STATE OF OHIO

DEPARTMENT OF NATURAL RESOURCES

# DIVISION OF WATER

# THE WATER RESOURCES OF GREENE COUNTY, OHIO

BULLETIN 19

STATE OF OHIO
FRANK J. LAUSCHE, *Governor*

DEPARTMENT OF NATURAL RESOURCES
A. W. MARION, *Director*

DIVISION OF WATER
C. V. YOUNGQUIST, *Chief*

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# THE WATER RESOURCES OF GREENE COUNTY, OHIO

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With sections on
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Prepared in cooperation with the Water Resources Division
U. S. Geological Survey

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DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER

COLUMBUS, OHIO

1950

LETTER OF TRANSMITTAL

August 15, 1950

Mr. A. W. Marion, Director
Department of Natural Resources
Columbus, Ohio

Dear Director Marion,

I am transmitting to you Bulletin 19, "The Water Resources of Greene County."

In June 1948, we completed our investigation of the water resources of Montgomery County. A similar survey of Greene County logically followed.

Greene County was found to have excellent opportunities for the development of large supplies of ground water. Large areas of the county have well-sustained stream flow.

I believe that industrial expansion from the Dayton area will be into Greene County because of its favorable water situation.

Very truly yours,

C. V. Youngquist, Chief
Division of Water

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# THE WATER RESOURCES OF GREENE COUNTY, OHIO

## INTRODUCTION

### PURPOSE AND SCOPE OF THE INVESTIGATION

Field investigations of the geology and the water resources of Greene County were made in 1947 and in the early part of 1948 to determine the availability and quality of the ground and surface water of the county. This report, which summarizes the results of the investigation, is intended as a guide for the development of farm, public, and industrial water supplies.

### DIVISION OF WORK AND ACKNOWLEDGMENTS

The collection and interpretation of most of the basic data of this report were by Stanley E. Norris, Geologist, Ground Water Branch, United States Geological Survey, who is the principal author. Field investigations of the surface glacial deposits were made by Richard P. Goldthwait, Professor of Geology, Ohio State University, Columbus, Ohio. Professor Goldthwait wrote the section of this report entitled "Wisconsin glacial deposits," and prepared the map of the glacial deposits, plate 2. The section of this report entitled "Surface-water resources" was prepared by William P. Cross, Hydraulic Engineer, Surface Water Branch, Geological Survey. William H. Nicholson, Jr., Engineering Aid, Ground Water Branch, Geological Survey, collected field data on approximately 1,200 wells in Greene County. Some of the wells were measured in the survey and, where possible, the well drillers were asked to verify or correct the information given by the well owners or tenants of the property on which the wells are located. Only well information derived from actual measurements or from the records of well drillers was used in making the maps in this report. Practically all the wells investigated in the survey are listed in table 8, which was compiled by Mr. Nicholson. Ten chemical analyses of ground water from wells in Greene County were made by the Quality of Water Branch of the Geological Survey. The Ohio Department of Health furnished analyses of water from the public supplies of the county, and a few analyses were obtained from other sources. Data on the Yellow Spring were furnished by Prof. A. C. Swinnerton of the Geology Department of Antioch College, from his own studies and from work done by students under his supervision.

This report was prepared as part of the cooperative investigation of the water resources of Ohio being conducted by the Ohio Water Resources Board and the United States Geological Survey. On August 11, 1949, the Ohio Water Resources Board became a part of the Division of Water, Ohio Department of Natural Resources. The Ohio Department of Natural Resources is represented in the investigation by A. W. Marion, Director, and by C. V. Youngquist, Chief, Division of Water. The Ground Water Branch, Geological Survey, is represented in the investigation by E. J. Schaefer, District Engineer, working under the general supervision of A. N. Sayre, Geologist in Charge, Washington, D. C. The Quality of Water Branch of the Geological Survey is represented in Ohio by W. L. Lamar, District Chemist, and M. E. Schroeder, Chemist, working under the direction of S. K. Love, Chief, Washington, D. C. The Surface Water Branch, Geological Survey, is represented by O. H. Jeffers, working under the direction of J.V.B. Wells, Chief, Washington, D. C.

Special thanks are extended to the well drillers of the Greene County area, especially to John A. Conner and Sons, who furnished several hundred records of wells drilled over a 30-year period, and M. C. Hughes and Son, who also furnished much valuable information. Among other well drillers who furnished information are Donald J. Roe, Earl Hollandsworth, Albert Boone, Ira Barnes and Sons, and the Layne-Ohio Company.

The authors also acknowledge the excellent service rendered by John C. Krolczyk, of the Ohio Water Resources Board, who prepared the maps and illustrations in this report.

## PREVIOUS WORK AND SOURCES OF INFORMATION

One of the earliest studies of the geology of Greene County was made by Edward Orton, former State Geologist, and was published in 1874 by the Ohio Geological Survey (1).* The earliest report to treat specifically the ground-water resources of the county was prepared by M. L. Fuller and F. G. Clapp of the United States Geological Survey, and was published in 1912 as part of a water-supply paper (2). The Ohio Geological Survey in 1944 published a bulletin entitled "Geology of Water in Ohio," by former State Geologist Wilber Stout and others (3). That publication, which contains a chapter on Greene County, is especially important for its explanation of the changes in drainage cycles caused by glaciation, and is the basis for most subsequent studies of the buried-valley systems in this State. The Ohio Water Resources Board in 1947 published a short reconnaissance report on ground water in the Little Miami Valley in the western part of Greene County (4).

Measurements of ground-water levels in Greene County were begun in August 1944, when a water-level-recording gage was installed on an unused well at the Xenia municipal well field at Oldtown. Another recording gage was installed in June 1948 on a test well drilled by the Ohio Water Resources Board on the H. K. Ankeney farm near Trebein, and in February 1949 an observation well was established at the Yellow Springs waterworks. Records of these wells are published annually by the United States Geological Survey in a series of water-supply papers entitled "Water levels and artesian pressures in observation wells in the United

*Numbers in parentheses refer to publications listed in the bibliography.

States," and they also appear in annual publications of the Ohio Water Resources Board.

Stream gaging was begun in Greene County at Spring Valley in 1925, and just outside the county near Huffman Dam in 1918. Stream-flow records also are published in annual water-supply papers of the United States Geological Survey, parts 3 and 4, Ohio River and St. Lawrence River Basins.

# GEOGRAPHY

## LOCATION AND SIZE OF AREA

Greene County is in southwestern Ohio. Xenia, the county seat, is about 55 miles southwest of Columbus and about the same distance northeast of Cincinnati. Of the 88 counties in the State, Greene County is 55th in size, having an area of 416 square miles and containing 12 townships. It extends about 18 miles north and south and 24 miles east and west. On the topographic maps of the U. S. Geological Survey it occupies parts of six quadrangles, namely, the Dayton, Octa, South Charleston, Springfield, Waynesville, and Xenia quadrangles. The location of Greene County with respect to adjoining counties is shown on plate 3.

## TOPOGRAPHY AND DRAINAGE

Greene County lies within the Till Plains section of the Central Lowland physiographic province. The northern and eastern parts of the county are comparatively high, with wide stretches of flat upland between the stream valleys. In the north, near the towns of Clifton and Yellow Springs, the valley of the Little Miami River and its tributary Yellow Springs Creek consist in part of narrow gorges bounded by precipitous limestone walls more than 100 feet high. These gorges terminate in picturesque waterfalls or cascades that provide some of the finest scenery to be found in the State. The western and southern parts of Greene County are characterized by broad valleys carved by ancient streams deep into the underlying bedrock formations and later partly filled with glacial drift. Elevations of the present valley floors range generally from about 800 to 850 feet above sea level, and elevations on the uplands range from 950 to 1,000 feet in the western part to more than 1,100 feet in the eastern part of the county.

Greene County is drained principally by the Little Miami River and its tributaries, which flow from the northeast to the southwest. Mad River flows across the northwestern corner of the county. In addition a tributary of Paint Creek drains a small area in the southeastern part. The drainage system is shown on plate 4.

## CLIMATE

The climate of Greene County is near the average for the State. The annual precipitation averages 37.17 inches at Xenia and is well distributed during the year. The average length of the growing season in Greene County is 171 days, the average first and last days being April 29 and October 17, respectively. The average annual temperature in the County is 53° F. January, with an average temperature of 30° F., is the coldest month. The average temperature during the hottest month, July, is 75° F., and extremes over an 18-year period have ranged from -23° F. to 108° F.


Plate 3. Map of Ohio, showing location of the area included in this report.

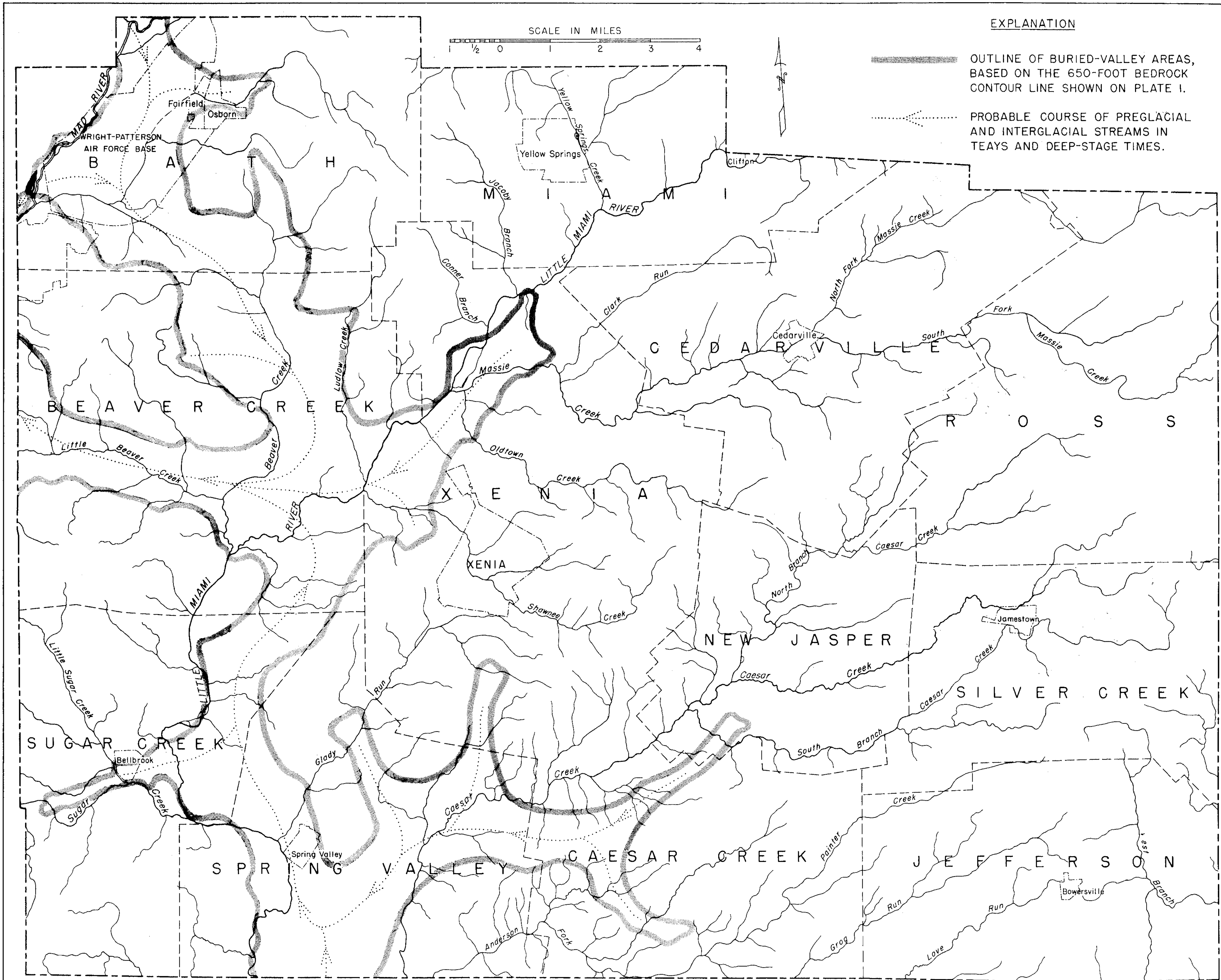



Plate 4. Map of Greene County, Ohio, showing the present drainage system and the principal buried valleys.

## ECONOMIC DEVELOPMENT

### Population

The population of Greene County, as determined by the 1940 census, was 35,863, an increase of 7.8 percent over the 1930 total. Of the 1940 total, 13,182 people were classed as urban and 22,681 as rural. The population of the principal towns in 1940 is given as follows: Xenia, 10,633; Osborn, 1,705; Yellow Springs, 1,640; Fairfield, 1,409; Jamestown, 1,079; Cedarville, 1,034; Spring Valley, 468; Bellbrook, 410; Bowersville, 316; and Clifton, 187.

During World War II the population of the county increased greatly; it was estimated by the United States Bureau of the Census to have reached 41,769 on March 1, 1943, an increase of 21.5 percent over the 1940 total. This increase resulted largely from the expansion of the industries of the city of Dayton, in adjacent Montgomery County, and from the expansion of the Wright-Patterson Air Force Base, the greater part of which is in Greene County. Wright and Patterson Fields employed about 2,000 people before the war and 41,500 in August 1943.

### Agriculture

In 1945, according to the census of agriculture, there were 2,289 farms in Greene County comprising 237,221 acres, or 88.4 percent of the total land area. Of this farm land 137,305 acres was used for crops, 79,398 acres was pastured, and 20,518 acres was in woodland. The total value in 1945 of all farms, including lands and buildings, was $26,648,007, an average of $112.33 per acre. Gross farm income in 1945 was $9,932,200, of which about one-third represented sales of livestock. The principal crops in Greene County are corn, wheat, and soybeans. In 1945 corn production amouted to 2,945,239 bushels and wheat production was 758,277 bushels. The corn crop increased to 3,117,000 bushels in 1947, while wheat production dropped slightly, to 711,000 bushels.

### Industrial Development

In 1947, according to the Ohio Department of Industrial Relations, there were 36 manufacturing establishments in Greene County, employing 1,646 persons. Cement making is the largest industry and is represented by two companies, the Southwestern Portland Cement Co. and the Universal Atlas Cement Co., both at Osborn. Together these firms employ more than 300 people. The manufacture of textile goods by the Hooven and Allison Co. at Xenia, which employs 278 people, ranks second in industrial importance within the county. Other important manufacturing concerns in Greene County include two large cordage works, a foundry, an ice factory, a broom factory, and a furniture factory. One of these establishments, the Brenner Furniture Corp. at Xenia, employs about 175 people, and the Morris Bean and Co. foundry at Yellow Springs employs about 150 people. It is estimated that the total annual value of all manufactured products in Greene County currently is slightly less than the gross farm income.

## Mineral Resources

The most important mineral resources of Greene County are sand, gravel, and limestone. The sand and gravel pits are located in valley-train, outwash-plain, or kame deposits, which are shown on plate 2. At least 10 commercial pits have been in operation at various times, and numerous small private pits have been opened. In 1947 the three principal producers marketed 665,621 tons of sand and gravel.

The areas of the county underlain by limestone, and the locations of most of the outcrops, are shown on plate 1. Quarries are operated at three places in Greene County, the two largest being near Osborn, where the Brassfield limestone of Silurian age is used in the manufacture of cement. In 1947, 642,611 tons of stone was quarried for this purpose. A smaller quarry is located near New Jasper, and is operated by the Greene County Highway Department. The stone, which is crushed for road material, is the Springfield limestone of Silurian age.

## Transportation and Public Utilities

Greene County is served by an excellent system of highways and railroads. U. S. Highways 35, 42, and 68 converge at Xenia, and these and several State highways form the principal lines of road transportation. Almost all the roads in the county are hard-surfaced, and the others are well-maintained gravel roads. All roads are passable for automobile traffic the year round. Four railroad systems cross Greene County; the Cincinnati and Cleveland Division of the New York Central R. R., the main branch of the Erie R. R., four branches of the Pennsylvania R. R., and the Toledo and Cincinnati R. R.

Electric power is furnished to practically all of Greene County by the Dayton Power and Light Co., and natural gas is brought by the Ohio Fuel Gas Co. Telephone service is provided Xenia and most of the rest of the county by the Ohio Bell Telephone Co. The Ohio Consolidated Telephone Co. and the New Burlington Telephone Co. serve some of the smaller communities.

# WATER RESOURCES

## SURFACE-WATER RESOURCES

By W. P. Cross

The drainage system of Greene County is described in the section on topography and drainage and is shown on plate 4. Except for the Mad River, which crosses the northwestern corner of the county, the streams entering the county are not large. However, the flow leaving the county, largely through the Little Miami River, is considerable. The analyses of stream-flow records, which follow, indicate possible sources of surface-water supplies, and are also of value to ground-water studies.

### Stream-Flow Records

The stream-gaging station near the southern boundary of Greene County, on the Little Miami River at Spring Valley, is well located to measure most of the stream flow leaving the county. The record, which covers a drainage area of 361 square miles, is only 17 years in length (as of Sept. 30, 1946) and has a 4-year break in it. Plate 5, A, shows a hydrograph of annual stream flow, in inches, at this gage. The mean flow for the period of record was 327 cubic feet per second. There were extremely low annual flows in 1931, 1934, and 1941.

#### Surface-Water Flow and its Relation to Ground-Water Conditions

Stream-flow characteristics are an indication of the natural storage properties of a drainage basin. A river flowing from a basin of barren, impermeable rock would experience a flood after every substantial rain, and would carry little or no flow a few hours or days later, depending on the size of the basin. A river with the same mean flow, but draining an area of thick permeable sands and gravels, might have but a slight increase in flow after a rain, and high sustained flows between rains. Natural lakes and artificial reservoirs would have the same effect, but in the Little Miami River basin these are unimportant; storage is largely in the glacial deposits and is therefore ground-water storage.

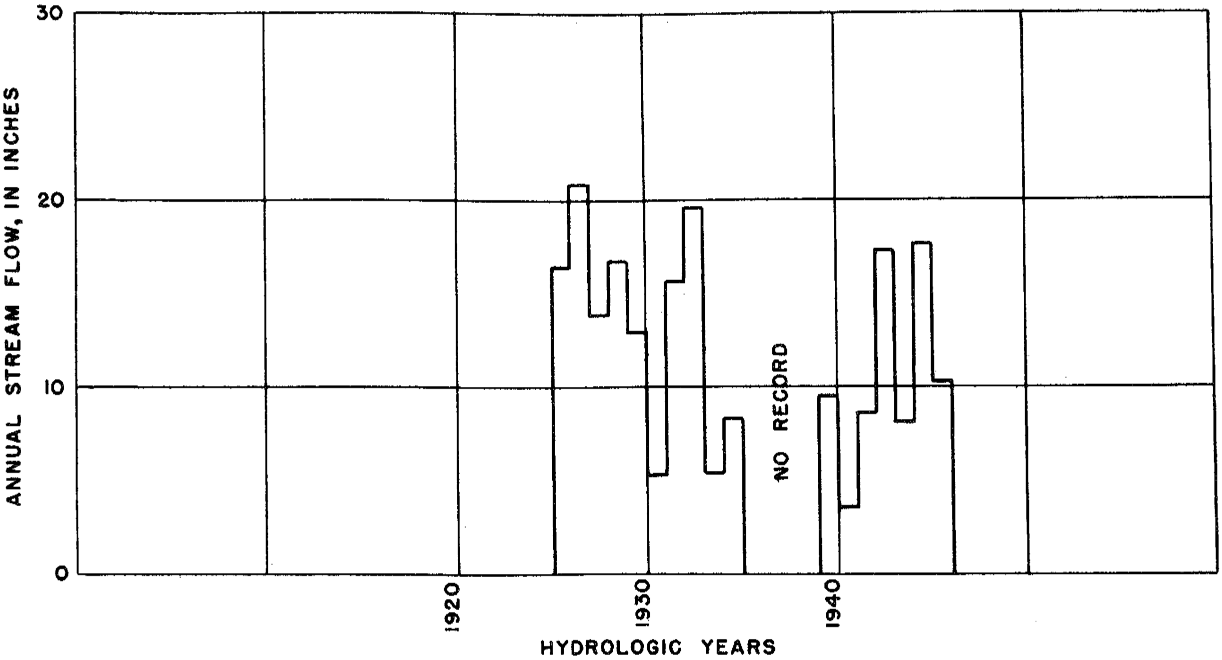
A convenient method of determining the distribution of high and low flows is by use of flow-duration tables and curves. In this method the daily flows are arranged in order of magnitude and plotted against the percentage of time during which they occur. The slope of the curve is a measure of the storage in the drainage basin; that is, the flatter the general slope of the curve, the lower the flood peaks and the higher the sustained dry-weather flow. The duration curve for the 16 years of stream-flow record at Spring Valley (pl. 5, B) shows nearly average conditions for streams in Ohio. Many streams with little or no permeable glacial or alluvial deposits above the bedrock are represented by much steeper duration curves, and the Mad River stations just north of Greene County, where there are very thick and permeable gravel deposits, are shown by much flatter curves than the curve for the

Table 1

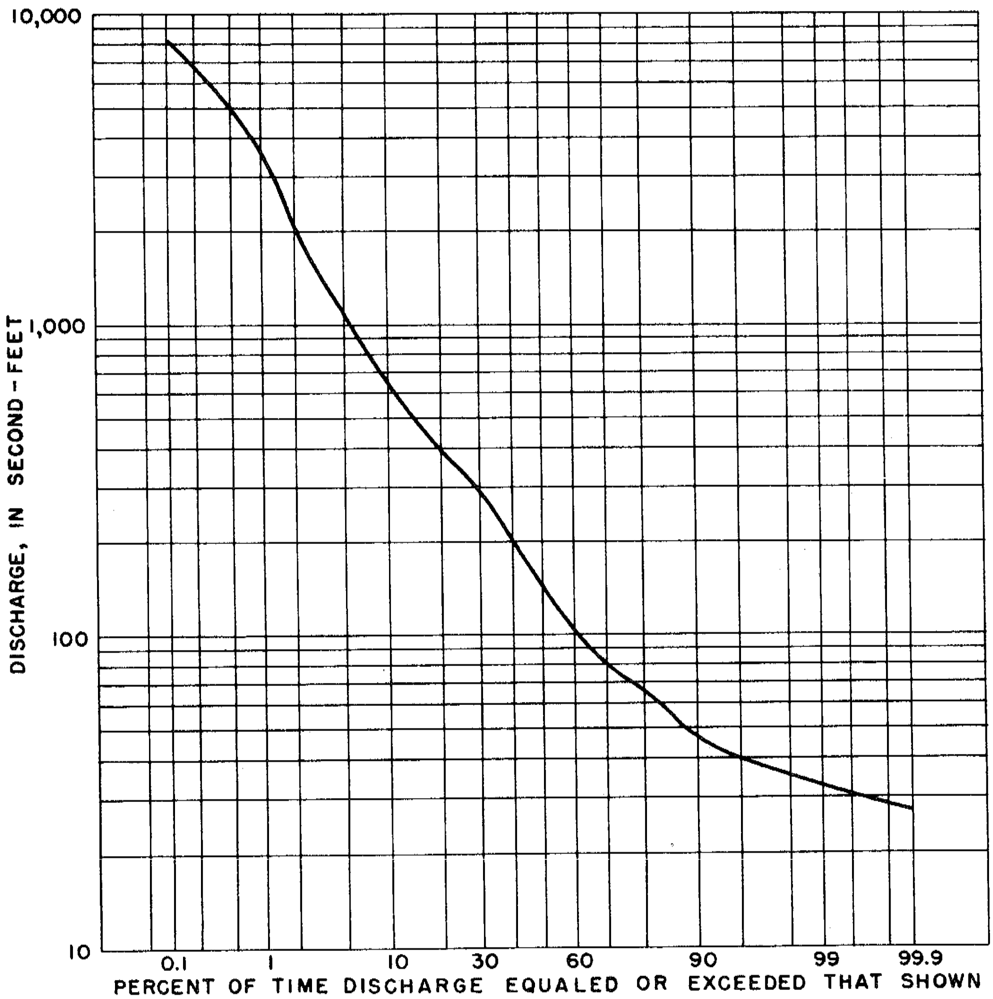
Stream-flow measurements, Little Miami River and tributaries

September 14, 1948

| Station number | Stream | Location | Drainage area (sq. mile) | Flow (c.f.s.) | Flow index (c.f.s. per sq. mile) |
|---|---|---|---|---|---|
| 51 | Mad River | Near Huffman Dam | 620.0 | 201. | 0.32 |
| 62 | Little Miami R. | Clifton | 100.0 | 3.77 | 0.04 |
| 63 | Little Miami R. | Above Yellow Springs Creek | 104.9 | 7.06 | 0.07 |
| 64 | Yellow Springs Creek | At mouth | 10.6 | 2.40 | 0.23 |
| 65 | Little Miami R. | Above Goes | 118.1 | 10.0 | 0.08 |
| 66 | Jacoby Branch | Goes | 6.19 | 0.43 | 0.07 |
| 67 | Little Miami R. | Below Goes | 125.7 | 10.7 | 0.09 |
| 68 | Conner Branch | Near Goes | 2.31 | 0.54 | 0.23 |
| 69 | Little Miami R. | At State Rt. 68 | 129.1 | 12.1 | 0.09 |
| 70 | Massie Creek | Cedarville | 50.5 | 0.35 | 0.007 |
| 71 | Massie Creek | Near Wilberforce | 66.9 | 1.74 | 0.03 |
| 72 | Clark Run | Near Wilberforce | 5.84 | 0.18 | 0.03 |
| 73 | Massie Creek | Near mouth | 74.8 | 3.30 | 0.04 |
| 74 | Ludlow Creek | Trebein | 6.79 | 0.57 | 0.08 |
| 75 | Shawnee Creek | Xenia | 3.96 | 0.08 | 0.02 |
| 76 | Little Miami R. | Trebein | 239.4 | 25.5 | 0.11 |
| 77 | Beaver Creek | Alpha | 18.8 | 7.31 | 0.39 |
| 78 | Little Miami R. | Below Beaver Creek | 293.3 | 44.1 | 0.15 |
| 79 | Little Miami R. | Above Washington Mills | 297.7 | 46.3 | 0.16 |
| 80 | Sugar Creek | Bellbrook | 31.8 | 0.56 | 0.02 |
| 81 | Glady Run | Spring Valley | 13.3 | 5.63 | 0.42 |
| 82 | Little Miami R. | Spring Valley | 361. | 48.7 | 0.13 |
| 83 | Caesar Creek | At State Rt. 68 | 66.8 | 0.25 | 0.004 |
| 84 | Caesar Creek | New Burlington | 88.1 | 1.18 | 0.01 |
| 85 | Anderson Fork | do | 93.1 | 0.16 | 0.002 |




A. Hydrograph of stream flow, 1926-35, 1940-46, expressed as depth in inches over drainage area, Little Miami River at Spring Valley, Ohio.




B. Flow duration curve, 1926-35, 1940-45, Little Miami River at Spring Valley, Ohio.

Plate 5. Flow characteristics of Little Miami River at Spring Valley, Ohio.

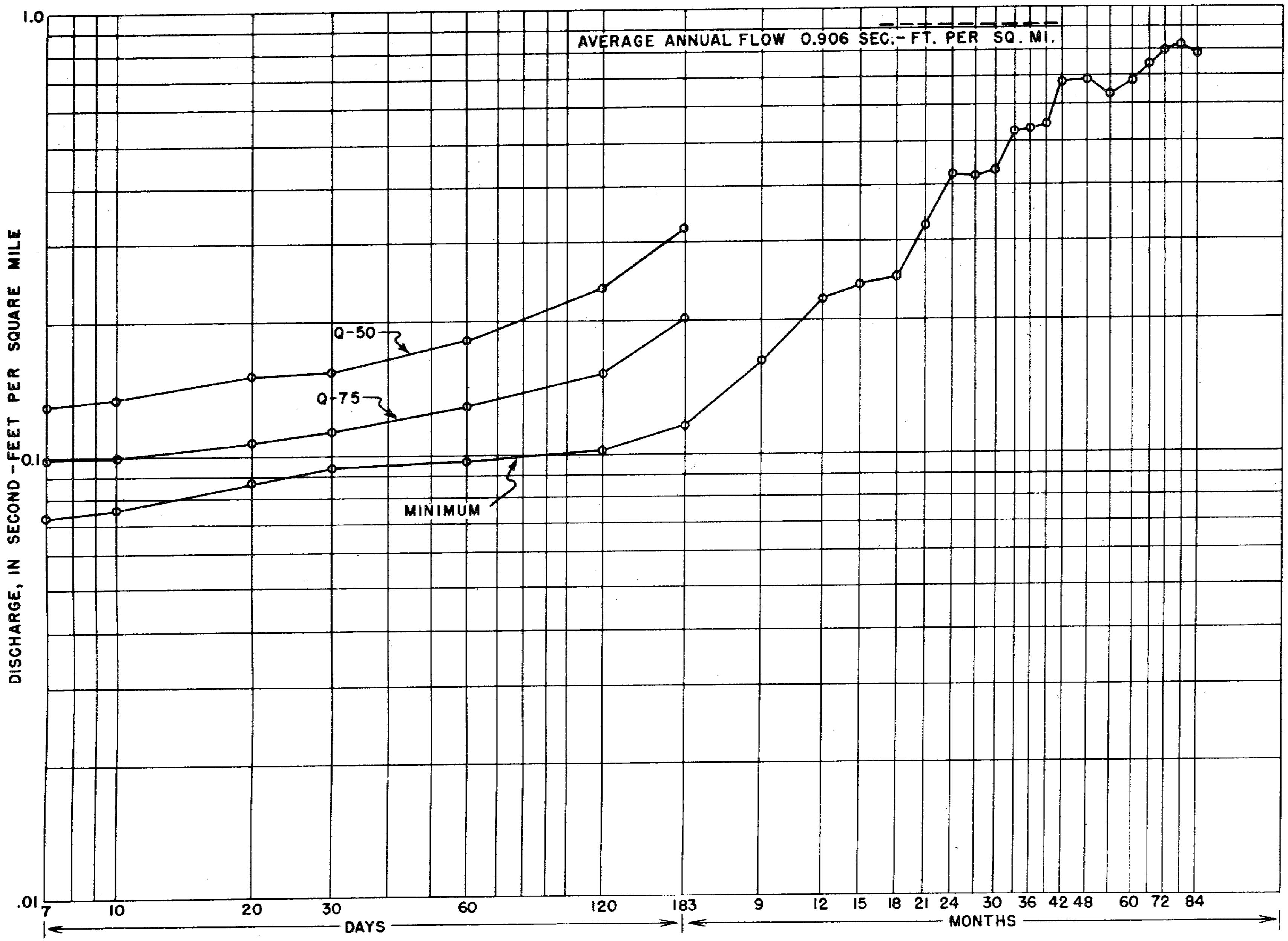



Plate 6. Discharge available without artificial storage, Little Miami River at Spring Valley, Ohio.

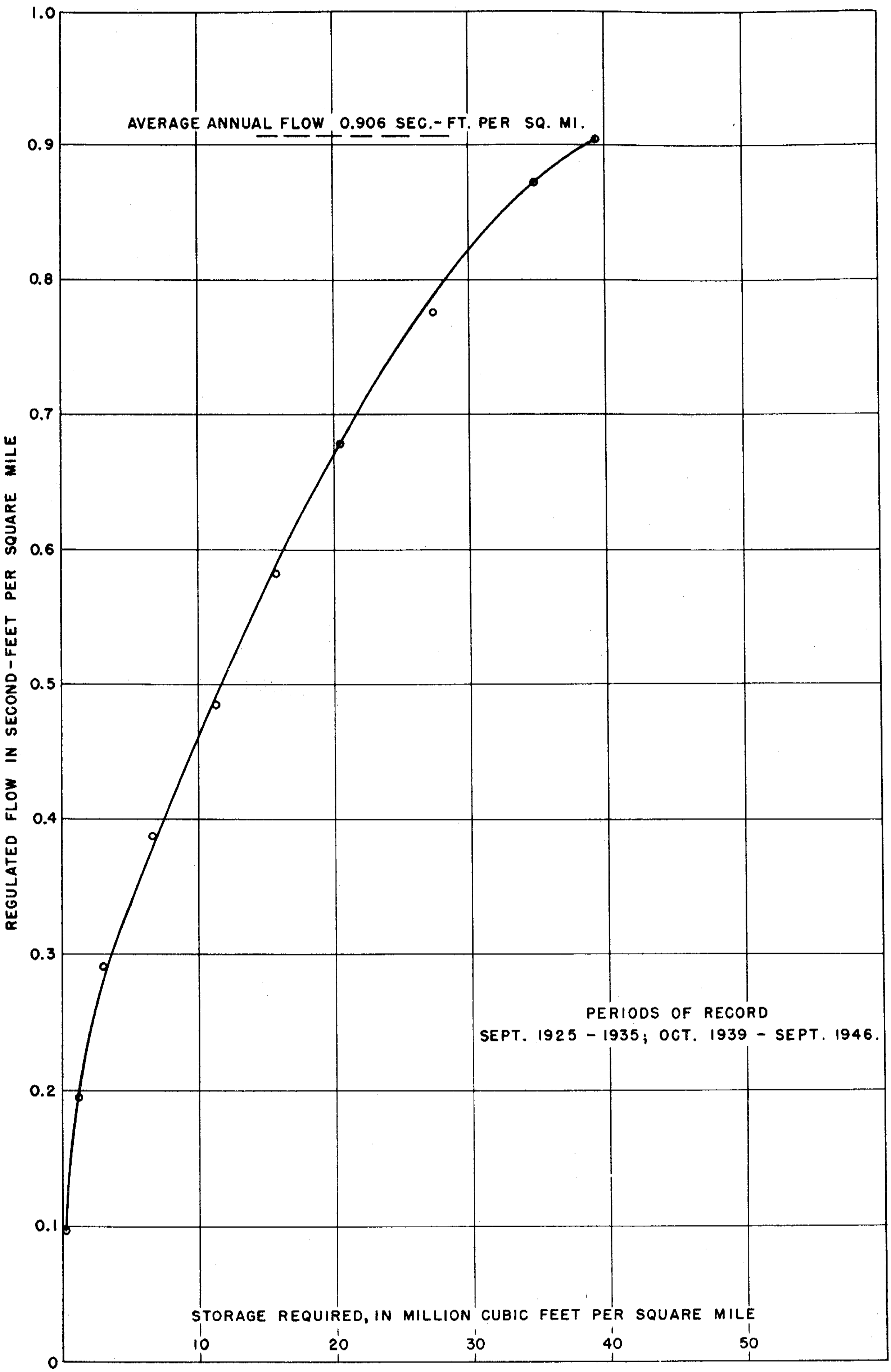



Plate 7. Unit-storage graph, Little Miami River at Spring Valley, Ohio.

record at Spring Valley.

A major disadvantage of the duration-curve method of studying stream flow is that the time sequence is lost. The duration curve indicates what flows may be expected, on the average, in a year, and the distribution of these flows in percentage of time, but the curve gives no indication of the probable sequence of flows. The discharge, in cubic feet per second per square mile, that is equaled or exceeded 90 percent of the time has been arbitrarily selected as an index of dry-weather flow. The index for the Little Miami River at Spring Valley is 0.130 cubic foot per second per square mile. This is considerably higher than that for nearby stations to the east and south where the index approaches zero, and it is above average for the State. It is, however, only about one-third as great as the indices for the Mad River stations.

In considering stream-flow characteristics it is also important to know the actual amount of discharge that is available from natural storage during various periods. Plate 6 shows an analysis of the daily flows at Spring Valley. The minimum line on the diagram indicates the lowest average flows for various periods of time. The Q50 and Q75 curves show, for selected periods, the minimum flows that have been exceeded in 50 percent and in 75 percent of the years, respectively. These flows or lower flows may be expected to occur, on the average, once in two years and once in 4 years, respectively.

On plate 7 is shown a unit-storage graph for the Little Miami River, which indicates the approximate amount of artificial storage that must be provided to give any specific flow continuously at any point in the basin. In this estimate, losses from evaporation and other causes have been neglected. The comparison of this curve with others for nearby streams again shows that the Little Miami River has low-flow characteristics about average for Ohio.

In order to obtain still more data on the low-flow characteristics of the Little Miami River and its tributaries, a large number of miscellaneous discharge measurements were made in Greene County on Sept. 14, 1948, during a prolonged rainless period. In this way the areas that produce the most ground-water discharge during dry-weather periods were located. The measurements are given in table 1, and the drainage areas and measurement points are shown on plate 2. By chance, the flow measured at Spring Valley was approximately that of the 90-percent point on the duration curve. The measured flows may therefore be considered dry-weather flow indices.

An examination of these dry-weather indices is revealing. The lowest unit flows are for the southeast corner of the county, where the bedrock is overlain by relatively impermeable till of the ground moraine. The unit flows gradually increase toward the north and west, where thicker and more permeable glacial drift occurs, one of the highest flows being measured on Beaver Creek at Alpha. The unit flows for the Little Miami River increase downstream as far as Washington Mills, about 4 miles above Spring Valley, and then begin to decrease. This decrease continues to the mouth of the river, as shown by downstream gaging stations.

Relatively large sustained flows in the Greene County area are caused mainly in two ways. At places where a water-bearing rock, such as a permeable limestone, overlies an impermeable bed, such as a shale formation, and both beds crop out, there may develop a "spring line," or line of seepage, which may contribute considerable flow to the stream. Such conditions exist in the gorge below Clifton and in the valley of Yellow Springs Creek. In this latter place the well-known Yellow Spring contributes an average flow to the stream of 60 to 80 gallons per minute. Spring zones may also occur in the glacial deposits where, for example, water in permeable gravels is deflected to the surface by impermeable underlying beds. Springs in the glacial deposits occur along Glady Run in the Spring Valley area, and possibly in some other tributaries of the Little Miami River where large increases in unit flows were detected. In general, however, the greatest unit flows are not caused by springs, but result from diffused ground-water discharge from the permeable sand and gravel deposited by the glaciers. Most of these deposits were laid down by water from the melting ice as outwash in the preglacial valleys. Beaver Creek, for example, where one of the highest unit flows was measured, drains a buried valley area that is filled with more than 200 feet of outwash sands and gravels. It is geologically similar to the adjacent Mad River Valley, which has the highest dry-weather flow index in the State.

## GROUND-WATER HYDROLOGY

### Occurrence, Source, and Movement of Ground Water

In Greene County ground water occurs in both the unconsolidated and the consolidated geologic formations. In the unconsolidated rocks, such as sand and gravel, the water is contained in the interstices between the individual particles making up the formations. In consolidated formations the water is generally contained in joint cracks, and along bedding planes, those in limestone generally being enlarged by solution.

A water-bearing formation that yields water to wells or springs in quantities sufficient to make it a practical source of water supply is called an aquifer. In Greene County the best aquifers are the outwash deposits of sand and gravel, which generally occur in the valleys. The limestone and dolomite strata also are good aquifers. Clay and till, although they may be saturated, are virtually impermeable and yield very little water to wells. Shale strata also are generally impermeable.

