson Union Rural Electrification Administration

Date		Water level	Date		Water level	Date		Water level
Dec.	23, 1949	36.83	Apr.	21, 1950	29.16	July	25, 1950	31.99
Jan.	6, 1950	[d]29.52		24	29.21	Aug.	8	33.94
	18	31.47		28	29.99	Sept.	1	[d]25.70
Feb.	3	[d]26.30	May	10	21.37		29	34.02
	17	[d]25.39		15	28.49	Oct.	13	34.97
Mar.	6	[d]27.38		18	28.22		27	35.22
	9	[d]27.34		29	27.85	Nov.	13	35.14
	14	[d]25.24	June	2	30.04	Dec.	1	36.89
	20	[d]28.89		8	27.37		15	34.69
	28	[d]19.41		23	28.60	Jan.	17, 1951	[d]27.97
Apr.	3	[d]11.80	July	7	30.79	Mar.	2[b]	28.42
	14	29.16						

[b]Measurement discontinued. [d]Surface seepage into well.

Table 13.—*Water levels in observation wells in the Henderson area, Kentucky*—Con.

Well 8735-3745-119. Owner: Charles Whitledge

Date	Water level	Date	Water level	Date	Water level
Jan. 11, 1950	13.05	Feb. 8, 1951	11.64	Feb. 14, 1952	10.66
May 29	13.06	Mar. 1	10.50	28	10.78
June 9	13.00	21	10.64	Mar. 14	11.16
23	13.77	Apr. 5	10.19	Apr. 2	11.80
July 7	15.06	23	10.44	16	12.53
25	16.90	June 26	15.06	May 1	13.19
Nov. 13	17.53	Aug. 1	15.45	14	13.99
Dec. 1	15.06	30	(j)	June 25	15.92
15	13.23	Oct. 8	(j)	Sept. 3	22.33
Jan. 1, 1951	14.10	31	(j)	Dec. 9[b]	24.93
17	9.88	Nov. 30	(j)		

[b]Measurement discontinued. [j]Water level below 18.64 ft.

Well 8735-3745-133. Owner: Mrs. Sally Munster

Date	Water level	Date	Water level	Date	Water level
Jan. 17, 1950	6.75	July 7, 1950	4.25	Dec. 21, 1950	[e]6.22
Feb. 3	5.62	25	4.90	22	[e]6.21
17	4.91	Aug. 8	5.38	23	[e]6.19
Mar. 6	4.27	Sept. 1	6.14	24	[e]6.17
20	3.92	29	6.45	25	[e]6.15
31	3.73	Oct. 13	6.59	26	[e]6.13
Apr. 14	3.52	27	6.82	27	[e]6.12
28	3.48	Nov. 13	6.94	28	[e]6.10
May 15	3.51	Dec. 1	6.75	29	[e]6.09
29	3.60	15	6.40	30	[e]6.07
June 9	3.70	20	6.23	31	[e]6.05
23	3.90				

[e]Noon daily water level from recorder graph.

Well 8735-3745-133—Continued

Date	Water level	Date	Water level	Date	Water level
Jan. 1, 1951	[e]6.03	Jan. 30, 1951	[e]5.18	Feb. 28, 1951	[e]4.27
2	[e]6.02	31	[e]5.16	Mar. 1	[e]4.23
3	[e]5.99	Feb. 1	[e]5.13	2	[e]4.20
4	[e]5.96	2	[e]5.11	3	[e]4.20
5	[e]5.94	3	[e]5.09	4	[e]4.16
6	[e]5.91	4	[e]5.05	5	[e]4.13
7	[e]5.88	5	[e]5.02	6	[e]4.10
8	[e]5.86	6	[e]4.99	7	[e]4.06
9	[e]5.83	7	[e]4.96	8	[e]4.03
10	[e]5.80	8	[e]4.93	9	[e]4.01
11	[e]5.78	9	[e]4.90	10	[e]4.00
12	[e]5.75	10	[e]4.89	11	[e]3.97
13	[e]5.72	11	[e]4.86	12	[e]3.95
14	[e]5.68	12	[e]4.83	13	[e]3.92
15	[e]5.63	13	[e]4.79	14	[e]3.88
16	[e]5.59	14	[e]4.76	15	[e]3.85
17	[e]5.55	15	[e]4.73	16	[e]3.82
18	[e]5.53	16	[e]4.71	17	[e]3.80
19	[e]5.49	17	[e]4.66	18	[e]3.76
20	[e]5.45	18	[e]4.63	19	[e]3.74
21	[e]5.42	19	[e]4.59	20	[e]3.71
22	[e]5.38	20	[e]4.55	21	[e]3.68
23	[e]5.36	21	[e]4.50	22	[e]3.65
24	[e]5.33	22	[e]4.46	23	[e]3.62
25	[e]5.30	23	[e]4.43	24	[e]3.59
26	[e]5.28	24	[e]4.40	25	[e]3.57
27	[e]5.25	25	[e]4.37	26	[e]3.56
28	[e]5.23	26	[e]4.33	27	[e]3.54
29	[e]5.20	27	[e]4.30	28	[e]3.53

[e]Noon daily water level from recorder graph.

Table 13.—*Water levels in observation wells in the Henderson area, Kentucky*—Con.

Well 8735-3745-133—Continued

Date		Water level	Date		Water level	Date		Water level
Mar.	29, 1951	e3.50	Apr.	7, 1951	e3.32	Apr.	18, 1951	e3.17
	30	e3.48		8	e3.30		19	e3.16
	31	e3.46		9	e3.28		20	e3.16
Apr.	1	e3.44		10	e3.27		21	e3.15
	2	e3.42		11	e3.25		22	e3.14
	3	e3.39		12	e3.24		23	e3.14
	4	e3.37		13	e3.22		27	3.10
	5	e3.35		16	e3.18	May	1b	3.09
	6	e3.34		17	e3.18			

bMeasurement discontinued. eNoon daily water level from recorder graph.

Well 8735-3745-145. Owner: Jennings Tillotson

Mar.	6, 1950	3.55	June	23, 1950	3.57	Nov.	13, 1950	4.64
	20	3.48	July	7	3.90	Dec.	1	4.34
	31	3.44		25	4.22		15	4.09
Apr.	14	3.25	Aug.	8	4.37	Jan.	1, 1951	4.49
	28	3.55	Sept.	1	4.43		17	3.44
May	15	3.24		29	4.55	Feb.	8	3.99
	29	3.50	Oct.	13	4.77	Apr.	5	3.99
June	9	3.56		27	4.78	Mar.	20, 1952b	3.67

bMeasurement discontinued.

Well 8735-3745-172. Owner: Kasey Bros.

Mar.	7, 1950	19.67	June	9, 1950	19.49	Dec.	1, 1950	22.67
	9	19.62		23	19.70		15	22.13
	14	20.32	July	7	20.00	Jan.	1, 1951	21.89
Apr.	24	18.80		25	20.40		17	20.86
	28	18.82	Aug.	8	20.75	Feb.	8	20.24
May	15	18.98	Sept.	1	21.35	Mar.	2	18.94
	18	19.04		29	21.87		21	18.41
	29	19.26	Oct.	27	22.26	Apr.	5b	18.16
June	2	19.34	Nov.	13	22.52			

bMeasurement discontinued.