Under natural conditions in Greene County, ground water has its source in precipitation that collects on the surface and seeps downward to the water table, or upper surface of the saturated zone. The water table in Greene County follows the general configuration of the land surface.

The movement of ground water occurring under water-table conditions is from the uplands to the valleys, where it discharges into the streams. In most parts of Greene County the deeper wells pass through impermeable strata into beds that contain water under artesian pressure. The level to which the water rises in such wells is called the piezometric surface. In parts of Greene County, most commonly in the main valleys, the piezometric surface is above the ground surface, and flowing wells result. The most notable artesian area in the county is at the confluence of the Little Miami River and Beaver Creek, near the towns of Trebein and Alpha. Many wells that tap the deeper water-bearing formations in the area flow several feet above the ground surface.

## Principles of Ground-Water Recovery

Ground water may be discharged naturally from an aquifer through springs and seeps, by evaporation from the soil, or by evaporation from plants (transpiration). In an aquifer from which no water is pumped the amount of this natural discharge is approximately balanced over a long period by recharge from precipitation or stream flow. Ground-water levels in wells generally show daily and seasonal fluctuations in response to these cycles of recharge and discharge.

When wells tap a water-bearing formation a new factor is introduced into the hydraulic system of the aquifer. When pumping begins, most of the water is taken from storage in the immediate vicinity of the pumped well. As pumping continues, more water flows to the pumped well from greater and greater distances and less is removed from storage in the immediate vicinity of the well. Thus hydraulic gradients are created around the pumped well that form a characteristic "cone of depression." The shape of this cone, and its rate of growth, are related both to the capacity of the aquifer to transmit water and to the storage properties of the aquifer. The cone of depression continues to expand in response to the pumping until it intercepts enough of the water recharged naturally, which otherwise would be discharged naturally, to balance the pumping; or until additional recharge is induced, as, for example, where the cone of depression reaches a stream, lowers the adjacent water table, and induces water to move from the stream toward the well. Up to this point, at a given pumping rate, the ground-water level will decline continuously, though generally at a decreasing rate, until it has reached the level of the pump settings. Then the yield of the well will decrease gradually until the total withdrawal is balanced by recharge.

If substantial economic losses are to be avoided in the development of large ground-water supplies, careful analysis must be made of the geologic and hydrologic conditions to insure that pumping will not be in excess of the natural recharge that can be intercepted plus the additional recharge that can be induced by pumping. This may require intensive hydrologic studies, including controlled pumping tests, but the cost of such studies represents only a small fraction of the total cost of large developments.

GEOLOGY AND WATER-BEARING PROPERTIES OF THE GLACIAL DEPOSITS

## Pleistocene Glaciation

Most of the thick covering of clay, gravel, sand, and stones that makes up the present surface of Greene County was left by the continental ice sheets of Pleistocene age. Four times in the last million years deep snows accumulated over vast areas in Canada and northern United States and gradually became compacted into glacial ice. At least two of these ice sheets or glaciers spread southward as far as southern Ohio. All the drift exposed at the surface in Greene County was deposited by the latest ice sheet, that of the Wisconsin stage. The Wisconsin ice advanced to within a few miles of Cincinnati and covered Greene County for several thousand years. It melted off this area about 30,000 years ago.

The glacial stage that preceded the Wisconsin is called the Illinoian stage. The Illinoian ice advanced farther south than any of the other glaciers and reached a point slightly south of Cincinnati. Illinoian drift is not exposed in Greene County but it probably underlies the more recent Wisconsin deposits in some areas, and it has undoubtedly been penetrated by some wells. This is suggested by reports from well drillers of yellow clay layers encountered in wells at considerable depths below the surface and interbedded in the blue tills that characterize the ground moraine. The yellow color probably resulted from the weathering of the deposits when they were at the surface of the ground. This situation possibly could have occurred during any of several intervals of ice advance or retreat during a given glacial stage, but extensive weathering of the now buried deposits would have required considerable time, such as the interglacial stage between Illinoian and Wisconsin glaciation. The Illinoian ice is believed to have melted off the Greene County area about 200,000 years ago, a long time before the arrival of the Wisconsin ice. Yellow clay layers were reported at depth in wells 224-L, 579-L, and 709-L*, and in test wells drilled at the Ohio Soldiers and Sailors Orphans Home in Xenia, and they probably have been found but not reported in other wells in the county. Yellow layers have also been detected in wells drilled in other counties of southwestern Ohio (5).

The Illinoian glaciation was not the oldest in Ohio, for it is evident from drainage changes (3) that at least one earlier ice sheet approached but probably did not actually reach the Greene County area. This pre-Illinoian glacier is thought to have been that of the Kansan stage, which occurred about 600,000 years ago.

## Former Drainage Systems

Before the great ice sheets of Pleistocene time covered Greene County and blocked or diverted its rivers and filled the valleys with glacial drift, the drainage was much different from that in existence today. The preglacial streams, which were larger than those now draining the county, flowed in broad, deep valleys, whose presence today is indicated in many places by broad, winding depressions in the present topography. Most of the present streams in Greene County as,

* Letter "L" following number indicates that log of well is shown on plate 22.

shown on plate 4, follow the courses of the preglacial valleys and are cutting their channels into the glacial drift that now fills these valleys. Present streams are also cutting into the bedrock in a few places where their courses do not coincide with those of the buried valleys. The glacial drift in the main preglacial valleys in Greene County is, in most places, more than 200 feet thick, and the present streams are 100 to 150 feet below the levels of the uplands. At only a few places, notably in the area northwest of Spring Valley, has the accumulation of drift been of sufficient thickness to obscure completely portions of the old valleys.

From data obtained from outcrops and wells, contours have been drawn on the bedrock surface (pl. 1), which show in detail the ancient drainage channels that now are partly or wholly filled with glacial drift. From the shapes and patterns of the old valleys, as defined by the contours, from the positions of their tributary valleys, and from regional studies made chiefly by Wilber Stout (3), the probable courses of the streams that cut these valleys before or during the different stages of glaciation may be postulated.

The drainage system that existed in Ohio prior to Pleistocene glaciation is called the Teays. The master stream of this system, called the Teays River, rose in the Piedmont area of the southeastern United States and flowed across Ohio in a northwesterly direction in a course that lay a few miles north of Greene County. Because of a drainage divide in its eastern and northern parts, Greene County was not drained by the main Teays River, but was the headwaters area of a large tributary of the Teays that flowed southwestward from Greene County through Montgomery, Butler, and Hamilton Counties. This tributary river, which has been named by Stout (3) the Hamilton River, flowed into the main Teays River somewhere in Indiana. It was formerly thought that the preglacial course of the Hamilton River did not extend into Greene County because of a drainage divide in the western part, but present data, together with studies made in Montgomery County (5), indicate that this river was at one time the principal stream in Greene County. The probable course of the Hamilton River and its tributaries in Greene County is shown on plate 4. The outlines of the valleys are based on the 650-foot contour line as shown on plate 1. The Hamilton River, having cut back into the county from the west through Beaver Creek Township, divided in the Alpha-Trebein area into three main branches. The north branch of the old river cut the broad valley through what is now the Wright-Patterson Air Force Base area and was terminated somewhere in southern Clark County. The middle branch of the Hamilton River cut back into the upland in the direction of Yellow Springs and Clifton, and the southern branch cut a broad valley headward to the Spring Valley and Roxanna areas, and from there it cut back into the upland to the east in the direction of Jamestown. The present Little Miami River, as shown on plate 4, follows a course through Greene County that was originally cut by the middle and southern branches of the Hamilton River. Also in Teays time a short tributary valley was cut back from the north into the northeast corner of Greene County. Apparently this was a tributary of the main Teays River, whose course lay to the north.

In Greene County in Teays or preglacial time a narrow col or drainage divide existed at the site of Huffman Dam in Bath Township, separating two short tributaries of the Hamilton River. Another col existed about a mile southeast of Osborn, and there were smaller cols at other points within the county. The level to which Teays stage drainage cut its valleys in Greene County is conjectural because of the effects of later drainage stages and because the old valley floors are obscured by glacial drift. According to studies made in adjacent Montgomery County (5), the Teays level in the northern part of that county is found at elevations ranging from 750 to 770 feet, as indicated by rock terraces that occur along some of the valleys. Though such terraces are not discernible in Greene County, the Teays level must have been at somewhat similar elevations except near the headwaters areas of the valleys.

The Teays drainage system, according to Stout (3), was terminated by the advance into central Ohio of a very early, pre-Illinoian glacier, perhaps that of the Kansan glacial stage. This early glacier, it is thought, never reached the Greene County area, but it did advance far enough to block the main Teays River to the north. This caused lakes to form in the main valleys into which, in some areas, silt and clay were deposited. The lake stage was ended when the water overflowed and cut through narrow drainage divides, or cols, and established the succeeding drainage system, which is called the "Deep Stage" system. The Deep Stage drainage system was interglacial, because it followed the advance of the pre-Illinoian glacier and was terminated by the later advance of the Illinoian ice sheet. It is called Deep Stage because during this time the streams cut deep, narrow valleys many feet below the levels established in Teays time.

It seems probable that Deep Stage drainage in Greene County followed the courses established in Teays time, inasmuch as the southwestward-flowing Hamilton River probably was not ponded by the pre-Illinoian glacier. During Deep Stage time the bedrock floors of the valleys were reduced to their present levels, more than 200 feet below the levels established in Teays time. The Illinoian glacier, which brought the Deep Stage system to a close, covered the area with drift. Post-Illinoian drainage was probably somewhat similar to the present system, which has evolved since the more recent Wisconsin glaciation. As shown on plate 4, the present drainage has been diverted through narrow cols at Huffman Dam, in the Bellbrook area, and in the area south of Alpha. These cols probably were breached when the Wisconsin ice front stood at or near these localities and forced the drainage over the divides.

## Wisconsin Glacial Deposits

By Richard P. Goldthwait

The Wisconsin ice sheet, the last great glacier of Pleistocene time, advanced and retreated a number of times over southwestern Ohio, and two distinct drift sheets of Wisconsin age are present in Greene County. These drift sheets are differentiated according to the degree of weathering of their soils and correspond to early and late Wisconsin time. Drift from the early Wisconsin ice is found at the surface only in the area south of Bellbrook in the southwestern corner of the county. There the drift has been weathered to a deep, yellow-brown soil that has been leached of its carbonates to depths of 4 to 6 feet. Over the remainder of Greene County the late Wisconsin drift lies at the surface and the soils formed on it are leached to depths of less than 3 feet. In some of the buried valleys of the county layers of till are interbedded with the outwash gravels. These till layers are important because in some places they confine water under artesian pressure, as in the Alpha-Trebein area. It is probable that at least some of these interbedded till layers were deposited by the early Wisconsin ice sheet and were covered by outwash gravels from the late Wisconsin ice.

The southward advance of the late Wisconsin ice sheet in Ohio was concentrated along two main valleys, the Scioto Valley in central Ohio and the Miami Valley in western Ohio (6). From these principal routes two great masses or lobes of ice spread outward and approached Greene County from two directions. The Scioto ice lobe spread westward across Greene County beyond the Little Miami River, where it met and joined with the ice of the Miami lobe that was pushing down from the northwest. The direction of former ice movement is shown by the location of the glacial deposits, by the origin of these deposits as indicated by the type of rock material they contain, and by the direction of glacial grooves or striae engraved in the bedrock by rock fragments carried in the ice. At New Jasper striae made by the ice of the Scioto lobe point almost due west. In the quarries near Osborn, striae left by the Miami lobe point in a south-easterly direction. The sources of the material in glacial deposits may be determined by stone counts in which the individual pebbles are identified and related to the outcrops of their parent formations. In Greene County the drift of both the Miami and the Scioto lobes consists chiefly of carbonate rocks, though the drift of the Scioto lobe contains a higher proportion of dolomite than that of the Miami lobe; drift of the Miami lobe is further distinguished by its fragments of lower Silurian (Brassfield) limestone and Upper Ordovician shale, outcrops of which lay in the path of the Miami lobe. Evidence based on several stone counts indicates that no drift brought by the Miami lobe occurs on the surface in Greene County east of the Little Miami River. On plates 10, 11, and 13 are shown the various positions of the ice sheets in Greene County during the times the principal deposits were formed.

There are only two types of drift or deposits left by any glacier. Material laid down directly by the ice as it wastes away is called till and occurs principally as ground moraine, or till plain. Till is a mixture of unstratified materials in which the individual particles range in size from clay or silt to boulders. Till is generally called "clay" or "hardpan" by well drillers. The other type of glacial deposits, commonly called outwash, consists chiefly of sand and gravel that have been carried and laid down in stratified layers by meltwater from the ice. Outwash materials have been roughly sorted by the water according to the sizes of the individual particles. They are generally deposited as kames, outwash plains, and valley trains. Plate 2 is a map of Greene County showing the types of glacial deposits covering the county.

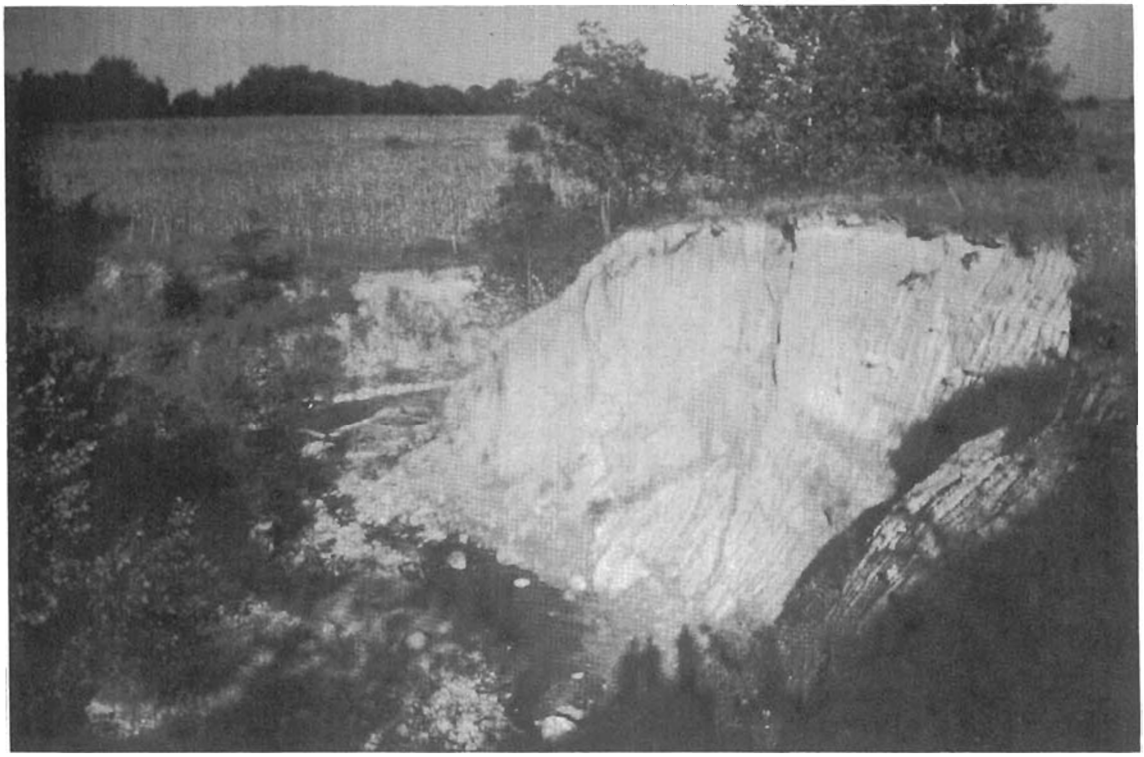
## Ground Moraine

The ground moraine in Greene County consists mostly of till deposited by the Scioto ice lobe. In most of the eastern half of the county the ground moraine obscures the underlying bedrock topography, producing a flat till plain. In the southern and southwestern parts of the county the ground moraine has been dissected by modern streams, and areas of strong relief have resulted. The ground-moraine deposits indicated on plate 2 as more than 20 feet thick range from slightly less than this figure to as much as 150 feet or more where they cover valleys. Ground moraine indicated as less than 20 feet in thickness may range from slightly more than this figure to a feather edge in areas of bedrock outcrops. Plates 8 and 9 show typical views of areas of thin and thick ground moraine in Greene County.

Till yields water to wells very slowly and most supplies developed in this material are taken from large-diameter dug wells. Such wells provide a large wall area for infiltration and a large storage space for the accumulation of water between periods of pumping. The average yield of these wells is generally adequate for hand pumps, but is seldom enough to supply electric-pump installations. In ground-moraine areas most drilled wells that do not penetrate the consolidated rocks obtain water from interbedded sand and gravel layers that occur in the till in some places. The yields of 55 typical wells in areas of thick till averaged 12 gallons a minute. The specific capacities of 38 of these wells averaged one-half gallon per foot of drawdown.

## End-Moraine Till Deposits

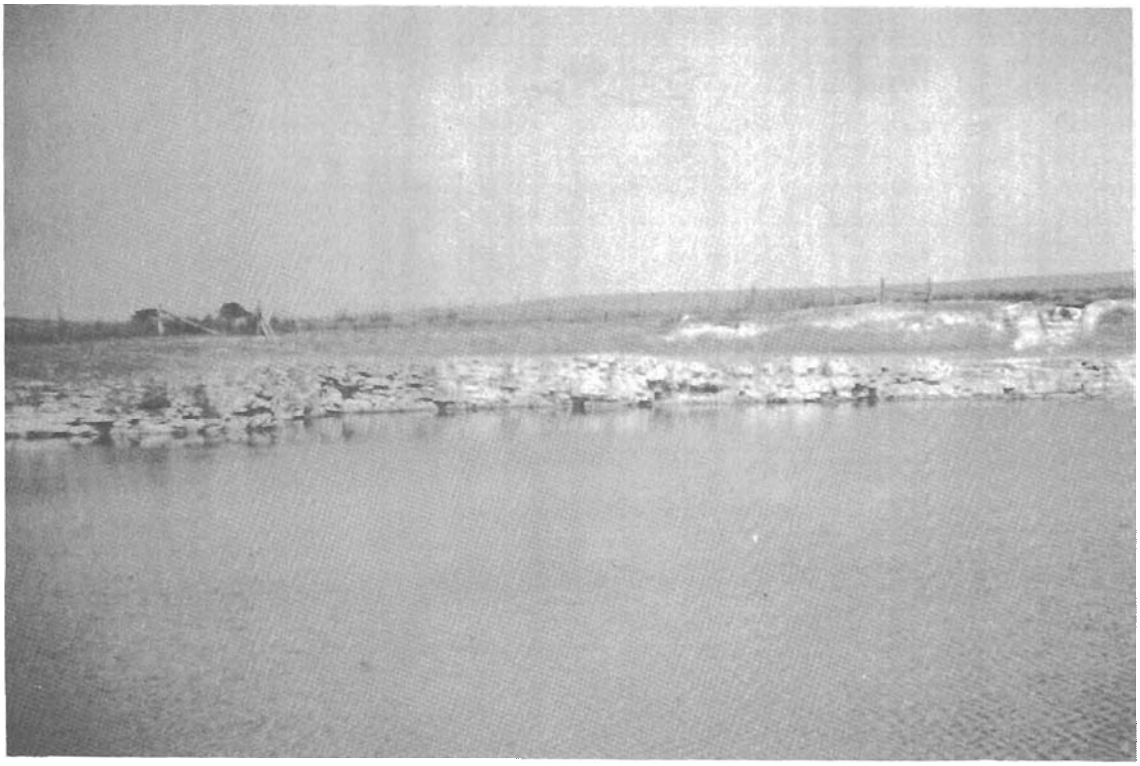
End moraines are deposits that accumulated along the ice front where the front remained relatively stationary for a long time. Stabilization of the ice front occurred whenever a temporary balance was reached between the rate of melting. Such conditions of temporary balance probably occurred during periods when the ice was advancing over an area, as well as during periods of ice retreat, but only those morainal deposits that were formed during periods of retreat are well preserved. These halts of the ice front may have lasted a few decades or even a few centuries, but the time involved must have been relatively short compared to the total period of glaciation. End-moraine deposits generally consist of till in the form of hummocky ridges as much as a few miles wide and several to many miles long, rising 10 to 40 feet or more above the general level of the till plain. Most of the end-moraine deposits in Greene County were formed by the ice of the Scioto lobe, which moved in a westerly direction, and consequently the long axes of these deposits are aligned approximately north and south. An early halt of the Scioto-lobe ice occurred in the vicinity of Spring Valley and left a broad ridge, marked on plate 10 by a dotted line, which extends southeastward into Clinton County. This was followed by a retreat to the Cedarville, Xenia, and Caesar Creek Township areas, where the ice deposited a long line of hills, indicated by the solid line on plate 10. The last moraine deposited by the Scioto ice lobe in Greene County occurs in the form of a long, low ridge that extends north and south through Jamestown. This moraine is indicated by the easternmost solid line shown on plate 11. A photograph (pl. 8,*B*) of the



A. Rolling ground moraine southwest of Spring Valley, showing an exposure of thick till.

B. Flat ground moraine south of Jamestown. The low ridge in the background is an end-moraine deposit.

Plate 8. Photographs of ground-moraine areas in Greene County, Ohio.



A. Area of thin ground moraine 2 miles west of Jamestown, showing till overlying limestone of the Niagara group at an abandoned quarry.

B. The Little Miami River at Clifton. The formation exposed is the Cedarville dolomite of Niagaran age, which is overlain by thin ground moraine.

Plate 9. Photographs of ground-moraine areas in Greene County, Ohio.

end moraine near Jamestown shows its relation to the general till plain.

The water-bearing properties of end-moraine deposits are similar to those of the ground moraine. Records of 31 drilled wells in end-moraine areas in Greene County showed their average yield to be 11 gallons a minute. In 18 of these wells the specific capacity averaged one-half gallon per foot of drawdown, the same as for 38 wells in ground-moraine deposits.

## Kame and Kame-Moraine Deposits

Under certain conditions a glacier front may not undergo a systematic retreat, but the ice may melt off an area in an irregular manner, the front thinning to a ragged edge. In many such cases, outwash materials are deposited around the ice edge in the form of irregular mounds of sand and gravel called kames. In some areas kame deposits coalesce to form kame moraines. In northwestern Greene County the Miami ice lobe deposited kames along the sides of some of the preglacial valleys where the outwash-laden melt waters were confined between the ice edge and the valley walls. As indicated on plate 2, kame deposits form an irregular moraine that extends from the county line to the east past Zimmerman, along the eastern side of Beaver Creek Valley, and in the Little Miami Valley from Alpha to Yellow Springs. This kame moraine also extends westward into Montgomery County, where it has been described in the Southern Hills area south of Dayton (7). Kames were deposited in northwestern Greene County by the Miami lobe when the ice lay against the highlands south of the Mad River Valley. The probable position of the ice front when these later kames were deposited is shown on plate 11. A smaller area of kame deposits was also formed by the Scioto lobe ice in the extreme northeastern part of the county.

As shown in the photograph on plate 12, B, many kame gravels are coarse-textured and highly permeable, but, because these deposits were formed at generally high levels relative to the surrounding terrain, the water table is sometimes found at considerable depth below the surface and may even be below the kames themselves. Also, because kames are seldom traversed by large streams, supplies cannot usually be developed by induced infiltration. Initial yields of wells obtaining water from kame deposits, however, should be comparable to those tapping the outwash-plain deposits, which are among the best aquifers in the county. Records of six wells in kame areas showed their average yield to be 29 gallons a minute, more than twice as much as the average of 55 wells in ground-moraine deposits.

## Outwash-Plain Deposits

In the early stages of its retreat, meltwaters from the Scioto lobe built an extensive outwash plain of sand and gravel to a comparatively high level in the area west of the town of Xenia in Xenia and Beaver Creek Townships. An outwash plain is formed in much the same way as kame deposits, by sediment-laden streams discharging their loads of sand and gravel at the wasting edge of the ice sheet.

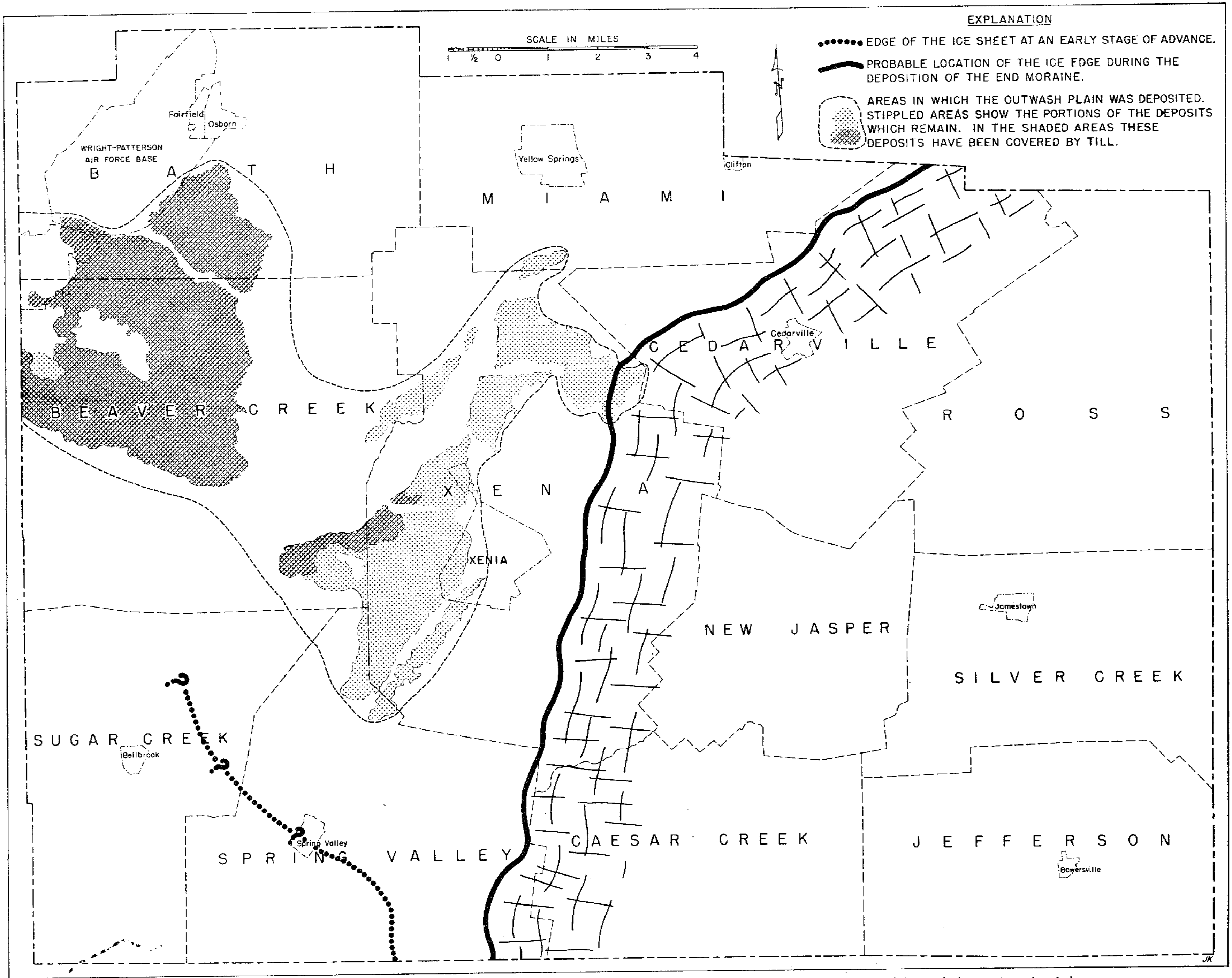



Plate 10. Map showing location of the edge of the ice sheet in Greene County, Ohio, during deposition of the outwash plain.

However, an outwash plain is generally much more extensive than kames or kame-moraine deposits, and it differs from the latter in that its surface is comparatively flat (except where it has been dissected by later streams) and slopes or is graded in a direction away from the former ice front. According to Flint (8), the average grain size of outwash material also diminishes downstream, which is generally in a direction away from the former ice edge. As indicated on plate 10, the outwash plain must originally have covered a much larger area in northwestern Greene County then it does now, but subsequent erosion removed these deposits in some areas and, as a result of later advance of the Miami lobe, part of the deposits are covered by till in the area south of the Wright-Patterson Air Force Base. At the time the outwash plain was deposited the principal valleys must have been filled with ice to cause the discharging streams to flow at such high levels.

The water-bearing properties of the outwash-plain deposits are generally good, andthe initial yields of wells in these deposits are as high as for wells in the valley-train deposits, which are the best aquifers in the county. Because the outwash plain occurs at a comparatively high level, however, the water table is generally at a considerable depth below the surface. Also, because the outwash plain is not traversed by major streams, practically no possibilities exist for the development of infiltration supplies, and consequently the sustained yield of wells in these deposits probably would not be as great as that of wells in the valley-train aquifers. Good possibilities exist, however, for the development of small industrial or municipal supplies, perhaps as much as several hundred thousand gallons per day, from the better areas.

## Valley-Train Deposits

A long, narrow body of glacial outwash confined within a valley is called a valley train. As the glaciers melted off Greene County, floods of meltwater poured down the valleys and deposited as much as 200 feet of stratified sands and gravels. The surfaces of the valley-train deposits grade in a direction away from the former ice front, with about the same slope as the gradients of the present streams that flow over these deposits. The principal courses of the glacial streams were down the Little Miami, Mad River, and Beaver Creek Valleys, as shown by the stippled areas on plate 13, which indicate areas in which outwash was deposited. The glacial streams did not deposit outwash materials everywhere along their courses, and locally they cut gorges in the bedrock where their gradients and velocities were very great. As indicated by arrows on plate 13, the gorges at Clifton, at Yellow Springs, at a point in the southern part of Beaver Creek Township, and at a point near Bellbrook were cut by glacial streams during the time most of the valley train deposits were being laid down. In the case of the Clifton and Yellow Springs gorges the waters merely deepened existing valleys. South of Alpha, however, the main valley was blocked by ice and the glacial drainage was forced to take a new course over the edge of the divide. This super-imposed stream cut a narrow gorge into the bedrock and outwash materials were carried through this channel into the wider part of the preglacial valley in the Bellbrook and Spring Valley areas. Southeast of Bellbrook, smaller gorges were also cut into the bedrock at this time by

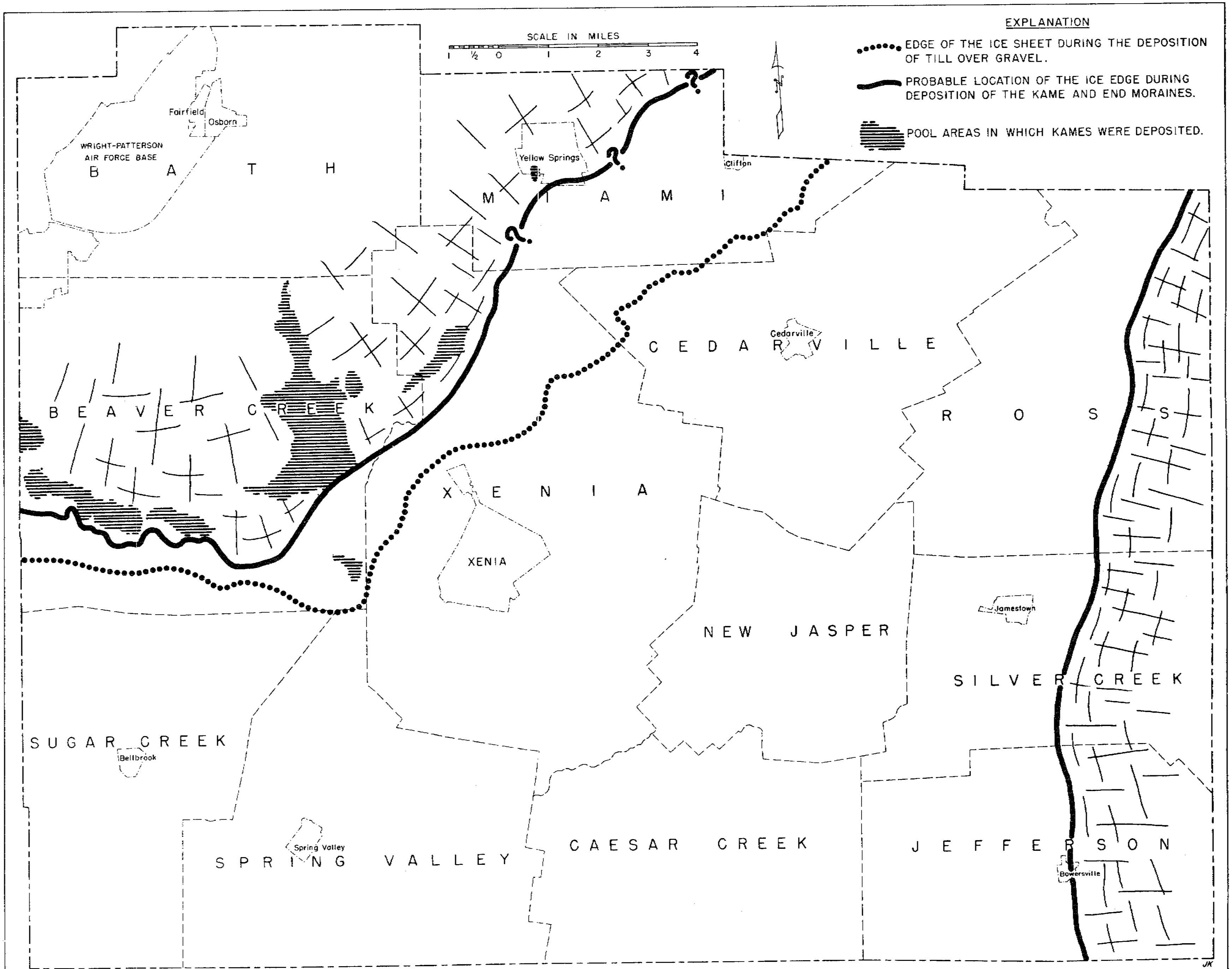



Plate II. Map showing locations of the edges of the ice sheets in Greene County, Ohio, during deposition of till over gravel and formation of end moraine near Jamestown.

ice-diverted streams. Modern streams are now flowing over and cutting away the valley train, and in some areas they have removed considerable quantities of these deposits.

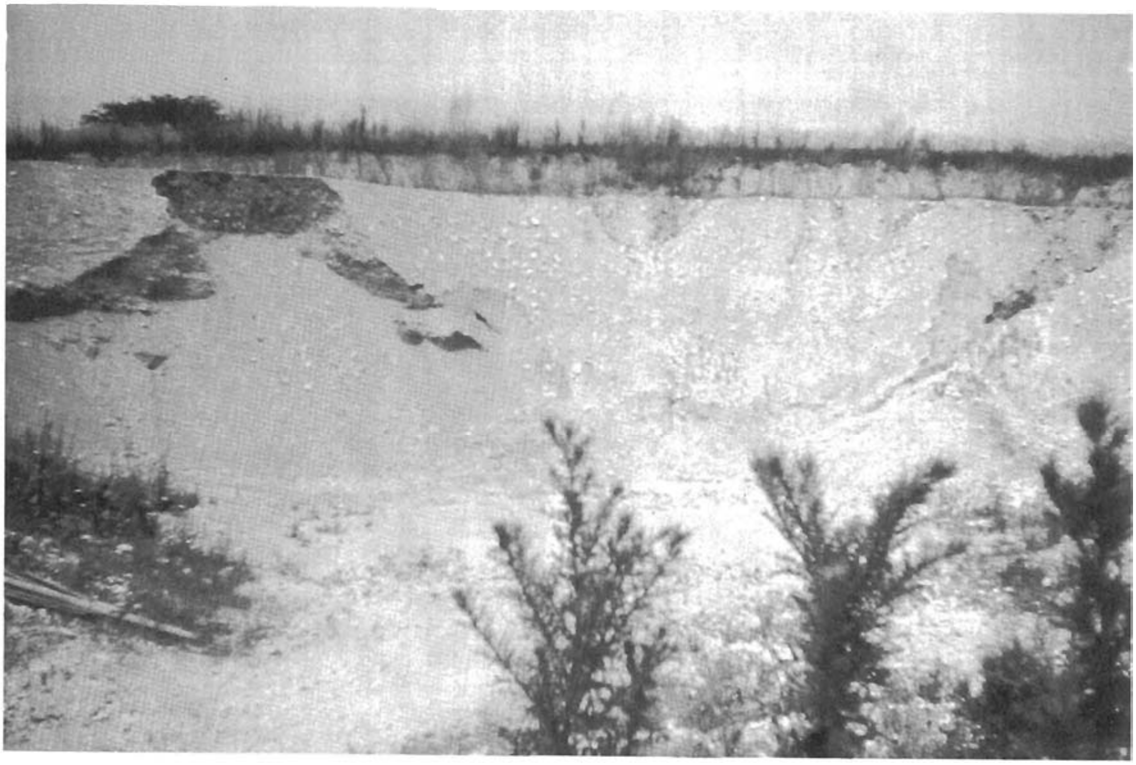
The best aquifers in the county are the sands and gravels making up the valley train. These deposits are almost everywhere coarse in texture and highly permeable. Individual wells yield as much as 2,000 gallons a minute, or even more, and where infiltration supplies can be developed close to the streams, as has been done in Montgomery County (5), several million gallons of water a day can be taken from small areas in these deposits without causing a progressive decline in water levels. At the Xenia municipal well field at Oldtown, the record of observation well Gr-1 indicates no continuous decline of water levels despite an average daily withdrawal of more than a million gallons. Undoubtedly the present yield from the Oldtown well field represents but a small fraction of its total capacity, as indicated by very much larger yields obtained from valley-train deposits in adjacent Montgomery County (5), where ground-water conditions are somewhat similar.

In many places layers or irregular lenses of till are interbedded in the sands and gravels of the valley train and in places these beds confine water under artesian pressure. In the Alpha-Trebein area coarse gravels occur below an extensive till layer that is found at depths of 80 to 100 feet below the surface. Water from this lower aquifer occurs under strong artesian pressure and rises in wells several feet above the land surface. It is probable that the chemical quality of the waters from the upper and lower valley-train aquifers is different, for in the Mad River Valley in adjacent Montgomery County, where two separate aquifers also occur in the valley train deposits, water from the lower aquifer is higher in iron and in total hardness (5) than water from the upper aquifer, which receives more direct stream infiltration.

## Gravel Deposits Covered by Till

In a broad area centering south of the Wright-Patterson Air Force Base, the ground moraine overlies thick deposits of stratified sand and gravel. As indicated on plate 10, these buried outwash deposits probably were laid down by meltwaters from the Scioto ice lobe in the form of an extensive outwash plain, the remnants of which occur on the surface west of Xenia. After this outwash plain was laid down, the ice of the Miami lobe readvanced and deposited till to a maximum thickness of 100 feet or more over the stratified materials. On plate 11 is shown the probable position of the Miami lobe ice front during this readvance. A photograph of till over a gravel deposit appears as plate 12, A.

Wells in the till-over-gravel areas penetrate 10 to 100 feet or more of till before breaking into the water-bearing sands and gravels. When this occurs the water, which usually is under artesian pressure, rises rapidly in the wells to attain its static level. Supplies of water from these deposits are excellent for farm and domestic use, and are adequate for small industrial or municipal requirements.



A. Old gravel pit northwest of Cedarville, showing till overlying stratified gravel and sand.

B. Photograph of kame gravel and sand in the northeast part of the country, showing the character of the bedding and texture of the material.

Plate 12. Photographs of glacial deposits in Greene County, Ohio.

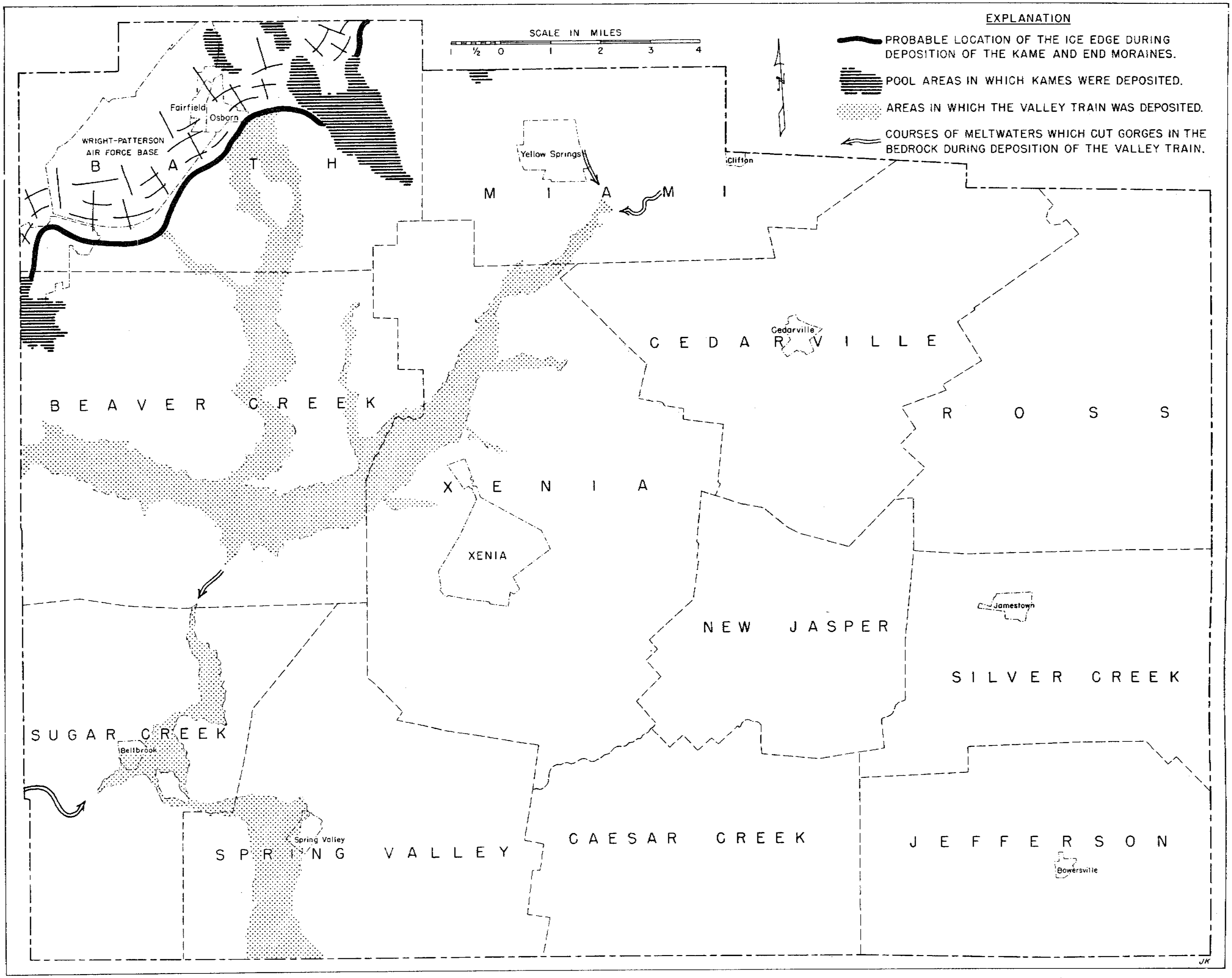



Plate 13. Map showing location of the edge of the ice sheet in Greene County, Ohio, during deposition of the valley train.

## Recent River Alluvium

Alluvium consists mostly of silts and sands deposited by the present streams on their flood plains during times they have overflowed their channels. The alluvium is thin, relatively impermeable, and generally not an important source of water. Wells commonly penetrate through these deposits into the valley-train deposits, which underlie the present streams in most areas.

# GEOLOGY AND WATER-BEARING PROPERTIES OF THE CONSOLIDATED ROCKS

## Stratigraphy and Structure

The consolidated rocks underlying Greene County are sedimentary in origin, having been laid down on the bottoms of large inland seas that at various times in geologic history have covered southwestern Ohio. These sedimentary rocks consist mostly of limestones and dolomites interbedded with and underlain by shales. Limestone is composed of calcium carbonate ($CaCO_3$) derived largely from the remains of marine organisms. Dolomite, which in physical appearance cannot be distinguished from limestone, consists of calcium and magnesium carbonate ($CaCO_3$ - $MgCO_3$). Shale is formed by the consolidation of silt, mud, or clay. The consolidated formations that underlie Greene County from the surface to the depths commonly penetrated by deep wells drilled for oil or gas are listed in table 2, which gives the character of the formations, their thicknesses, and general water-bearing properties. Not all these formations are to be found everywhere in the county, some having been removed by erosion in certain areas, as shown on plate 1.

The formations listed in table 2 were originally deposited in a nearly horizontal position. In some areas, through elevation, subsidence, compaction, or faulting, they have become warped into domes, depressions, anticlines, or synclines The beds in such structures in Ohio generally dip only at low angles and the structures are important mainly for the different successions of strata that are brought to the surface in different regions. The most important structural feature of southwestern Ohio is the Cincinnati anticline, a broad arch whose center crosses the State from north to south and passes into Kentucky near Cincinnati. From Cincinnati the rocks dip gently to the east, north, and west. There is nothing in the surface relief or elevation to indicate this rock uplift; its presence is known only from geologic studies.

Greene County lies on the east flank of the Cincinnati anticline and in general the strata dip in a northeasterly direction. The elevation of the Brassfield limestone where it is exposed at the surface, or where its position is known from well data, was determined at approximately 10 places in Greene County by means of a surveying altimeter. The base of the Brassfield was found at elevations ranging from more than 950 feet in the southwestern part of the county to as low as 848 feet in the Yellow Springs well field, located about a mile north of the village. Some minor structural irregularities occur within the county, and locally the dip of the rocks deviates or is reversed from the regional trend. The inclination of the strata

TABLE 2

STRATIGRAPHIC SEQUENCE OF THE CONSOLIDATED ROCKS ABOVE THE SO-CALLED TRENTON LIMESTONE OF DRILLERS, GREENE COUNTY

| SYSTEM | GROUP | FORMATION | CHARACTER OF MATERIAL | WATER BEARING PROPERTIES | AVERAGE THICKNESS (feet) |
|---|---|---|---|---|---|
| Silurian | Niagara group | Cedarville dolomite | Massive, porous | Generally adequate water supplies available for farm and domestic requirements, except from the Osgood and Massie shales. Wells ordinarily yield from 5 to 15 gallons a minute. A few wells yield more than 100 gallons a minute. Water very hard. Important spring horizons at base of system, above Massie shale, and in Springfield formation | 50 + |
| | | Springfield limestone | Well-bedded, dense | | 10 |
| | | Euphemia dolomite of Foerste | Massive, porous | | 6 |
| | | Massie clay shale of Foerste | Calcareous, dense | | 5 |
| | | Laurel dolomite | Well-bedded, dense | | 5 |
| | | Osgood shale | Shale, calcareous, with limestone beds | | 25 |
| | | Dayton limestone | Limestone, or dolomite, well-bedded, dense | | 8 |
| | Beds of Clinton age | Brassfield limestone | Fossiliferous, massive to irregularly bedded | | 30 |
| Ordovician | Richmond, Maysville, and Eden groups, undifferentiated | | Shale, soft, calcareous, interbedded with thin hard limestone layers; called Cincinnati shale in old reports | Wells generally yield no water, or seldom more than 1 gallon a minute. Water in places is high in iron and is hard. Water, where present, generally occurs in top few feet of strata. | 1,000 |
| | Beds of pre-Eden age | So-called Trenton limestone of drillers | Limestone or dolomite with some shale | Generally yields salt water at base from so-called blue lick horizon of drillers | 500 |

The strata below the so-called Trenton limestone of drillers generally consists of several hundred feet of limestones, dolomites and shales. These strata are not a source of fresh water.

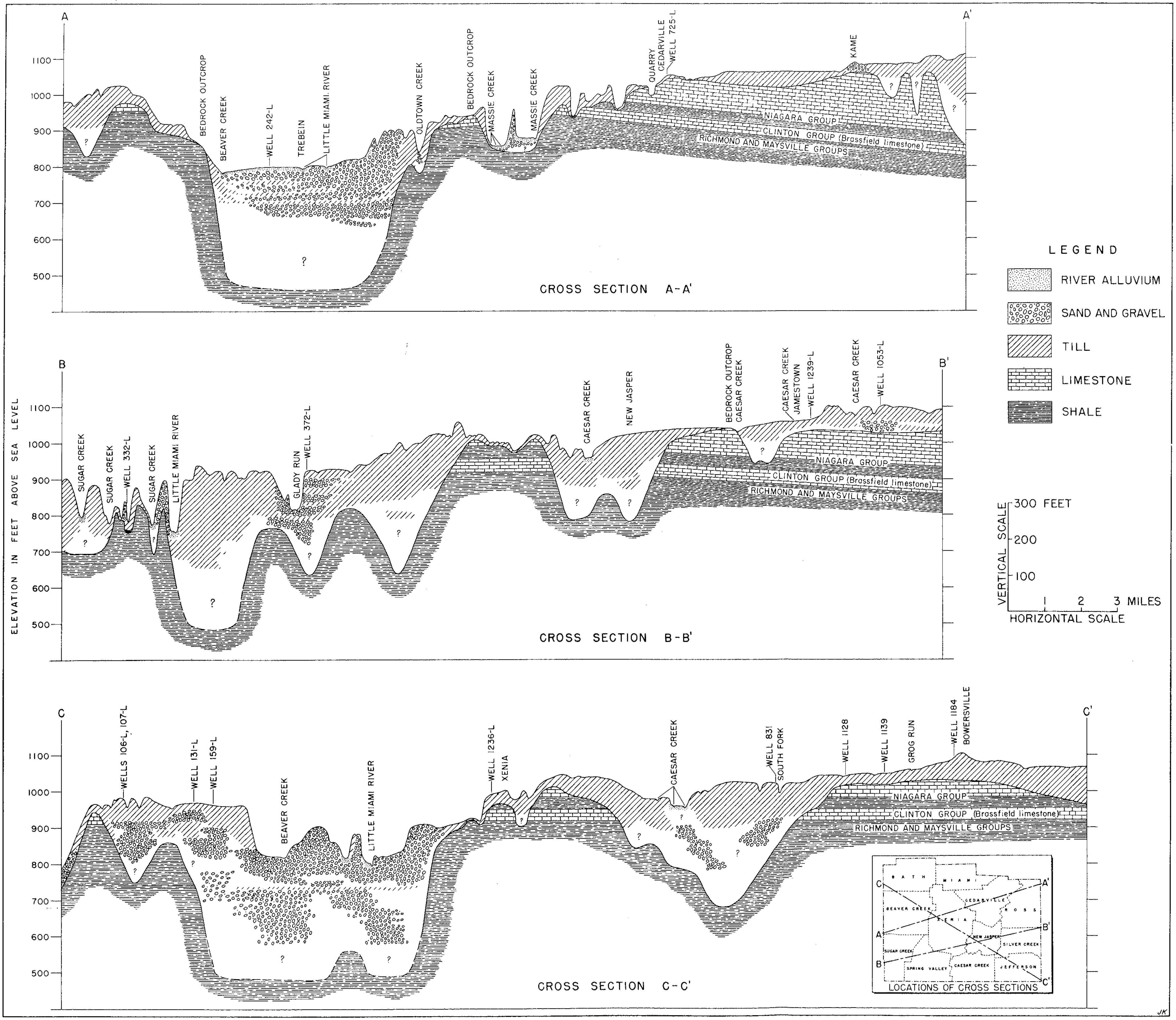



Plate 14. Cross sections showing geology of Greene County, Ohio.

is not significant in relation to their water-bearing properties; it is important mainly in defining the areas in which the different rock formations crop out at the surface or beneath the drift. On plate 14 are three geologic cross sections showing the consolidated and unconsolidated formations underlying Greene County.

## Silurian System

### Beds of Niagaran and Clinton Age

The rocks of Niagaran and Clinton age are the youngest and highest, both stratigraphically and topographically, of the consolidated formations of Greene County. They form the bedrock beneath the glacial drift in the eastern half of the county and occur as outliers in higher areas in the western part, notably in Bath, Beaver Creek, and Sugar Creek Townships. Outcrops of the Niagara group form cliffs along the gorges of Yellow Springs Creek, the Little Miami River at Clifton, and Massie Creek near Cedarville. Numerous other outcrops occur in the northeastern part of the county, and the glacial drift throughout the whole eastern area is comparatively thin.

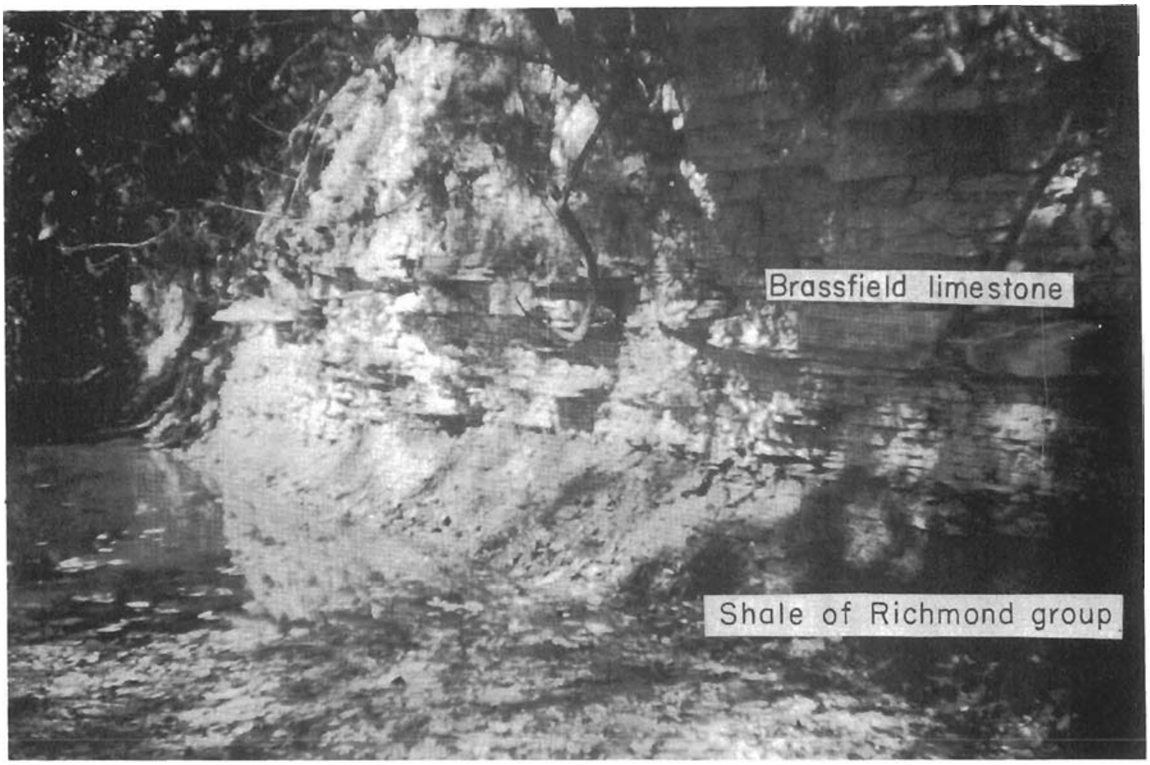
The Niagara group, as shown in table 2, is composed of seven formations in Greene County aggregating more than 100 feet in thickness. The rocks are mostly limestones, but a shale about 25 feet thick, the Osgood shale, occurs near the base of the section. At the top of the Niagara group is the Cedarville limestone, a massive porous rock, dolomitic in composition, named for the town of Cedarville, where for many years it was extensively quarried and burned for lime. The average thickness of this formation in Greene County is probably more than 50 feet.

Below the Cedarville limestone is the more evenly and thinner-bedded Springfield limestone, which averages 10 feet in thickness, and is important as a spring horizon, especially in the upper parts of the valleys of Massie Creek, Yellow Springs Creek, and the Little Miami River. These springs result from water deflected to the outcrop by thin shale partings between some of the limestone beds. The Springfield limestone is quarried by the Greene County Highway Department about a mile northeast of New Jasper. A photograph of this quarry, showing the character of the bedding of the formation, is shown on plate 15, A.

The Springfield limestone is underlain by about 6 feet of massive dolomite, the Euphemia dolomite of Foerste. The Euphemia dolomite is distinguished from the Springfield limestone by its different fossils and by its thick and uneven bedding. The Euphemia in places crops out as a prominent cliff face, as at Bryan State Park and near Yellow Springs. This is because of its stratigraphic position overlying the soft Massie clay shale of Foerste. Plate 16 is a photograph of part of the Niagara group at Bryan State Park, showing the characteristic overhand of the more resistant rocks above the Massie clay shale.

The Massie clay shale of Foerste is so named because it crops out along Massie Creek. The formation is limited in occurrence to the Greene County area, being absent from the geologic column beyond about a 20-mile radius from Yellow Springs.

A. Exposure of Springfield limestone at quarry near New Jasper, showing the character of the bedding.




B. Exposure of the Brassfield limestone of Silurian age and shale of the Richmond group of Ordovician age along Oldtown Creek 2 miles northeast of Xenia showing the contact between the rock systems.

Plate 15. Photographs of consolidated rock strata in Greene County, Ohio.

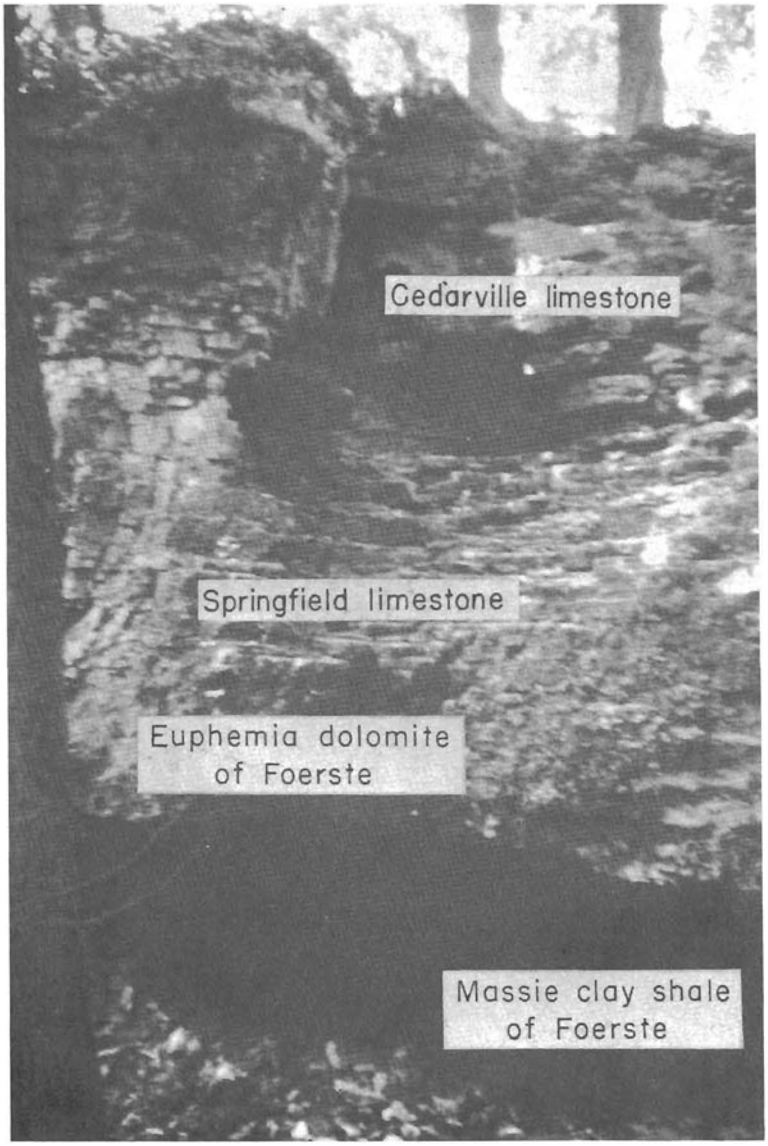



Plate 16. Exposure of Niagara group in Bryan State Park, Greene County, Ohio, showing reentrant formed under the massive Euphemia dolomite by the weathering of the soft Massie shale.

The Massie clay shale is important locally as the base of a spring zone, especially in the gorge of Yellow Springs Creek. It overlies the thin Laurel dolomite, which is a hard, dense rock that grades downward into the Osgood shale.

The Osgood is a hard, blocky shale, about 25 feet thick, and is important as a horizon marker near the base of the Niagara group and also because it acts as an impermeable body separating the limestone and dolomite aquifer of the Niagara group from that of the Clinton group. Because of this separation the water in the Niagara and Clinton groups generally occurs under different hydraulic heads, and pumping from one aquifer does not immediately affect the water level in the other. It is possible, because of this difference in static water levels, that the upper formations might be partly or entirely drained by wells tapping both aquifers. Such a situation was reported in a test well (No. 478-L) drilled for the Morris Bean Co. 2 miles south of Yellow Springs. The Niagara group was encountered 6 feet below the ground surface in this well, and water entered the well at depths of 15 and 20 feet. Drilling was then continued into the Clinton group, and at a depth of 75 feet, at the base of the Brassfield limestone, a crevice was struck that completely drained the well. This crevice was later plugged to prevent the unwatering of the upper aquifer, and the well was abandoned.

The Osgood shale overlies, and is somewhat transitional with, the basal formation of the Niagara group, the Dayton limestone. The Dayton is a hard white limestone stratum about 8 feet thick and occurs in thin, well-defined beds. The Dayton was formerly in great demand as a building stone and was quarried at several places in Greene County.

The Clinton group in Greene County is represented by only one formation, the Brassfield limestone, which was formerly called the Clinton limestone. The Brassfield is extensively quarried near Osborn, where it is used in the manufacture of cement. Other outcrops occur along Massie and Oldtown Creeks, in the road cut at the southern end of Huffman Dam, along Caesar Creek south of Xenia, and at numerous other places within the county. Lithologically the Brassfield limestone presents two distinct phases. The lower part of the formation is massively and evenly bedded, whereas the upper part is so thinly and irregularly bedded that it is almost impossible to trace a single bed more than a few feet. The upper part of the formation is also extremely fossiliferous, being made up in a large part of small fossil crinoid fragments that resemble small segmented stems of plants. On the outcrop the Brassfield is dark gray to pink in color, the pinkish cast being in itself almost diagnostic of the formation. At places near the base, the Brassfield contains a coarsely granular layer made up of limestone sand. This stratum is called the "firestone" or "sugar rock" layer and is well developed in the quarry 2 miles east of Osborn. The firestone layer breaks down easily, is porous, and probably is a better water-bearing material than the rest of the formation, though no definite data are available. The thickness of the Brassfield limestone is about 25 feet near Spring Valley, 35 feet at Jamestown, and about 43 feet at Yellow Springs. The base of the Brassfield is important as a spring zone, the water being concentrated along the contact with the underlying impervious Ordovician shale. In former years spring water from this source furnished most of the water supplies at Goes.

The water-bearing properties of the Niagara and Clinton groups depend chiefly on the presence of interconnecting openings such as enlarged bedding planes of fractures through which water may move to wells. Because these openings vary greatly in number and size from place to place, wells located only a short distance apart and tapping the same aquifer may show large differences in capacity.

Generally speaking, wells in the Niagara and Clinton groups in Greene County can be expected under favorable conditions to yield as much as 50 gallons a minute. Exceptional wells, such as a test well (No. 1240-L) at the Yellow Springs waterworks, yield as much as 150 gallons per minute or more, though no data are available as to the sustained yields of such wells over a long period of time. The average yield of 85 wells in Greene County that penetrated the Niagara and Clinton groups was 16 gallons a minute. The average specific capacity of 48 of these wells was 2.3 gallons a minute per foot of drawdown, which is about the same as for 56 wells in ground-moraine and end-moraine deposits.

Recharge to the Niagara and Clinton groups in Greene County must come primarily from direct precipitation, because the larger streams flow in valleys that are cut well below the base of these rocks. The chances are therefore small for inducing additional recharge by pumping heavily enough to lower the water levels in the outcrop area or other intake area of a given stratum, and it appears that the perennial water supply of these rocks is adequate only for relatively small-scale withdrawals.

## Ordovician System

### Richmond, Maysville, and Eden Groups

As shown in table 2, the Brassfield limestone of Clinton age is underlain by a thick succession of non-water-bearing shales and shaly limestones of Upper Ordovician age. The contact between these formations is shown on plate 15, B. The Ordovician rocks, including the Eden group, are made up of about 1,000 feet of soft greenish or blue-gray shales, interbedded with thin, hard layers of limestone. The limestone layers average between 1 and 5 inches in thickness and may make up from 25 to 50 percent of the whole sequence. Though lithologically similar throughout most of the section, the rocks are subdivided into groups and smaller units by classification of their fossils. In older reports they were referred to collectively as the Cincinnati shale. As shown on plate 1, this shale, which in outcrop is represented in Greene County almost entirely by the Richmond group, underlies the glacial drift throughout wide areas in the western part of the county where the overlying formations have been removed by erosion. Numerous outcrops of the Richmond group occur in Sugar Creek, Beaver Creek, Bath, and Xenia Townships. Locally the upper part of the Richmond group may contain lenses of sandy shale, as in the road cut at the southern end of Huffman Dam in western Bath Township. These sandy beds are not important water bearers. The upper part of the Richmond group may show striking red colors alternating with the prevailing greenish tints, as at Goes.

The shales and shaly limestones of these rock groups offer extremely poor possibilities for the development of ground-water supplies. The limestone layers are dense in texture, not very porous, and almost completely impervious to percolating water. The interbedded shale is fine-grained and also impervious. Practically the only water contained in these rocks is near the top where weathering has locally enlarged fracture or bedding planes. Because of the presence of pyrite and other minerals, any water found is likely to contain large amounts of iron or sulfur compounds.

Most wells drilled into the Ordovician shale are dry or yield barely enough water to supply a residence. The average yield is probably not more than 1 gallon a minute, with a considerable drawdown of the water level and a slow rate of recovery. Many drilled wells in the shale act primarily as storage reservoirs, the water from overlying glacial materials entering the well between the bottom of the casing and the top of the shale or through perforations in the casing. The chief importance of the impervious Ordovician shale with respect to ground water is that they deflect the water to the surface as springs.

## Water in Deep Wells Drilled for Oil or Gas

During the oil and gas boom of the last century, which achieved its greatest impetus in the 1880's, at least eight wells were drilled into the so-called Trenton limestone ("Birdseye limestone" of old reports), which has yielded large amounts of oil and gas in northwestern Ohio. The Trenton horizon of the driller averages about 500 feet in thickness in Greene County, and is reached at depths ranging from about 950 to 1,200 feet. It underlies the Richmond, Maysville, and Eden groups of Upper Ordovician age. All the older Trenton wells in Greene County were reported to be nonproductive, or did not produce oil or gas in commercial quantities, for all the wells are now abandoned and only fragmentary records remain. The record of one well (No. 21) drilled at the former site of Osborn, in the NE$\frac{1}{4}$ sec. 34, Bath Township, is given by Orton (9) as follows:

| | From | To |
|---|---|---|
| Glacial drift | 0 | 207 ft. |
| Blue shale (Richmond and Maysville) | 207 | 707 " |
| Darker shale (Eden shale) | 707 | 920 " |
| Gray rock | 920 | 990 " |
| Hard crystalline limestone (Trenton) | 990 | ___ " |

Gas was obtained in this well at 750 to 850 feet but apparently no water was encountered.

Interest in the possibilities of oil or gas production in Greene County has been revived within the past 10 years, and five more unsuccessful wells have been drilled to the Trenton limestone. The records of these wells have been made available by the Ohio Geological Survey. The locations of these more recent Trenton tests are shown by numbers 414, 881, 893, 1228, and 1237 on plate 17. These wells are located in Spring Valley, Caesar Creek, Miami, and Xenia Townships. The records of the wells are given as follows:

Well 414, drilled by Sun Oil Co., on Steele Poague property, 1939

| | From | To |
|---|---|---|
| Glacial drift | 0 | 124 ft. |
| Shale (Richmond and Maysville) | 124 | 878 " |
| Utica shale (Eden) | 878 | 1,059 " |
| Trenton | 1,059 | 1,512 " |
| Shale | 1,512 | 1,537 " |
| "Calciferous" | 1,537 | 1,537 " |

Well 881, drilled by Sun Oil Co., on E. M. Marshall property, 1939

| | From | To |
|---|---|---|
| Glacial drift | 0 | 292 ft. |
| Shale (Richmond and Maysville) | 292 | 934 " |
| Utica shale (Eden) | 934 | 1,107 " |
| Trenton limestone | 1,107 | 1,622 " |
| "Calciferous" (mostly dolomite) | 1,622 | 1,725 " |

Well 893, drilled by Sun Oil Co., on W. M. Henry property, 1940

| | From | To |
|---|---|---|
| Glacial drift | 0 | 173 ft. |
| Shale (Richmond and Maysville) | 173 | 940 " |
| Utica black shale (Eden) | 940 | 1,141 " |
| Trenton limestone | 1,141 | 1,644 " |
| "Glenwood" | 1,644 | 1,703 " |
| "St. Peters" | 1,703 | 1,735 " |
| "Calciferous" | 1,735 | 1,958 " |

Well 1228, drilled by Midwest Development Co., on A. E. Peterson property, 1938

| | From | To |
|---|---|---|
| Glacial drift | 0 | 14 ft. |
| Dolomite (Niagara and Clinton) | 14 | 150 " |
| Shale (Richmond, Maysville, and Eden) | 150 | 1,165 " |
| "Lime" | 1,170 | 1,198 " |
| Trenton limestone | 1,198 | 1,689 " |
| Shale, gray | 1,689 | 1,697 " |
| Dolomite | 1,697 | 1,706 " |
| Shale | 1,706 | 1,710 " |
| Dolomite | 1,710 | 1,843 " |

Well 1237, drilled by Sun Oil Co., on R. and R. Hackett property, 1942

| | From | To |
|---|---|---|
| Shale (Richmond and Maysville) | ? | 800 ft. |
| Utica black shale (Eden) | 800 | 913 " |
| Limestone | 913 | 923 " |
| Shale | 923 | 968 " |
| Trenton limestone | 968 | 1,255 " |

All the available records of deep wells drilled in Greene County indicate that the strata below the upper few feet of the Ordovician shale have been consistently dry down to the so-called blue lick water (St. Peter sandstone), at or not far below the base of the Trenton. The St. Peter apparently has yielded salt water at every place within the county where it has been penetrated. This is the source of the so-called "Okee" water, which is pumped from a deep well (No. 1243) at Spring Valley and sold for medicinal purposes. According to Orton (9), this well reached the Trenton between 850 and 875 feet, and was continued to a depth of about 1,500 feet, where a flow of salt water was struck. This water is strongly mineralized, as shown by the analysis made by C. S. Adams (10), Professor of Chemistry, Antioch College, Yellow Springs, Ohio, which is given in table 7. Dr. Adams writes, "The... analysis shows that the water contains rather large amounts of sodium chloride along with Epsom salts and Glaubers salts and traces of bromine and iodine..." Another well at Jamestown was drilled to the reported depth of 1,766 feet and a strong "sulphosaline" water, termed "1776 water," was obtained, which for a time was sold for medicinal purposes (2). A partial analysis of this water is also given in table 7.

The water found in the St. Peter sandstone is under sufficient artesian pressure to cause it to rise considerably above the level at which it is encountered in the wells. Water in the "Okee" well (No. 1243) at Spring Valley reportedly rose 800 feet after it was encountered. The static level in well No. 881 was measured at only 220 feet below the top on January 8, 1940, though this level might have been influenced by a reportedly leaking drive pipe that would admit some water from the glacial drift. The water in this well was first struck between the depths of 1,698 and 1,706 feet, and came in slowly, the well yielding 5½ bailers (approximately 150 gallons) in 2½ hours. More water came in between 1,706 and 1,713 feet and the water level rose 300 feet in 3½ hours. Between 1,713 and 1,725 feet a somewhat stronger flow was encountered that rose 400 feet in 3½ hours. Well No. 414 yielded a small amount of water at 1,527 feet, and well No. 1228 yielded from 10 to 12 gallons of water in 12 hours from a depth of 1,639 to 1,664 feet. Water was also encountered in this well between depths of 1,836 to 1,843 feet and rose 50 feet in 3 hours. This well (No. 1228) was later plugged back to 1,482 feet and shot with nitroglycerine from 1,455 to 1,475 feet. After this it produced a total of 5 barrels of water and 1½ barrels of oil.

The source of the "blue-lick" water found in the St. Peter sandstone is probably the outcrop area of the stratum in which it is found, as it is unlikely that water migrates from the surface downward through the impermeable Ordovician shale and the dense Trenton limestone. The Trenton limestone and the formations below it crop out in Kentucky. It seems probable that this is the intake area for the "blue-lick" water that migrates down dip to the southwestern Ohio area, becoming highly mineralized in its journey. The meager well records do not indicate large yields from the St. Peter sandstone and the possible commercial use of this water for its salt or other minerals, or the use of the stratum for the disposal of other unpotable water, should not be undertaken without conducting pumping tests to determine the capacity of the aquifer.

## UTILIZATION OF GROUND WATER

Most of the ground water used in Greene County is obtained from drilled wells. A considerable percentage of the water comes from dug and driven wells, also, and a small fraction is furnished by springs.

### Wells

Most drilled wells in rural areas of Greene County are constructed of galvanized iron casing 4¼ ,5, 5 5/8 or 6 inches in diameter. They range in depth from less than 30 feet to more than 200 feet, the average depth being less than 100 feet. Wells that obtain water from the glacial drift are generally left with the open end of the casing in permeable water-bearing sand or gravel that is sufficiently coarse to remain outside the casing when the wells are pumped. In some areas, however, generally in the buried valleys, wells penetrate thick deposits of sand so fine that it is carried in suspension into the well whenever the pressure in the well is lowered by pumping, until it fills the casing to the level of the pump intake and clogs the pump. Wells that end in such fine material, therefore, are satisfactory for only a short time. Few wells in rural areas in Greene County are equipped with well screens, though in most cases screened wells can be developed better by the driller and are useful for a longer period than wells of the open-end type. Wells drilled into consolidated rock formations are cased only to the top of the bedrock, and the hole is continued into the rock until it intersects sufficient water-bearing fractures or other openings to supply the required amount of water.

Water requirements for household use are generally estimated to be about 50 gallons of water per day for each person. If a hand pump is used, only small amounts are generally withdrawn from wells supplying water for household purposes. However, most electrically-powered pumps deliver 4 to 8 gallons per minute. Wells of small yield equipped with such pumps are therefore drilled deeper than the stratum from which the water is obtained in an effort to provide more storage space in the well. In many wells drilled into the Ordovician shale that part of the hole which is in the shale acts principally as a storage reservoir, most of the water from overlying rock or sand and gravel entering the well through perforations in the casing or at the point where the casing ends in the bedrock.

Generally speaking, the location of a well site in Greene County is selected not on the basis of the geology but on the basis of the location and size of the owner's property. Farmers generally have a somewhat wider choice of location than residents of towns, but this too is often limited to a certain small area where the water will be used or at which the pump can be operated most conveniently. In certain cases, however, it is necessary to locate the well as nearly as possible where geologic and hydrologic conditions are most favorable so as to minimize the risk of failure. This is especially true in the areas underlain by Ordovician shale and capped by relatively impermeable glacial till, where the percentage of drilled-well failures is high. In such areas it is desirable that wells be located where the glacial drift is thickest, for there the chances are greatest for encountering a water-bearing layer of sand or gravel in the drift. In some areas the consolidated rocks are more highly weathered in draws and valleys than on hills and knolls; wells in topographically low places might have a better chance of encountering water-bearing openings in the rocks. Also, ground water tends to move from high to low areas, so that the recharge conditions tend to be better in depressions than on hills.

In Greene County the ground water contains relatively large amounts of calcium and magnesium dissolved from limestone and dolomite or from gravels made up of those rocks. In many places the water is also high in iron compounds. Some wells, especially large-capacity wells, may become inefficient after being in use for a few months or years by the accumulation of calcium carbonate or iron compounds deposited on the openings of the well screens or of the water-bearing formation surrounding the well. This condition of incrustation is the chief cause of well trouble in Greene County, except for the presence of fine sand. According to G. F. Briggs (11),

> Well screen incrustation is usually due to the precipitation of carbonates--principally of calcium--from the ground water in the proximity of the well screen...... The deposit fills the voids, and the flow of water into the well is proportionately reduced.
>
> The probable explanation for this phenomenon is as follows: Calcium carbonate can be carried in solution in ground water in proportion to the amount of dissolved carbon dioxide in the water. The capacity of water to hold carbon dioxide in solution varies with the pressure--the higher the pressure the more carbon dioxide will be held. When water is pumped from a well, the water table is drawn down to produce the necessary gradient or pressure differential in the water-bearing formation to cause water to flow into the well. The hydrostatic pressure in the deeper portions of the water-bearing formation is thus decreased, the greatest change being at the well. Because of the reduction in pressure, more or less carbon dioxide is released from the water. When this occurs, the water is often unable to carry in solution its full load of calcium carbonate and part of this limey material is then precipitated in the sand adjacent to the well screen.

Thus far a means of entirely preventing the incrustation of well screens has not been found. Certain things can be done, however, to delay it and make it a less serious trouble.

First, the well screen itself should have the maximum possible inlet area to reduce the velocity of flow through the screen openings to a minimum. The length of the screen should be adequate, and the well should be properly finished by using the right method of developing the formation surrounding the screen. Second, the pumping rate may be reduced, under some circumstances, and the pumping period increased. This produces benefits to the extent that the drawdown is decreased. Third, the pumping load may be divided among a larger number of smaller wells instead of obtaining all of the supply from one or a few large wells. This also has the effect of reducing the drawdown.