Well 8735-3750-4. Owner: City of Henderson

June	2, 1950	37.25	Mar.	30, 1951	19.99	Mar.	28, 1952	17.38
	9	34.44	Apr.	5	22.52		29	16.58
July	24	39.46		20	22.29		30	16.20
Aug.	8	41.31	May	10	27.61		31	15.80
Sept.	1	39.99		22	32.32	Apr.	1	15.87
	29	32.76	June	27	34.81		2	16.15
Oct.	13	39.24	Aug.	1	37.04		3	16.84
	27	39.50		30	37.30		9	23.82
Nov.	13	34.71	Oct.	8	37.54		16	26.75
Dec.	1	31.99		31	37.51		30	28.10
	6	28.83	Nov.	30	32.52	May	14	32.72
	15	18.80	Jan.	8, 1952	19.84	June	25	35.76
Jan.	1, 1951	34.80		25	24.05	July	29	36.73
	17	21.46	Feb.	14	15.87	Sept.	3	37.02
Mar.	1	17.17		28	28.03	Oct.	8	37.68
	9	20.16	Mar.	14	25.25	Nov.	12	37.60
	16	20.60		25	19.94	Dec.	9	37.32
	21	20.74		26	19.11		29b	37.09
	23	19.12		27	17.97			

bMeasurement discontinued.

Table 13.— *Water levels in observation wells in the Henderson area, Kentucky*— Con.

Well 8740-3745-143. Owner: W. W. Wilson

Date		Water level	Date		Water level	Date		Water level
Oct.	16, 1950	6.78	Dec.	15, 1950	3.90	Mar.	1, 1951	3.28
	27	6.50	Jan.	1, 1951	5.01		21	3.31
Nov.	13	5.46		17	2.63	Apr.	5[b]	3.49
Dec.	1	4.42	Feb.	8	3.98			

[b]Measurement discontinued.

Well 8740-3745-186. Owner: R. B. Alves

Date		Water level	Date		Water level	Date		Water level
Oct.	23, 1950	23.10	June	26, 1951	21.11	Apr.	2, 1952	20.17
	27	23.10	Aug.	1	22.56		16	18.65
Nov.	13	23.49		30	23.63	May	1	18.87
Dec.	1	22.64	Oct.	8	24.87		14	19.65
	15	22.04		30	25.47	June	25	21.69
Jan.	1, 1951	21.60	Nov.	30	24.93	July	29	23.37
	17	20.18	Dec.	20	22.68	Sept.	3	24.87
Mar.	1	17.67	Jan.	8, 1952	20.54	Oct.	8	27.01
	21	17.88		25	20.28	Nov.	12	26.73
Apr.	5	16.51	Feb.	14	19.23	Dec.	8	26.85
	23	17.02		28	18.75		29[b]	26.88
May	10	17.15	Mar.	14	18.60			

[b]Measurement discontinued.

Logs of wells and test borings in the Henderson area, Kentucky

In many drillers' logs, especially the older ones, various terms are used describing the strata encountered. In this report the terminology has been changed in many of the logs so that the terms are somewhat standardized. Thus, shale has been substituted for soapstone in all the logs. Limestone replaces lime; sandstone replaces sand to distinguish it from alluvial sand. The term "lime shells and shale" means shale with thin beds of limestone; "sand shells and shale" means shale with thin sandstones. These quoted terms have been left unchanged in the logs. Correlations by author.

Formation	Thickness (feet)	Depth (feet)	Remarks

Well 8730-3745-1

Altitude of land surface: 415 ft (aneroid) above mean sea level.
Type of record: Driller's log.
Static water level: 84.5 ft below land surface, Sept. 8, 1949

Formation	Thickness (feet)	Depth (feet)	Remarks
Soil and shale	75	75	
Lisman formation: Shale, sandy, and limestone.	50	125	
Carbondale formation:			
Shale, light-gray	11	136	
Sandstone, gray; water at 155 ft	36	172	
Shale, dark, sandy; water at 172 ft	4	176	

Well 8730-3745-80

Altitude of land surface: 425 ft (approx.) above mean sea level.
Type of record: Driller's log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent: Surface (surficial material).	25	25	
Lisman formation:			
Sandstone, red	50	75	Anvil Rock sandstone member.
Sandstone, white	6	81	Do.
Top of Providence limestone member; well stops above. No. 11 coal.	-------	81	

Well 8730-3745-234

Altitude of land surface: 400 ft (approx.) above mean sea level.
Type of record: Driller's log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent: Soil	12	12	
Lisman formation:			
Mud, gray	28	40	
Coal and mud	8	48	No. 12 coal.
Limestone	4	52	Providence limestone member.
Carbondale formation:			
Lime and coal	15	67	No. 11 coal.
Sandstone	10	77	
Shale	10	87	
Limestone, sandy	20	107	
Slate	4	111	
Slate, dark	11	122	
Sandstone, shaly	39	161	
Coal	4	165	No. 9 coal.
Shale, sandy	5	170	
Limestone	5	175	
Slate, white	15	190	
Limestone, black	15	205	
Shale	50	255	
Coal	2	257	No. 8B coal.
Sandstone	19	276	
Shale, sandy	6	282	
Slate	30	312	
Shale	55	367	
Limestone	15	382	

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Logs of wells and test borings in the Henderson area, Kentucky—Continued

Well 8730-3745-234—Continued

Formation	Thickness (feet)	Depth (feet)	Remarks
Carbondale formation—Continued			
Shale, sandy	33	415	Sebree sandstone of Glenn, 1912b.
Tradewater formation:			
Slate	16	431	
Coal	1	432	No. 7 (DeKoven) coal?
Shale, sandy	55	487	
Sandstone	13	500	
Shale	5	505	
Shale, sandy	5	510	
Sandstone; hole full of water	100	610	Curlew sandstone of Owen, 1856.
Slate	5	615	
Limestone, sandy	10	625	
Slate	5	630	
Rock, red	9	639	
Limestone	2	641	Curlew limestone member?
Slate	10	651	
Shale, sandy	29	680	
Limestone	4	684	
Slate	45	729	
Sandstone	6	735	Aberdeen sandstone? of Crider, 1915.
Limestone, sandy	9	744	Do.

Well 8730-3745-252

Altitude of land surface: 394 ft above mean sea level.
Type of record: Sample log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Cased. No samples	-------	70	
Carbondale formation:			
Sandstone, white to gray micaceous, calcareous; pyritic in part.	25	95	
Shale, gray, sandy	5	100	
Shale, gray, fine sandy	8	108	
Coal, thin	1	109	No. 10 coal?
Shale, gray to dark-gray, fine sandy	26	135	
Limestone, fossiliferous, thin	1	136	
Shale, gray, fine sandy; plant markings	14	150	
Shale, light-gray	3	153	
Coal	1	154	No. 9 coal.
Limestone, white fossiliferous	1	155	
Sandstone, white, medium- to fine-grained, micaceous.	15	170	
Sandstone and shale, light-gray; darker and more shaly toward base.	50	220	
Shale, gray, becoming dark gray at base	20	240	
Limestone, white, sandy	3	243	
Shale, black	5	248	No.8B coal horizon.
Shale	2	250	
Sandstone, white to light-gray; shaly toward base.	40	290	
Shale, gray	10	300	
Coal, thin	1	301	
Sandstone, gray, fine grained; coaly markings.	6	307	
Shale and thin coal	8	315	
Sandstone, white, medium-grained, clean; little mica.	10	325	
Shale, gray, sandy, fine-grained	31	356	