## Springs

Springs or seeps represent visible natural discharge of ground water where it is deflected to the surface by impermeable rocks or by other means. In the glacial drift the upper surfaces of till or clay layers interbedded in water-bearing sands and gravels are common spring zones. In consolidated rocks the shale beds generally are impermeable and in places they deflect percolating ground water to the outcrop. The top of the Osgood and Massie shales of the Niagara group form prominent spring zones in Greene County, as does the upper surface of the Ordovician shale where they are overlain by the Brassfield limestone. Bedding planes in consolidated rocks are often the source of springs, and in Greene County the Springfield limestone and, to a lesser extent, the Cedarville dolomite, give rise to springs where the water follows bedding planes or shale partings to the outcrop.

Springs in the glacial drift are common along the Little Miami Valley in the Spring Valley and Trebein areas, along Glady Run, and in the lower part of Beaver Creek Valley. Springs originating in the consolidated rock formations are most common in Greene County in the gorges of Yellow Springs Creek and the Little Miami River at Clifton. In these areas the springs occur at the top of the Osgood and Massie shales and in the Springfield limestone and Cedarville dolomite. At Goes the base of the Brassfield limestone is a prominent spring horizon, and the Springfield limestone gives rise to springs along its outcrop in New Jasper Township.

### Yellow Spring

Probably the largest and certainly the best-known spring in Greene County is Yellow Spring, which issues from the side of the gorge of Yellow Springs Creek in Miami Township, and for which both the creek and the nearby town are named. Because of the large flow of Yellow Spring and the mineralized character of its water, which has resulted in the accumulation, around the orifice, of a large mound

A. The east side of the valley of Yellow Springs Creek, showing the large mound of travertine deposited by the Yellow Spring.

B. View of the Yellow Spring deposit on the flank of the mound, showing the inclination of the strata resulting from the sheet-like deposition of the travertine by the flow of spring water over the surface of the deposit.

Plate 17. Photographs of Yellow Spring deposit, Greene County, Ohio.

of iron-stained calcareous material called travertine, the spring has long been the object of interest and study. In recent years most of this study has been directed by A. C. Swinnerton, Professor of Geology at Antioch College, Yellow Springs, who, with the help of certain of his students, has contributed much of the present knowledge of the spring and its immediate area. Several years ago the spring was used as a source of water supply for Antioch College but because of the high mineral content of the water its use was never satisfactory.

The orifice of Yellow Spring is on the east side of the gorge in the eastern part of section 14, Miami Township, at the lower end of an artificial lake about 6 or 7 acres in extent, which was formed by damming the creek where the valley has been constricted by the mineral deposit from the spring. The waters of the spring issue from the Cedarville dolomite, from a fissure located near the top of the valley wall. The Cedarville forms the cap rock in the Yellow Springs area, and all the formations below it down to the Brassfield limestone are exposed in the gorge. In the vicinity of the spring the Cedarville is capped by glacial till about 10 feet thick.

The flow of Yellow Spring has been measured at various times since the earliest settlement of southwestern Ohio, and estimates range from more than 100 to as little as 60 gallons per minute. The most reliable of the recent calculations seem to have been made by Allan P. Bennison (12), a former student at Antioch College, who made weir measurements between June 1941 and May 1942. During this period the flow was found to range from 60 to 81 gallons per minute.

Yellow Spring, because of its iron-bearing water, is often referred to as a chalybeate spring. The total iron content of the water is not excessive, however, as indicated by the analysis shown in table 7. The spring deposit is composed of about 85 percent limestone ($CaCO_3$) and about 6 percent hematite ($Fe_2O_3$), the rest of the material being mostly organic. The bulk of the travertine of Yellow Spring, according to Professor Swinnerton (13), "is an earthy, porous, fragile tufa 1/, colored orange-brown by ferric oxide. This is interbedded with horizons of a white, more massive, but still porous travertine and with occasional thin layers of charred wood and other carbonaceous matter." As shown in the photograph, plate 17, A, this material has accumulated in the form of a mound 75 feet high and 500 feet in basal diameter where it rests against the valley wall. It is covered with small trees, grass, and bushes, and in appearance is similar to mounds formed in other places by slumping of the valley wall. The greater part of the deposit was laid down in broad, sheetlike layers by the spreading flow of the spring water over the surface of the mound. In the process leaves, twigs, numerous shells of land snails, and other organisms were trapped and encrusted. Plate 17, B, shows the character of the bedding of the deposit. The flow of the spring at present is confined to an

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1/ Limestone deposited by spring waters under atmospheric conditions is called travertine. When the material is porous or earthy in character it is called tufa rock, or calcareous tufa.

artificial channel across the top of the mound in which the water is discharged as a single stream.

The quantity of dissolved mineral matter in Yellow Spring water, and its rate of deposition, were studied by William K. Gealey (14), a former student at Antioch College. Successive analyses showed that precipitation of the dissolved minerals takes place very rapidly, nearly all the iron being deposited by the time the water has run over only about half the length of the mound. Of the nearly 400 parts per million of dissolved minerals that the spring water normally carries, about 18 parts per million is deposited along the artificial channel within 100 yards of the point of issuance. Precipitation of calcium carbonate results from the escape of carbon dioxide ($CO_2$) from the water as it issues from the rock into a different temperature and pressure environment. The temperature of the water at its point of issue is 53.6° F. and, so far as is known, it has varied only a little more than one-half degree from this figure.

Studies of the rate of deposition of the mineral matter from Yellow Springs water, and the consequent rate of growth of the mound, have been made primarily in an attempt to determine the length of postglacial time, for it is assumed that the deposit has been built since the retreat of the last ice sheet that covered this area, that of late Wisconsin time. The principal reason for the assumption that the spring deposit must be entirely postglacial in origin is given by Professor Swinnerton (15) as follows: "The ice moved from a northwesterly direction; the deposit is located on the east side of the valley--hence, it is reasonable to suppose that any pre-glacial deposit would have been removed by ice abrasion." Professor Swinnerton estimates the amount of material in the mound to be 100,000 cubic yards, weighing 168,750 tons. Assuming an average flow of 80 gallons per minute, and an average rate of deposition of 10.4 milligrams per 500 cubic centimeters, William Gealey (14) calculated that 7,304 pounds of travertine would be deposited in a year, and that the age of the deposit would be about 46,000 years. Other minor factors, some of which are difficult to evaluate, were not considered in this estimate. Other estimates of postglacial time based on the Yellow Spring deposit have been made by Professor Swinnerton and other observers and most of these agree substantially with Gealey's conclusions. Studies have also been made on the fossil content of the deposit in efforts to learn about climatic changes since glaciation and the evolution of some plant and animal life. In this work extensive tunneling of the mound has been done and much material taken out and studied by paleontologists. Because of the poor state of preservation of the fossils within the deposit, however, the results have been disappointing.

In the Yellow Springs gorge are at least two smaller mounds of travertine that were deposited by former springs, which no longer flow. These, plus the fact that some of the early measurements of the flow of Yellow Spring showed a flow somewhat larger than that of the last few years, have led some observers to speculate on the possibility that the spring might be slowly drying up. Inasmuch as very little is known of rainfall or other climatic conditions at the times of the earliest measurements, no definite conclusions can be drawn at present.

## Principal Ground-Water Users

Total industrial and municipal pumpage in Greene County averages about 7,500,000 gallons per day. This may be compared to a total of nearly 91,000,000 gallons per day in adjacent Montgomery County (5), which has the largest pumpage of all the counties in the State. Because the geologic and hydrologic conditions that make this large ground-water yield possible in Montgomery County occur in many areas in Greene County also, it is evident that large potentialities for development of additional ground-water supplies also exist in Greene County.

In table 3 are listed, in order of greatest pumpage, the principal ground-water users in Greene County, together with pertinent information on their wells and water supplies. None of these supplies are treated except the Xenia municipal supply, which is treated for iron removal.

## Tables of Water-Supply Data

The results of the field inventory of rural water supplies in Greene County, made in 1947-48, are given in table 8 in the appendix of this report. That table contains most of the data on which this report and several of the accompanying maps are based. The locations of the wells listed are shown on plate 18. As indicated by the data given in table 8, the average depth of 955 of the wells in Greene County investigated in the field survey is 81 feet. The average static water level in 288 of these wells was 55 feet. The most common type of pump in use in Greene County is the electrically operated deep-well piston-type pump having a capacity of 4 to 8 gallons a minute.

# CHEMICAL QUALITY OF THE GROUND WATER

Samples of ground water from 10 sources in Greene County were analyzed by the Quality of Water Branch, U. S. Geological Survey. These were samples of water from three wells in the valley-train deposits, one well in the outwash-plain deposits, two wells in ground-moraine or frontal-moraine deposits, two wells in the Silurian limestone, and two wells in the Ordovician shale. The results of these analyses are given in table 5, and also, in diagrammatic form, on plate 19. Included in table 5 is the analysis of a sample of surface water from the Little Miami River at Spring Valley. This sample, which was collected on May 10, 1946, is comparable to the average ground water of the county, though large variations in mineral content are often found in streams, depending on the rate of discharge. Chemical analyses were also obtained from the Ohio Department of Health of water for all the municipal systems and some other public supplies within the county. These analyses are given in table 6. In table 7 are analyses of the water from two wells drilled to the "blue-lick" water (St. Peter, sandstone) the "Okee" medicinal well at Spring Valley and the "1776" well at Jamestown. Also in table 7 are two typical analyses of water from Yellow Spring.

TABLE 3

Principal ground-water users in Greene County

| Name | Township | Use 1/ | Average Pumpage (gal. per day) | Number of Active Wells | Average Depth of wells (ft.) | Average Static Water levels 2/ | Well references | Aquifer 3/ |
|---|---|---|---|---|---|---|---|---|
| Wright-Patterson A.F. Base Areas A, C, and D 4/ | Bath | GP | 2,050,000 | 8 | 65 | 9 | 1241-L 1242-L | Gl. |
| Wright-Patterson A.F. Base Area B (auxiliary supply) 4/ | Bath | GP | 900,000 | 5 | 83 | 5 | 26-L | Gl. |
| Universal Atlas Portland Cement Company | Bath | Ind | 720,000 | 4 | 103 | 24 | | Gl. |
| Southwestern Portland Cement Company | Bath | Ind | 720,000 | 3 | 47 | | | Gl. |
| Xenia Ice Company | Xenia | Ind | 288,000 | 2 | 21 | | | Gl. |
| Ohio S. & S. O. Home | Xenia | GP | 168,000 | 1 | 65 | | 599-L | Gl. |
| Wilberforce University | Xenia | GP | 100,000 | 5 | 55 | | 562-L | Gl. |
| The Hooven & Allison Company | Xenia | Ind | 90,000 | 1 | 30 | | | Gl. |
| Xenia 4/ | Xenia | PS | 1,686,000 | 9 | 85 | 5/ | 543-5-L | Gl. |
| Osborn 4/ | Bath | PS | 350,000 | 2 | 48 | | 15-L | Gl. |
| Yellow Springs 4/ | Miami | PS | 225,000 | 1 | 24 | 8 | 1240-L | Ls |
| Cedarville 4/ | Cedarville | PS | 60,000 | 3 | 100 | 17 | 725-L | Ls |
| Fairfield 4/ | Bath | PS | 55,000 | 2 | 101 | | 22-L | Gl. |
| Jamestown 4/ | Silver Creek | PS | 33,000 | 3 | 112 | 12 | 1239-L | Ls |

1/ GP, general purpose; Ind, industrial processing; PS, public supply.

2/ Depth in feet below land surface.

3/ Gl, glacial drift; Ls, limestone.

4/ Supplies discussed in text under respective townships.

5/ See hydrograph on plate 21.

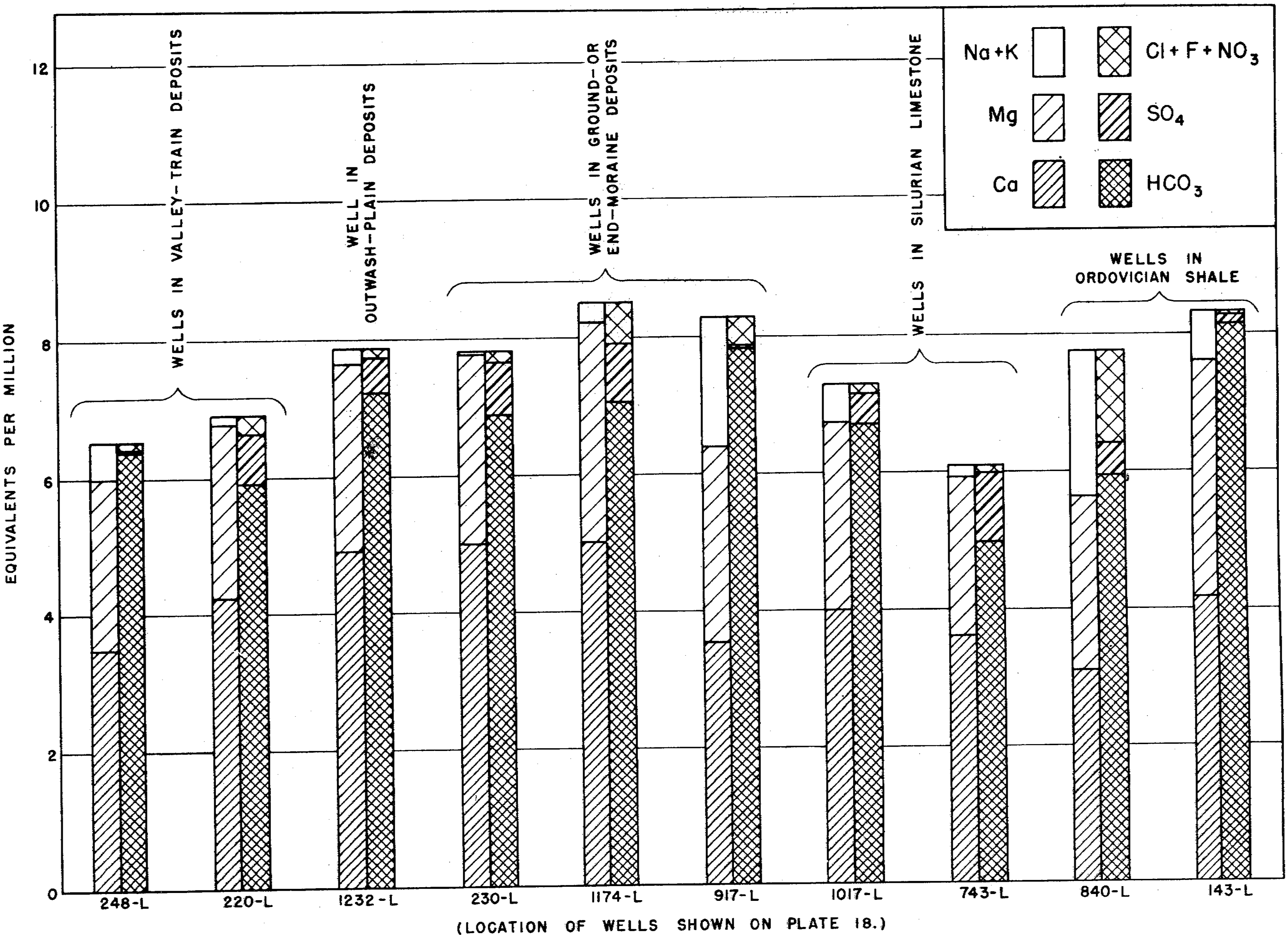


Plate 19. Chemical analyses of ground water from Greene County, Ohio.

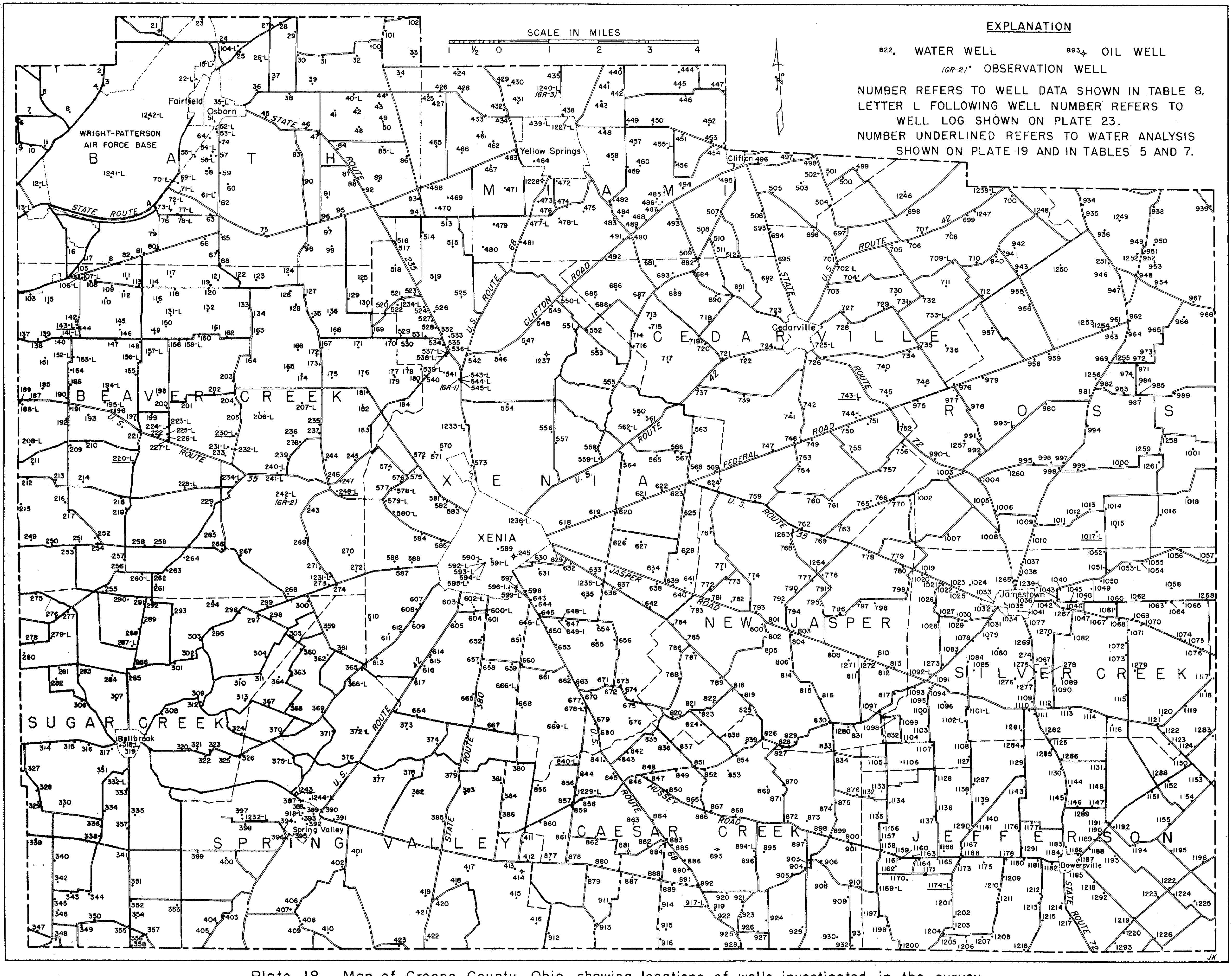


Plate 18. Map of Greene County, Ohio, showing locations of wells investigated in the survey.

The iron content and hardness of natural waters affect the suitability of the water for many uses. The average iron content and hardness of 22 ground-water samples in Greene County, representing wells in different geological formations, are shown in table 4.

Table 4

Average iron content and hardness of ground water from different geological formations in Greene County (in parts per million)

| Aquifer | Iron (Fe) | Total hardness as $CaCO_3$ | Number of samples |
|---|---|---|---|
| Valley-train deposits | 0.60 | 324 | 5 |
| Outwash-plain or kame deposits | .57 | 374 | 3 |
| Ground or frontal-moraine deposits | 1.25 | 400 | 8 |
| Silurian limestone | 1.10 | 343 | 4 |
| Ordovician shale | .80 | 331 | 2 |

On the basis of these few analyses there seem to be no significant differences in the waters from different aquifers. All samples were excessively hard and for most purposes softening would be desirable. The average iron content of the samples from all aquifers is also high, being above 0.3 ppm, which is about the maximum quantity of iron that ordinarily remains in solution without being precipitated on utensils or in wash water when exposed to air.

## Source and Significance of Mineral Constituents in Natural Waters

The characteristics and mineral constituents of natural waters here considered include those found in quantities sufficient to have a practical effect on the value of the waters for ordinary uses.

Color.-- In water analysis the term "color" refers to the appearance of water that is free from suspended solids. Color in natural waters is caused largely by organic matter extracted from decaying plants. A color less than 20 passes unnoticed. At many places high color in water results from industrial wastes.

pH.__ The acidity or alkalinity of a water, as indicated by the hydrogen-ion concentration, is related to the corrosiveness of the water and is of importance with reference to proper treatment for coagulation at water-treatment plants. The symbol pH is commonly used in indicating hydrogen-ion concentration. It represents the negative logarithm of the number of moles of ionized hydrogen per liter of water. For practical purposes, the pH scale may be used with reference to acidity and alkalinity as a temperature scale is used with reference to heat conditions. A neutral water has a pH of 7.0. The pH of most natural waters ranges from 6.0 to 8.0. Some alkaline waters have pH values greater than 8.0 and waters containing free mineral acid usually have pH values less than 4.5.

Table 5

Analyses of water from representative wells and the Little Miami River in Greene County, Ohio
(Quality of Water Branch, U. S. Geological Survey)

[Chemical constituents given in parts per million]

| Well No. | Owner | Approximate Location | Depth (Ft.) | Date | Silica ($SiO_2$) | Iron (Fe) | Calcium (Ca) | Magnesium (Mg) | Sodium and Potassium (Na + K) | Carbonate ($CO_3$) | Bicarbonate ($HCO_3$) | Sulphate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | Dissolved Solids | Total Hardness as $CaCO_3$ | Specific Conductance at 25°C (micromhos) | Color | pH | Temperature (°F) | Discharge (Sec.- ft.) | Aquifer |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 248-L | James Miller | Trebein | 53 | 12-6-48 | 14 | 2.0 | 70 | 30 | 14 | 0 | 390 | 0.8 | 4.0 | 0.1 | 1.6 | 323 | 295 | 584 | 4 | 7.9 | 54 | - | Valley train |
| 220-L | Harold Fetz | Zimmerman | 26 | 12-6-48 | 10 | 0.23 | 85 | 31 | 2.7 | 0 | 360 | 35 | 2.6 | 0.1 | 12 | 359 | 340 | 624 | 4 | 7.8 | 53 | - | Valley train |
| 1232-L | Roy Stoneburner | Spring Valley | 85 | 12-4-48 | 14 | 1.0 | 99 | 33 | 5.4 | 0 | 440 | 25 | 4.2 | 0.0 | 2.4 | 394 | 383 | 686 | 3 | 7.5 | 54 | - | Outwash plain |
| 230-L | S. O. Noble | Alpha | 48 | 12-7-48 | 12 | 0.21 | 100 | 34 | 1.2 | 0 | 419 | 37 | 2.8 | 0.1 | 7.3 | 407 | 389 | 696 | 5 | 7.3 | 54 | - | Ground or end moraine deposits |
| 1174-L | Grace Adams | Gunnerville | 74 | 12-4-48 | 12 | 0.52 | 101 | 39 | 6.9 | 0 | 432 | 41 | 10 | 0.3 | 25 | 458 | 412 | 775 | 5 | 7.7 | 53 | - | do |
| 917-L | John Wallace | Paintersville | 77 | 12-4-48 | 13 | 1.2 | 72 | 35 | 43 | 0 | 482 | 1.3 | 13 | 0.9 | 0.6 | 415 | 324 | 740 | 5 | 7.7 | 46 | - | do |
| 1017-L | J. E. Syfred | Jamestown | 100 | 12-6-48 | 15 | 1.6 | 81 | 33 | 13 | 0 | 410 | 22 | 1.8 | 1.2 | 2.6 | 379 | 338 | 653 | 5 | 7.9 | 53 | - | Silurian limestone |
| 743-L | J. H.Thordsen | Cedarville | 60 | 12-6-48 | 10 | 1.0 | 73 | 28 | 4.2 | 0 | 304 | 48 | 5 | 0.1 | 0.0 | 305 | 297 | 530 | 3 | 7.5 | 52 | - | do |
| 840-L | Alton Lumpkin | Xenia | 80 | 12-4-48 | 8.2 | 0.5 | 62 | 31 | 50 | 0 | 362 | 22 | 47 | 0.9 | 2.8 | 412 | 282 | 735 | 2 | 7.7 | 54 | - | Ordovician shale |
| 143-L | R. T. Cousineau | New Germany | 80 | 12-4-48 | 12 | 1.1 | 83 | 42 | 18 | 0 | 496 | 8.4 | 1.2 | 0.5 | 0.8 | 414 | 380 | 726 | 5 | 7.6 | 52 | - | do |
| Little Miami River at Spring Valley | | | - | 5-10-46 | 4.8 | 0.07 | 74 | 31 | 4.3 | - | 314 | 48 | 6.5 | 0.2 | 5.6 | 348 | 312 | 576 | 16 | 7.9 | 60 | 164 | - |
| | | | - | 9-4-46 | - | - | - | - | - | - | 327 | - | - | - | - | - | - | 581 | 7 | 7.8 | - | 55 | - |

Table 6

Analyses of water from public supplies in Greene County, Ohio
(State of Ohio, Department of Health)

[Chemical constituents given in parts per million]

| Municipality | Source | Treatment | Date | Silica ($SiO_2$) | Iron (Fe) | Calcium (Ca) | Magnesium (Mg) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Non carbonate Hardness | Turbidity | Manganese (Mn) | Chloride (Cl) | Fluoride (F) | Nitrate ($NO_3$) | Dissolved Solids | Total Hardness as $CaCO_3$ | Color | Free $CO_2$ | pH before treatment | pH after $CaCO_3$ treatment | Aquifer |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bellbrook | Public School | None | 5-22-47 | 6 | 0.05 | 69 | 26 | 250 | 0 | 30 | 0 | .00 | 7 | .1 | - | 332 | 280 | 0 | 24 | 7.3 | 7.3 | Valley train |
| Spring Valley | Canning factory | do | 5-22-47 | 15 | 1.15 | 78 | 29 | 335 | 0 | 0 | 15 | .05 | 8 | .2 | - | 365 | 315 | 10 | 24 | 7.4 | 7.3 | do |
| Cedarville | Waterworks tap | do | 3-10-48 | 12 | 0.2 | 94 | 35 | 302 | 0 | 76 | 0 | .02 | 27 | .1 | 1.0 | 463 | 378 | 2 | 40 | 7.3 | 7.2 | Silurian limestone |
| Jamestown | Waterworks tap | do | 9-21-48 | 15 | 1.6 | 92 | 31 | 377 | 0 | 0 | 12 | .01 | 12 | .9 | .04 | 479 | 359 | 5 | 31 | 7.4 | 7.2 | do |
| Xenia | Waterworks raw | Iron removal | 9-21-48 | 11 | 0.7 | 84 | 27 | 284 | 0 | 38 | 0 | .08 | 7 | .1 | - | 358 | 322 | 1 | 36 | 7.3 | 7.2 | Valley train |
| Xenia | Waterworks tap | do | 9-21-48 | 10 | 0.25 | 86 | 27 | 284 | 0 | 44 | 0 | .02 | 6 | .1 | 12 | 362 | 328 | 0 | 13 | 7.6 | 7.5 | do |
| Yellow Springs | Waterworks tap | Chlorine disinfection | 9-21-48 | 8 | 0.1 | 105 | 25 | 293 | 0 | 74 | 0 | .05 | 5 | .1 | .02 | 420 | 367 | 3 | 47 | 7.1 | 7.1 | Outwash plain |
| Osborn | Waterworks north well | do | 2-11-47 | 8 | 0.05 | 97 | 34 | 294 | 0 | 88 | 0 | .00 | 22 | .0 | - | 504 | 382 | 5 | 24 | 7.4 | 7.3 | Valley train |
| Fairfield | Waterworks tap | do | 6-8-48 | 13 | 0.6 | 89 | 36 | 309 | 0 | 62 | 5 | .10 | 77 | .1 | - | 624 | 371 | 2 | 24 | 7.4 | 7.2 | do |
| Xenia | O.S.S.O. Home | None | 6-1-39 | 12 | 0.1 | - | 41 | 360 | 0 | - | 0 | .03 | 17 | .1 | - | 528 | 444 | 2 | 58 | 7.1 | - | End moraine deposits |
| Wilberforce | Old power house middle well | do | 9-30-43 | 12 | 2.6 | - | - | 350 | 0 | - | 35 | .18 | 12 | .15 | - | 584 | 461 | 10 | 67 | 7.0 | - | do |

Table 7

Analyses of water from miscellaneous sources in Greene County, Ohio

[Chemical constituents given in parts per million]

| Source | Location | Depth of Well (Ft.) | Date | Silica ($SiO_2$) | Iron (Fe) | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Carbonate ($CO_3$) | Bicarbonate ($HCO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Nitrate ($NO_3$) | Nitrite ($NO_2$) | Aluminum (Al) | Ammonia ($NH_3$) | Phosphate ($PO_4$) | Bromine (Br) | Iodine (I) | Insoluble Residue | Traces and Losses | Turbidity | Total Solids | Source of Data (1) | Aquifer |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mineral Well (2) | Spring Valley | 1480 | - | 15 | 2.5 | 914 | 177.9 | 6059 | 350.4 | 0 | 136.6 | 3638.4 | 9,791.7 | 0.3 | 0.1 | 240.1 | 0.99 | 9.5 | 26.8 | Tr. | 21.8 | 205.5 | 12 | 21,591.59 | 10 | "Blue Lick" Horizon |
| Mineral Well (3) | Jamestown | 1776 | - | 69 | 57 | 2,351 | 854 | 7951 | 90 | 0 | 329 | 2015 | 17,110 | - | - | - | - | Tr. | 422 | 73 | - | - | - | 33,658 | 2 | do |
| Yellow Spring | Yellow Springs | - | 1901 | 24 | 1.4 | 89 | 37 | (4) 6.9 | - | 0 | 406 | 16 | 2.5 | 0.1 | - | - | - | - | - | - | - | - | - | 394 | 2 | Cedarville Dolomite |
| do | do | - | - | - | 1.0 | 93 | 41 | 0 | - | - | 457 | 20 | 6 | 0.5 | - | - | - | - | - | - | - | - | - | - | 13 | do |

(1) Numbers in this column refer to publications listed in the bibliography.
(2) Known as "OKEE" well. (No.1243)
(3) Formerly known as "1776" well.
(4) Sodium + Potassium

Specific conductance.--- The specific conductance of a water is a measure of its ability to conduct a current of electricity. It varies with the concentration and degree of ionization of the different minerals in solution. Specific conductance is expressed in micromhos, K x $10^6$. In earlier publications it was reported as K x $10^5$.

Silica ($SiO_2$).--Silica is dissolved from practically all rocks. A few natural waters contain less than 3 parts per million of silica and some contain more than 50 parts, but most of them contain from 10 to 30 parts per million. Silica affects the usefulness of a water because it contributes to the formation of boiler scale.

Aluminum and manganese (Al and Mn).-- Aluminum and manganese are not regularly determined in the practical analysis of water. However, acid waters may have relatively large quantities of these constituents, which can be troublesome to certain users of the waters. Manganese is especially objectionable in laundry work and in textile processing that involves washing because, like iron, it causes staining.

Iron (Fe).-- Iron is dissolved from many rocks and soils. On exposure to the air, water that contains more than about 0.3 part per million of iron soon becomes turbid with the insoluble compound produced by oxidation. This causes stains on porcelain or enameled ware and on clothing or other fabrics washed in the water.

Calcium (Ca).-- Calcium is dissolved from practically all rocks, but particularly from limestone, dolomite, and gypsum. Calcium and magnesium make water hard and are the active agents in forming boiler scale.

Magnesium (Mg).-- Magnesium is dissolved from many rocks but particularly from dolomite or dolomitic limestone. Its effects are similar to those of calcium and, in addition, waters that contain much magnesium and chloride are likely to be corrosive, especially in steam boilers. The magnesium in soft waters may amount to only 1 or 2 parts per million, but that in water in areas of dolomite or dolomitic limestone may amount to 20 to 50 parts per million, or more.

Sodium and potassium (Na and K).--Sodium and potassium are dissolved from practically all rocks, but they make up only a small part of the dissolved mineral matter in most waters in humid regions. Natural waters that contain only 3 or 4 parts per million of the two together are likely to carry about equal quantities of each. As the total quantity of these constituents increases the proportion of sodium becomes greater. Moderate quantities of these constituents have little effect, but more than 50 or 100 parts per million of the two may require careful operation of steam boilers to prevent foaming. Waters that contain large quantities of sodium salts may be injurious to crops, and some waters contain so much sodium that they are unfit for nearly all uses.

Carbonate and bicarbonate ($CO_3$ and $HCO_3$).-- Carbonate and bicarbonate occur in waters largely through the action of carbon dioxide, which enables the water to dissolve carbonates of calcium and magnesium, converting them to bicarbonates. Carbonate is not present in appreciable quantities in most natural waters. Waters that come from insoluble rocks may contain less than 10 parts per million of bicarbonate; many waters from linestone contain from 200 to 400 parts per million; and certain waters that contain sodium bicarbonate may contain 1,000 or more parts per million of bicarbonate. Water containing large quantities of bicarbonates are unsatisfactory for use in boilers or condensers without treatment because, upon heating, the soluble bicarbonates of calcium and magnesium are converted to insoluble carbonates, which are deposited as a hard scale in the boiler tubes or condensing system. A large quantity of bicarbonate may make water unsatisfactory for drinking and other domestic uses.

Sulfate ($SO_4$).-- Sulfate is dissolved in large quantities from gypsum ($CaSO_4 . 2H_2O$) and from deposits of Glauber salt ($Na_2SO_4 . 10H_2O$). It is also formed by the oxidation of sulfides of iron and other metals and is generally present in considerable quantities in waters from mines and from many beds of shale. Sulfate in waters that contain much calcium and magnesium contributes to the formation of hard scale in steam boilers and may increase the cost of softening the water.

Chloride (Cl).-- Chloride is dissolved in small quantities from soil or rocks in most parts of the country. The chloride in waters normally has little effect on their use unless it is present in excessive quantities. Chloride in excess of about 500 parts per million can generally be detected by taste, but it is not too distasteful for domestic use even when in the range of 500 to 800 parts per million. Because of the highly corrosive nature of waters containing excessive amounts of calcium or magnesium chlorides, industries necessarily require water relatively free of these salts.

Fluoride (C).-- Fluoride has been reported as being present in the rocks of the earth's crust to about the same extent as chloride. However, the quantity of fluoride present in a natural water is usually much less than that of chloride. Fluoride in water is associated with the dental defect known as mottled enamel, if the water is used for drinking by young children during calcification or formation of the teeth. This condition becomes more noticeable as the quantity of fluoride in water increases above 1 part per million. It is reported also that the incidence of dental caries (decay of teeth) is less where the water contains small quantities of fluoride than where it contains none.

Nitrate ($NO_3$).--Nitrate in water is generally the final oxidation product of nitrogenous organic material. The quantities usually present have little effect on the value of water for ordinary use. Quantities of nitrate in excess of about 10 parts per million, however, suggest organic pollution.

Dissolved solids.-- The quantity reported as dissolved solids (the residue on evaporation) consists mainly of the dissolved mineral constituents in the water. It may also contain some organic matter and water of crystallization. Waters having less than 500 parts per million of dissolved solids are usually satisfactory for domestic and most industrial uses. Waters with more than 1,000 parts per million of dissolved solids are likely to be unsuitable for most uses.

Hardness.-- Hardness is usually expressed as the quantity of calcium carbonate ($CaCO_3$) equivalent to the calcium and magnesium present. Water that has less than 50 parts per million of hardness is usually rated as soft and its treatment for removal of hardness is seldom justified. Hardness of 50 to 150 parts per million does not seriously interfere with the use of water for many purposes but its removal by softening processes may be profitable for laundries and other industries. Water with hardness of more than 150 parts per million can be profitably softened for many uses.

## Expression of Analyses

Parts per million (ppm).-- A quantity expressed in parts per million is a measure of the concentration of a dissolved constituent by weight in a million parts of the water by weight. Thus, a water that contains 1 part per million of calcium contains 1 part of calcium by weight in 1 million parts of water by weight. To convert parts per million to grains per gallon, divide parts per million by 17.12.

Equivalents per million (epm).-- An equivalent per million is a unit chemical equivalent weight of a constituent in a million unit weights of water. A unit chemical equivalent weight may be calculated by dividing the concentration of a constituent in parts per million by the chemical combining weight of the constituent.

In order to compare analyses it is often desirable to express them in equivalents per million. In this form the concentrations of the constituents are directly comparable, whereas in parts per million they are not. This is because elements or radicals of different atomic weights unite to form compounds. For example, 23 grams of sodium (Na) is equivalent chemically to 35.5 grams of chlorine (Cl). They combine to form the compound sodium chloride, or common salt.

## Interpretation of Water Analyses

The water analyses in this bulletin are stated in the ionic form in parts per million, with no attempt to state the manner in which they may be associated. Methods have been devised for expressing the ions in hypothetical combinations, and to the layman such hypothetical combinations often make the analysis more intelligible. The method of Hale, as described by Montgomery (17), is often used for computing hypothetical combinations. According to Montgomery's description, the method of combining is as follows: "Calcium is first combined with bicarbonate. If there is excess calcium above that required for bicarbonate, it is combined with sulfate, chloride, and nitrate, until exhausted. As each positive and negative radical is used up, the next following radical is combined until the radicals on both sides are exhausted."

Diagramming a water analysis consits of plotting to scale the cations (positive ions), expressed in equivalents per million, alongside the anions (negative ions) expressed similarly. Cations are plotted from bottom to top in the order of calcium, magnesium, sodium, and potassium; anions, in the order of bicarbonate, sulfate, chloride, fluoride, and nitrate.

Hypothetical combinations are made from bottom to top, combining the calcium with bicarbonate until the calcium is exhausted, etc., as previously explained. By scaling the diagram the amounts of the hypothetical compounds can be determined in equivalents per million, which can then be converted to parts per million by multiplying the e.p.m. of each compound so scaled by its appropriate chemical factor (combination factor) as follows:

$$\text{e.p.m.} = \text{p.p.m.} \times \frac{\text{valence}}{\text{atomic weight}}$$

Diagrams of analyses of the representative waters from Greene County as given in table 5 are shown on plate 19. These diagrams are drawn so that hypothetical combinations of compounds can readily be seen.