Logs of wells and test borings in the Henderson area, Kentucky— Continued

Formation	Thickness (feet)	Depth (feet)	Remarks
Well 8730-3745-252—Continued			
Carbondale formation—Continued			
Shale, gray to black, and light-buff to gray fossiliferous limestone.	8	364	Horizon of Schultztown coal and Oak Grove member of Wanless, 1931.
Shale, gray, and white, clay; some calcareous shale.	6	370	
Sandstone, white, fine to medium; contains a thin coal near the base.	12	382	Sebree sandstone of Glenn, 1912b.
Shale and sandy shale, dark-gray to brown micaceous.	18	400	Do.
Sandstone, shaly, micaceous	10	410	Do.
Tradewater formation:			
Shale, gray, fine, sandy	8	418	
Limestone, thin, and coal with shale	6	424	No. 7 (DeKoven) coal.
Sandstone, white, and gray shale	21	445	
Shale and thin sandstone	10	455	
Limestone, thin	2	457	Horizon of No. 6 (Davis) coal?.
Shale and sandstone	13	470	
Limestone, white and black shale	5	475	
Sandstone and thin shales	27	502	
Shale, gray	8	510	
Shale, black; limestone and thin coal	8	518	
Shale	7	525	
Sandstone, gray, shaly, micaceous	23	548	
Sandstone, white, medium-grained, clean, friable.	12	560	Curlew sandstone of Owen, 1856.
Sandstone, shaly	5	565	
Limestone, white, sandy	5	570	
Sandstone and thin shales	30	600	
Shale, green, gray, and black; contains thin coal.	30	630	
Sandstone, gray, shaly, micaceous	25	655	
Shale, gray; contains thin sandstones, limestones, and some coal markings.	25	680	
Sandstone, silty, and thin shales	40	720	Aberdeen sandstone of Crider, 1915.
Shale, sandy; contains several limestones at about 800 ft.	100	820	
Sandstone, white, friable; includes a thin coal at about 835 ft.	25	845	
Shale and shaly sandstone	45	890	
Caseyville sandstone:			
Sandstone, white, friable, medium to coarse; contains a thin shale at about 930 ft.	80	970	
Shale and thin coal	30	1,000	
Sandstone, white, medium to coarse friable.	48	1,048	
Limestone, white, fossiliferous, black sandy shale and coal.	17	1,065	
Shale, gray, sandy, with granules of quartz.	30	1,095	
Shale and coal	5	1,100	
Sandstone interbedded with shale containing granules of chert and quartz. Limestone at 1,175 ft.	100	1,200	
Sandstone, coarse, friable, well-rounded grains and granules of quartz.	50	1,250	
Shale, gray; coal markings, and thin coal at 1,295 ft.	50	1,300	Complete record not given here. Total depth 2,479 ft.

Logs of wells and test borings in the Henderson area, Kentucky— Continued

Formation	Thickness (feet)	Depth (feet)	Remarks

Well 8730-3745-256

Altitude of land surface: 448 ft (aneroid) above mean sea level.
Type of record: Driller's log.
Static water level: 27.3 ft below land surface, Apr. 25, 1951.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent: Surface (surficial material).	20	20	
Lisman formation:			
Sandstone, red, water	37	57	Anvil Rock sandstone member.
Coal	1	58	No. 12 coal?
Sandstone	2	60	

Well 8730-3745-257

Altitude of land surface: 432 ft (aneroid) above mean sea level.
Type of record: Sample log.
Static water level: 12.1 ft below land surface, Apr. 24, 1951.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent: Surface (surficial material).	17	17	
Lisman formation:			
Sandstone, water at 28 ft	21	38	Anvil Rock sandstone member.
Shale	2	40	

Well 8730-3745-260

Altitude of land surface: 406 ft (aneroid) above mean sea level.
Type of record: Driller's log.
Static water level: 14.6 ft below land surface, Sept. 10, 1951.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent: Soil and loess	18	18	
Lisman formation:			
Sandstone, red, poorly cemented	13	31	
Sandstone, light; water at 31 to 32 ft	6	37	
Shale, gray	48	85	

Well 8730-3745-261

Altitude of land surface: 410 ft (approx.) above mean sea level.
Type of record: Driller's log 0-100 ft; sample log 100-211 ft.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent: Mud	20	20	
Lisman formation:			
Shale, gray	50	70	
Coal	4	74	
Limestone	26	100	Probably hard calcareous sandstone.
Limestone, light fossiliferous	5	105	
Carbondale formation:			
Sandstone, white, hard, micaceous	24	129	
Sandstone, white, hard, friable	6	135	
Sandstone, gray to dark-gray, shaly	12	147	
Shale, fine, sandy	4	151	
Shale, black, and thin coal	5	156	No. 10 coal?
Shale, gray	10	166	
Shale, dark-gray, calcareous; abundant crinoid stems.	5	171	
Shale, gray, fine, sandy	3	174	
Coal and gray clay shale	6	180	No. 9 coal.
Limestone, thin, and hard sandstone	5	185	
Sandstone, white, hard, calcareous	5	190	
Sandstone, white, hard	5	195	
Sandstone, white, shaly	5	200	
Sandstone, shaly, and light-tan limestone	11	211	

Logs of wells and test borings in the Henderson area, Kentucky—Continued

Formation	Thickness (feet)	Depth (feet)	Remarks

Well 8730-3745-267

Altitude of land surface: 470 ft (approx.) above mean sea level.
Type of record: Driller's log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent:			
Soil	3	3	
Clay, yellow	14	17	
Lisman formation:			
Sandstone, gray	1	18	
Shale	106	124	
Limestone	2	126	Providence limestone member.
Carbondale formation:			
Shale	15	141	
Limestone	6	147	
Shale, sandy	15	162	
Limestone, sandy	2	164	
Shale, sandy	63	227	
Shale, black, and coal	3	230	No. 9 coal.
Shale, sandy	11	241	
Limestone, sandy	4	245	
Shale	70	315	

Well 8730-3750-188

Altitude of land surface: 412 ft above mean sea level.
Type of record: Driller's log.
Static water level: 74.5 ft below land surface, Mar. 27, 1952.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent: Top soil	40	40	
Lisman formation:			
Shale, blue	20	60	
Limestone, brown	13	73	Providence limestone member.
Carbondale formation:			
Shale, blue	3	76	
Limestone, gray	24	100	Probably much of the limestone is hard calcareous sandstone.
Limestone, sandy; water	15	115	Do.
Shale, blue	25	140	
Shale, red	25	165	
Limestone, sandy	20	185	Do.
Shale, blue	25	210	

Well 8730-3750-223

Altitude of land surface: 441 ft (aneroid) above mean sea level.
Type of record: Driller's log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent: Clay	20	20	
Lisman formation:			
Shale	40	60	
Coal	3.5	63.5	No. 12 coal.
Shale	3	66.5	
Rock, hard, gray	4.5	71	Some limestone. Providence limestone member?
Carbondale formation:			
Coal	4	75	No. 11 coal?
Shale and fire clay	3	78	
Limestone	3.5	81.5	
Shale and 10 in. of coal	4	85.5	
Shale	4.5	90	
Sandstone, soft	46	136	
Shale and coal	3.5	139.5	No. 10 coal.
Shale, dark	21	160.5	
Coal	4.5	165	No. 9 coal.

Logs of wells and test borings in the Henderson area, Kentucky—Continued

Formation	Thickness (feet)	Depth (feet)	Remarks
Well 8730-3750-223—Continued			
Carbondale formation—Continued			
Shale	93	258	
Shale, black	3.5	261.5	
Sandstone	1	262.5	
Coal	2.5	265	No. 8B coal.
Sandstone	182	447	Sebree sandstone? of Glenn, 1912b.
Tradewater formation:			
Coal	1.5	448.5	
Shale	13	461.5	
Coal	5.5	467	
Shale	46	513	
Sandstone	26	539	Curlew sandstone of Owen, 1856.
Shale	11	550	
Limestone	23	573	
Coal	20	593	Probably carbonaceous shale in part.
Limestone	20	613	
Shale	10	623	
Limestone	8	631	
Shale	5	636	
Limestone	36	672	
Shale	5	677	
Rock, black, hard	7	684	
Shale, indurated	178	862	
Coal	6	868	
Sandstone	156	1,024	

Well 8730-3750-226

Altitude of land surface: 425 ft above mean sea level.
Type of record: Driller's log.

Pleistocene and Recent: Clay, yellow	20	20	
Lisman formation:			
Shale, sandy	25	45	Anvil Rock sandstone member.
Shale	40	85	
Coal	2	87	No. 12 coal.
Flint rock	2	89	Providence limestone member.
Slate, soft	1	90	
Carbondale formation:			
Coal	2.6	92.6	No. 11 coal.
Fire clay	.4	93	
Shale, concretions	17.2	110.2	
Sandstone	65	175.2	
Slate	12	187.2	
Coal	.6	187.8	No. 10 coal.
Fire clay	.2	188	
Slate	15	203	
Coal	4.3	207.3	No. 9 coal.

Well 8730-3750-227

Altitude of land surface: 382 ft above mean sea level.
Type of record: Driller's log.

No record	36.5	36.5	Cased off.
Carbondale formation:			
Shale, blue	18.5	55	
Sandstone, blue	100	155	
Slate, gray	24	179	
Coal	4	183	No. 9 coal.
Fire clay	8	191	

Logs of wells and test borings in the Henderson area, Kentucky— Continued

Formation	Thickness (feet)	Depth (feet)	Remarks
Well 8730-3750-227—Continued			
Carbondale formation—Continued			
Limestone, white	4	195	
Shale, white	12.5	207.5	

Well 8730-3750-232

Altitude of land surface: 391 ft (aneroid) above mean sea level.
Type of record: Sample log of coal shaft.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent: Surface (surficial material).	30	30	Not exposed.
Lisman formation:			
Shale, greenish-gray, silty	6	36	
Clay, gray, shaly, calcareous	16	52	
Shale	9	61	
Limestone, gray, shaly	2	63	
Coal	1	64	No. 12 coal.
Shale, dark-gray, soft	1	65	
Shale	11	76	
Limestone, 2-in. breccia layer	1	77	Providence limestone member.
Limestone, brown to gray, hard; contains abundant fossils.	4	81	Do.
Carbondale formation:			
Shale, gray, soft	3	84	
Shale, dark-gray; calcareous with thin coal streaks.	1	85	
Shale, light-gray, sandy, hard, thin-bedded, micaceous nodular.	11	96	
Sandstone, medium-gray, coarse; micaceous with pyrite and some calcareous cement.	2	98	
Sandstone, dark-gray, thin-bedded; micaceous with many coal markings.	29	127	
Sandstone, thin-bedded, fine-grained, micaceous.	6	133	
Sandstone, dark-gray, fine-grained	6	139	
Shale, gray, massive	16	155	
Shale, black	5	160	
Shale	10	170	
Shale and dark-gray slate	1	171	
Coal	4	175	No. 9 coal.

Well 8730-3750-239

Altitude of land surface: 405 ft (aneroid) above mean sea level.
Type of record: Log of shaft.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent:			
Clay and soil	15	15	
Mud and quicksand	15	30	
Lisman formation:			
Shale, soft	99	129	
Limestone	1	130	Providence limestone member.
Carbondale formation:			
Coal	2	132	No. 11 coal.
Limestone	2.5	134.5	
Sandstone, shaly	24.5	159	
Sandstone, white; water	37	196	
Shale	16	212	
Coal	4	216	No. 9 coal.

Logs of wells and test borings in the Henderson area, Kentucky—Continued

Well 8730-3750-240

Altitude of land surface: 444 ft above mean sea level.
Type of record: Sample log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent: Silt, tan, and a little sand.	40	40	Loess.
Lisman formation:			
Samples missing	15	55	
Limestone, fossiliferous	4	59	
Shale and sandy shale	48	107	
Coal	3	110	
Shale	10	120	
Shale, gray, sandy	26	146	
Limestone, thin	1	147	
Carbondale formation:			
Coal and shale	7	154	
Sandstone, white, fine, micaceous, with shale layers.	20	174	
Coal	1	175	
Sandstone, brown; medium-fine at top becoming white, clean, coarser and angular toward bottom.	65	240	
Coal and black shale	2	242	
Sandstone and shale	11	253	
Shale, black	1	254	Roof of No. 9 coal.
Coal	4	258	No. 9 coal.
Limestone, light-tan	2	260	
Shale, sandy	15	275	
Shale, light-gray, fine, sandy; calcareous at 295 ft.	35	310	
Coal, thin	1	311	
Shale and gray sandstone	19	330	
Shale, slightly calcareous with coal markings.	16	346	
Shale, black, sandy	4	350	No. 8B coal horizon?
Sandstone, white, fine	10	360	
Sandstone, shaly	10	370	
Shale	30	400	
Limestone, thin	1	401	
Shale, black, thin; abundant pyrite	1	402	
Sandstone, shaly, light-gray, fine-grained.	38	440	
Shale, gray, fossiliferous	8	448	
Limestone, white, thin	2	450	
Shale, black, with coal markings but no coal.	10	460	
Sandstone, gray to white, becoming darker with depth, fine- to medium-grained, micaceous.	20	480	Sebree sandstone of Glenn, 1912b.
Shale, sandy, brown, micaceous	40	520	
Tradewater formation:			
Shale, black, and little coal; abundant pyrite.	10	530	
Coal, thin; white argillaceous shale; calcareous sandstone; and thin limestone.	10	540	No. 7 coal at about 528 to 530 ft.
Shale, light-gray, with abundant soft ferruginous nodules.	10	550	
Shale and sandstone; thin coal at about 556 ft.	30	580	No. 6 coal.
Shale and sandstone; thin coal at about 580 ft.	15	595	
Shale, sandy, black; abundant pyrite	5	600	
Sandstone, shaly, gray, micaceous; shale layers.	40	640	Curlew sandstone of Owen, 1856.

Logs of wells and test borings in the Henderson area, Kentucky—Continued

Formation	Thickness (feet)	Depth (feet)	Remarks
Well 8730-3750-240—Continued			
Tradewater formation—Continued			
Sandstone, shaly, fossiliferous	5	645	Curlew sandstone of Owen, 1856.
Sandstone, white, medium-grained, clean	20	665	Do.
Shale, black, thin	5	670	Do.
Sandstone, white, clean, medium-grained	25	695	Do.
Shale, green to gray, contains thin limestones.	35	730	
Sandstone, shaly, brown to gray, fine- to medium-grained.	18	748	
Limestone, white to brown; somewhat fossiliferous in lower part.	7	755	Curlew limestone member.
Shale, sandy, gray; gray sandstone containing coal markings; and pyrite.	20	775	
Coal	2	777	
Sandstone, gray; fine to medium-grained becoming more shaly with depth.	28	805	
Shale, black, and thin coal	10	815	
Sandstone, white, and thin coal	15	830	
Shale, sandy, gray, fine	23	853	
Limestone, fossiliferous, thin	1	854	
Shale, sandy, fine	16	870	
Limestone, black shale, and coal; abundant pyrite.	5	875	
Shale, sandy	17	892	
Sandstone, shaly	8	900	
Limestone, white, dense; also thin coal	2	902	
Shale, sandy, gray, fine-grained; some black clay shale toward bottom; somewhat more calcareous toward lower part.	68	970	
Limestone, white, fossiliferous, and green shale and thin coal.	5	975	
Shale, gray	5	980	
Shale and sandstone	10	990	
Caseyville sandstone:			
Sandstone, white to brown, medium-grained, angular, clean.	30	1,020	
Shale, sandy, dark-gray to black	10	1,030	
Sandstone, calcareous, light, medium-grained, hard.	10	1,040	
Shale, gray, fine sandy	15	1,055	
Coal, thin, and green shale	2	1,057	
Sandstone, clean, medium-grained, calcareous.	13	1,070	
Shale, gray to black, sandy	15	1,085	
Sandstone, white, medium to coarse, clean.	60	1,145	
Sandstone and thin interbedded black shaly sandstone.	25	1,170	
Sandstone, white, medium- to coarse-grained, clean; well-rounded to angular grains.	80	1,250	
Sandstone and shale, gray, micaceous; some coaly fragments.	36	1,286	
Sandstone, white, medium- to coarse-grained.	34	1,320	
Shale and sandstone, light to dark-gray; several thin coals.	95	1,415	
Sandstone, white, medium to coarse; subangular to well-rounded grains; some green clay shale partings.	85	1,500	
Shale, black and green, with some pyrite	5	1,505	
Sandstone, mostly white, medium- to coarse-grained; clean in top part becoming more shaly at depth; thin limestone at 1,562 ft with an overlying thin coal.	90	1,595	