## GROUND-WATER CONDITIONS IN SPECIFIC AREAS

Plate 20 is a map of Greene County showing ground-water conditions. This map was compiled from plates 1 and 2 and from the water-supply data in table 8. The hydrologic areas shown on plate 20 correspond generally to the areas underlain by the different geologic formations, whose water-bearing properties have been discussed. The best ground-water areas in the county are in parts of the buried valleys where permeable outwash deposits of gravel and sand are traversed by the larger streams. Wells in these areas are favorably situated to receive recharge from stream infiltration, and consequently the water-bearing capacity of the aquifers is determined largely by the total amount of stream water that can be induced by pumping to enter the water-bearing formations. In other areas underlain by permeable outwash deposits, but not traversed by streams, recharge to the aquifers must come directly from precipitation, and consequently the sustained yields of wells in these areas are much less than of those wells receiving stream infiltration.

In the northwestern part of the county the limestones and dolomites of Niagara and Clinton age are the principal aquifers, and ground-water conditions in these areas are good. Adequate supplies can generally be obtained from these formations for home, farm, and limited industrial or municipal use. In most of the rest of the county ground-water supplies are generally obtained from interbedded sand and gravel layers within the glacial till, or from more extensive outwash deposits, which in some areas are covered by till. The poorest ground-water areas in Greene County are those in which thin glacial till directly overlies the non-water-bearing Ordovician shale. Most supplies in these areas are obtained from dug wells in the till, and many drilled wells that penetrate the shale are unsuccessful. These poor ground-water areas are mostly confined to western Sugar Creek Township, but they also occur in eastern Bath Township and in isolated areas in other parts of the county.

### Bath Township

Bath Township is traversed from north to south by a broad buried valley whose course lies between Fairfield and Huffman Dam. This buried valley is filled with

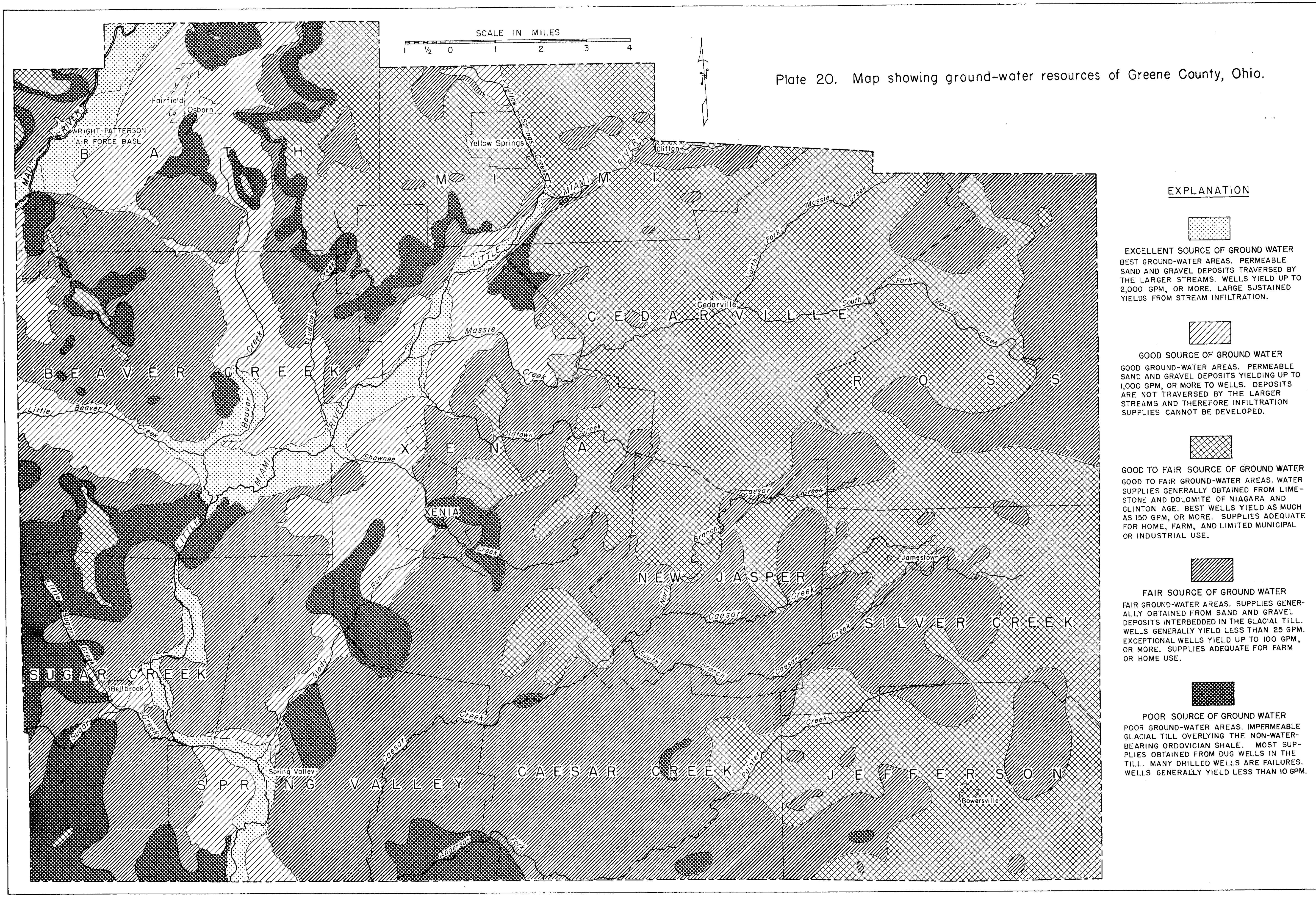


Plate 20. Map showing ground-water resources of Greene County, Ohio.

very permeable glacial sands and gravels more than 200 feet thick, and ground-water conditions, especially near the Mad River, are among the best in the county. Wells on the upland areas in the eastern and western parts of Bath Township generally obtain water from the limestones and dolomites of Niagaran and Clinton age, which provide adequate supplies for farm use. Very poor ground-water conditions exist in the area immediately south of Osborn, including most of the Osborn View residential development in sections 20 and 26. In this area the Ordovician shale lies close to the surface and many wells in these formations are failures or obtain only a small amount of water at the top of the bedrock. The Wright View residential development, which is mostly in section 25, is also near the edge of this bedrock hill but the glacial drift is thicker than at Osborn View and most wells obtain water in coarse gravel at depths of 50 to 155 feet. The average depth of all wells that were investigated in Bath Township was 75 feet. The average static water level in these wells was 26 feet below the ground surface.

## Wright-Patterson Air Force Base

The water supply for areas A, C, and D of the Wright-Patterson Air Force Base is obtained from eight drilled wells located in about the center of the reservation, and within the main buried valley area. The wells range in depth from about 60 to 100 feet and are 20 inches in diameter. Drilling records in the area (see well Nos. 1241-L and 1242-L for reference) show no distinct till layers interbedded in the outwash gravels, and water-table conditions probably prevail. The production wells have been tested at rates of 500 to 1,500 gallons per minute with drawdowns of 7 to 22 feet. The average static water level in the area is about 9 feet below the surface. The water is not treated, except by chlorination, and average daily pumpage amounts to about 2,000,000 gallons.

Another well field has been developed in the Wright-Patterson area, just above Huffman Dam, where five 36-inch-diameter wells have been drilled. These wells range in depth from 75 to 90 feet (see well No. 12-L for reference) and furnish a reserve supply for Area B, which is located just below Huffman Dam in Montgomery County. The yield of each well is slightly more than 1,500 gallons a minute, with a drawdown at this rate of about 6 feet. Each well is pumped 2 hours per day, and the total average pumpage is about 900,000 gallons per day. The records of these wells show coarse sand and gravel underlying the area to the maximum depth reached of 90 feet. No definite till or clay layers were reported. When this well field was developed in 1945, preliminary test wells were finished 12 inches in diameter. When tested they were pumped at rates of 500 to 1,500 gallons a minute and the drawdowns ranged from 5 to 40 feet. Specific capacities of the wells ranged from 36 to 111 gallons a minute per foot of drawdown.

## Fairfield

The village of Fairfield has one main well 8 inches in diameter and about 100 feet deep, and another 8-inch well of the same depth is used as a stand-by. These wells are located north of the town and at the edge of the buried-valley area in which the Wright-Patterson Air Force Base wells are drilled. The yield of the main Fairfield well is 500 gallons a minute. At that rate the water is reported to stand 88 feet below the surface. The stand-by well yields 250 gallons a minute. When originally tested at 125 gallons a minute, the drawdown was 7 feet. The static level was 7 feet below the surface. The log of the stand-by well (No. 22-L) shows some till or clay overlying the more permeable outwash gravels, and ground-water conditions, therefore, are probably not as good as toward the center of the buried-valley area. Fairfield water is not treated, except by chlorination. The average daily pumpage is 55,000 gallons.

## Osborn

The village of Osborn has two main wells, 12 inches in diameter and about 48 feet deep, located at the north end of town at the edge of the main buried valley that crosses Bath Township. The logs of these wells (see No. 15-L) show about 20 feet of till overlying the water-bearing sands and gravels. The wells yield 275 gallons a minute each, and the average daily pumpage is 350,000 gallons. Additional wells have been drilled in the southern part of town, near well No. 51. At this location the Ordovician shale is encountered about 50 feet below the surface, and it is overlain by about 20 feet of permeable gravel in which the wells are developed. These are called the "park wells," three of which are used to augment the main supply in times of excessive demand. At least one other production well of 26-inch diameter was constructed recently at this site.

## Beaver Creek Township

Three buried valley tributaries come together in the Alpha-Trebein area to form the main stem of the preglacial Hamilton River that flowed through Zimmerman toward the Dayton area in adjacent Montgomery County. The junction of these three buried valleys in Beaver Creek Township forms a broad lowland which is underlain with permeable sands and gravels and is traversed by the Little Miami River and Beaver Creek. It is potentially one of the best ground-water areas in the county.

There are at least two principal aquifers in the Alpha-Trebein area. Sand and gravel immediately under the soil zones yield water to dug and driven wells in quantities sufficient for most domestic needs. However, the best aquifer lies from 80 to 100 feet below the surface and is separated from the upper sand and gravel by a thin and impermeable till layer, which confines the lower water under strong artesian pressure. The relationship of the two aquifers is brought out by means of cross-section diagram A-A' shown on plate 14. The great width of the buried valley area around Alpha and Trebein is also apparent from a comparison of cross section A-A' with cross section B-B', which is shown on plate 15.

Practically all the wells in Alpha are either dug or driven. There is one drilled well (No. 234-L) in the center of the town, which obtains water from the lower aquifer at a depth of 91 feet. The static water level in this well is about 2 feet above the ground surface. Another well (No. 242-L) about midway between

Alpha and Trebein, on the H. K. Ankeney farm, was drilled as a test well by the Ohio Water Resources Board to explore further the character of the lower aquifer, and to serve as an observation well (Gr-2) in this aquifer. The confining till layer was struck in this well at a depth of 97 feet, and when the drill broke through the till into coarse gravel, which contained some stones as large as golf balls, the water gushed out of the casing at a rate of at least 100 gallons a minute, as estimated by the driller, John A. Conner of Wilmington. It was only with the greatest difficulty that the casing was driven down to shut off this strong flow so that drilling could be resumed. The remainder of the hole, down to the total depth of 178 feet, showed less permeable material than that found immediately below the till layer. The water level in the well at present is about at the ground surface. An automatic water-stage recorder has been maintained on this well since September 1948 by the Ohio Water Resources Board and the U. S. Geological Survey.

Another flowing well (No. 243) was drilled about half a mile southwest of Trebein on the Swaney farm. This well is 80 feet deep and the static water level rose 8 feet above the ground surface. The well flowed at the rate of about 60 gallons a minute from an orifice 18 inches above the ground surface. A log is not available for this well but Nelson Moore, the tenant, said he was certain a "clay bed" lay just above the gravel aquifer.

Ground-water conditions in Beaver Creek Township in the buried-valley area that extends north from Trebein and forms the present valley of Beaver Creek are also good, probably in part comparable to the Alpha-Trebein area. An accurate analysis of its potentialities is not possible, however, because adequate test-well data are not available.

Elsewhere in the buried-valley areas of Beaver Creek Township ground-water conditions are not generally good because of the fine sand that makes up much of the valley fill. This sand is troublesome, especially in the Zimmerman area and along parts of State Highway 35 above and below its intersection with Zimmerman Road. In these areas many of the wells have been drilled more than 200 feet deep in an attempt to find coarser materials near the top of the bedrock. Fine sand is also encountered in many of the wells in the Knollwood section, located north of Highway 35. At places in this area wells are developed in the sand, and because the water level generally rises in the casing to a substantial height, the well seems satisfactory. When pumping begins, however, the lowering of the water level in the well allows the fine sand to come up in the casing, and in a short time it rises to the bottom of the pump pipe and clogs the pump. In all these areas of fine sand, the situation is made worse by the fact that the area is underlain by the non-water-bearing Ordovician shale. Some wells are carried into the shale in an attempt to find water or to create a reservoir for water that may enter the well between the top of the rock and the bottom of the casing, or through slots that are cut into the casing by a perforator after the well is drilled. In either case fine sand often enters the well with the water and clogs the pump after a short time. Among the other methods of coping with the problem of fine sand, some drillers often fill the lower part of the well with clean pea-sized gravel in what is usually an unsuccessful attempt to hold down the sand. Whether commercial well screens could be obtained with slots fine enough to screen out the sand and yet permit the passage of water into the well is conjectural, for apparently none have been tried in this area.

Ground-water conditions in the upland areas of Beaver Creek Township are generally poor, for the bedrock is close to the surface and is covered with till, in which only dug wells are generally successful. The bedrock itself is mostly Ordovician shale, capped in some places with a thin remnant of the Brassfield lime stone, which is generally of insufficient thickness to supply any but domestic wells. The average depth of all wells surveyed in Beaver Creek Township was 102 feet. The average water level in these wells was about 44 feet below the land surface. No large commercial or industrial supplies have been developed in the township.

## Caesar Creek Township

Thick impermeable till covers most of the surface of Caesar Creek Township, and the bedrock is mostly Ordovician shale, except for the upland north of Paintersville. Ground-water conditions, therefore, are not generally good except for farm or domestic supplies, which are obtained from the Silurian limestone in upland areas north of Paintersville, or from sand and gravel layers interbedded in or occurring below the till. A deep buried valley underlies the middle of the township and this valley splits at Maple Corners into a northern and a southern branch. The thickness of the glacial drift over these buried-valley areas is generally more than 300 feet, though the drift contains permeable beds near the top and most domestic wells are comparatively shallow. The average depth of all wells surveyed in Caesar Creek Township was 87 feet. The average depth to water in these wells was 24 feet. There are no large ground-water developments in Caesar Creek Township and no very promising areas exist for such development. The best places seem to be the upland north of Paintersville, where limestone wells with capacities up to about 50 gallons a minute might be developed, or possibly along that part of Caesar Creek which bounds the northwest corner of the township, where shallow alluvial or outwash gravels occur.

## Cedarville Township

Almost all of Cedarville Township is covered with impermeable till, which is generally less than 50 feet thick and in many places is less than 20 feet thick. Most ground-water supplies are taken from the limestones and dolomites of the Niagara group, which form the bedrock in most of the area. The average depth of the wells surveyed in the township was 69 feet. The average depth to water in these wells was 19 feet.

## Cedarville

The village of Cedarville has five drilled wells, four of which penetrate the Niagara group to the top of the Osgood shale at depths of about 100 feet. (See well 725-L for reference.) One well at Cedarville is reported to be 300 feet deep, which would carry it far below the Brassfield limestone and into the Ordovician shale. Only three wells are used at present, the best being a Niagara well only 5 inches in diameter. This well is equipped with a turbine pump and yields 70 gallons a minute with only a 6-foot drawdown. The other two wells, which are held mostly in reserve, are 10 inches in diameter and yield only about 25 gallons a minute each, with drawdowns to almost 100 feet below the surface after about 6 hours of pumping. These wells require 2 or 3 hours to recover to the static level, which is about 17 feet below the land surface. One of the stand-by wells is the same depth and taps the same rocks as the main well, and the other is 300 feet deep and penetrates both the Niagara and Clinton groups. The fact that the yields of the stand-by wells are so much less than that of the main well, when all wells tap the same formations and are less than 100 feet apart, emphasizes the highly variable hydrologic conditions found in consolidated rock aquifers. The main well in this case has apparently intersected more or larger water-conducting openings in the rocks than have the other two wells.

Another deep well at Cedarville that taps both the Niagara and Clinton groups was drilled for oil or gas about 1880 at the site of the Yellow Springs Foundry, formerly the Hager Paper Mill. This is in the southwestern part of Cedarville near the large abandoned quarry. It was reported (2) that a strong flow of water was encountered in this well at a depth of 250 feet, which would probably be near or below the base of the Brassfield limestone. This well was carried to a depth of 1,500 feet and, when oil or gas was not found, it was plugged back to about 300 feet to utilize the water. It reportedly was test-pumped at 150 to 200 gallons a minute with a pumping level about 75 feet below the surface. In 1903 two additional wells were drilled and water was encountered at the same depth as in the original well. It was said that the pumping of one well immediately affected the water levels of the others. None of these wells are used at the present time.

## Jefferson Township

Jefferson Township is covered by till generally less than 50 feet thick, except in the areas covered by the end moraine near Jamestown, and in a buried-valley area south of Gunnerville, where the depth to bedrock is considerably greater in places.

Most water supplies are taken from the glacial drift in the buried-valley area south of Gunnerville, and in the remainder of the township, water is obtained from the limestones and dolomite of the Niagara group, which makes up the bedrock. No large water-supply developments exist within the township, as Bowersville, the only community of any size, does not have a public supply. The average depth of all the wells surveyed in Jefferson township was 69 feet. The average depth to water in these wells was 11 feet.

## Miami Township

Almost all of Miami Township is underlain by limestone and dolomite of the Niagara group, which is generally covered by less than 20 feet of till. Consequently most farm and domestic water supplies are taken from wells that penetrate the consolidated rocks.

There is a small area north of Yellow Springs, however, in which the Niagara group is covered by glacial-outwash gravels. The village of Yellow Springs obtains most of its water supply from a well in those gravels. Alluvial and glacial gravels also fill the valley of the Little Miami River south of Yellow Springs, and very large water supplies probably could be developed in that area. Wells drilled into the gravels might induce infiltration from the river. The average depth of all wells surveyed in Miami Township was 58 feet. The average depth to water in these wells was 19 feet.

## Yellow Springs

At the Yellow Springs waterworks, about a mile north of the village, most of the supply is pumped from a large dug well that penetrates about 20 feet of glacial gravels lying on top of the Niagara group. Two 8-inch wells drilled 20 feet into the Niagara are pumped at rates of 25 to 50 gallons a minute into the dug well to augment the supply in times of dry weather. It is reported that one of these Niagara wells, called the north well, was originally pumped for 45 days, more or less continuously, at 75 to 80 gallons a minute, but no records are available of the resulting drawdown of the water levels in the well field. The static water levels in the dug well and in the Niagara wells now average about 8 feet below the land surface.

In 1946 an 8-inch well (No. 1240-L) was drilled through both the Niagara and Clinton groups to the top of the Ordovician shale, which was reached at a depth of 111 feet. This well penetrated 20 feet of the Springfield and Euphemia formations, 30 feet of the Osgood shale, and 41 feet of the limestones of the Clinton group. A pumping test of this well was made by E. J. Schaefer, District Engineer, Ground Water Branch, U. S. Geological Survey, on July 20 and 21, 1949. An unused well (Gr-3) 113 feet deep, located 173 feet south of the supply well, was used for observation purposes. Measurements of water level were made in the observation well for several hours before and during the 24 hours of the test.

The supply well (No. 1240-L) was pumped by means of an electrically driven deep-well turbine pump. A 4-inch discharge line was installed on the pump and the rate of pumping was controlled by means of a valve in the discharge line. Measurements of the rate of pumping were made by means of a 3-inch freely discharging orifice installed at the end of the discharge line. The rate of pumping was maintained at 100 g.p.m. during the period of the test.

The purpose of the test was to determine the physical properties of the aquifer and to gain as much knowledge of its boundaries as possible. The physical properties of an aquifer may be measured by its coefficient of transmissibility and coefficient of storage, defined as follows:

The <u>coefficient of transmissibility</u> of a given aquifer is expressed as the quantity of water, in gallons a day, at the prevailing temperature, that will pass through a vertical section of the aquifer 1 foot wide under a hydraulic gradient of 1 foot per foot, or through a section of the formation 1 mile wide under a gradient of 1 foot per mile.

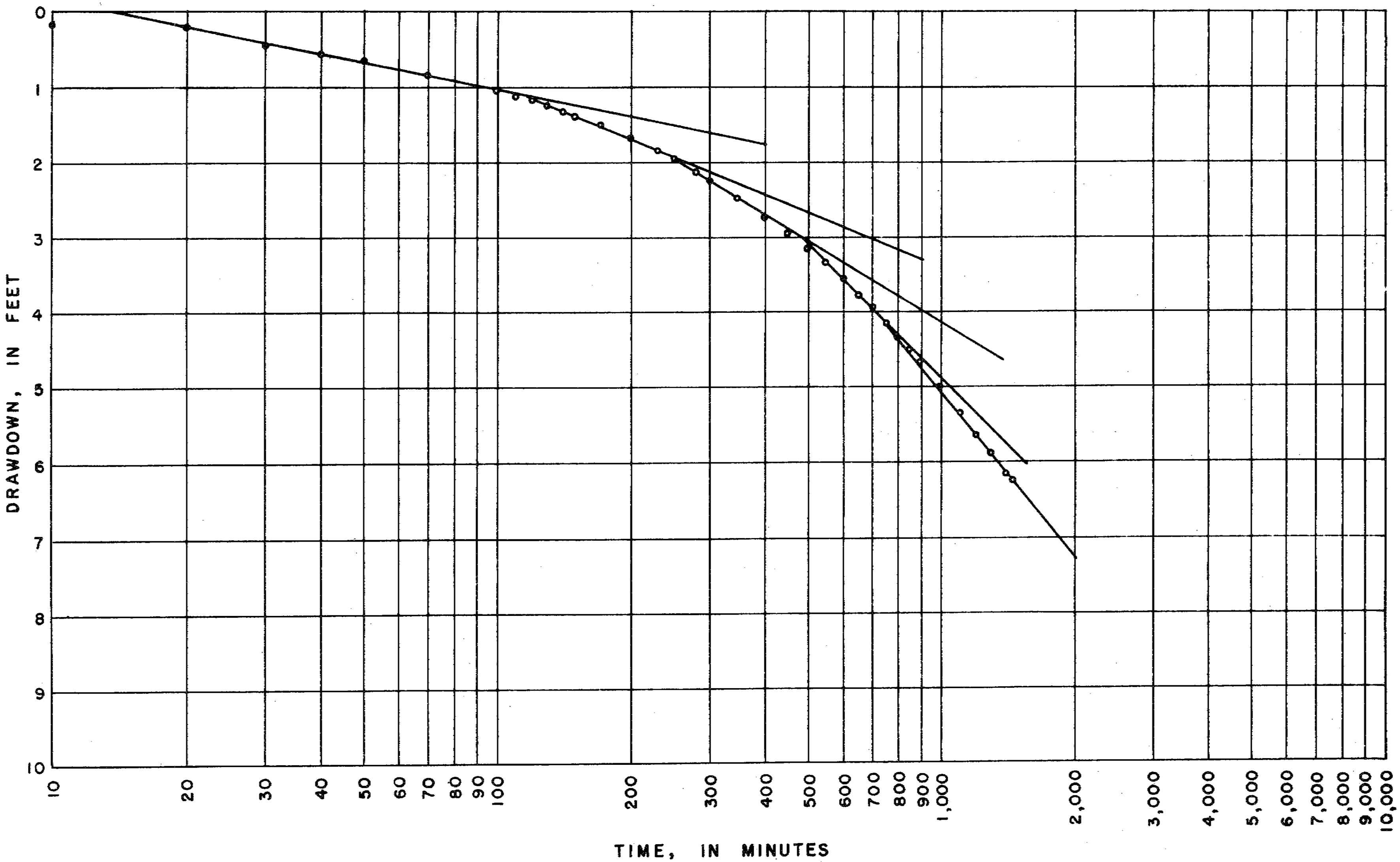


Plate 21. Semilog time-drawdown curve, observation well Gr-3.
Pumping test, Yellow Springs waterworks, July 18-19, 1949.

The coefficient of storage is the amount of water, in cubic feet, released from a vertical column of the aquifer with a base 1 foot square, when the hydrostatic head is reduced 1 foot.

Analysis of the data obtained from the test may be made by means of the Theis nonequilibrium formula and the image-well method in a manner described by Ferris (18). Following this method the water-level measurements were first plotted against time on plain coordinate paper and a smooth curve drawn through the plotted points. Drawdowns (the difference between the static and pumping levels in the well) were then plotted against time on semilog paper, as shown on plate 21.

If the aquifer were uniform and infinite in extent the plotted points would have followed a single straight line on semilog paper. However, the graph drawn from the test data increased in steepness during the test and, as shown on plate 21, the curve may be resolved into five limbs, each a straight line. The first limb represents the trend that would be followed in an infinite aquifer. The others are produced by the boundary conditions.

From the first limb the coefficient of transmissibility of the aquifer was computed to be approximately 22,000 gallons a day per foot and the coefficient of storage 0.00218. By the image-well method it was found that at least two boundaries are present, the nearest points on these boundaries being approximately 247 feet and 365 feet, respectively, from the observation well. Because only one observation well was available for the test it was not possible to determine the position of the points on the boundaries, and because a test of only one pumped well was made it was not possible to determine the direction of the boundaries. However, the semilog plot shows that the relatively favorable transmissibility encountered in the immediate vicinity of the pumping well, which results in a rather high initial yield (the well was once test-pumped at the rate of 162 gallons a minute) may be misleading as a criterion for judging the perennial yield of the well. If the boundaries are parallel, for example, it can be shown by the image-well method that approximately 70 increases in slope will occur in the semilog time-drawdown plot in a 6-month period. If that were true, the well if pumped continuously would have an ultimate yield only a fraction of its initial yield.

The Brassfield limestone, penetrated by the wells, is known to be much more extensive than indicated by the boundaries determined from the test. It therefore seems probable from the test data that sudden large changes in transmissibility occur in the formation. These changes probably represent differences in the degree of fracturing of the formation or in the number of solution channels present. The test serves to illustrate the necessity for careful analysis of boundary conditions in any part of the formation chosen for development of important municipal or industrial water supplies.

## New Jasper Township

New Jasper Township is almost wholly covered with till, except for a small area along Caesar Creek that is covered by alluvium laid down by the present stream. A buried valley underlies New Jasper Township along the general course of Caesar Creek. The depth to bedrock in this valley area is more than 250 feet in places, though no well logs are available to show the character of this deeper fill. Wells in the area, however, are generally less than 100 feet deep, indicating that stratified gravels are present at comparatively shallow depths. Most of the northern part and also the extreme western part of the township are underlain by Silurian limestone and dolomite, which generally supply most wells in these areas. There are numerous outcrops of these rocks along Caesar Creek and its branches, the formations most prominently exposed being the Brassfield and Springfield limestones. The latter formation is quarried for road material at a place about a mile northwest of the village of New Jasper. A photograph of this formation (pl. 15, A), taken at the quarry, shows the character of its bedding.

Numerous springs occur along the outcrop line of the Springfield limestone and feed the north branch of Caesar Creek. What is believed to be the largest of these springs is located on the Herbert S. Dean farm about $1\frac{1}{4}$ miles southeast of Stringtown. There are no large water-supply developments in New Jasper Township. The average depth of all wells surveyed in the township was 81 feet, and the average depth to water in these wells was 21 feet. The best ground-water areas are in the shallow gravels along Caesar Creek and in the areas underlain by Silurian formations.

## Ross Township

Except for two small kame areas in the northern part, Ross Township is covered by till that is generally less than 50 feet thick. Gravel is obtained from a pit in one of the kame areas, about 2 miles northwest of Gladstone. A photograph of this pit (pl. 12, B) shows the character of the bedding of the gravel. These kames are composed of coarse and permeable gravels but they are not important sources of ground water because of their limited areal extent. Most of Ross Township is underlain by Silurian limestone and dolomite, which generally yield good water supplies for farm use. At the extreme eastern side, along the county line, a buried valley has been cut back into the uplands near Grape Grove. In this area the Silurian strata have been removed by erosion and the bedrock is the Ordovician shale. The depth to bedrock in part of this area is more than 300 feet, and thick deposits of till and, in some places, fine sand result in generally poor ground-water conditions. A well No. 987, was drilled in Grape Grove at the edge of this buried-valley area, and bedrock was struck at a depth of 203 feet. The material above the rock was mostly till, with a thin layer of sand at a depth of 67 feet. An attempt was made to develop a small water supply in this sand, but after a few weeks it proved unsatisfactory and the well was deepened to the Brassfield limestone, which yielded 15 gallons a minute.

There are no large ground-water developments in Ross Township. The average depth of all wells surveyed in the township was 71 feet. The average depth to water in these wells was 14 feet.

## Silver Creek Township

Silver Creek Township is covered with till of the ground moraine and of the end moraine near Jamestown. A buried valley terminates in the western part of the township south of Jamestown, and most wells in this area obtain water from the glacial drift at depths generally less than 100 feet. Elsewhere in the township most wells tap the Silurian limestones and dolomites. The average depth of all wells surveyed in Silver Creek Township was 90 feet and the average depth to water in these wells was 19 feet.

### Jamestown

The village of Jamestown has two main wells, 8 inches in diameter and about 110 feet deep, which penetrate nearly 100 feet of the Niagara group to the top of the Osgood shale. A third well in the field (No. 1239-L) is about 192 feet deep and taps both the Niagara and Clinton groups to the top of the Ordovician shale. All wells are equipped with turbine pumps of 125 gallon-a-minute capacity. The Niagara wells are pumped at 45 gallons a minute and the well that taps both the Niagara and Clinton groups is pumped at 50 gallons a minute. It is reported that the Clinton furnishes only a small part of the total supply of this well, a condition that has not been found at other places in the county where most of the supply of such wells has come from the Clinton. When one of the Niagara wells was tested in 1940, at the rate of 43.9 gallons a minute the drawdown was about 41 feet. This pumping also lowered the water level 5 feet in the other Niagara well, which is located about 100 feet east of the pumped well. In a 5 5/8 inch test well in the Niagara group, drilled in 1935, the drawdown was 72 feet at a pumping rate of 30 gallons a minute. Static water levels in the Jamestown well field are comparatively high, being at times 3 to 12 feet below the land surface.

## Spring Valley Township

The glacial drift in Spring Valley Township is almost entirely under-lain by Ordovician shale. Preglacial streams cut a deep valley into the shale in the Spring Valley and Roxanna areas and the course of this valley extends to the east in the direction of Pogue Corners. Most of the valley fill in the Spring Valley-Roxanna area is made up of outwash gravels into which the present Little Miami River is cutting its channel. This gravel area, especially near the present river, is a potential source of large ground-water supplies comparable to those obtained by the Xenia water department at Oldtown, where geologic conditions are similar. At present there are no large ground-water developments in the Spring Valley-Roxanna area, though at least two large-capacity wells have been developed at the Roxanna cannery. One of these wells, No. 407, is 6 inches in diameter and 75 feet deep and is screened in permeable outwash gravels. This well yielded 75 gallons a minute with a drawdown of only $1\frac{1}{2}$ feet. The static level in 1947 was 21 feet below the surface.

Elsewhere in Spring Valley Township the buried-valley area is mostly covered by till, which, in places, as in the eastern part of the village of Spring Valley, overlies fine sand deposits in which well development is difficult. In the Spring Valley area the glacial drift forming the bluffs along the Little Miami River and along Glady Run give rise to a large number of springs, which give the village its name. One of these springs furnishes water to the Spring Valley Packing Co., a large cannery that operates seasonally.

In July 1949 an 8-inch test well (No. 1244-L) was drilled for the village of Spring Valley to determine the possibilities of developing a water supply for the village. The test well is located approximately due north of the center of town and about 300 feet north of the corporation line, at the eastern edge of the buried valley. The surface material at this site, as shown by the well log, consists of 20 feet of what the driller termed "black muck" overlying 4 feet of clean coarse gravel which in this case yielded a fine flowing well. Below this gravel stratum, till was encountered to the depth of 66 feet where another layer of clean coarse gravel 15 feet in thickness was found. Below this lower gravel stratum fine sand was encountered to the depth of 100 feet, where drilling stopped. It seems probable, on the basis of other well data in the area, that this fine sand might make up the remainder of the fill within the buried valley and might therefore approach 200 feet in thickness. It is improbable that other gravel deposits suitable for development occur below the stratum found in the test well between the depths of 66 and 81 feet. A screen was installed in the test well in this gravel stratum and the well yielded 200 gallons a minute during an 8-hour test with a 51-foot drawdown of the water level at the end of the period. The static water level in the well was 14 feet below the surface at the beginning of the test. It is probable that when put into operation this single well will adequately supply the village.

The depth to bedrock in the buried-valley area in Spring Valley Township is generally more than 300 feet and, except in the areas of shallow outwash deposits, wells are quite deep, the average depth of those surveyed being 92 feet. The average depth to water in these wells was 38 feet. The poorest ground-water area in Spring Valley Township is the southwest corner, where thin till overlies the impermeable Ordovician shale. Most supplies in this area are taken from large-diameter dug wells.

## Sugar Creek Township

Sugar Creek Township is mostly covered with till, except along the Little Miami River where outwash gravels and alluvial deposits occur. A buried valley underlies the areas south and east of Bellbrook and extends along the east side of the present river. Where this buried valley is filled with outwash gravels and is traversed by the present stream, very good ground-water conditions prevail. Large ground-water supplies, therefore, probably could be developed in the valley areas south and east of Bellbrook and along the river to the north, beyond Washington Mills.

The bedrock underlying Sugar Creek Township is Ordovician shale, except for small areas in which erosional remnants of Silurian strata occur. A few wells in these areas obtain water from the Brassfield limestone. Ground-water conditions in the remainder of the upland are generally poor because most wells penetrate the Ordovician shale. Most of these wells yield barely enough water for farm use, and many of them are failures. The average depth of all wells investigated in Sugar Creek Township was 71 feet. The average depth to water in these wells was 22 feet below the land surface. There are at present no large ground-water developments in the township.

## Xenia Township

East of a line drawn approximately north and south along the west side of the city of Xenia the township is covered by till of the ground moraine and of a frontal moraine. Most wells in this area obtain water from the glacial drift or from the Silurian limestones and dolomites that underlie the drift in the eastern half of the township. The western part of Xenia Township is underlain by the impermeable Ordovician shale, but the shale is covered by outwash gravels that supply water abundantly to wells. Ground-water conditions are especially good along the Little Miami River in the Oldtown area, where the city of Xenia has its well field. The average depth of all wells surveyed in Xenia Township was 77 feet. The average static water level in these wells was 31 feet below the land surface.

### Xenia

About 1898 the water supply for the City of Xenia came from large springs, which in summer were said to have flowed at the rate of approximately 350 gallons a minute. At present the City of Xenia, which requires an average of 1,686,000 gallons of water a day, pumps its supply from nine wells located half a mile north of Oldtown, near the junction of Massie Creek and the Little Miami River. These wells range in depth from 67 to 110 feet and average 85 feet. Logs of three of the wells (Nos. 543-L, 544-L, and 545-L) indicate that geologic conditions are similar to those in the Alpha-Trebein area, in that there seem to be two principal gravel aquifers, one above the other, separated by a till layer, the lower aquifer supplying most of the water. It is worthy of note that the elevation of the ground surface at the Xenia well field is approximately 20 feet higher than at wells 242-L and 243 in the Trebein area, both of which flowed several feet above the ground surface from the lower aquifer. At the Xenia well field static levels in the lower aquifer, as shown by the hydrograph on plate 22, based on water-level records maintained since August 1944, range from about 4 to about 11 feet below the ground surface. These fluctuations are related primarily to the amounts of pumpage. It is possible that the till layer found both at the Xenia well field and at Trebein, separating the

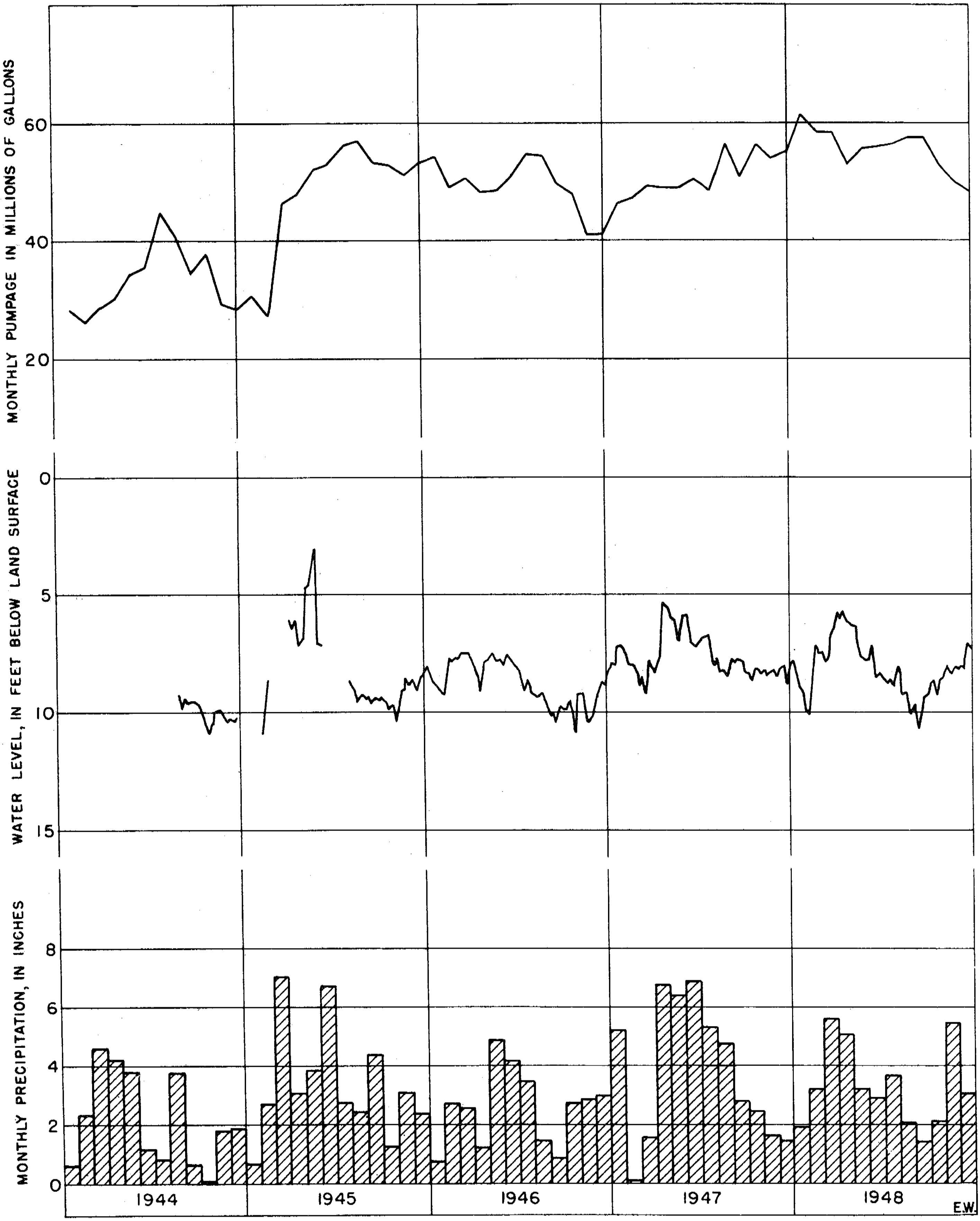


Plate 22. Hydrograph of observation well in Xenia waterworks well field near Oldtown, compared to pumpage from the well field and to precipitation.