Logs of wells and test borings in the Henderson area, Kentucky—Continued

Well 8730-3750-240—Continued

Formation	Thickness (feet)	Depth (feet)	Remarks
Caseyville sandstone—Continued			
Sandstone, white, with very large amount of pyrite on the sand grains.	5	1,600	
Shale, gray, green, and black	4	1,604	Top of Mississippian system. Complete record not given here. Total depth 2,594 ft.

Well 8730-3750-293

Altitude of land surface: 390 ft above mean sea level.
Type of record: Sample log.
Static water level: 35.9 ft below land surface, Mar. 22, 1951.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent: Mud, brown, and granules.	5	50	
Carbondale formation?:			
Clay or shale gray	5	55	Casing at 50 ft.
Sandstone, yellow, silty, micaceous, fine to coarse-grained; some coal particles at 80 ft.	30	85	
Sandstone, white, fine to medium, coal particles.	5	90	
Sandstone, white, fine to medium	30	120	
Sandstone, calcareous, white	11	131	Hard drilling.
Sandstone, hard	9	140	
Shale, sandy	5	145	
Sandstone, white; calcareous at 150 ft	22	167	
Shale	3	170	

Well 8730-3750-316

Altitude of land surface: 363 ft above mean sea level.
Type of record: Sample log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent:			
Silt and fine sand	26	26	
Sand and little pea gravel	30	56	
Gravel, fine pea, and sand	10	66	
Gravel with coal pebbles	20	86	
Gravel, pea, becoming coarser with depth	29	115	
Limestone	2	117	Providence limestone member.
Carbondale formation:			
Shale, sandy, light-gray	13	130	
Sandstone, light-gray	14	144	Complete record not given here. Total depth 2,568 ft.

Well 8730-3755-9

Altitude of land surface: 361.4 ft above mean sea level.
Type of record: Driller's log.
Static water level: 28.0 ft below land surface, Sept. 15, 1950.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent:			
Mud and brown clay	34	34	
Sand, brown, very fine	8	42	
Sand, medium-fine, and some medium gravel.	11	53	
Sand, coarse, pea and large gravel	15	68	
Sand, medium, some fine gravel	3	71	
Sand, medium-fine, large gravel, clay balls.	3	74	
Sand, coarse, and fine gravel	5	79	

Logs of wells and test borings in the Henderson area, Kentucky—Continued

Formation	Thickness (feet)	Depth (feet)	Remarks
Well 8730-3755-9—Continued			
Pleistocene and Recent—Continued			
Sand, medium, fine gravel and clay balls	5	84	
Sand, coarse, small gravel, and clay balls	6	90	
Sand, coarse, and medium gravel	6	96	
Gravel, large, and coarse sand	5	101	
Gravel, large and medium sand	4	105	
Stone, blue	-------	105	Shale.

Well 8735-3745-175

Altitude of land surface: 410 ft above mean sea level.
Type of record: Driller's log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent:			
Soil	1	1	
Clay, sandy	11	12	
Sand	7	19	
Clay, sandy	9	28	
Lisman formation:			
Sandstone	1	29	Anvil Rock sandstone member?
Sandstone, red	9	38	Do.
Sandstone, gray; water	5	43	Do.
Shale, gray, soft	8	51	
Sandstone	2	53	
Shale, soft	1	54	
Coal	1	55	
Shale, gray	6	61	
Limestone	2	63	
Shale, gray, soft	9	72	
Shale, dark	16	88	
Sandstone, shaly	2	90	
Shale, sandy	10	100	
Shale, sandy	10	110	
Shale	5	115	
Sandstone, shaly	5	120	
Carbondale formation?:			
Shale, dark, sandy	59	179	
Shale, sandy	2	181	
Shale, dark	4	185	
Shale, sandy	1	186	
Sandstone	58	244	
Shale, blue	5	249	
Shale, dark, tough	1	250	
Shale, black	2	252	
Coal bony	1	253	
Coal	3.8	256.8	No. 9 coal.
Fire clay	2	258.8	

Well 8735-3745-177

Altitude of land surface: 395 ft above mean sea level.
Type of record: Driller's log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent:			
Surface (surficial material), sandy clay	19	19	
Sand, yellow	40	59	
Sand, fine, blue	30	89	
Gravel	2	91	
Clay, soft, blue	7	98	
Carbondale formation:			
Sandstone	33	131	
Sandstone, bastard	2	133	
Sandstone	12	145	

Logs of wells and test borings in the Henderson area, Kentucky—Continued

Well 8735-3745-177—Continued

Formation	Thickness (feet)	Depth (feet)	Remarks
Carbondale formation—Continued			
Limestone	5	150	
Slate, black	.5	150.5	
Shale, blue	.5	151	
Slate, black	2	153	
Sandstone	5	158	
Shale, soft, gray	2	160	
Shale, hard, gray, with light streaks	21	181	
Slate, black	1	182	
Coal	4.4	186.4	No. 9 coal.
Fire clay	3.5	189.9	
Shale, gray	2.5	192.4	

Well 8735-3745-185

Altitude of land surface: 373 ft above mean sea level.
Type of record: Driller's log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent:			
Clay, yellow	21	21	
Clay, blue	48	69	
Lisman formation:			
Coal, soft, dirty	2	71	No. 12 coal.
Fire clay	1	72	
Limestone, hard layers with soft partings	2	74	Providence limestone member.
Carbondale formation:			
Coal with blue band near bottom	7	81	No. 11 coal.
Fire clay	2	83	
Shale, soft, blue	23	106	
Shale, blue, with soft partings	21	127	
Coal	.5	127.5	No. 10 coal.
Shale, dark, hard limestone layers	4.5	132	
Sandstone	2	134	
Shale, lime	9	143	
Shale, dark, with hard and soft partings	39	182	
Shale, black	1	183	
Shale, dark, gray, sandy	1	184	
Coal	3	187	No. 9 coal.
Fire clay	5	192	
Shale, dark, gray, sandy	17	209	
Shale, dark	7	216	
Shale, light, soft	8	224	
Shale, dark	6	230	