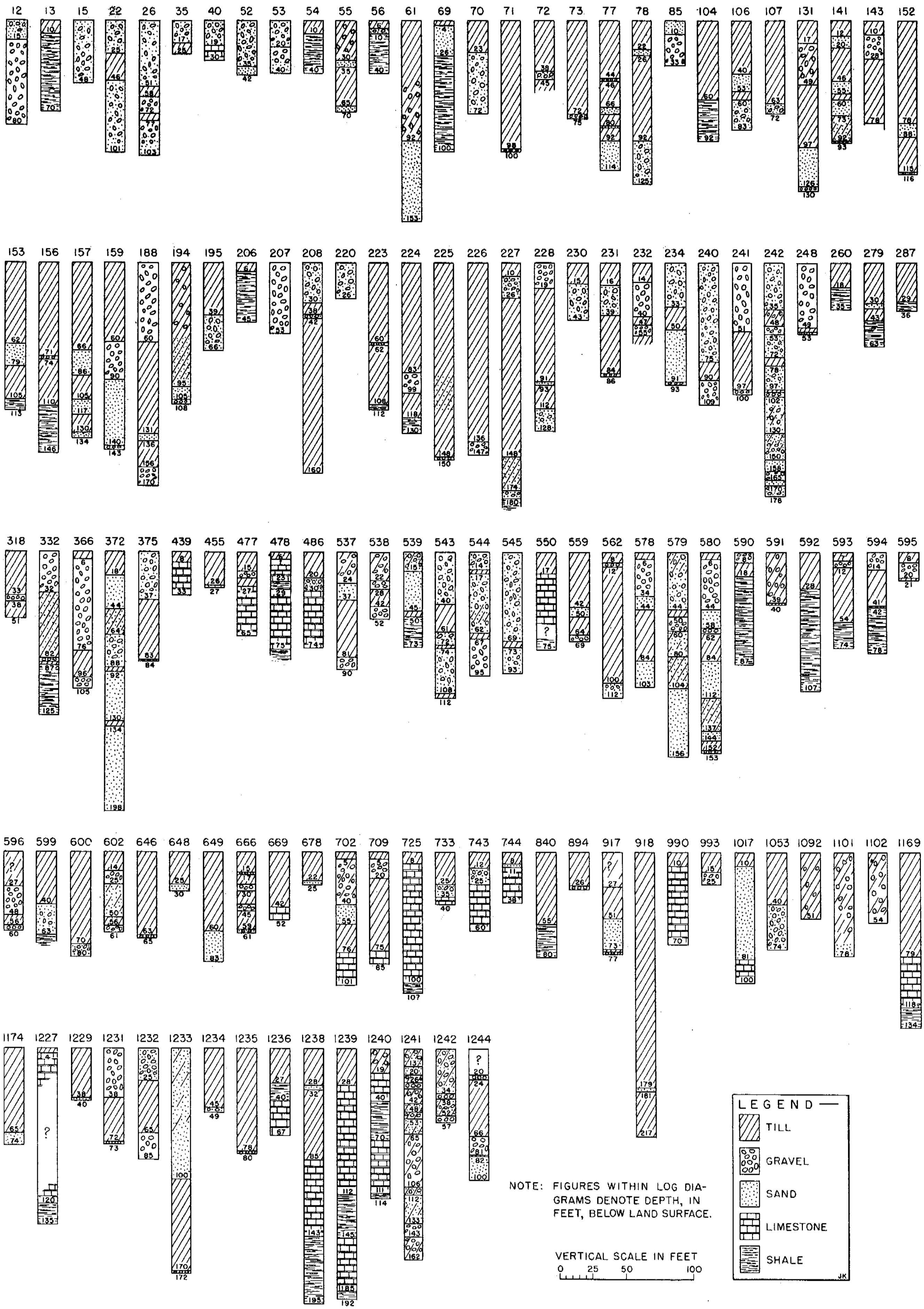


Plate 23. Logs of wells in Greene County, Ohio. Well numbers refer to locations shown on plate 18.

upper gravels from the lower and principal aquifer, is continuous down the Little Miami Valley between these points, and that the very coarse and permeable gravel stratum found immediately below this till in both localities may also underlie the till throughout its entire extent. If this gravel stratum does exist throughout the valley, there are excellent possibilities for the development of additional large ground-water supplies all along the Little Miami River from a point perhaps 2 miles south of Trebein to a point somewhere between Oldtown and Goes. Recharge to the lower gravel aquifer in all probability is derived from the Little Miami River somewhere along its course, the static head in the aquifer indicating an intake of water above Oldtown, possibly at a point where the confining till layer comes to the surface or is absent from the valley fill.

The greatest yield of any of the wells at the Xenia well field was obtained from a 30-inch well 84 feet deep, drilled in 1935. When tested this well yielded 2,700 gallons a minute for 24 hours, with a drawdown of 10 feet at the end of the period. It is pumped at present at the rate of 1,500 gallons a minute about 6 hours daily. Another well 36 inches in diameter, drilled in 1942, was originally tested at 1,500 gallons per minute with a drawdown of 24 feet. The capacity of this well has steadily declined, however, because of incrustation of the well screen. Xenia water in its raw state contains objectionable amounts of iron, one sample (shown in table 6), containing 0.7 part per million. The total hardness is about 322 parts per million. The water is aerated and filtered at the pumping station to remove the iron, and the water is chlorinated. It receives no softening or further treatment. The City of Xenia also maintains six reserve wells in the southwestern part of town near Cincinnati Avenue and Stelton Road. These wells average 40 feet in depth and are used only as standby. They silt badly and their total capacity is only 300 gallons per minute.

## SUMMARY AND CONCLUSIONS

### SURFACE-WATER CONDITIONS

The Little Miami River is the most important potential source of surface water in Greene County. Mad River has a greater flow but crosses only the northwestern corner of the county. Relatively large flows per unit of drainage area occur in the Little Miami River, indicating large amounts of ground-water storage in the glacial gravels underlying the valley. The principal areas of sustained high dry-weather flow occur in the Alpha-Trebein area and in the valley between Trebein and Yellow Springs. The Mad River is underlain by thick permeable glacial gravels that make up one of the best aquifers in the State. The dry-weather flow index of the Mad River is the highest in the State.

There is no important use of surface water in Greene County by industries, though the chemical quality of the water is fairly good, and the county is well situated with respect to its availability. The Little Miami River at Spring Valley drains an area of 361 square miles and has a low-flow index of 0.13 cubic feet per second per square mile.

### GROUND-WATER CONDITIONS

The best ground-water areas in Greene County are in the Mad River Valley in the Wright-Patterson Air Force Base area, in the Little Miami River Valley between Trebein and Yellow Springs, and in the Little Miami River Valley in the vicinity of Bellbrook and Spring Valley. In these areas the valleys are filled with thick, permeable glacial gravels into which recharge from stream flow may be induced by pumping from wells near the streams. At Oldtown the Xenia Water Department pumps an average of about 1,686,000 gallons per day from these valley-train gravels, from nine wells that average 85 feet in depth. As shown by the record of observation well Gr-1, located in this well field, there has been no net decline in water levels since the record began in 1941. One large-diameter well in the Oldtown well field yielded, when drilled, 2,700 gallons a minute, and other wells also showed high yields.

Excellent ground-water conditions occur in the Alpha-Trebein area, where a very coarse and permeable gravel stratum is found 80 to 100 feet below the surface. This gravel stratum is overlain by an impermeable till layer, which confines the water under sufficient artesian pressure to cause the wells to flow at rates of as much as 100 gallons per minute.

In certain other areas of Greene County outwash materials occur at high levels, are not crossed by streams, and therefore are not subject to stream infiltration. Ground-water conditions in those areas are good, though not as good as in the valley-train areas, and supplies adequate for small industries and municipalities can be developed. The remainder of the glacial drift covering the uplands of the county consists mostly of the till of the ground and end moraines. Where this till contains interbedded sand and gravel deposits, good supplies for farm and domestic use can be developed. Where the till is thin and overlies the non-water-bearing Ordovician shale, most rural supplies are obtained from dug wells.

The consolidated rock strata underlying Greene County consist of limestones and dolomites of the Silurian system and the shales of the Ordovician system. The Silurian rocks generally yield good farm and domestic supplies, and a few wells in these rocks yield as much as 150 gallons a minute. The Ordovician shales are very poor sources of water and many wells drilled into these rocks are failures, or yield barely enough for small household requirements. Wells in these shales generally yield no more than about 1 gallon a minute.

## QUALITY OF WATER

Ground water in Greene County is generally hard and contains sufficient iron to be troublesome. There is no notable difference in the characteristics of the waters from the different aquifers. The quantity of dissolved solids in the ground water of Greene County is less than 500 parts per million in most of the well water analyzed and is within the common range for natural waters. For most domestic and industrial purposes softening and removal of the iron are desirable and often necessary. Incrustation of well screens in the more heavily pumped wells, caused by precipitation of some of the dissolved minerals in the water, is a problem in many areas. Some waters from limestone and shale are high in sulfur compounds, possibly hydrogen sulfide, which give the water a bad taste, and some wells in Ordovician shale also yield water high in chloride. Water from all the aquifers generally contains more than 0.3 part per million of iron; contents in excess of this cause staining of fabrics and utensils.

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## Records of Wells and Springs in Greene County, Ohio

### Explanation of terms and symbols:

Number: The number of the well shown on the map, plate 18; *, well data confirmed by driller; L, letter "L" following well number refers to log shown on plate 23. Numbers are listed by township.

File Number: The number under which the driller's log of the well is filed in the offices of the Ohio Division of Water, Department of Natural Resources.

Owner or Name: The name of the land owner or tenant at the time the well was drilled or at the time of the well survey.

Elevation of Well: Determined approximately from the topographic maps of the United States Geological Survey.

Depth to Bedrock: Depth to the surface of the consolidated rocks; dash indicates that bedrock was not reached; when space is blank it indicates that data are not available.

Depth of Well: Depth reported by driller, owner, or tenant; M, well measured at time of field survey.

Depth Water Encountered: Depth water entered the well when it was being constructed.

Character of Material: Geologic material in which water was obtained or in which well was terminated; Lmstone, limestone; Sd + gr, sand and gravel; Cse. gr., coarse gravel; Cse. sand, coarse sand; Gl. drift, glacial drift, undifferentiated.

Geologic Horizon: Refers to the geologic age group of the consolidated rocks.

Static Water Level: The depth below land surface of the water level in the well as reported by the driller, land owner, or tenant; M, water level in the well measured at the time of the field survey.

Yield: The rate at which the well was pumped or bailed.

Drawdown: The amount of lowering of the water level in the well caused by the withdrawal of water at the rate indicated in the yield column; sml, small.

Date: The date of determination of the static water level, yield, or drawdown.

Quality of Water: Generally indicates the opinion of the driller, land owner, or tenant; A, water analysis given in table 4.

Type of Well: Method used in constructing well; Dr, drilled; Dv, driven; D-Dr, dug and drilled; D-Dv, dug and driven; B, bored; Spr, spring; ✧ well drilled for oil or gas, discussed in section "water in deep wells drilled for oil or gas."

Method of Lift: Pump and power data; Cnt, centrifugal pump, C, cylinder pump; Tr, turbine pump; Ej, ejector pump; Sw, shallow well type pump; Dw, deep well type pump; P, pitcher pump; Pj, pump jack; Ram, hydraulic ram; H, hand power; G, gasoline driven; E, electric power; W, wind driven.

Diameter of Well: Approximate inside diameter of casing.

Use: Water-utilization data; C, condensing or cooling; DS, domestic supply; I, industrial use; PS, public supply; S, stock; T, test well; Irr, irrigation.

Table 8

Records of wells and springs in
Greene County, Ohio

(Based on well survey made in 1947-48)

| Number | File Number (Ohio Water Resources Board) | Owner or name | Elevation at well (feet above sea level) | Depth to bedrock (feet) | Depth of well (feet) | Principal water-bearing bed: Depth water encountered (ft) | Principal water-bearing bed: Character of material | Principal water-bearing bed: Geologic horizon | Static water level (feet below land surface) | Yield (g.p.m.) | Drawdown (feet) | Date | Quality of water | Type of well | Method of lift | Diameter of well (inches) | Use | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bath Township | | | | | | | | | | | | | | | | | | |
| 1* | | E.B.Hebble | 918 | 6 | 50 | | Lmstone | Clinton | 6(M) | | | 4-48 | | Dr | SwE | 5½ | DS | |
| 2 | | Steve Berzeny | 850 | - | 30 | | Gl.drift | | 6(M) | | | 4-48 | | Dug | CH | | DS | Has 3 springs for stock |
| 3 | | Vincent Bolling | 850 | | 75 | | Shale | Richmond | 14 | | | | | Dr | EjE | 5½ | DS | |
| 4* | | L. E. Bird | 820 | | 100 | | Shale | Richmond | | | | | | Dr | DwE | 6 | DS | |
| 5* | | N. Nieffer | 910 | - | 35 | | Gl.drift | | | | | | | Dr | PjE | 6 | DS | |
| 6 | | J. W. Baker | 920 | 16 | 35 | | Lmstone | Clinton | 33.5 | | | | | Dr | CH | 5½ | DS | |
| 7* | | A. L. Trick | 915 | 56 | | | Shale | Richmond | | | | | | Dr | | | | |
| 8* | | H. Piatt | 882 | 56 | 56 | | Gl.drift | | 15 | | | | | Dr | CH | 6 | DS | |
| 9 | | L. C. Ayers | 923 | | | | Lmstone? | Clinton? | | | | | | Dr | CH | | DS | |
| 10 | | F. Snell | 903 | - | 75 | | Gl.drift | | 30 | | | | | Dr | SwE | | DS | |
| 11 | | J. J. Revak | 863 | 60? | 60 | | Gl.drift | | 35 | | | | | Dr | EjE | 6 | DS | |
| 12-L | 23 | U.S.Air Force | 790 | - | 80 | | Gravel | | 6 | 1550 | 12 | 1-30-46 | | Dr | TrE | 12 | T | |
| 13-L | 1 | State of Ohio | 782 | 10 | 70 | | Shale | Richmond | 45 | | | | | Dr | CH | 5½ | PS | |
| 15-L | 59 | Village of Osborn | 840 | - | 48 | | Sd+gr | | | 275 | | | | Dr | TrE | 8 | PS | |
| 16* | | L. H. Leedy | 942 | - | 38 | | Gl.drift | | | | | | | Dr | - | 5½ | | Abandoned |
| 17* | | H. Sanzon | 985 | | 120 | | Gl.drift | | | | | | | Dr | PjE | 5½ | DS | |
| 18 | | J. E. Brehm | 960 | - | 58 | | Gl.drift | | 41 | | | | | Dr | PjE | | DS | |
| 21* | | S. C. Gorsuch | 816 | 207 | 990 | | | | | | | | | ✧ | | | | No water encountered |
| 22-L | 6 | V. of Fairfield | 822 | - | 101 | | Sd+gr | | 7 | 125 | 7 | | | Dr | TrE | 8 | PS | Used only as stand-by |
| 23 | | U.S.Air Force | 937 | - | 33 | | Gl.drift | | | | | | | Dr | CH | | DS | |
| 24* | | D. L. Musick | 900 | 62 | 71 | | Shale | Richmond | 39 | | | | | Dr | EjE | 6 | DS | |
| 25* | | Vanderbilt | 904 | 95 | 147 | | Shale | Richmond | | | | | | Dr | DwE | 6 | DS | |
| 26-L | 81 | Univ-Atlas Co. | 880 | - | 103 | | Sd+gr | | 24 | | | 9-16-40 | | Dr | TrE | 10 | I | |
| 27* | | J. J. Baleski | 866 | 20 | 55 | | Shale | Richmond | 20 | | | | | Dr | EjE | 6 | DS | |
| 28* | | Vee Lampman | 860 | 40 | 155 | | Shale | Richmond | | | | | | Dr | CH | | DS | |
| 29 | | O. J. Adams | 853 | - | 60 | | Gl.drift | | | | | | | Dr | SwE | 6 | DS | |
| 30 | | E. Esterline | 876 | - | 30 | | Gl.drift | | 18 | | | | | Dr | SwE | 1¼ | DS | |
| 31* | | Chas. Armstrong | 905 | 6 | 64 | | Shale | Richmond | 30 | | | | | Dr | DwE | 6 | DS | |
| 32 | | Chas. Armstrong | 1004 | | 74 | | Lmstone | Clinton | 32 | | | | | Dr | DwE | 6 | DS | |
| 33* | | Cecil Hunter | 982 | 20 | 41 | | Lmstone | Niagara | 16 | | | | | Dr | SwE | 6 | DS | |
| 34* | | Sipe Bros | 1000 | 20 | 61 | | Lmstone | Niagara | 30 | | | | | Dr | CH | 6 | | |
| 35-L | 22 | SW Port.Cement | 855 | - | 25 | | Sd+gr | | 12 | 65 | 17 | | | Dr | TrE | 40 | I | |
| 36 | | Wayne Goosman | 844 | - | 30 | | Gl.drift | | 25 | | | | | Dug | SwE | 48 | DS | |
| 37 | | J. R. Cramer | 847 | - | 30 | | Gl.drift | | 10 | | | | | Dv | CH | 1½ | DS | |
| 38* | | Univ-Atlas Co. | 873 | - | 51 | | Gl.drift | | 28 | 15 | | | | Dr | EjE | 6 | | |
| 39* | | McCurdy Bros | 885 | 55 | 55 | | Gl.drift | | 15 | | | | | Dr | DwE | 5 | DS | |
| 40-L | 55 | Sam Horner | 943 | 19 | 30 | | Lmstone | Clinton | 18 | 4 | 4 | 2-10-48 | | Dr | | 6 | DS | |
| 41 | | Frank Evans | 925 | | 101 | | Shale | Richmond | | | | | | Dr | CH | 6 | DS | |
| 42 | | Frank Heider | 955 | - | 2 | | Gl.drift | | Flow | | | 4-48 | | Spr | SwE | | DS | |
| 43* | | J. W. Sipe | 1000 | 42 | 62 | | Lmstone | Niagara | 27 | | | | | Dr | CH | 5½ | DS | |
| 44* | | J. W. Sipe | 1027 | 103 | | | Lmstone | Clinton? | | | | | | Dr | | | | |
| 45* | | Chas. Conner | 858 | 32 | 80 | | Shale | Richmond | 14 | | | | | Dr | SwE | | DS | |
| 46 | | SW Port.Cement | 970 | | | | Lmstone | Clinton | | | | | | Dr | CH | | DS | |
| 47 | | A. Evans | 950 | | | | Lmstone | Clinton | | | | | | Dr | EjE | 6 | DS | |
| 48 | | Frank Heider | 970 | | 30 | | Lmstone | Clinton | | | | | | Dr | CH | 5½ | DS | |
| 49 | | Fred King | 1010 | 32 | 32 | | Gl.drift | | 25 | | | | | Dv | CH | 1¼ | DS | |
| 50 | | Fred King | 1010 | - | 2 | | Gl.drift | | Flow | | | | | Spr | | | S | |
| 51* | | Village of Osborn | 838 | 54 | 55 | | Shale | Richmond | | | | | | Dr | | 6 | T | |
| 52-L | 74 | Paul Runion | 841 | - | 42 | | Sand | | 30 | 7 | | 3-16-48 | | Dr | | 5½ | DS | |
| 53-L | 76 | Joseph Connizzo | 842 | - | 40 | | Sd+gr | | 21 | 13 | | 3- 6-48 | | Dr | | 5 | DS | |
| 54-L | 119 | C. Brewer | 840 | 10 | 40 | | Shale | Richmond | | | | | | Dr | | 5½ | DS | |
| 55-L | 67 | C. Gayheart | 837 | - | 70 | | Sand | | | | | | | Dr | | 6 | DS | |
| 56-L | 135 | Chester Addis | 842 | 10 | 40 | | Shale | Richmond | | | | | | Dr | | 5½ | DS | |
| 57* | | | 870 | 5 | | | Shale | Richmond | | | | | | | | | | |
| 58* | | G. E. Titlow | 902 | 24 | 140 | | Shale | Richmond | | | | | | Dr | DwE | 4 | DS | |
| 59* | | Durham | 920 | 45 | | | Shale | Richmond | | | | | | Dr | | 5½ | DS | |
| 60* | | Lloyd Cornelius | 883 | 20 | 61 | | Shale | Richmond | | | | | | Dr | PjE | 5½ | DS | |
| 61-L | 66 | Caulkins | 924 | - | 153 | | Sand | | 84 | 11 | 4 | 3-20-48 | | Dr | | 5½ | DS | |
| 62* | | Garrety | 920 | - | 123 | | Gl.drift | | | | | | | Dr | EjE | 6 | DS | |
| 63* | | Ducker | 945 | - | 130 | | Gl.drift | | | | | | | Dr | | | DS | |
| 64* | | C. H. Black | 840 | 30 | 60 | | Shale | Richmond | 40 | ½ | | 5-21-48 | | Dr | | 5¼ | DS | |
| 65* | | T. H. Ponn | 940 | - | 227 | | Gl.drift | | | | | | | Dr | DwE | 6 | DS | |
| 66* | | Archie Koegler | 943 | - | 222 | | Gl.drift | | | | | | | Dr | DwE | 6 | DS | |
| 67* | | Chas. Foster | 941 | - | 53 | | Gl.drift | | 38(M) | | | 4-48 | | Dr | CH | 5½ | DS | |

Table 8 (Continued)

| Bath and Beaver Creek Townships | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number | File Number (Ohio Water Resources Board) | Owner or name | Elevation at well (feet above sea level) | Depth to bedrock (feet) | Depth of well (feet) | Principal water-bearing bed: Depth water encountered (ft) | Principal water-bearing bed: Character of material | Principal water-bearing bed: Geologic horizon | Static water level (feet below land surface) | Yield (g.p.m.) | Drawdown (feet) | Date | Quality of water | Type of well | Method of lift | Diameter of well (inches) | Use | Remarks |
| Bath Township (Continued) | | | | | | | | | | | | | | | | | | |
| [illegible] | | R. Varner | 860 | - | 54 | | Gl.drift | | 46 | | | | | Dr | CH | | DS | |
| 69-L | 136 | Grover Cantell | 865 | 26 | 100 | | Shale | Richmond | | | | | | Dr | | 5¼ | DS | |
| 70-L | 110 | Delmer Shearer | 860 | - | 72 | | Sd+gr | | 18 | 15 | | 4-27-48 | | Dr | CH | 5⅝ | DS | |
| 71-L | 112 | Chas. Goodman | 880 | - | 100 | | Gravel | | | | | | | Dr | | 5⅝ | DS | |
| 72-L | 131 | Vester Whitt | 883 | - | 45 | | Sd+gr | | 15 | 10 | | 7-13-48 | | Dr | CH | 5¼ | DS | |
| 73-L | 114 | Thomas Lewis | 883 | - | 75 | | Gravel | | 61 | 5 | | 5-6-48 | | Dr | CH | 4¼ | DS | |
| 74* | | S. Cornelius | 841 | 20 | 275 | | Shale | Richmond | | | | | | Dr | | 6 | | Well abandoned |
| 75 | | W. Bursack | 880 | - | 117 | | Gl.drift | | 8 | | | | | Dr | SwE | | DS | |
| 76* | | Chester Campbell | 881 | - | 155 | | Gl.drift | | 55 | | | | | Dr | | 5⅝ | DS | |
| 77-L | 130 | C. F. Bell | 903 | - | 114 | | Sd+gr | | | | | | | Dr | | 4¼ | DS | |
| 78-L | 113 | T. F. Nicholas | 908 | - | 125 | | Sd+gr | | 100 | 10 | | 5-14-48 | | Dr | | 5¼ | DS | |
| 79 | | Geo. Warner | 870 | - | 85 | | Gl.drift | | | | | | | Dr | CH | 4¼ | DS | |
| 80 | | T. W. Shuman | 911 | | | | | | | | | | | Dr | DwE | | DS | |
| 81 | | Jno. Barr | 910 | - | 71 | | Gl.drift | | 57 | | | | | Dr | EjE | 4¼ | DS | |
| 82 | | Jacob Barr Jr. | 920 | - | 52 | | Gl.drift | | | | | | | Dr | DwE | 5⅝ | DS | |
| 83 | | SW Portland Cement | 940 | - | 1 | | Gl.drift | | Flow | | | 4-48 | | Spr | SwE | | DS | |
| 84 | | Bernard Coy | 984 | | | | Lmstone | Clinton? | | | | | | Dr | CH | | DS | |
| 85-L | 138 | K. L. Herr | 1005 | - | 33 | | Gravel | | 23 | 10 | Sml | 7-7-48 | | Dr | PjE | 5 | DS | |
| 86* | | A. J. Pitstick | 1058 | 65 | 102 | | Lmstone | Niagara | | | | | | Dr | PjE | 5⅝ | DS | |
| 87* | | Page Carter | 960 | 5 | 38 | | Lmstone | Niagara | 2 | | | | | Dr | SwE | 6 | DS | |
| 88 | | B. E. Linsmayer | 968 | - | 18 | | Gl.drift | | | | | | | Dug | CH | 48 | DS | |
| 89 | | SW Portland Cement | 1000 | 18 | 22 | | Lmstone | Niagara | 18 | | | | | Dr | SwE | 6 | DS | |
| 90* | | G. W. Miller | 910 | 24 | 83 | | Shale | Richmond | 26 | | | | | Dr | CH | 6 | DS | |
| 91 | | SW Portland Cement | 905 | | - | | Shale | Richmond | | | | | | Dr | CH | | DS | |
| 92* | | Frank Beasley | 985 | 23 | 65 | | Lmstone | Niagara | 18 | | | | | Dr | EjE | 6 | DS | |
| 93* | | Cremeens | 1035 | 5 | 37 | | Lmstone | Niagara | 5 | | | | | Dr | CH | 6 | DS | |
| 94 | | Bearden | 1021 | - | | | Gl.drift | | | | | | | Dug | CH | 42 | DS | |
| 95* | | H. L. Trollinger | 960 | 31 | 72 | | Lmstone | Clinton | 22 | | | | | Dr | DwE | | DS | |
| 96 | | J. L. Maxton | 905 | - | 14 | | Gl.drift | | 12 | | | | | Dug | CH | 42 | DS | |
| 97 | | D. C. Harner | 920 | 13 | 50 | | Shale | Richmond | 15 | | | | | Dr | PjE | 6 | DS | |
| 98 | | C. D. Miller | 882 | 20 | 46 | | Shale | Richmond | 10 | | | | | Dr | DwE | 6 | DS | |
| 99 | | J. B. Harner | 920 | 20 | 20 | | Gl.drift | | | | | | | DDv | PjE | 48½ | DS | |
| 100 | | S. L. Johnson | 1004 | | 78 | | Lmstone | Clinton | | | | | | Dr | CW | | DS | |
| 101 | | Wm Wilkerson | 997 | | 83 | | Lmstone | Clinton | 35 | | | | | Dr | PjE | 4¼ | DS | |
| 102 | | " " | 990 | | | | | | | | | | | Dr | CH | 4¼ | DS | |
| 104-L | 157 | James Blair | 917 | 60 | 92 | | Shale | Richmond | 41 | | | 7-15-48 | | Dr | | 5⅝ | DS | |
| 1241L | 166 | U. S. Air Force | 805 | - | 162 | | Sd+gr | | | | | | | Dr | - | 6 | T | |
| 1242L | 167 | U. S. Air Force | 815 | - | 57 | | Gravel | | 9 | 1500 | 16 | | | Dr | TrE | 20 | I | |
| Beaver Creek Township | | | | | | | | | | | | | | | | | | |
| 103 | | C. Gerlaugh | 860 | 100 | 153 | | Shale | Richmond | 100 | | | | | Dr | DwE | 6 | DS | |
| 105 | | Reese | 984 | 20 | 90 | | Shale | Richmond | | | | | | Dr | DwE | | DS | |
| 106L | 78 | Harper | 997 | - | 83 | | Sd+gr | | 42 | 15 | 3 | 3-12-48 | | Dr | | 5⅝ | DS | |
| 107L | 77 | N. A. Faini | 996 | - | 72 | | Sd+gr | | | | | | | Dr | | 5⅝ | DS | Preserved wood found at 72 feet |
| 108 | | Wagner | 982 | 143 | 143 | | Gl.drift | | | | | | | Dr | DwE | 5⅝ | DS | |
| 109 | | Deger | 985 | 142 | 142 | | Gl.drift | | | | | | | Dr | DwE | | DS | |
| 110 | | G. D. Berwager | 1000 | - | 34 | | Gl.drift | | 16 | | | | | Dr | EjE | 3 | DS | |
| 111 | | Peter Gmaz | 982 | - | 109 | | Gl.drift | | 60 | | | | | Dr | EjE | 5⅝ | DS | |
| 112 | | G. Durnbaugh | 989 | 133 | 143 | | Shale | Richmond | 60 | | | | | Dr | DwE | 5⅝ | DS | |
| 113 | | W Higgins | 980 | - | 40 | | Gl.drift | | 14 | | | | | Dr | CH | 5⅝ | DS | |
| 114 | | A.and L. Varner | 960 | 95M | 192 | | Shale | Richmond | 57M | | | 9-19-47 | | Dr | - | 5⅝ | - | |
| 115 | | G. F. Kemp | 927 | - | 40 | | Gl.drift | | 36M | | | 9-17-47 | | Dug | CH | 36 | DS | |
| 116 | | Geo. Miller | 865 | - | 128 | | Gl.drift | | 105 | | | | | Dr | DwE | 5⅝ | DS | |
| 117 | | Wolf | 921 | - | 170 | | Gl.drift | | | | | | | Dr | DwE | | Ds | |
| 118 | | C.R.Oberschlake | 949 | - | 134 | | Gl.drift | | 40 | | | | | Dr | DwE | 5⅝ | DS | |
| 119 | | Robt. Sweeney | 950 | - | 137 | | Gl.drift | | | | | | | Dr | DwE | 5⅝ | DS | |
| 120 | | Short | 935 | - | 131 | | Gl.drift | | 100 | | | | | Dr | DwE | 5⅝ | DS | |
| 121 | | L. M. Dupper | 920 | - | 132 | | Gl.drift | | | | | | | Dr | DwE | 5⅝ | DS | |
| 122 | | R. R. Varner | 843 | - | 54 | | Gl.drift | | 8 | | | | | Dr | CH | 4¼ | DS | |
| 123 | | Ralph Kendig | 865 | - | 15 | | Gl.drift | | 7 | | | | | Dv | SwE | 1¼ | DS | 5 similar stock wells. |
| 124 | | G. Harshman | 888 | - | 32 | | Gl.drift | | 15 | | | | | Dr | PjE | 6 | DS | |
| 125 | | M. Stewart | 922 | 45 | 47 | | Shale | Richmond | 27 | | | | | Dr | CH | 6 | DS | |
| 126 | | G. Ashbaugh | 882 | - | 35 | | Gl.drift | | | | | | | Dug | CH | 36 | DS | |
| 127 | | J. M. Scott | 905 | - | 50 | | Gl.drift | | 18 | | | | | Dr | SwE | 5⅝ | DS | |
| 128 | | J. L. Burtch | 884 | - | 91 | | Gl.drift | | 26 | | | | | DDr | EjE | 6 | DS | |
| 129 | | R. Clark | 881 | - | 9 | | Gl.drift | | 5 | | | | | Dv | SwE | 1¼ | DS | Also has strong spring |
| 130 | | A. F Zink | 903 | - | 42 | | Gl.drift | | | | | | | Dug | CH | 48 | DS | |
| 131L | 99 | H. C. Fogle | 978 | - | 130 | | Gravel | | 93 | 10 | 2 | 5-3-48 | | Dr | | 5⅝ | DS | |
| 132 | | Goldshot | 982 | - | 48 | | Gl.drift | | 23 | | | | | Dug | CH | 36 | DS | |
| 133 | | S. H. Harshman | 840 | - | 23 | | Gl.drift | | 14 | | | | | Dr | PjE | 4¼ | DS | |
| 134 | | S. H. Harshman | 840 | - | 24 | | Gl.drift | | 20 | | | | | Dug | CH | 36 | DS | |
| 135 | | C. K. Hawkins | 906 | - | 100 | | Gl.drift | | 80 | | | | | Dr | PjE | 5⅝ | DS | |
| 136 | | E. D. Mequown | 880 | - | 2 | | Gl.drift | | Flow | | | | | Spr | SwE | | DS | |
| 137 | | M. Shellabarger | 900 | - | 237 | | Gl.drift | | | | | | | Dr | DwE | 5⅝ | DS | |
| 138 | | G. Matthews | 923 | - | 30 | | Gl.drift | | 27 | | | | | Dug | SwE | 42 | DS | |
| 139 | | E. G. Kundert | 940 | - | 196 | | Gl.drift | | | | | | | Dr | DwE | 5⅝ | DS | |
| 140 | | Zimmerman | 967 | - | 130 | | Gl.drift | | 100 | | | | | Dr | DwE | 5⅝ | DS | |
| 141L | 86 | Jas. Loy | 979 | - | 93 | | Gravel | | 42 | 8 | 5 | 4-48 | | Dr | | 5⅝ | DS | |
| 142 | | C.Miller | 986 | 85 | | | Shale | Richmond | | | | | | Dr | | | DS | |
| 143L | 129 | R. T. Cousineau | 980 | 78 | 80 | | Shale | Richmond | 20 | | 2 | 5-5-48 | A | Dr | CH | 5⅝ | DS | |
| 144 | | Van Gundy | 987 | - | 106 | | Gl.drift | | 26 | | | | | Dr | DwE | 5⅝ | DS | |