Well 8735-3745-194

Altitude of land surface: 403 ft (aneroid) above mean sea level.
Type of record: Sample log.
Static water level: 73.5 ft below land surface, Mar. 21, 1950.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent:			
Surface (surficial material)	15	15	
Clay, blue	.5	15.5	
Lisman formation:			
Sandstone, yellow coarse; water at 37 ft cased off.	24.5	40	Anvil Rock sandstone member.
Shale, sandy	5	45	
Shale, gray to blue, argillaceous; lime shell at 56 ft.	13.5	58.5	
Shale, gray, thin coal	2.5	61	
Shale, gray	3	64	
Shale, gray, with streaks of coal; thin water sand at 66 ft.	4	68	

Logs of wells and test borings in the Henderson area, Kentucky— Continued

Formation	Thickness (feet)	Depth (feet)	Remarks
Well 8735-3745-194—Continued			
Lisman formation—Continued			
Shale, gray	2	70	
Shale, gray and black, with limestone	4.5	74.5	
Limestone	2.5	77	Providence limestone member.
Limestone and thin shale	4	81	
Carbondale formation: Sandstone, gray, fine-grained; water.	1	82	

Well 8735-3745-211

Altitude of land surface: 383 ft above mean sea level.
Type of record: Sample log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent:			
Soil	5	5	
Silt, brown	21	26	
Silt, grayish	10	36	
Silt and clay, gray to buff	10	46	
Granules, slate, and sandstone fragments; shell fragments.	20	66	
Sand, friable, clean, medium-grained	30	96	
Sample missing	5	101	
Carbondale formation:			
Sandstone, silty	5	106	
Shale, gray	10	116	
Sample missing	10	126	
Shale and shaly sandstone	25	151	
Coal	4	155	No. 9 coal.
Limestone, brown, hard, fossiliferous	2	157	
Shale	29	186	
Shale with thin limestone and sandstone	66	252	
Limestone and thin coal	3	255	
Sandstone, shaly to hard	21	276	
Shale, sandy	15	291	
Coal	4	295	
Sandstone, with coal markings	11	306	
Shale	18	324	
Coal	1	325	
Sandstone, fine-grained	9	334	
Shale, gray to brown, with thin sandstones.	127	461	
Tradewater formation:			
Coal	1	462	
Shale	30	492	
Coal	1	493	
Shale, dark	13	506	
Limestone, light-gray to white	5	511	
Sandstone, white, friable, large mica flakes.	145	656	Curlew sandstone of Owen, 1856.
Limestone, gray, fine, crystalline, fossiliferous.	15	671	Curlew limestone member.
Shale, gray, sandy	25	696	Complete record not given here. Total depth 2,610 ft.

Well 8735-3745-226

Altitude of land surface: 452 ft above mean sea level.
Type of record: Sample log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent: Surface (surficial material).	40	40	

Logs of wells and test borings in the Henderson area, Kentucky—Continued

Formation	Thickness (feet)	Depth (feet)	Remarks
Well 8735-3745-226—Continued			
Lisman formation:			
Sandstone, yellow coarse, silty	60	100	Anvil Rock sandstone member.
Shale, gray	65	165	
Shale with coal markings	2	167	
Limestone, buff, soft, impure	6	173	Providence limestone member.
Shale	7	180	
Limestone, light buff, fossiliferous	10	190	Providence limestone member.
Carbondale formation:			
Sandstone, thin coal, and fire clay	7	197	No. 11 coal.
Sandstone and shaly sandstone	32	229	
Shale, thin coal, and limestone	8	237	No. 10 coal.
Shale and sandy shale	33	270	
Sandstone, gray, hard, micaceous	5	275	
Shale, black, coal, and limestone	5	280	
Sandstone, brown, shaly, micaceous	12	292	
Shale, black, and coal	5	297	No. 9 coal.
Limestone, fossiliferous	3	300	
Shale and shaly sandstone	78	378	
Coal	1	379	No. 8B coal.
Shale, gray, silty	51	430	
Shale, gray, sandy	10	440	
Shale, gray	18	458	
Shale, black	1	459	
Limestone, brown, fossiliferous	3	462	Oak Grove member? of Wanless, 1931.
Shale	13	475	
Coal	3	478	Schultztown coal?
Shale	7	485	
Sandstone and shaly sandstone	65	550	Sebree sandstone of Glenn, 1912b.
Tradewater formation:			
Shale and shaly sandstone	37	587	No. 6 (Davis) coal?
Shale and thin coal	1	588	Do.
Shale, sandy	32	620	
Limestone, white, thin	1	621	
Sandstone and shaly sandstone	131	752	Curlew sandstone of Owen 1856, in part.
Limestone	8	760	Curlew limestone member.
Shale and sandy shale	52	812	
Sandstone	38	850	Aberdeen sandstone? of Crider, 1915.
Shale, gray to black	30	880	
Limestone	5	885	
Shale and sandstone	30	915	
Sandstone, dark	20	935	
Shale and black sandstone	5	940	
Sandstone, shaly	54	994	
Coal	1	995	
Caseyville sandstone: Sandstone	40	1,035	Complete record not given here. Total depth 2,766 ft.

Well 8735-3745-228

Altitude of land surface: 384 ft above mean sea level.
Type of record: Sample log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent: Surface (surficial material) silt and clay.	20	20	
Lisman formation:			
Sandstone, yellow, coarse	25	45	Anvil Rock sandstone member.
Shale with coal markings	4	49	Do.
Sandstone with calcareous cement	57	106	Do.
Limestone, gray to brown, fossiliferous	10	116	Providence limestone member.
Shale, sandy, micaceous	14	130	

Logs of wells and test borings in the Henderson area, Kentucky—Continued

Formation	Thickness (feet)	Depth (feet)	Remarks
Well 8735-3745-228—Continued			
Carbondale formation:			
Coal	2	132	No. 11 coal.
Sandstone, white micaceous	8	140	
Limestone, gray, fossiliferous	8	148	
Shale, gray; thin coal at about 170 ft	22	170	No. 10 coal.
Sandstone, gray, hard	10	180	
Shale and sandy shale	20	200	
Shale, gray, fossiliferous	10	210	
Limestone and thin coal	10	220	No. 9 coal.
Sandstone, gray, hard, fine-grained	20	240	
Shale, gray to light-gray	50	290	
Shale, gray, and coal	10	300	No. 8B coal.
Sandstone, white, hard fine	20	320	
Shale and thin sandstones	80	400	
Shale, dark-gray, hard, fossiliferous	10	410	
Limestone, buff, fossiliferous, and black shale.	10	420	Oak Grove member? of Wanless, 1931. Schultztown coal horizon.
Sandstone, shaly with ferruginous concretions.	52	472	Sebree sandstone of Glenn, 1912b.
Shale, gray and brown	12	484	
Tradewater formation:			
Shale, black, and brown limestone	6	490	No. 7 (DeKoven) coal?
Shale and thin sandstone	95	585	
Sandstone, hard, becoming more friable at depth.	80	665	Curlew sandstone of Owen, 1856.
Shale and sandstone	25	690	
Limestone, white to light-gray, fossiliferous.	20	710	Curlew limestone member?
Shale	10	720	
Shale, sandy, and thin coal	15	735	
Limestone, tan, fossiliferous	15	750	
Sandstone and shale	27	777	
Limestone, gray to brown	3	780	
Sandstone, white, hard	30	810	Aberdeen sandstone? of Crider, 1915.
Shale and thin sandstone, with thin coal and limestone.	40	850	
Sandstone, white, friable	30	880	
Shale, light to dark-gray	40	920	
Limestone, dark-brown, and black shale	10	930	
Shale, gray	10	940	
Sandstone, hard, shaly	15	955	
Limestone, brown, and thin coal	5	960	
Caseyville sandstone: Sandstone, white friable.	150	1,110	Complete record not given here. Total depth 2,654 ft.