Beaver Creek Township (Continued)

| Number | File Number (Ohio Water Resources Board) | Owner or name | Elevation at well (feet above sea level) | Depth to bedrock (feet) | Depth of well (feet) | Principal water-bearing bed: Depth water encountered (ft) | Principal water-bearing bed: Character of material | Principal water-bearing bed: Geologic horizon | Static water level (feet below land surface) | Yield (g.p.m.) | Drawdown (feet) | Date | Quality of water | Type of well | Method of lift | Diameter of well (inches) | Use | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 145 | | Sullivan | 1005 | - | 26M | | Gl.drift | | 15M | | | 9-19-47 | | Dug | CH | 36 | DS | |
| 146 | | F. Gerspacher | 1000 | | 36 | | Gl.drift | | 16 | | | | | Dug | CH | 36 | DS | |
| 147 | | E. Hoyer | 1004 | 72 | | | Lmstone | Clinton | | | | | | Dr | | | DS | |
| 148 | | Howard Haller | 976 | 75M | 94M | | Shale | Richmond | 40M | | | 1948 | | Dr | - | 5½ | - | |
| 149 | | S. H. Hower | 968 | - | 95 | | Gl.drift | | 80 | | | | | Dr | PjE | 5½ | DS | |
| 150 | | C. Batdorf | 978 | - | 196 | | Gl.drift | | 92 | | | 9-23-47 | | Dr | PjE | 5½ | DS | |
| 151 | | H. A. Wagner | 942 | - | 18 | | Gl.drift | | 10 | | | | | Dug | SwE | 36 | DS | |
| 152L | 85 | Wm. de Porter | 992 | - | 116 | | Sd+gr | | 43 | 2 | 73 | | | Dr | | 5 | DS | |
| 153L | 82 | Wm. Manning | 999 | 105 | 113 | | Shale | Richmond | 34 | 4 | 81 | 1948 | | Dr | | 5 | DS | |
| 154 | | J. E. Kearns | 962 | 85 | | | Shale | Richmond | | | | | | Dr | | | | |
| 155 | | E. M. Pierce | 940 | | 55 | | Lmstone | Clinton | 8 | | | | | Dug | CH | 42 | DS | |
| 156L | 125 | H. W. Waltman | 902 | 110 | 146 | | Shale | Richmond | | | | | | Dr | | 5½ | DS | |
| 157L | 126 | Farley | 961 | - | 134 | | Sand | | 65 | 2 | | 4-5-48 | | Dr | CH | 5½ | DS | |
| 158 | | R. T. Long | 963 | - | 151 | | Gl.drift | | 80 | | | | | Dr | DwE | 5½ | DS | |
| 159L | 122 | R. Seale | 960 | - | 143 | | Sd+gr | | 90 | 8 | 3 | 5-17-48 | | Dr | | 5½ | DS | |
| 160 | | Koogler | 940 | - | 202 | | Gl.drift | | | | | | | Dr | DwE | 5½ | DS | |
| 161 | | Poliquin | 962 | - | 120 | | Gl.drift | | 60 | | | | | Dr | DwE | 5½ | DS | |
| 162 | | J. Hotopp | 960 | - | 143 | | Gl.drift | | 81 | | | | | Dr | CH | 5½ | DS | |
| 163 | | S. H. Shawhan | 842 | - | 32 | | Gl.drift | | 30 | | | | | Dug | CH | 48 | DS | |
| 164 | | D. E. Tobias | 826 | - | 12M | | Gl.drift | | 9M | | | 9-47 | | Dug | SwE | 36 | DS | |
| 165 | | Nelson Ankeney | 841 | - | 35 | | Gl.drift | | | | | | | Dug | PjE | 42 | DS | |
| 166 | | M. C. Ruffner | 839 | - | 29 | | Gl.drift | | | | | | | Dv | SwE | 1½ | DS | Has similar well for stock |
| 167 | | Fred Gilbert | 903 | - | 85 | | Gl. drift | | 60 | | | | | Dr | PjE | 4¼ | DS | |
| 168 | | J. Gilbert | 902 | - | 96 | | Gl.drift | | | | | | | Dr | DwE | | DS | |
| 169 | | R. F. Beal | 900 | 12 | | | Shale | Richmond | | | | | | Dr | | | | |
| 170 | | L. A. Harner | 938 | - | 30 | | Gl.drift | | 29 | | | | | Dug | PjE | 48 | DS | |
| 171 | | L. M. Rumbaugh | 977 | - | | | Gl.drift | | Flow | | | | | Spr | | | DS | |
| 172 | | D. S. Williams | 920 | - | 284 | | Gl.drift | | 100 | | | | | Dr | DwE | 5½ | DS | |
| 173 | | Geo. Rudy | 922 | - | 137 | | Gl.drift | | 100 | | | | | Dr | DwE | 6 | DS | |
| 174 | | C. McCalmont | 841 | - | 80 | | Gl.drift | | 40 | | | | | Dr | CH | 6 | DS | |
| 175 | | Jas. Wolfe | 880 | - | | | Gl.drift | | Flow | | | | | Spr | SwE | 1¼ | DS | |
| 176 | | A. C. Haines | 890 | - | 14 | | Gl.drift | | | | | | | Dug | CH | 42 | DS | |
| 177 | | Mr. Linkhart | 920 | 60 | 158 | | Shale | Richmond | | | | | Salty | Dr | - | 5 | - | Abandoned |
| 178 | | Mr. Brown | 922 | | | | | | | | | | | Dr | CH | 5½ | DS | |
| 179 | | Mr. Linkhart | 920 | 60 | 112 | | Shale | Richmond | 75 | | | | | Dr | DwE | 5½ | DS | |
| 180 | | W. L. Harner | 890 | - | 40 | | Gl.drift | | 37 | | | | | Dug | PjE | 36 | DS | |
| 181 | | J. T. Hutchinson | 901 | - | 94 | | Gl.drift | | 74 | | | | | Dr | PjE | 5 | DS | |
| 182 | | J. T. Hutchinson | 900 | - | 98 | | Gl.drift | | 78 | | | | | Dr | EjE | 5 | DS | |
| 183 | | V. E. Eckert | 864 | - | 120 | | Gl.drift | | 60 | | | | | Dr | DwE | 5½ | DS | |
| 184 | | J. I. Willett | 842 | - | 115 | | Gl.drift | | 50 | | | | | Dr | CH | 4¼ | DS | |
| 185 | | Mr. Jackson | 908 | - | 22 | | Gl.drift | | 10 | | | | | Dug | CH | 24 | DS | |
| 186 | | M. Schneider | 938 | - | 97 | | Gl.drift | | 61 | | | | | Dr | CH | 5½ | DS | |
| 187 | | Mr. Thomas | 924 | - | 169 | | Gl.drift | | 87 | | | | | Dr | DwE | 5½ | DS | |
| 188L | 90 | Walnut Grove Club | 930 | - | 170 | | Gravel | | 97 | 125 | | 11-47 | | Dr | TrE | 8 | Irr | |
| 189 | | Walnut Grove Club | 920 | - | 165 | | Gl.drift | | | | | | | Dr | | | | |
| 190 | | Malcolm Frank | 919 | 205 | 236 | | Shale | Richmond? | 150 | | | | | Dr | DwE | 5½ | DS | |
| 191* | | J. Routzoung | 900 | - | 101 | | Gl.drift | | | | | | | Dr | EjE | 5½ | DS | |
| 192* | | Jno. Coy | 881 | - | 52 | | Gl.drift | | | | | | | Dr | CH | 5½ | DS | |
| 193 | | G. I. Beaver | 908 | 271 | | | Shale | Richmond? | | | | | | Dr | | | | |
| 194L | 89 | D. Carnell | 942 | - | 108 | | Gravel | | 71 | 12 | Sml | | | Dr | | 5½ | DS | |
| 195L | 137 | H. Vest | 921 | - | 66 | | Gravel | | 35 | 12 | Sml | 6 21-48 | | Dr | | 5½ | DS | |
| 196* | | Rest Haven Park | 920 | - | 190 | | Gl.drift | | | | | | | Dr | DwE | | PS | |
| 197 | | Mr. Butcher | 918 | - | 75 | | Gl.drift | | 25M | | | 9-47 | | Dr | CH | 4¼ | DS | |
| 198 | | Mr. Ferguson | 902 | | | | | | | | | | | Dr | | | | |
| 199 | | Earl Cyphers | 920 | - | 63 | | Gl.drift | | | | | | | Dr | CH | 5½ | DS | |
| 200 | | N. M. Day | 880 | - | 18 | | Gl.drift | | 14 | | | | | Dug | SwE | 36 | DS | |
| 201 | | Ella Shoup | 927 | - | 161 | | Gl.drift | | | | | | | Dr | | | | |
| 202 | | G. C. Wolf | 917 | - | 36 | | Gl.drift | | 33 | | | | | Dug | SwE | 36 | DS | |
| 203 | | Bert Cline | 947 | - | 190M | | Gl.drift | | 19M | | | 9-47 | | Dr | CH | 5½ | DS | |
| 204 | | A. R. McGreevy | 855 | | 37 | | Shale | Richmond | 30 | | | | | Dr | SwE | 6 | DS | |
| 205 | | | 910 | | 40 | | Shale | Richmond | | | | | | Dr | CH | 5½ | DS | |
| 206L | 92 | Mr. Pence | 847 | 6 | 45 | | Shale | Richmond | 6 | ½ | 39 | | | Dr | | 6 | DS | |
| 207L | 93 | Howard Cosler | 856 | - | 53 | | Gravel | | 38 | 16 | Sml | | | Dr | | 6 | DS | |
| 208L | 35 | City of Oakwood | 820 | - | 160 | | | | 12 | | | | | Dr | - | 8 | T | |
| 209 | | Carl Lehman | 861 | | | | | | | | | | | Dr | SwE | 6 | DS | |
| 210* | | A. A. Shoup | 860 | - | 35 | | Gl.drift | | | | | | | Dr | EjE | 5½ | DS | |
| 211 | | W. F. Croft | 928 | - | 166 | | Gl.drift | | | | | | | Dr | | 5½ | | |
| 212* | | M. Milbauer | 998 | - | 159 | | Gl.drift | | | | | | | Dr | CH | 5½ | DS | |
| 213* | | L. VanWert | 942 | - | 201 | | Gl.drift | | 125 | | | | | Dr | DwE | 5 | DS | |
| 214 | | Allen Andrew | 890 | - | 22 | | Gl.drift | | 6 | | | | | Dv | CH | 2 | DS | |
| 215 | | G. Frey | 921 | | 230 | | Shale | Richmond | | | | | | Dr | | | | |
| 216 | | Forest Hyland | 940 | - | 30 | | Gl.drift | | | | | | | Dug | SwE | 48 | DS | |
| 217* | | Fred Howker | 980 | 60 | 101 | | Shale | Richmond | | | | | | Dr | EjE | | DS | |
| 218* | | Mr. Greer | 895 | - | 49 | | Gl.drift | | | | | | | Dr | DwE | 6 | DS | |
| 219* | | Mr. Klingabeal | 950 | - | 122 | | Gl.drift | | | | | | | Dr | DwE | 6 | DS | |
| 220L | 49 | Harold Fetz | 840 | - | 26 | | CseSand | | 12 | 5 | 4 | 8 20-47 | A | Dr | CH | 6 | DS | |
| 221 | | D. M. Sipe | 889 | - | 226 | | Gl.drift | | | | | | | Dr | | | DS | |
| 222* | | Jno. Lawrence | 880 | - | 285 | | Gl.drift | | | | | | | Dr | | 6 | DS | |
| 223L | 64 | Oliver Wagner | 878 | 108 | 112 | | Shale | Richmond | Flow | 1 | | | | Dr | | 5½ | DS | |
| 224L | 128 | W. T. Davis | 883 | 118 | 130 | | Shale | Richmond | | | | | | Dr | | 5 | DS | |
| 225L | 63 | Wm. Calvert | 890 | - | 150 | | Gravel | | 41 | 9 | | 3-16-46 | | Dr | | 5½ | DS | |
| 226L | 65 | Chas. Harvey | 882 | - | 147 | | Gravel | | 41 | 10 | | | | Dr | | 5½ | DS | |

Table 8 (Continued)

Beaver Creek and Sugar Creek Townships

| Number | File Number (Ohio Water Resources Board) | Owner or name | Elevation at well (feet above sea level) | Depth to bedrock (feet) | Depth of well (feet) | Principal water-bearing bed: Depth water encountered (ft) | Principal water-bearing bed: Character of material | Principal water-bearing bed: Geologic horizon | Static water level (feet below land surface) | Yield (g.p.m.) | Drawdown (feet) | Date | Quality of water | Type of well | Method of lift | Diameter of well (inches) | Use | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Beaver Creek Township (Continued) | | | | | | | | | | | | | | | | | | |
| 227L | 36 | Mr. Arndst | 878 | - | 180 | | Sd+gr | | 44 | 8 | | 10-15-47 | | Dr | | 5 | DS | |
| 228L | 91 | G. C. Coy | 820 | - | 128 | | Gravel | | 5 | 24 | 7 | | | Dr | | 5½ | DS | |
| 229* | | W. A. Shoemoke | 902 | - | 90 | | Gl.drift | | 20 | | | | | Dr | DwE | 6 | DS | |
| 230L | 88 | Sam Noble | 877 | - | 43 | | Gravel | | 31 | 15 | Sml | | A | Dr | | 5½ | DS | |
| 231L | 123 | Claud Wright | 840 | - | 86 | | Gravel | | 49 | 8 | 12 | 6-18-48 | | Dr | CH | 5½ | DS | |
| 232L | 29 | Ralph Brill | 839 | - | 55 | | Gravel | | 28 | 4 | | 4-26-46 | | Dr | | 5 | DS | |
| 233* | | Mr. Rice | 840 | - | 80 | | Gl.drift | | | | | | | Dr | | 5½ | DS | |
| 234L | 32 | Lewis Stewart | 803 | - | 93 | | Gravel | | Flow | | | 5-3-46 | | Dr | | 5 | DS | |
| 235 | | J. D. Ankeney | 900 | - | 198 | | Gl.drift | | 100 | | | | | Dr | DwE | 5½ | DS | |
| 236 | | R. M. Slifer | 825 | - | 16 | | Gl.drift | | Flow | | | | | Dv | SwE | 2 | DS | |
| 237 | | Nelson Ankeney | 900 | - | 115 | | Gl.drift | | 35 | | | | | Dr | DwE | 5½ | DS | |
| 238* | | H. M. Ankeney | 834 | - | 94 | | Gl.drift | | 44 | | | | | Dr | PjE | 4 | DS | |
| 239* | | A. S. Ankeney | 843 | - | 57 | | Gl.drift | | 50 | | | | | Dr | CH | 5 | DS | |
| 240L | 87 | C. Harlow | 841 | - | 109 | | Gravel | | 42 | 8 | | | | Dr | | 5½ | DS | |
| 241L | 31 | L. Prine | 842 | - | 100 | | Gravel | | 46 | 8 | 10 | 5-8-46 | | Dr | | 5 | DS | |
| 242L | 96 | H. K. Ankeney | 800 | - | 172 | | Gravel | | Flow | 100 | | 9-48 | | Dr | - | 6 | T | Observation well GR-2 |
| 243* | | W. A. Swaney | 800 | - | 80 | | Gl.drift | | Flow | 60 | | | | Dr | SwE | 6 | DSS | |
| 244 | | M. Bradford | 827 | - | 25 | | Gl.drift | | 20 | | | | | Dug | SwE | 36 | DS | |
| 245* | | D. O. Jones | 830 | - | 30 | | Gl.drift | | 26 | | | | | Dr | CH | 4 | DS | |
| 246* | | C. O. Miller | 810 | - | 52 | | Gl.drift | | 18 | | | | | Dr | SwE | 5½ | DS | |
| 247 | | P. A. Trubee | 807 | | | | | | | | | | | Dr | CH | 4 | DS | |
| 248L | 30 | Jas. Miller | 800 | - | 53 | | Gravel | | 15 | 20 | | 6-26-46 | A | Dr | CH | 5 | GP | |
| 249 | | Gosiger-Stoeklein | 979 | - | 271M | | Gl.drift | | | | | | | Dr | | | | |
| 250 | | R. E. Detrick | 1023 | - | 250 | | Gl.drift | | | | | | | Dr | | | DS | |
| 251* | | V. Keger | 1021 | - | 93 | | Gl.drift | | | | | | | Dr | DwE | | | |
| 252 | | E. Rosell | 980 | 20 | | | Lmstone | Clinton | | | | | | Dr | | | DS | |
| 253* | | R. L. Wetzel | 1022 | 49 | 107 | | Shale | Richmond | | | | | | Dr | DwE | 6 | | |
| 254 | | E. Rosell | 1009 | 36 | | | Lmstone | Clinton | | | | | | Dr | | | DS | |
| 255 | | C. W. Sipe | 1000 | | 80 | | Lmstone | Clinton | | | | | | Dr | EjE | 6 | DS | |
| 256 | | R. Thomas | 1032 | | 80 | | Lmstone | Clinton | | | | | | Dr | CH | | DS | |
| 257 | | B. Shoup | 1000 | | 60 | | Shale | Richmond | | | | | | Dr | CH | 4 | | |
| 258 | | H. M. Darst | 900 | | | | | | | | | | | Dr | | 5 | DS | |
| 259* | | C. Louis | 900 | 42 | 82 | | Shale | Richmond | | | | | | Dr | CH | 5 | DS | |
| 260L | 124 | H. E. Cyphus | 985 | 18 | 35 | | Shale | Richmond | | | | | | Dr | | 5½ | DS | |
| 261 | | H. W. Peeling | 950 | - | 28 | | Gl.drift | | 24 | | | | | Dug | CH | 20 | DS | |
| 262* | | W. F. Richards | 937 | 22 | 53 | | Shale | Richmond | | | | | | Dr | CH | 5½ | DS | |
| 263* | | R. E. Kidd | 895 | 31 | 87 | | Shale | Richmond | | | | | | Dr | CH | | DS | |
| 264 | | E. Geultig | 900 | 32 | 145 | | Shale | Richmond | 30 | | | | | Dr | EjE | 6 | DS | |
| 265* | | J. Weng | 820 | 45 | 100 | | Shale | Richmond | | | | | | Dr | CH | 6 | S | Also has spring |
| 266* | | W. S. Milligan | 811 | 5 | 79 | | Shale | Richmond | | | | | | Dr | CH | 5 | DS | |
| 267* | | E. P. Dorsey | 864 | 27 | 129 | | Shale | Richmond | | | | | | Dr | CH | 5½ | DS | |
| 268 | | Jas. McCalmont | 881 | - | 80 | | Gl.drift | | 35 | | | | | Dr | PjE | 5 | DS | |
| 269 | | F. L. Morgan | 850 | - | | | Gl.drift | | | | | | | Dr | DwE | 5 | DS | |
| 270 | | J. N. Robinson | 940 | - | 185M | | Gl.drift | | 105M | | | | | Dr | CH | 5½ | DS | |
| 271* | | H. S. Croushorn | 920 | - | 169 | | Gl.drift | | 103 | | | | | Dr | DwE | 6 | DS | |
| 272 | | F Haines | 930 | - | 86 | | Gl.drift | | | | | | | Dr | PjE | 6 | DS | |
| 273 | | J. E. McClellan | 917 | - | 180 | | Gl.drift | | | | | | | Dr | | | | |
| 274* | | J. E. McClellan | 921 | - | 99 | | Gl.drift | | | | | | | Dr | EjE | 5 | DS | |
| 1231L | 148 | C. Moore | 918 | - | 73 | | Gravel | | 38 | 5 | 15 | 7-8-48 | | Dr | | 5½ | DS | |
| Sugar Creek Township | | | | | | | | | | | | | | | | | | |
| 275 | | A. Renaker | 940 | 60 | 110 | | Shale | Richmond | | | | | | Dr | EjE | 5½ | DS | |
| 276 | | M. C. Cunningham | 930 | 62 | 68 | | Shale | Richmond | | | | | | Dr | DwE | 6 | DS | |
| 277 | | E. F. Larrick | 975 | | | | | | | | | | | Dr | DwE | 6 | DS | |
| 278 | | J. M. Roland | 980 | | 75 | | Shale | Richmond | | | | | | Dr | CH | 6 | DS | |
| 279L | 97 | M. Keiter | 940 | 43 | 63 | | Shale | Richmond | 5 | 5 | 28 | 8-15-46 | | Dr | EjE | 6 | DS | |
| 280 | | R. Patterson | 980 | 20 | | | Shale | Richmond | | | | | | Dr | | | | |
| 281 | | J. F. Smith | 921 | | | | | | | | | | | Dr | | | | |
| 282 | | J. C. White | 935 | - | 27 | | Gl.drift | | | | | | | Dug | CH | 24 | DS | |
| 283 | | C. McHouston | 890 | 30 | 30 | | Gl.drift | | 8 | | | | | Dug | CH | 30 | DS | |
| 284 | | H. Tate | 931 | | | | Gl.drift | | 28 | | | | | Dug | CH | | DS | |
| 285 | | C. Cables | 953 | | | | Gl.drift | | | | | | | Dug | CH | 36 | DS | |
| 286 | | C. Johnson | 968 | | | | Gl.drift | | | | | | | Dug | CH | 36 | DS | |
| 287L | 79 | J. White | 973 | 29 | 36 | | Shale | Richmond | 17 | 5 | Sml. | 8-28-46 | | Dr | | 6 | DS | |
| 288 | | C. W. Johnson | 915 | | | | | | | | | | | Dr | CH | 6 | DS | |
| 289 | | F. H. Turner | 921 | | | | | | | | | | | Dr | | 6 | DS | |
| 290 | | G. Busse | 960 | | 95 | | Shale | Richmond | | | | | | Dr | DwE | 6 | DS | |
| 291 | | T. Pepper | 940 | - | 35 | | Gl.drift | | 15 | | | | | Dug | CH | 42 | DS | |
| 292 | | W. Thompson | 943 | | | | | | | | | | | Dr | SwE | 6 | DS | |
| 293 | | J. R. McBee | 903 | - | 35 | | Gl.drift | | | | | | | Dug | CH | 48 | DS | |
| 294* | | D. Miltibarger | 875 | 30 | 67 | | Shale | Richmond | | | | | | Dr | CH | 5½ | DS | |
| 295* | | R. P. Nevitt | 830 | - | 55 | | Gl.drift | | Flow | 5 | | | | Dr | - | | DS | |
| 296 | | C. S. Wolf | 865 | - | 75 | | Gl.drift | | | | | | | Dr | DwE | | DS | |
| 297 | | N. Carey | 898 | - | 131 | | Gl.drift | | | | | | | Dr | CH | | DS | |
| 298* | | P. Ferguson | 902 | - | 63 | | Gl.drift | | 30 | | | | | Dr | DwE | | DS | |
| 299 | | C. P. Beal | 900 | - | 32 | | Gl.drift | | 25 | | | | | Dug | CH | 42 | DS | |
| 300* | | E. McClellan | 912 | - | 153 | | Gl.drift | | 58 | 10 | 10 | | | Dr | CH | 5 | DS | |
| 301 | | S. Thomas | 913 | - | 30 | | Gl.drift | | | | | | | Dug | SwE | 48 | DS | |
| 302 | | R. Meader | 840 | - | 30 | | Gl.drift | | 16 | | | | | Dug | CH | 48 | DS | |
| 303 | | O. E. Grismer | 780 | - | 39 | | Gl.drift | | 8 | | | | | Dug | CH | 42 | DS | |
| 304 | | J. Mills | 905 | - | 25 | | Gl.drift | | 21 | | | | | Dug | CH | 36 | DS | |

Table 8 (Continued)

Sugar Creek and Spring Valley Townships

| Number | File Number (Ohio Water Resources Board) | Owner or name | Elevation at well (feet above sea level) | Depth to bedrock (feet) | Depth of well (feet) | Principal water-bearing bed: Depth water encountered (ft) | Principal water-bearing bed: Character of material | Principal water-bearing bed: Geologic horizon | Static water level (feet below land surface) | Yield (g.p.m.) | Drawdown (feet) | Date | Quality of water | Type of well | Method of lift | Diameter of well (inches) | Use | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sugar Creek Township (Continued) | | | | | | | | | | | | | | | | | | |
| 305* | | A. C. Nick | 921 | - | 189 | | Gl.drift | | 119 | 12 | Sml | | | Dr | CH | 5½ | DS | |
| 306* | | R. Klingebiel | 870 | 21 | 102 | | Shale | Richmond | | | | | | Dr | DwE | | DS | |
| 307 | | L. Polk | 921 | | | | | | | | | | | Dr | EjE | | DS | |
| 308* | | R. G. Reeves | 775 | 31 | 75 | | Shale | Richmond | | | | | | Dr | SwE | 6 | DS | |
| 309 | | W. J. Moore | 775 | - | 22 | | Gl.drift | | 12 | | | | | Dv | SwE | 1¼ | DS | |
| 310 | | S. E. Seitner | 820 | - | 98 | | Gl.drift | | | | | | | Dr | DwE | 6 | DS | |
| 311 | | J. W. Gibbons | 892 | - | 24 | | Gl.drift | | | | | | | Dug | CH | 36 | DS | |
| 312 | | C. C. Grap | 770 | - | 27 | | Gl.drift | | 6 | | | | | Dv | CH | 2 | DS | |
| 313 | | W. B. Farnsworth | 921 | | | | | | | | | | | Dr | CH | | DS | |
| 314* | | C. E. Haines | 903 | - | 28 | | Gl.drift | | 6 | 15 | 3 | 1943 | | Dr | | 5 | DS | |
| 315* | | E. Shahan | 901 | 20 | 153 | | Shale | Richmond | 35 | | | | | Dr | EjE | 5½ | DS | |
| 316 | | C. E. Gunklack | 880 | | | | | | | | | | | Dr | PjE | | DS | |
| 317* | | O. S. Schmidt | 809 | 90 | 180 | | Shale | Richmond | 3 | | | | | Dr | SwE | 6 | DS | |
| 318L | 39 | D. Hodson | 786 | - | 51 | | Gl.drift | | | | | | | Dr | | 6 | DS | |
| 319* | | H. Hodson | 776 | - | 51 | | Gl.drift | | 8 | | | | | Dr | SwE | 5½ | DS | |
| 320 | | H. Sieber | 780 | - | 39 | | Gl.drift | | 10 | | | | | Dr | SwE | | DS | |
| 321 | | E. Graves | 815 | - | 100 | | Gl.drift | | | | | | | Dr | CH | | DS | |
| 322 | | L. Dierken | 920 | - | 132 | | Gl.drift | | 120 | | | | | Dr | DwE | | DS | |
| 323* | | J. McWilliams | 943 | - | 130 | | Gl.drift | | 16 | 8 | | 1941 | | Dr | DwE | 5½ | DS | |
| 324 | | S. B. Wright | 903 | - | 156 | | Gl.drift | | | | | | | Dr | | | | |
| 325* | | H. Sieber | 907 | - | 36 | | Gl.drift | | 30 | 5 | 4 | 1941 | | Dr | | 5½ | DS | |
| 326 | | S. C. Frederick | 927 | - | 66M | | Gl.drift | | 25M | | | 4-1-48 | | Dr | EjE | 6 | DS | |
| 327 | | H. Roland | 902 | 100 | 150 | | Shale | Richmond | | | | | | Dr | DwE | 6 | DS | |
| 328 | | J. W. Cole | 877 | - | 125 | | Gl.drift | | | | | | | Dr | | | | |
| 329 | | H. Wood | 899 | - | 70 | | Gl.drift | | | | | | | Dr | | | | |
| 330* | | R. Fisher | 902 | 30 | 200 | | Shale | Richmond | 33 | | | | | Dr | | 6 | DS | |
| 331 | | H. Smith | 790 | - | 28 | | Gl.drift | | 8 | | | | | Dv | SwE | 1¼ | DS | |
| 332L | 45 | P. Armstrong | 800 | 87 | 125 | | Shale | Richmond | 40 | 1 | | 12-11-47 | | Dr | EjE | 6 | DS | |
| 333 | | A. R Hornbrook | 870 | - | 69 | | Gl.drift | | 17 | | | | | Dr | - | 6 | | |
| 334* | | D. Quigley | 889 | 8 | 19 | | Shale | Richmond | 10 | | | | | Dug | CH | 72 | DS | |
| 335 | | R. Austin | 920 | - | 35 | | Gl.drift | | 7 | | | | | Dug | SwE | 36 | DS | |
| 336 | | T. Hignite | 912 | | 52 | | Shale | Richmond | | | | | | Dr | CH | 5½ | DS | |
| 337 | | F. Berryhill | 962 | - | 23 | | Gl.drift | | | | | | | Dug | CH | 28 | DS | |
| 338* | | C. C. Davis | 940 | 28 | 125 | | Shale | Richmond | | | | | | Dr | - | 6 | - | Well abandoned |
| 339 | | J. W. Cole | 928 | - | 40 | | Gl.drift | | | | | | | Dr | | | | |
| 340* | | A. J. Sprauer | 962 | 20 | 65 | | Shale | Richmond | | | | | | Dr | CH | | DS | |
| 341 | | W. O. Berryhill | 991 | | | | Gl.drift | | | | | | | Dug | CH | 24 | DS | |
| 342 | | L. W. Gerhard | 968 | 35 | 65 | | Shale | Richmond | | | | | | Dr | CH | 6 | DS | |
| 343 | | P. Shaffer | 1000 | | 90 | | Lmstone | Clinton | | | | | | Dr | EjE | | DS | |
| 344 | | J. L. Smith | 961 | 5 | | | Shale | Richmond | 20 | | | | | Dr | CH | 8 | DS | |
| 345 | | C. H. Pieper | 987 | | 22 | | Shale | Richmond | 7 | | | | | Dug | CH | 24 | DS | |
| 346 | | C. H. Pieper | 982 | | 40? | | Lmstone | Clinton | 13 | | | | | Dug | SwE | 36 | DS | |
| 347 | | H. Higgins | 983 | | | | | | | | | | | Dr | CH | | DS | |
| 348 | | J. Shelley | 995 | | 70 | | Shale | Richmond | | | | | | Dr | SwE | 5½ | DS | |
| 349 | | J. W. Roland | 929 | | | | | | | | | | | Dr | CH | 5 | DS | |
| 350 | | C. Schelling | 941 | | | | Gl.drift | | | | | | | Dug | CH | 36 | DS | |
| 351 | | C. Kine | 931 | | | | Gl.drift | | 3 | | | | | Dug | CH | 36 | DS | |
| 352 | | J. W. Roland | 928 | | | | Gl.drift | | | | | | | Dug | CH | 36 | DS | |
| 353* | | G. H. Thomas | 853 | 30 | 56 | | Shale | Richmond | 6 | 30 | 6 | 1947 | | Dr | SwE | 5½ | DS | |
| 354 | | J. S. Scott | 900 | - | 22 | | Gl.drift | | 8 | | | | | Dr | SwE | 4 | DS | |
| 355 | | R. W. Scott | 860 | - | 18 | | Gl.drift | | 8 | | | | | Dug | CH | 48 | DS | |
| 356* | | J. Michael | 880 | - | 50 | | Gl.drift | | 12 | | | | | Dr | CH | 5½ | DS | |
| 357* | | J. Michael | 884 | 21 | | | Shale | Richmond | | | | | | Dr | CH | 4¼ | S | |
| 358 | | W. T. Sallee | 900 | | | | Gl.drift | | | | | | | Dug | CH | 24 | DS | |
| Spring Valley Township | | | | | | | | | | | | | | | | | | |
| 359 | | J. W. Billmyer | 912 | - | 30 | | Gl.drift | | | | | | | Dug | PjE | | DS | |
| 360 | | T. Mitchell | 930 | - | | | Gl.drift | | | | | | | Dug | PjE | 24 | DS | |
| 361 | | J. S. Van Eaton | 904 | | 220 | | Shale | Richmond | | | | | | Dr | PjE | | DS | |
| 362 | | O. W Lawless | 922 | - | 40 | | Gl.drift | | | | | | | Dr | CH | | DS | |
| 363 | | H. E. Manor | 961 | | | | Gl.drift | | | | | | | DDr | SwE | | DS | |
| 364 | | W. B. Farnsworth | 920 | - | 99 | | Gl.drift | | | | | | | Dr | | | | |
| 365* | | O. D. Littrell | 913 | - | 128 | | Gl.drift | | 65 | 10 | Sml | 1947 | | Dr | CH | 5 | DS | |
| 366L | 40 | H. Armentrout | 900 | - | 105 | | Gravel | | 35 | | | | | Dr | | | DS | |
| 367 | | F. Fisher | 905 | - | 45 | | Gl.drift | | 25 | | | | | Dr | CH | 4 | DS | |
| 368 | | W. T. Stevens | 943 | - | 25 | | Gl.drift | | | | | | | Dug | SwE | 36 | DS | |
| 369* | | L. Hutchison | 924 | - | 223 | | Gl.drift | | 40 | | | | | Dr | PjE | | DS | |
| 370 | | S. Knee | 926 | - | 35 | | Gl.drift | | | | | | | Dug | PjE | | DS | |
| 371 | | B. G. Ferris | 870 | 140 | 135M | | Gl.drift | | 70M | | | 4-1-48 | | Dr | - | 4 | | |
| 372L | 25 | W. A. Crumley | 923 | - | 198 | | Sand | | | | | | | Dr | | 4 | DS | |
| 373* | | E. Faust | 921 | - | 77 | | Gl.drift | | 14 | 20 | 10 | 1945 | | Dr | | 5½ | DS | |
| 374 | | M. Wead | 941 | - | 72 | | Gl.drift | | | | | | | Dr | PjE | | DS | |
| 375L | 94 | C. R. Ryerson | 885 | - | 84 | | Gravel | | 59 | 12 | Sml | | | Dr | | 5½ | DS | |
| 376* | | L. Merkle | 880 | 175 | 178 | | Shale | Richmond | 88 | 14 | 2 | 1944 | | Dr | DwE | 5 | DS | |
| 377 | | J. R. Watkins | 890 | - | 30 | | Gl.drift | | 20 | | | | | Dug | CH | | DS | |
| 378 | | B. Kyne | 938 | - | 100 | | Gl.drift | | | | | | | Dr | EjE | | DS | |
| 379 | | L. Bean | 901 | - | 35M | | Gl.drift | | 13M | | | 3-30-48 | | Dr | EjE | 5½ | DS | |
| 380* | | D. T. Cast | 905 | - | 58 | | Gl.drift | | 20 | | | 1941 | | Dr | EjE | | DS | |
| 381 | | M. Anderson | 930 | - | 27 | | Gl.drift | | 25 | | | | | Dug | CH | | DS | |
| 382* | | B. Elam | 882 | - | 75 | | Gl.drift | | | | | | | Dr | CH | 4 | DS | |

Spring Valley and Miami Townships

| Number | File Number (Ohio Water Resources Board) | Owner or name | Elevation at well (feet above sea level) | Depth to bedrock (feet) | Depth of well (feet) | Principal water-bearing bed: Depth water encountered (ft) | Character of material | Geologic horizon | Static water level (feet below land surface) | Yield (g.p.m.) | Drawdown (feet) | Date | Quality of water | Type of well | Method of lift | Diameter of well (inches) | Use | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spring Valley Township (Continued) | | | | | | | | | | | | | | | | | | |
| 383 | | W. A. Shearer | 898 | - | 30 | | Gl.drift | | | | | | | Dug | CH | 36 | DS | |
| 384 | | M. Anderson | 983 | - | 57 | | Gl.drift | | 55 | | | | | Dug | CH | | DS | |
| 385* | | H. Beam | 905 | - | 70 | | Gl.drift | | 3M | 20 | 44 | 3-3-48 | | Dr | EjE | 5½ | DS | |
| 386 | | E. A. Beam | 962 | - | 76 | | Gl.drift | | 12 | | | | | Dr | EjE | 4 | DS | |
| 387* | | Spr.Valley Pack Co. | 778 | - | 57 | | Gl.drift | | | | | | | Dr | | 8 | I | |
| 388* | | W. Faul | 780 | - | 63 | | Gl.drift | | 2 | 20 | 2 | 1946 | | Dr | | 4¼ | DS | |
| 389 | | Mr. Cooper | 810 | - | 78 | | Gl.drift | | 37 | | | | | Dr | | 5½ | DS | |
| 390 | | P.K.Alexander | 901 | - | 190 | | Gl.drift | | | | | | | Dr | | | | |
| 391 | | High School | 902 | 99 | 163 | | Shale | Richmond | 99 | 10 | 22 | 1941 | | Dr | | 6 | PS | |
| 392* | | J. B. Kine | 780 | - | 137 | | Gl.drift | | Flow | 20 | | 1943 | | Dr | | 5 | DS | |
| 393* | | A. Powers | 810 | - | 62 | | Gl.drift | | 8 | | | 1943 | | Dr | | 5 | DS | |
| 394* | | Grade School | 860 | - | 145 | | Gl.drift | | 65 | 5 | 35 | 1943 | | Dr | | 4¼ | DS | |
| 395* | | B. Cline | 760 | - | 45 | | Gl.drift | | 12 | 20 | Sml | 1946 | | Dr | | 5 | DS | |
| 396* | | J. Johnson | 760 | - | 30 | | Gl.drift | | 21 | 10 | 21 | 1945 | | Dr | SwE | 5½ | DS | |
| 397* | | Cook-Stoneburner | 807 | - | 72 | | Gl.drift | | 60 | | | | | Dr | EjE | | DS | |
| 398* | | Grushon-Zennie | 823 | 85M | 152 | | Shale | Richmond | 79M | 1½ | | 1946 | | Dr | | 5½ | DS | |
| 399 | | D . Evans | 885 | - | 39 | | Gl.drift | | 8 | 10 | 12 | 1945 | | Dr | | 6 | DS | |
| 400 | | J. Rye | 865 | 97M | 100M | | Shale | Richmond | 65M | | | 4-1-48 | | Dr | - | 6 | DS | |
| 401 | | B. Elam | 925 | - | 175 | | Gl.drift | | | | | | | Dr | PjE | 4 | DS | |
| 402* | | R. Houston | 893 | - | 68 | | Gl.drift | | | | | 1943 | | Dr | | 5½ | DS | |
| 403 | | W. Nelson | 807 | 20? | 96 | | Shale | Richmond | | | | 1947 | | Dr | EjE | 5½ | DS | |
| 404* | | E. L. Roberts | 855 | 18 | 47 | | Shale | Richmond | 6 | | | | | Dr | EjE | 6 | DS | |
| 405 | | M. H. Smith | 883 | - | 22 | | Gl.drift | | 5 | | | | | Dug | CH | 9 | DS | |
| 406 | | H. Rye | 790 | - | 60M | | Gl.drift | | 35M | | | 4-5-48 | | Dr | CH | 6 | DS | |
| 407* | | Roxanna Cannery | 755 | - | 75 | | Gl.drift | | 21 | 120 | 1½ | 1947 | | Dr | | 6 | I | |
| 408 | | R. Sheehan | 795 | - | 106 | | Gl.drift | | | | | | | Dr | DwE | 5 | DS | |
| 409* | | C. Stanley | 780 | - | 96 | | Gl.drift | | 26 | 2 | | 1947 | | Dr | | 5 | DS | |
| 410* | | A. Cruse | 820 | - | 118 | | Gl.drift | | | | | 1925 | | Dr | | 5½ | DS | |
| 411* | | E. A. Beam | 982 | - | 127 | | Gl.drift | | 75 | 5 | | 1944 | | Dr | DwE | 4 | DS | |
| 412 | | E. A. Beam | 963 | - | 75 | | Gl.drift | | | | | | | Dr | CH | 4 | S | |
| 413* | | S. Pogue | 960 | - | 118 | | Gl.drift | | 52 | 12 | 12 | 1946 | | Dr | | 6 | DS | |
| 414* | | S. Pogue | 944 | 124 | 1575 | | Lmstone? | Trenton | | | | | | ✧ | | | | |
| 415* | | S. Pogue | 890 | 25 | 51 | | Shale | Richmond | 4 | 25 | 5 | 1946 | | Dr | | 6 | DS | |
| 416 | | D. Mustard | 947 | 65 | 176 | | Shale | Richmond | | | | | | Dr | | | DS | Pulled to top shale |
| 417 | | L. Simms | 961 | | | | | | | | | | | Dr | | 6 | DS | |
| 418* | | F. D. Bailey | 939 | 103 | 149 | | Shale | Richmond | 25 | 1 | | 1946 | | Dr | | 6 | DS | |
| 419 | | E. Compton | 965 | - | 30 | | Gl.drift | | | | | | | Dug | CH | | DS | |
| 420* | | D. W. Conklin | 942 | - | 78 | | Gl.drift | | 40 | 6 | 15 | 1946 | | Dr | | 6 | DS | |
| 421 | | C. E. Smith | 940 | | 109 | | Shale | Richmond | 79 | 14 | 10 | 1941 | | Dr | | 5 | DS | |
| 422 | | C. D. Miars | 883 | - | 35M | | Gl.drift | | 8M | | | 3-30-48 | | Dug | | 36 | DS | |
| 423* | | C. D. Miars | 890 | - | 111 | | Gl.drift | | 45 | 6 | 55 | 1945 | | Dr | DwE | 6 | DS | |
| 918L | 155 | A. Keyer | 860 | - | 217 | | Gl.drift | | 52 | 25 | 150 | 9-27-48 | | Dr | | 5½ | DS | |
| 1232L | 151 | R. Stoneburner | 810 | - | 85 | | Cse.Sand | | | | | 6-48 | A | Dr | | 5 | DS | |
| 1243* | | T. A. Davison | 765 | | 1500 | | Lmstone? | Trenton | 700? | | | | See table 6 | ✧ | | | PS | "OKEE" medicinal well |
| 1244L | | Spring Valley | 800 | - | 81 | | Gravel | --- | 14 | 200 | 51 | 7-13-49 | | Dr | | 8 | TW | Water temp. 52 degrees F |
| Miami Township | | | | | | | | | | | | | | | | | | |
| 424 | | A. L. Little | 980 | 36 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 425 | | B. W Katon | 1007 | | 35 | | Lmstone | Niagara | 9 | | | | | Dr | SwE | 5 | DS | |
| 426 | | R. Acton | 1000 | | 32 | | Lmstone | Niagara | 5 | | | | | Dr | SwE | 6 | DS | |
| 427 | | S. B. Harner | 1000 | 18 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 428 | | F. E. Geiss | 995 | - | 25 | | Gl.drift | | 8 | | | | | Dug | CH | 48 | DS | |
| 429 | | R. F. Betcher | 987 | - | 25 | | Gl.drift | | 18 | | | | | Dug | SwE | 42 | DS | |
| 430 | | E. Fogg | 986 | 20 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 431* | | E. K. Fogg | 1004 | 25 | 35 | | Lmstone | Niagara | | | | | | Dr | SwE | 6 | DS | |
| 432 | | E. K. Fogg | 1007 | | 52 | | Lmstone | Niagara | 15 | | | | | Dr | CH | 6 | DS | |
| 433 | | J. J. Bittner | 1014 | - | 24 | | Gl.drift | | 4 | | | | | Dug | PjE | | DS | |
| 434 | | W. E. Stevens | 1015 | | 38 | | Lmstone | Niagara | | | | | | Dr | SwE | 6 | DS | |
| 435 | | R, Fields | 996 | | | | Lmstone | Niagara | | | | | | Dr | CH | 5 | DS | |
| 438 | | C. McKnight | 981 | | | | Lmstone | Niagara | | | | | | Dr | CH | 6 | DS | |
| 439L | 37 | L. Strewing | 997 | 8 | 33 | | Lmstone | Niagara | 12 | 20 | Sml | | | Dr | | 5 | DS | |
| 440 | | M. Shaw | 1020 | 16 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 441 | | M. Shaw | 1015 | 20 | 22 | | Lmstone | Niagara | | | | | | Dr | CH | 6 | DS | |
| 442 | | J. Lewis | 1021 | 20 | 46 | | Lmstone | Niagara | 19 | | | | | Dr | EjE | 5 | DS | |
| 443 | | A. D. Hutsler | 1002 | 13 | 30 | | Lmstone | Niagara | 10 | | | | | Dr | SwE | 6 | DS | |
| 444* | | P. D. Gerhardt | 1030 | 16 | 34 | | Lmstone | Niagara | 8 | | | | | Dr | SwE | 5 | DS | |
| 445 | | P. D. Gerhardt | 1042 | | 60 | | Lmstone | Niagara | 16 | | | | | Dr | CH | 5 | DS | |
| 446 | | W. Routzong | 1052 | | 36 | | Lmstone | Niagara | 8 | | | | | Dr | SwE | 4 | DS | |
| 447 | | R. Newman | 1056 | | 88 | | Lmstone | Niagara | 25 | | | | | Dr | CH | 6 | DS | |
| 448 | | C. M. Williams | 982 | | 42 | | Lmstone | Niagara | | | | | | Dr | SwE | | DS | |
| 449 | | F. W. Dawson | 1017 | 18 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 450* | | A. Folck | 1048 | 25 | 54 | | Lmstone | Niagara | | | | | | DDr | EjE | 4 | DS | |
| 451 | | S. T. Bailey | 1050 | 25 | 25 | | Gl.drift | | 20 | | | | | Dug | CH | 36 | DS | |
| 452 | | M. W. Ault | 1030 | - | | | Gl.drift | | | | | | | Dug | CH | 36 | DS | |
| 453 | | G. Braley | 1004 | | | | Lmstone | Niagara | | | | | | Dr | CH | 5 | DS | |
| 454* | | A. Harphant | 1010 | 25 | 72 | | Lmstone | Niagara | | | | | | Dr | DwE | 5 | DS | |
| 455L | 68 | M. H. Finley | 1041 | 26 | 27 | | Lmstone | Niagara | 15 | 20 | Sml | 11-20-47 | | Dr | | 5 | DS | |
| 456* | | R. M. O'Conner | 1042 | 20 | 65 | | Lmstone | Niagara | 12 | | | | | Dr | SwE | 5 | DS | |
| 457 | | Mr. Paul | 1035 | 32 | 32 | | Gl.drift | | 22 | | | | | Dug | PjE | 36 | DS | |
| 458 | | C. M. Alexander | 1010 | 20 | 90 | | Lmstone | Niagara | 81 | | | | | DDr | DwE | 6 | DS | |
| 459 | | C. M. Confer | 1022 | 28 | | | Lmstone | Niagara | | | | | | Dr | | | | |