Well 8735-3745-240

Altitude of land surface: 390 ft above mean sea level.
Type of record: Sample log.
Static water level: 11.6 ft below land surface, June 25, 1951.

Formation	Thickness (feet)	Depth (feet)	Remarks
No record	80	80	
Carbondale formation:			
Shale, black, and thin coal	5	85	
Shale	5	90	
Sandstone; water?	4	94	
Shale	18	112	

Logs of wells and test borings in the Henderson area, Kentucky— Continued

Formation	Thickness (feet)	Depth (feet)	Remarks

Well 8735-3745-241

Altitude of land surface: 385 ft (approx.) above mean sea level.
Type of record: Sample log.
Static water level: 7.8 ft below land surface, Sept. 27, 1951.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent: Sand, medium-grained, some mica, clean, white.	70	70	
Lisman formation:			
Coal	1	71	
Sandstone, poorly cemented	28	99	
Sandstone	3	102	
Limestone	.5	102.5	Providence limestone member?
Carbondale formation:			
Shale, gray	12.5	115	
Shale, dark-gray to black; some limestone fragments.	2	117	
Sandstone, coarse; well-rounded grains	3	120	
Sandstone, calcareous, and coal	6	126	

Well 8735-3745-268

Altitude of land surface: 365 ft above mean sea level.
Type of record: Driller's log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent:			
Top soil, sandy loam	2	2	
Clay, brown	32	34	
Sand and gravel	1	35	
Sand	4	39	
Sand, coarse, and pea gravel	3	42	
Sand, coarse	12	54	
Sand and gravel	3	57	
Gravel, medium and pea	6.4	63.4	
Clay, gray	8.3	71.7	

Well 8735-3750-3

Altitude of land surface: 390 ft above mean sea level.
Type of record: Driller's log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent:			
Soil and clay	30	30	
Sand	5	35	
Mud	33	68	
Lisman formation:			
Shale	15	83	
Coal	3	86	No. 12 coal.
Limestone	3	89	Providence limestone member.
Carbondale formation:			
Sandstone	24	113	
Shale	22	135	
Sandstone	20	155	
Shale	4	159	
Sandstone	27	186	
Shale	21	207	
Coal	5	212	No. 9 coal.
Fire clay	8	220	
Shale	93	313	

Logs of wells and test borings in the Henderson area, Kentucky—Continued

Formation	Thickness (feet)	Depth (feet)	Remarks

Well 8735-3750-5

Altitude of land surface: 403 ft (aneroid) above mean sea level.
Type of record: Driller's log.
Static water level: 48.5 ft below land surface, Mar. 27, 1952.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent:			
Clay, yellow	8	8	
Sand, red	40	48	
Clay, brown	42	90	
Quicksand	4	94	
Carbondale formation:			
Coal blossom	1	95	
Sandstone, dark	21	116	
Sandstone, light	20	136	
Sandstone, white	45	181	
Slate, black	1	182	

Well 8735-3750-14

Altitude of land surface: 361 ft above mean sea level.
Type of record: Sample log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent:			
Soil and brown silt	16	16	
Sand, brown, fine- to medium-grained	10	26	
Sand, light-brown, fine- to coarse-grained.	10	36	
Sand, coarse, and very fine gravel	30	66	
Sand, coarse, and fine gravel	25	91	
Sand and some fine gravel	5	96	
Sand and fine gravel	20	116	Complete record not given here. Total depth 2,630 ft.
Pennsylvanian bedrock below.			

Well 8735-3750-41

Altitude of land surface: 368 ft above mean sea level.
Type of record: Driller's log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent:			
Surface (surficial material)	30	30	
Sand	30	60	
Sand and gravel	61	121	
No record	10	131	
Carbondale formation:			
Sandstone	63	194	
Shale and sandy shale	13	207	
Coal at 207 ft			No. 9 coal. Complete record not given here. Total depth 2,571 ft.

Well 8740-3745-26

Altitude of land surface: 387 ft above mean sea level.
Type of record: Driller's log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent: Soil, quicksand, etc.	100	100	Cased.
Lisman formation?:			
Sandstone, white	15	115	Anvil Rock sandstone member?
Slate, gray	6	121	
Sandstone, white	30	151	

Logs of wells and test borings in the Henderson area, Kentucky—Continued

Formation	Thickness (feet)	Depth (feet)	Remarks
Well 8740-3745-26—Continued			
Carbondale formation—Continued			
Coal	4	155	No. 11 coal?
Fire clay	2	157	

Well 8740-3745-29

Altitude of land surface: 454 ft above mean sea level.
Type of record: Driller's log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent: Soil	20	20	
Lisman formation:			
Sandstone, soft, brown	15	35	
Slate, dark-gray	15	50	
Slate, dark-gray	25	75	
Coal	1	76	
Sandstone, broken	4	80	
Sandstone; water	20	100	Anvil Rock sandstone member?
Slate	30	130	
Slate, white	25	155	
Slate, gray	20	175	
Mud	10	185	
Slate	12	197	
Coal	3	200	No. 12 coal?
Slate, gray	10	210	
Limestone, white, hard	10	220	Providence limestone member?
Carbondale formation:			
Slate, gray	50	270	
Slate, black	20	290	
Slate, sandy, broken	20	310	
Slate, gray	16	326	
Coal	3	329	No. 9 coal?
Slate	4	333	
Limestone	6	339	
Slate, calcareous, broken	31	370	
Slate, black	13	383	
Slate, gray	24	407	
Limestone	4	411	
Slate, black	14	425	
Sandstone; salt water	27	452	
Sandstone; salt water	13	465	
Slate, sandy	15	480	
Slate, black	54	534	
Limestone	5	539	
Slate, white	16	555	
Slate, sandy	22	577	Sebree sandstone? of Glenn, 1912b.
Tradewater formation:			
Shale, brown	28	605	
Slate, gray	13	618	
Limestone	4	622	
Slate, black	28	650	
Sandstone, calcareous, broken	9	659	
Slate, dark-gray	6	665	
Limestone	3	668	
Slate, gray	33	701	
Sandstone	2	703	Oil show.
Sandstone, fire clay	16	719	
Slate	6	725	
Sandstone	12	737	Curlew sandstone of Owen, 1856.
Slate, dark-gray	18	755	
Sandstone; water	8	763	
Sandstone; hole full of salty water	5	768	
Sandstone, white, fine	13	781	

Logs of wells and test borings in the Henderson area, Kentucky—Continued

Formation	Thickness (feet)	Depth (feet)	Remarks
Well 8740-3745-59			
Altitude of land surface: 385 ft (approx.) above mean sea level. Type of record: Driller's log. Static water level: 63.2 ft below land surface, Mar. 27, 1952.			
Pleistocene and Recent: Soil and surface (surficial material).	90	90	
Lisman formation:			
Shale	42	132	
Coal	2	134	No. 13 coal?
Shale	6	140	
Shale, sandy; water	6	146	Anvil Rock sandstone member?
Shale	17	163	
Lime shells	7	170	Providence limestone member.
Shale	15	185	
Carbondale formation:			
Coal; water	4	189	No. 11 coal.
Shale	11	200	
Shale, sandy; water	10	210	
Shale	23	233	
Well 8740-3745-83			
Altitude of land surface: 448 ft (aneroid) above mean sea level. Type of record: Sample log. Static water level: 29.1 ft below land surface, Aug. 27, 1950.			
Pleistocene and Recent: Surface (surficial material).	25	25	
Lisman formation:			
Sandstone, shaly; water at 40 ft	20	45	
Shale, bluish-gray clay	25	70	
Shale, gray	22	92	
Siltstone, hard	6	98	
Sandstone, hard	7	105	
Shale and thin coal	7	112	
Sandstone	8	120	
Shale	4	124	
Sandstone	26	150	
Well 8740-3745-97			
Altitude of land surface: 471 ft above mean sea level. Type of record: Sample log.			
No samples	120	120	
Lisman formation:			
Sandstone, coarse, poorly cemented; water.	10	130	Anvil Rock sandstone member.
Shale, compact, brown	20	150	
Samples missing	10	160	
Shale, gray, brown, and red	60	220	
Shale and coal	5	225	No. 12 coal.
Shale	5	230	
Limestone, buff, fossiliferous	10	240	Upper part of Providence limestone member.
Shale, red	5	245	
Limestone, gray, fossiliferous	4	249	Lower part of Providence limestone member.
Carbondale formation:			
Coal	1	250	No. 11 coal.
Sandstone, shaly	41	291	
Shale and thin coal	9	300	No. 10 coal.

Logs of wells and test borings in the Henderson area, Kentucky—Continued

Formation	Thickness (feet)	Depth (feet)	Remarks
Well 8740-3745-97—Continued			
Carbondale formation—Continued			
Sandstone, shaly	28	328	
Shale	2	330	
Samples missing	18	348	
Slate, black	4	352	No. 9 coal horizon.
Shale, gray	65	417	Complete record not given here. Total depth 2,605 ft.

Well 8740-3745-110

Altitude of land surface: 390 ft (approx.) above mean sea level.
Type of record: Driller's log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent:			
Soil	5	5	
Quicksand	95	100	
Lisman formation:			
Slate	10	110	
Limestone and sandstone; some water	5	115	
Coal	4	119	No. 13 coal?
Shale, sandy, light	55	174	
Carbondale formation?:			
Coal	1	175	No. 11 coal?
Shale, sandy, brown	24	199	
Shale, sandy, light	10	209	

Well 8740-3745-111

Altitude of land surface: 420 ft (approx.) above mean sea level.
Type of record: Driller's log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent: Clay soil	18	18	
Lisman formation:			
Sandstone, soft, brown	70	88	Anvil Rock sandstone member.
Coal	.5	88.5	No. 13 coal?
Fire clay	15.5	104	
Mud, blue	16	120	
Slate, gray	15	135	
Slate and sandstone, broken	10	145	
Sandstone	41	186	
Carbondale formation:			
Mud, blue	16	202	
Slate, gray	10	212	
Sandstone	14	226	
Slate, gray	50	276	
Coal	5	281	No. 9 coal.
Slate	6	287	Complete record not given here. Total depth 805 ft.

Well 8740-3745-137

Altitude of land surface: 438 ft (aneroid) above mean sea level.
Type of record: Driller's log.
Static water level: 20.3 ft below land surface, July 23, 1951.

Formation	Thickness (feet)	Depth (feet)	Remarks
No record	70	70	
Lisman formation:			
Sandstone, white, with coarse red sandstone pebbles, one-eighth inch across.	10	80	Anvil Rock sandstone member.
Sandstone, fewer and smaller pebbles	10	90	Do.
Sandstone and shale	8	98	Do.

Logs of wells and test borings in the Henderson area, Kentucky—Continued

Well 8740-3745-195

Altitude of land surface: 439 ft (aneroid) above mean sea level.
Type of record: Driller's log.
Static water level: 30.6 ft below land surface, July 9, 1951.

Formation	Thickness (feet)	Depth (feet)	Remarks
No record	45	45	
Lisman formation:			
Sandstone, shaly, dark	5	50	Anvil Rock sandstone member?
Shale, black	5	55	
Sandstone, shaly, calcareous	5	60	
Sandstone, shaly	5	65	
Sandstone	4	69	
Coal	1	70	
Sandstone, water	20	90	

Well 8740-3745-232

Altitude of land surface: 420 ft (approx.) above mean sea level.
Type of record: Driller's log.
Static water level: 30.4 ft below land surface, Oct. 2, 1952.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent:			
Dirt	6	6	
Quicksand	7	13	
Clay, brown	17	30	
Lisman formation:			
Sandstone, brown; water to drill	47	77	Anvil Rock sandstone member.
Sandstone, white; water at 76 ft	13	90	
Shale, light-gray; thin coal	5	95	

Well 8740-3750-5

Altitude of land surface: 360 ft above mean sea level.
Type of record: Sample log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent:			
Silt, sand, and some pea gravel	26	26	
Gravel, pea to medium-coarse	20	46	
Sand and coarse gravel	70	116	
Lisman formation:			
No samples	30	146	
Shale, brown sandy	25	171	
Coal, thin, shaly	1	172	No. 12 coal?
Limestone, light-brown, fossiliferous	14	186	Providence limestone member.
Carbondale formation:			
Coal; abundant pyrite	2	188	No. 11 coal?
Limestone	13	201	
Sandstone, white to gray, medium-grained; abundant pyrite.	25	226	
Sandstone, medium- to dark-gray, micaceous; little pyrite.	35	261	
Shale, black	3	264	
Sandstone, shaly, gray, and gray to brown shale.	22	286	
Shale, black, and light-brown crinoidal limestone.	5	291	Horizon of No. 9 coal.
Shale	5	296	
Sandstone, white to gray, calcareous, micaceous.	30	326	
Shale, gray, sandy in part	70	396	
Shale, black, calcareous; abundant pyrite.	10	406	
Limestone, thin, brown	2	408	
Sandstone and black shale	3	411	

Logs of wells and test borings in the Henderson area, Kentucky—Continued

Formation	Thickness (feet)	Depth (feet)	Remarks
Well 8740-3750-5—Continued			
Carbondale formation—Continued			
Shale and shaly sandstone	90	501	
Limestone, thin, and dark-gray to black shale.	3	504	
Shale and thin limestone	22	526	
Sandstone, white, gray, brown, calcareous; much pyrite.	20	546	Sebree sandstone of Glenn, 1912b.
Shale, sandy; much pyrite	30	576	Do.
Tradewater formation:			
Shale, black, and thin limestone	5	581	
Shale	15	596	
Sandstone, white; iron stained in part; pyrite increasing with depth.	45	641	
Limestone	5	646	
Sandstone, buff to dark; contains shale, little pyrite.	15	661	
Limestone, white to gray	5	666	
Shale, sandy, and sandstone	10	676	
Shale, black, and thin coaly shale	1	677	
Shale and sandy shale	34	711	
Sandstone, clean, medium- to coarse-grained.	25	736	Curlew sandstone of Owen, 1856.
Shale, sandy	25	761	Do.
Limestone, buff	10	771	Curlew limestone member. Complete record not given here. Total depth 2,638 ft.

Well 8740-3750-68

Altitude of land surface: 365 ft above mean sea level.
Type of record: Sample log.

Formation	Thickness (feet)	Depth (feet)	Remarks
Pleistocene and Recent:			
Silt, brown; many angular fragments of limestone, shale and sandstone; no igneous or metamorphic rock grains; little coarse sand.	25	25	
Silt and little sand; change from brown to gray color occurred between 25 to 40 ft.	15	40	
Silt and gray sand	5	45	
Silt and coarse sand	15	60	
Gravel, sand, silt	20	80	
Mud, little gravel, gray	10	90	
Gravel, coarse pea size; angular fragments of coal and black shale.	10	100	
Gravel, pea, and sand	10	110	
Gravel, sand, clay	5	115	
Gravel, medium, and shale; bedrock at about 117 ft.	2	117	
Carbondale formation?: Shale, gray	15	132	Complete record not given here. Total depth 2,711 ft.

INDEX

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