Table 8 (Continued)

Miami and Xenia Townships

| Number | File Number (Ohio Water Resources Board) | Owner or name | Elevation at well (feet above sea level) | Depth to bedrock (feet) | Depth of well (feet) | Principal water-bearing bed: Depth water encountered (ft) | Principal water-bearing bed: Character of material | Principal water-bearing bed: Geologic horizon | Static water level (feet below land surface) | Yield (g.p.m.) | Drawdown (feet) | Date | Quality of water | Type of well | Method of lift | Diameter of well (inches) | Use | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Miami Township (Continued) | | | | | | | | | | | | | | | | | | |
| 460 | | Mr. Mussetter | 1039 | | | | Lmstone | Niagara | | | | | | Dr | CH | | DS | |
| 461 | | T. Mehan | 1022 | 25 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 462 | | R. Fulton | 1027 | 15 | 115 | | Lmstone | Niagara | 13 | | | | | DDr | PjW | 6 | DS | |
| 463 | | C. H. Morgan | 1031 | 22 | 26 | | Lmstone | Niagara | 21 | | | | | Dug | SwE | 48 | DS | |
| 464 | | R. Viemeister | 1039 | | 26 | | Lmstone | Niagara | 10 | | | | | Dug | SwE | 20 | DS | |
| 465* | | L. Davis | 1025 | 5 | 40 | | Lmstone | Niagara | 4 | | | | | Dr | DwE | 6 | DS | |
| 466* | | W. A. Tanner | 1015 | 25 | 45 | | Lmstone | Niagara | 15 | | | | | Dr | CH | 6 | DS | |
| 467 | | C. P. Schaub | 1008 | | | | Lmstone | Niagara | Flow | | | | | Spr | SwE | | DS | |
| 468 | | L. B. Sidenstick | 1040 | 15 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 469 | | R. A. Houston | 1021 | - | 20 | | Gl.drift | | 5 | | | | | Dug | SwE | 36 | DS | |
| 470 | | J. E. Bailey | 1004 | 15 | 32 | | Lmstone | Niagara | 8 | | | | | Dr | DwE | 6 | DS | |
| 471 | | C. Forbeck | 1000 | - | 3 | | Gl.drift | | Flow | | | | | Spr | DH | | DS | |
| 472 | | L. E. Spillan | 1021 | 21 | 57 | | Lmstone | Niagara | 2 | | | | | DDr | DwE | 5 | DS | |
| 473 | | G. A. Confer | 981 | 6 | 38 | | Lmstone | Niagara | 11 | | | | | Dr | SwE | 6 | DS | |
| 474 | | L. R. Loe | 876 | 4 | 4 | | Lmstone | Niagara | Flow | | | | | Spr | SwE | | DS | |
| 475 | | R. Funderburg | 970 | - | 42 | | Gl.drift | | 36 | | | | | Dug | PjE | 48 | DS | |
| 476 | | H. Kahoe | 972 | 20 | 56 | | Lmstone | Niagara | 28 | | | | | Dr | EjE | 5 | DS | |
| 477L | 139 | W. A. Hammond | 961 | 27 | 65 | | Lmstone | Niagara | 40 | 20 | 10 | 6-23-48 | | Dr | CH | 5 | DS | |
| 478L | 95 | M. Bean | 962 | 6 | 75 | | Lmstone | Niagara | 8 | 50 | 14 | 4-23-48 | | Dr | | 10 | | |
| 479 | | Mr. Esterline | 955 | | | | Lmstone | Clinton | | | | | | Dr | CH | 5½ | DS | |
| 480 | | M. M. Bean | 940 | 8 | 50 | | Shale | Richmond | 27 | | | | | Dr | CH | 6 | DS | |
| 481 | | W. A. Hammond | 938 | 35 | | | Lmstone | Clinton | | | | | | Dr | CH | | DS | |
| 482 | | R. M. Whitmore | 900 | | | | Lmstone | Clinton | Flow | | | | | Spr | Ram | | DS | |
| 482 | | C. Grinnell | 900 | - | 3 | | Gl.drift | | Flow | | | | | Spr | SwE | | DS | |
| 484 | | W. T. Sullivan | 910 | | 108 | | Shale | Richmond | | | | | | Dr | EjE | 4 | DS | |
| 485 | | R. L. Jacobs | 980 | - | 142 | | Gl.drift | | | | | | | Dr | | | DS | |
| 486L | 80 | R. Jacobs | 1005 | 30 | 74 | | Lmstone | Clinton | 15 | 10 | | 10-28-44 | | Dr | | 5 | DS | |
| 487 | | A. Staggs | 1022 | | 78 | | Lmstone | Clinton | | | | | | Dr | CH | 6 | DS | |
| 488 | | R. L. Jacobs | 1010 | 40 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 489 | | C. M. Cory | 1007 | 20 | 60 | | Lmstone | Niagara | | | | | | Dr | CH | 6 | DS | |
| 490* | | C. Corry | 1018 | 22 | 45 | | Lmstone | Niagara | 39 | | | | | DDr | EjE | 3½ | DS | |
| 491 | | E. Dean | 982 | | 90 | | Lmstone | Niagara | 86 | | | | | Dr | CH | 6 | DS | |
| 492 | | C. Beatty | 998 | 8 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 493 | | G. Young | 1047 | 30 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 494* | | C. D. Coulter | 1000 | 25 | 72 | | Lmstone | Niagara | | | | | | Dr | DwE | | DS | |
| 495* | | J. A. Finney Jr. | 1018 | 15 | 63 | | Lmstone | Niagara | | | | | | Dr | CH | 5 | S | |
| 496 | | A. L. Flatter | 1001 | 18 | 45 | | Lmstone | Niagara | | | | | | Dr | SwE | | DS | |
| 497 | | T. B. Summers | 1001 | 15 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 498 | | E. J. Sparks | 1001 | - | 37M | | Gl.drift | | 17M | | | 4-48 | | Dr | | 5 | DS | |
| 499 | | P. Sexton | 1080 | | 170 | | Lmstone | Niagara | 19M | | | 4-48 | | Dr | | 4 | DS | |
| 500 | | B. Rife | 1082 | | 165 | | Lmstone | Niagara | | | | | | Dr | PjW | | S | |
| 501 | | J. C. Finney | 1050 | - | 60 | | Gl.drift | | | | | | | Dr | | | DS | |
| 502 | | L. A. DeVoe | 1040 | | | | | | | | | | | DDr | | | DS | |
| 503* | | P. W. Rife | 1043 | - | 65M | | Gl.drift | | 15M | | | 4-48 | | Dr | EjE | 6 | DS | |
| 504* | | R. Rife | 1068 | 60 | 80 | | Lmstone | Niagara | | | | | | Dr | CH | | DS | |
| 505 | | A. L. Flatter | 1044 | 27 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 506 | | A. M. Skillings | 1052 | - | 19 | | Gl.drift | | 5 | | | | | Dv | PH | 1¼ | DS | |
| 507* | | E. Flatter | 1066 | 21 | 50 | | Lmstone | Niagara | | | | | | Dr | PjE | | DS | |
| 508 | | L. Geis | 1051 | | 80 | | Lmstone | Niagara | 20 | | | | | DDr | CH | 6 | DS | |
| 509 | | L. Markley | 1050 | | | | | | | | | | | Dr | CH | 6 | DS | |
| 510 | | R. Griffith | 1049 | | 55 | | Lmstone | Niagara | | | | | | Dr | CH | 6 | DS | |
| 511 | | M. B. Tobias | 1041 | -? | 35 | | Gl.drift? | | | | | | | Dr | CH | | DS | |
| 512 | | W. Baldwin | 1080 | 42 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 1227L | 140 | Canning Company | 958 | 4 | 135 | | Lmstone | Niagara | | | | | | Dr | - | | - | Abandoned |
| 1228* | | A. E. Peterson | 1021 | 14 | 1843 | | Lmstone? | Trenton? | | | | 1938 | | ⌖ | | | - | |
| 1240L | 26 | Vil. of Yellow Springs | 965 | 19 | 114 | | Lmstone | Clinton | | | | 10-15-46 | | Dr | | 8 | PS | |
| Xenia Township | | | | | | | | | | | | | | | | | | |
| 513 | | L. A. Beatty | 980 | 2 | | | Lmstone | Niagara | Flow | | | | | Spr | SwE | | DS | |
| 514* | | S. Fulton | 1005 | 20 | 67 | | Lmstone | Niagara | | | | | | Dr | EjE | 5½ | DS | |
| 515 | | J. H. Snively | 1000 | | 90 | | Lmstone | Clinton | | | | | | Dr | PjE | 4 | DS | |
| 516 | | F. E. Ballard | 940 | 10 | 97 | | Lmstone | Clinton | | | | | | Dr | CH | 5½ | DS | |
| 517 | | F. E. Ballard | 935 | 5 | 5 | | Lmstone | Clinton | Flow | | | | | Spr | CH | | S | |
| 518 | | Mr. Bryson | 940 | | | | Lmstone | Clinton | Flow | | | | | Spr | | | DS | |
| 519 | | Mr. Ellis | 940 | | | | Lmstone | Clinton | Flow | | | | | Spr | Ram | | DS | |
| 520 | | O. Day | 900 | - | | | Gl.drift | | Flow | | | | | Spr | SwE | | DS | |
| 521 | | A. J. Pitstick | 960 | - | | | Gl.drift | | Flow | | | | | Spr | SwE | | DS | |
| 522 | | Mr. Spencer | 962 | | | | | | | | | | | Dr | EjE | 6 | DS | |
| 523 | | A. J. Pitstick | 979 | 20 | 40 | | Lmstone | Clinton | 20 | | | | | Dr | DwE | 6 | DS | |
| 524 | | F. G. Collins | 986 | 7 | 200 | | Shale | Richmond | 35 | | | | | Dr | DwE | 6 | DS | |
| 525 | | J. Sutton | 920 | | 150 | | Shale | Richmond | | | | | | Dr | PjG | | DS | |
| 526 | | J. H. Harner | 960 | | | | Gl.drift | | Flow | | | | | Spr | | | | |
| 527 | | F. W. Kendig | 962 | 16 | 32 | | Shale | Richmond | 27 | | | | | Dr | SwE | | DS | |
| 528 | | H. DeVoe | 941 | | | | Gl.drift | | | | | | | Dr | SwE | 48 | DS | |
| 529 | | H. Harner | 942 | | | | | | | | | | | Dr | | | | |
| 530 | | P. Harner | 945 | 60 | 75 | | Shale | Richmond | | | | | | DDr | DwE | 5½ | DS | |
| 531 | | J. Harner | 959 | - | 35 | | Gl.drift | | | | | | | Dug | SwE | 36 | DS | |
| 532 | | F. W. Kendig | 950 | - | | | Gl.drift | | | | | | | Dug | | | DS | |
| 533 | | Mr. Lake | 958 | - | | | Gl.drift | | Flow | | | | | Spr | | | DS | |
| 534 | | J. B. Lane | 990 | - | 80 | | Gl.drift | | 40 | | | | | Dr | DwE | 5½ | DS | |

Table 8 (Continued)

Xenia Township

| Number | File Number (Ohio Water Resources Board) | Owner or name | Elevation of well (feet above sea level) | Depth to bedrock (feet) | Depth of well (feet) | Principal water-bearing bed: Depth water encountered (ft) | Principal water-bearing bed: Character of material | Principal water-bearing bed: Geologic horizon | Static water level (feet below land surface) | Yield (g.p.m.) | Drawdown (feet) | Date | Quality of water | Type of well | Method of lift | Diameter of well (inches) | Use | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Xenia Township (Continued) | | | | | | | | | | | | | | | | | | |
| 535 | | A. D. Crowley | 920 | - | | | Gl.drift | | Flow | | | | | Spr | SwE | | DS | |
| 536 | | A. D. Crowley | 910 | - | 70 | | Gl.drift | | | | | | | Dr | CH | | DS | |
| 537L | 50 | J. Jones | 910 | - | 90 | | Gravel | | 68 | 5 | 5 | 8-28-47 | | Dr | | 6 | DS | |
| 538L | 42 | E. Strayer | 900 | - | 52 | | Gravel | | | | | 11-15-47 | | Dr | | 5 | DS | |
| 539L | 51 | J. Harner | 918 | 50 | 73 | | Shale | Richmond | 34 | 5 | Sml | 9-4-47 | | Dr | CH | 6 | S | |
| 540 | | J. Harner | 908 | - | 42 | | Gl.drift | | 14 | | | | | Dug | SwE | 60 | DS | |
| 541 | | J. Harner | 890 | | 74 | | Shale | Richmond | 44 | | | | | Dr | CH | 5½ | S | |
| 542 | | C. A. Riley | 840 | - | 23 | | Gl.drift | | 15 | | | | | Dr | SwE | 5 | DS | |
| 543L | 7 | City of Xenia | 810 | - | 112 | | Gl.drift | | 14 | | | 1935 | | Dr | - | | T | Abandoned |
| 544L | 27 | City of Xenia | 810 | - | 95 | | Gravel | | 20 | | | 1931 | | Dr | TE | | PS | |
| 545L | 33 | City of Xenia | 810 | - | 93 | | Sd+gr | | 13 | 1500 | | 1942 | | Dr | TE | 26 | PS | |
| 546 | | J. W. Van Eaton | 840 | - | 2 | | Gl.drift | | Flow | | | | | Spr | Ram | | DS | |
| 547 | | E. Howe | 921 | - | 78 | | Gl.drift | | 20 | | | | | DDr | CH | | DS | |
| 548 | | D. Ferguson | 930 | - | 60 | | Gl.drift | | | | | | | Dug | PjE | 42 | DS | |
| 549 | | E. H. Hutchinson | 940 | | 90 | | Shale | Richmond | 25 | | | | | DDr | DwE | 8 | DS | |
| 550L | 54 | B. Ferguson | 940 | 17 | 75 | | Shale | Richmond | 45 | 4 | 10 | 1-28-48 | | Dr | | 6 | DS | |
| 551* | | K. Hutchinson | 930 | 170 | 173 | | Shale | Richmond | 100 | | | 1940 | | Dr | DwE | 5½ | DS | |
| 552 | | J. E. Bradfute | 940 | | | | | | | | | | | DDr | | | | |
| 553 | | F. Corrigan | 961 | | 110 | | Lmstone | Clinton | | | | | | Dr | CH | | DS | |
| 554 | | H. O. Beatty | 902 | | 140 | | Shale | Richmond | 90 | | | | | Dr | DwE | 6 | DS | |
| 555* | | C. Storey | 977 | 50 | 70 | | Lmstone | Clinton | | | | | | Dr | CH | 5½ | DS | |
| 556* | | J. R. Mangan | 940 | 12 | 52 | | Lmstone | Clinton | | | | | | Dr | | 5½ | DS | |
| 557* | | J. W. Levalley | 959 | - | 40 | | Gl.drift | | | | | 1942 | | Dr | CH | | DS | |
| 558 | | W. P. Welch | 1017 | - | 60 | | Gl.drift | | | | | 1938 | | Dr | | | DS | |
| 559L | 57 | Geo. Young | 1000 | - | 69 | | Gravel | | 29 | 5 | Sml | 3-20-48 | | Dr | EjE | 5½ | DS | |
| 560* | | N. Shields | 1003 | - | 30 | | Gl.drift | | | | | | | Dr | CH | 5½ | DS | |
| 561 | | C. S. Spivey | 990 | | | | | | | | | | | Dr | CH | 4¼ | DS | |
| 562L | 60 | Wilberforce U. | 1009 | - | 112 | | Sd+gr | | 68 | | | 1-20-42 | | Dr | DwE | 8 | PS | |
| 563* | | E. Shaw | 1041 | 35 | 60 | | Lmstone | Niagara | | | | | | DDr | | 5 | DS | |
| 564 | | P. Crenshaw | 1025 | - | 37 | | Gl.drift | | | | | | | Dug | CH | | DS | |
| 565* | | F. Byers | 1035 | 40 | 60 | | Lmstone | Niagara | | | | | | Dr | PjE | | DS | |
| 566 | | W. Hartman | 1037 | | 75 | | Lmstone | Niagara | | | | | | Dr | DwE | 6 | DS | |
| 567 | | W. Hartman | 1041 | | 100 | | Lmstone | Niagara | | | | | | Dr | DwE | 4¼ | S | |
| 568 | | R. Mills | 1043 | 35 | 35 | | Gl.drift | | 29 | | | | | Dug | PjW | 48 | DS | |
| 569 | | H. H. Cherry | 1061 | - | 30 | | Gl.drift | | 8 | | | | | Dug | PjW | 42 | DS | |
| 570 | | Mr. Junk | 875 | - | | | Gl.drift | | Flow | | | | | Spr | Ram | | DS | |
| 571 | | Mr. McClain | 875 | - | | | Gl.drift | | Flow | | | | | Spr | SwE | | DS | |
| 572 | | Mr. Dallas | 875 | - | | | Gl.drift | | Flow | | | | | Spr | Ram | | DS | |
| 573 | | Mercury Realty | 902 | - | 103 | | Gl.drift | | | | | | | Dr | | | | |
| 574 | | R. R. Brewer | 817 | - | 8 | | Gl.drift | | Flow | | | | | Spr | SwE | | DS | |
| 575 | | Mr. Glotfelter | 875 | - | 12 | | Gl.drift | | 2 | | | | | Dug | CH | 24 | DS | Also has spring |
| 576 | | Mr. Burbe | 830 | - | 85 | | Gl.drift | | | | | | | Dr | CH | | DS | |
| 577* | | W. S. Lee | 855 | - | 57 | | Gl.drift | | Flow | | | | | Dr | EjE | 6 | DS | |
| 578L | 47 | Wm. Miles | 870 | - | 103 | | Sand | | 53 | 3 | | 8-6-47 | | Dr | | 6 | DS | |
| 579L | 52 | R. Winters | 875 | - | 156 | | Cse.Sand | | 45 | 14 | 5 | 2-29-47 | | Dr | | 6 | DS | |
| 580L | 28 | S. Johnson | 860 | - | 153 | | Gravel | | 57 | 4 | | | | Dr | | 5 | DS | |
| 581* | | E. Booth | 880 | 86 | | | Shale | Richmond | | | | | | Dr | | | | |
| 582* | | B. Pierce | 880 | 20 | 98 | | Shale | Richmond | 26 | | | | | Dr | - | 6 | | |
| 583* | | Mr. Hutchinson | 901 | 65M | 85M | | Shale | Richmond | 25M | | | 4-6-48 | | Dr | - | 6 | | Abandoned |
| 584* | | Wm. Spahr | 917 | - | 125 | | Gl.drift | | 70 | | | 1940 | | Dr | DwE | | DS | |
| 585 | | W. R. Bone | 921 | - | 130 | | Gl.drift | | | | | | | DDr | | 5½ | DS | |
| 586 | | R. H. Haines | 941 | - | 70 | | Gl.drift | | 62 | | | | | Dug | PjE | | DS | |
| 587* | | St. Bricid Cem. | 936 | - | 108M | | Gl.drift | | 50M | | | 4-2-48 | | Dr | - | 4 | - | Abandoned |
| 588* | | M. M. Shupp | 928 | 160 | | | Shale | Richmond | | | | | | Dr | | | | |
| 589* | | Orpheum Theater | 838 | 27 | 100 | | Shale | Richmond | | | | | | Dr | - | | - | Abandoned |
| 590L | 16 | Pa. R. R. Co. | 900 | 18 | 87 | | Shale | Richmond | | | | 3-7-26 | | Dr | - | | T | Abandoned |
| 591L | 18 | Pa. R. R. Co. | 919 | - | 40 | | Gl.drift | | | | | 3-9-26 | | Dr | - | | T | Abandoned |
| 592L | 15 | Pa. R. R. Co. | 910 | 41 | 107 | | Shale | Richmond | | | | 2-27-26 | | Dr | - | | T | Abandoned |
| 593L | 19 | Pa. R. R. Co. | 910 | 54 | 74 | | Shale | Richmond | | | | | | Dr | - | | T | Abandoned |
| 594L | 20 | Pa. R. R. Co. | 910 | 42 | 78 | | Shale | Richmond | | | | 2-19-26 | | Dr | - | | T | Abandoned |
| 595L | 8 | Hooven-Allison Co. | 918 | - | 21 | | Gravel | | | 300 | | | | Dr | DwE | 11 | I | |
| 596L | 13 | Ohio S-S Home | 950 | - | 60 | | Gravel | | | | | | | Dr | | 12 | | |
| 597* | | E. R. Teeters | 950 | - | 50M | | Gl.drift | | 32M | 10 | 10 | 3-31-48 | | Dr | CH | 5 | DS | |
| 598* | | H. W. Eavey | 965 | 12 | | | Shale | Richmond | | | | | | Dr | | | | |
| 599L | 14 | Ohio S-S Home | 955 | 63 | 64 | | Shale | Richmond | | | | 10-12-37 | | Dr | TE | 12 | PS | |
| 600L | 53 | C. Klontz | 963 | - | 80 | | Cse.gr. | | 41 | 5 | Sml | 1-12-48 | | Dr | CH | 6 | DS | |
| 601* | | State of Ohio | 949 | - | 128M | | Gl.drift | | 53M | | | 3-30-48 | | Dr | CH | 6 | PS | |
| 602L | 48 | R. Shaw | 964 | - | 61 | | Gravel | | 26 | 5 | 10 | 8-11-47 | | Dr | | 6 | DS | |
| 603* | | J. H. Stout | 923 | - | 28 | | Gl.drift | | 19 | 20 | Sml | 1946 | | Dr | SwE | 5½ | DS | |
| 604* | | G. C. Crawford | 961 | - | 97M | | Gl.drift | | 60M | | | 3-30-48 | | Dr | - | 6 | | |
| 605* | | P. H. Boxwell | 920 | - | 115M | | Gl.drift | | 32M | | | 3-29-48 | | Dr | - | 6 | | |
| 607 | | C. Weiss | 921 | - | 70 | | Gl.drift | | | | | | | Dr | DwE | 6 | DS | |
| 608* | | E. Weiss | 922 | - | 74 | | Gl.drift | | | | | | | Dr | PjE | 4 | DS | |
| 609* | | P. Smith | 920 | - | 40M | | Gl.drift | | 28M | | | 4-1-48 | | Dr | CH | 6 | DS | |
| 610* | | J. W. Cooper | 928 | 116 | 127 | | Shale | Richmond | 67 | 5 | 40 | 1944 | | Dr | PjG | 6 | DS | |
| 611* | | R. A. Webb | 905 | 75 | 108 | | Shale | Richmond | 26 | 90 | 108 | 1947 | | Dr | EjE | 6 | DS | |
| 612* | | P. Smith | 910 | - | 45 | | Gl.drift | | 34 | 7 | 4 | 1943 | | Dr | | 5 | DS | |
| 613* | | A. J. Fulkerson | 908 | 45M | 95M | | Shale | Richmond | 21M | | | 4-1-48 | | Dr | | 6 | | |
| 614* | | W. Bartlett | 921 | - | 69 | | Gl.drift | | 30 | | | | | Dr | DwE | | DS | |
| 615* | | R. Bartlett | 922 | | 100 | | Shale | Richmond | | | | | | Dr | | | DS | |
| 616 | | M. Bartlett | 920 | | | | | | | | | | | Dr | CH | | DS | |

Table 8 (Continued)

Xenia and Cedarville Townships

| Number | File Number (Ohio Water Resources Board) | Owner or name | Elevation at well (feet above sea level) | Depth to bedrock (feet) | Depth of well (feet) | Depth water encountered (ft) | Principal water-bearing bed: Character of material | Principal water-bearing bed: Geologic horizon | Static water level (feet below land surface) | Yield (g.p.m.) | Drawdown (feet) | Date | Quality of water | Type of well | Method of lift | Diameter of well (inches) | Use | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Xenia Township (Continued) | | | | | | | | | | | | | | | | | | |
| 617* | | H. Scott | 925 | 42M | 82M | | Shale | Richmond | 3M | 5 | | 3-29-48 | | Dr | CH | 6 | S | |
| 618* | | J. Wylie | 989 | 42 | 68 | | Lmstone | Clinton | 18 | 5 | | 1946 | | Dr | CH | 6 | S | |
| 619* | | R. Heaton | 1020 | 33 | 53 | | Lmstone | Niagara | 10 | 10 | 10 | 1946 | | Dr | | 5½ | DS | |
| 620* | | C; Mangan | 1023 | - | 42 | | Gl.drift | | 11 | 5 | 21 | 1943 | | Dr | CH | 5 | DS | |
| 621* | | L. D. Chitty | 1026 | 60 | 94 | | Lmstone | Niagara | 43 | 14 | 2½ | 1945 | | Dr | | 5½ | DS | |
| 622* | | H. O. Glass | 1042 | 34 | 47 | | Lmstone | Niagara | 16 | 15 | 12 | 1943 | | Dr | PjE | 5 | S | |
| 623* | | E. O. Webster | 1041 | 42 | 66 | | Lmstone | Niagara | 19 | 6 | 8 | 1945 | | Dr | EjE | 5½ | PS | |
| 624 | | A. C. Williamson | 1044 | | | | | | | | | | | Dr | CH | 5 | DS | |
| 625 | | H. Bickett | 1043 | - | 28 | | Gl.drift | | 20 | | | | | Dug | CH | | DS | |
| 626 | | E. S. Foust | 1045 | 30 | 70 | | Lmstone | Niagara | | | | | | Dr | | | | |
| 627 | | J. Bigler | 1045 | 30 | 70 | | Lmstone | Niagara | 12 | | | | | Dr | | | DS | |
| 628 | | H. Rector | 1042 | 20 | 86 | | Lmstone | Niagara | | | | | | DDr | PjE | 5½ | DS | |
| 629 | | F. Sutton | 980 | - | 25 | | Gl.drift | | 23 | | | | | Dug | CH | 30 | DS | |
| 630* | | Xenia Abattoir | 996 | 65 | 70 | | Shale | Richmond | | | | | | Dr | TE | 6 | I | |
| 631 | | B. V. Bell | 1021 | | 88 | | Shale | Richmond | | | | | | Dr | PjE | | DS | |
| 632 | | W. Bales | 1018 | - | | | Gl.drift | | 10 | | | | | Dug | CH | 36 | DS | |
| 633* | | W. L. Nash | 1042 | | 113 | | Lmstone | Niagara | | | | 1913 | | Dr | PjE | 6 | DS | |
| 634* | | S. Slate | 1041 | - | 78 | | Gl.drift | | 9 | | | | | Dr | PjE | | DS | |
| 635 | | E. G. Buchsieb | 1022 | | | | | | | | | | | Dr | CH | 5 | DS | |
| 636 | | D. Mangan | 1036 | - | 37 | | Gl.drift | | 30 | | | | | Dug | EjE | 36 | DS | |
| 637 | | C. Bales | 1040 | | | | | | | | | | | Dr | SwE | 6 | DS | |
| 638* | | W. McCoy | 1041 | - | 97 | | Gl.drift | | 17 | 15 | 23 | 1945 | | Dr | | | DS | |
| 639* | | P. Crestwell | 1023 | 40 | 80 | | Lmstone | Niagara | | | | | | Dr | DwE | | DS | |
| 640* | | D. H. Snyder | 1020 | - | 34 | | Gl.drift | | 19 | 15 | 1 | 1946 | | Dr | | 6 | DS | |
| 641* | | L. Tucker | | - | 73 | | Gl.drift | | 38 | 10 | Sml | 1945 | | Dr | | 5 | DS | |
| 642 | | C. Penewitt | 1032 | | | | | | | | | | | Dr | CH | 6 | DS | |
| 643* | | E. Wilson | 977 | 83 | 107 | | Shale | Richmond | | | | 1944 | | Dr | - | 5½ | - | |
| 644* | | T. B. Hayes | 1001 | 112 | | | Shale | Richmond | | | | | | Dr | | | | |
| 645* | | T. B. Hayes | 1026 | 170 | | | Shale | Richmond | | | | | | Dr | | | | |
| 646L | 59 | T. Leath | 1026 | - | 65 | | Gravel | | 49 | 4 | 6 | 4-2-48 | | Dr | | | DS | |
| 647 | | L. Ober | 1024 | - | 101 | | Gl.drift | | | | | 1942 | | Dr | | 4¼ | | |
| 648L | 108 | L. Berry | 1000 | - | 30 | | Cse.Sand | | 10 | 5 | Sml | 6-10-48 | | Dr | CH | 6 | DS | |
| 649L | 107 | R. Hull | 997 | - | 83 | | Cse.Sand | | 28 | 5 | Sml | 6-18-48 | | Dr | | 5½ | DS | |
| 650* | | J. W. Jennings | 1042 | 181 | 203 | | Shale | Richmond | 55 | | | | | Dr | EjE | 6 | DS | |
| 651 | | E. Deal | 1005 | - | 22 | | Gl.drift | | 21 | | | | | Dug | CH | | DS | |
| 652* | | B. Bickett | 985 | - | 93 | | Gl.drift | | 73 | 10 | 6 | 1946 | | Dr | | 5½ | | |
| 643 | | S. B. Haines | 1048 | - | 100 | | Gl.drift | | | | | | | Dr | CH | 5 | DS | |
| 654* | | L. B. Stingley | 1038 | - | 84 | | Gl.drift | | 10 | 10 | 50 | 1946 | | Dr | | 5 | DS | |
| 655* | | W. Marsh | 1039 | 60 | 69 | | Lmstone | Niagara | 18 | 7 | | 1946 | | Dr | | 5 | DS | |
| 656* | | J. F. Marsh | 1042 | 24 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 657 | | R. Wolf | 983 | - | 14 | | Gl.drift | | | | | | | Dug | PjE | | DS | |
| 658* | | C. Mathews | 1002 | - | 68 | | Gl.drift | | | | | | | Dr | PjE | 6 | DS | |
| 659* | | H. G. Robinson | 1020 | - | 90 | | Gl.drift | | 23 | | | | | Dr | PjE | 4¼ | DS | |
| 660* | | Union school | 1009 | - | 110 | | Gl.drift | | | | | | | Dr | CH | 4¼ | PS | |
| 661 | | W. DeVoe | 1039 | | | | | | | | | | | Dr | | 6 | | |
| 662* | | V. Ary | 1020 | | 40 | | Lmstone | Niagara | 12 | 14 | 10 | 1943 | | Dr | | 5 | DS | |
| 663 | | J. Watkins | 1021 | | | | | | | | | | | Dr | CH | | DS | |
| 664 | | G. Keplinger | 922 | 100 | 140 | | Shale | Richmond | 12 | | | 1945 | | Dr | PjE | 4¼ | DS | |
| 665 | | E. Hurley | 978 | - | 60 | | Gl.drift | | 16 | | | | | Dr | SwE | 4¼ | DS | |
| 666L | 152 | C. E. Parks | 1012 | - | 61 | | Sd-gr | | | | | 6-24-48 | | Dr | | 5½ | DS | |
| 667 | | C. Curry | 980 | - | 80 | | Gl.drift | | 50 | | | | | Dr | PjE | 6 | DS | |
| 668* | | J. T. Anderson | 1040 | - | 37M | | Gl.drift | | 20M | 5 | | 3-31-48 | | Dr | CH | 5½ | S | |
| 669L | 41 | T. Canning | 987 | 42 | 52 | | Lmstone | Clinton | | | | 10-11-47 | | Dr | | 4¼ | DS | |
| 670 | | F. C. Seelenbinder | 1001 | | 44 | | Lmstone | Clinton | | | | | | Dr | SwE | 4¼ | DS | |
| 671 | | ♣. Shaw | 998 | | 200 | | Lmstone | Clinton | | | | | | Dr | DwE | 5 | DS | |
| 672* | | E. DeWine | 1001 | 34 | 49 | | Lmstone | Niagara | 11 | 20 | 12 | 1947 | | Dr | | 5½ | DS | |
| 673 | | O. B. Lotts | 997 | | 80 | | Lmstone | Niagara | | | | | | Dr | SwE | 6 | DS | |
| 674* | | C. B. Lotts | 981 | 28 | 70 | | Lmstone | Clinton | 15 | 2 | 25 | 1947 | | Dr | | 6 | DS | |
| 675* | | L. S. Haines | 999 | 62 | | | Lmstone | Clinton | | | | | | Dr | | | | |
| 676 | | S. Moon | 962 | | | | | | | | | | | Dr | CH | 4 | DS | |
| 677* | | H. Rupert | 980 | 33 | 71 | | Lmstone | Clinton | 12 | 8 | 71 | 1945 | | Dr | DwE | 6 | DS | |
| 678L | 46 | F. Weaver | 977 | - | 25 | | Cse.Sand | | 7 | 15 | 1 | 7-25-47 | | Dr | | 6 | DS | |
| 679 | | O. J. Ellis | 1000 | | 100 | | Lmstone | Clinton | | | | | | Dr | PjE | | DS | |
| 680 | | Mr. Mound | 995 | | | | | | | | | | | Dr | CH | 6 | DS | |
| 1233L | 141 | H. Sexton | 860 | - | 172 | | Gravel | | 70 | | | | | Dr | CH | 5 | S | |
| 1234L | 143 | R. Hermann | 962 | - | 49 | | Gravel | | 37 | 3 | 4 | 8-17-48 | | Dr | | 5 | DS | |
| 1235L | 145 | G. Chard | 1020 | - | 80 | | Sd-gr | | 40 | 5 | 4 | 7-17-48 | | Dr | - | 5½ | DS | |
| 1236L | 147 | W. L. Smith | 983 | 27 | 67 | | Lmstone | Clinton | 30 | 3 | 20 | 7-14-48 | | Dr | | 5½ | DS | |
| 1237* | | R. Hackett | 840 | | 1255 | | | | | | | 1942 | | ✧ | | | | No water encountered |
| 1245 | | ----- | 938 | 94 | 1200 | | Lmstone | Trenton | | | | 1887 | | | | | | |
| Cedarville Township | | | | | | | | | | | | | | | | | | |
| 681 | | L. Glass | 1003 | | 65 | | Lmstone | Niagara | | | | | | Dr | CH | 5 | DS | |
| 682* | | W. E. Burda | 1028 | 2 | 85 | | Lmstone | Niagara | | | | | | Dr | CH | 6 | DS | |
| 683* | | J. E. Pemberton | 1000 | 3 | 50 | | Lmstone | Niagara | | | | | | Dr | DwE | | DS | |
| 684 | | J. Stover | 1038 | 4 | 64 | | Lmstone | Niagara | 12 | | | | | Dr | DwE | | DS | |
| 685* | | R. Turnbull | 942 | 160 | | | Shale | Richmond | | | | | | Dr | | | | |
| 686* | | R. Turnbull | 968 | 30 | 85 | | Lmstone | Clinton | | | | | | Dr | PjE | 6 | DS | |
| 687 | | H. Harding | 998 | - | | | Gl.drift | | 18 | | | | | Dug | DH | 42 | DS | |
| 688 | | J. E. Bradfute | 940 | - | 65 | | Gl.drift | | | | | | | Dr | EjE | 6 | DS | |
| 689* | | C. J. Turnbull | 1041 | 9 | 50 | | Lmstone | Niagara | 9 | | | | | Dr | CH | 6 | DS | |

Table 8 (Continued)

Cedarville Township

| Number | File Number (Ohio Water Resources Board) | Owner or name | Elevation of well (feet above sea level) | Depth to bedrock (feet) | Depth of well (feet) | Principal water-bearing bed: Depth water encountered (ft) | Principal water-bearing bed: Character of material | Principal water-bearing bed: Geologic horizon | Static water level (feet below land surface) | Yield (g.p.m.) | Drawdown (feet) | Date | Quality of water | Type of well | Method of lift | Diameter of well (inches) | Use | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cedarville Township (Continued) | | | | | | | | | | | | | | | | | | |
| 690 | | Mr. Hixon | 1061 | | | | | | | | | | | Dr | CH | | DS | |
| 691 | | W. Clevelle | 1068 | | 48 | | Lmstone | Niagara | 14 | | | | | Dr | SwE | | DS | |
| 692 | | J. H. Nagley | 1068 | | | | | | | | | | | Dr | CH | 6 | DS | |
| 693* | | E. Cory | 1061 | 25 | 74 | | Lmstone | Niagara | 22 | | | 1940 | | Dr | PjE | | DS | |
| 694 | | H. Cory | 1061 | | | | | | | | | | | Dr | SwE | | DS | |
| 695 | | J. M. Bull | 1063 | | 36 | | Lmstone | Niagara | | | | | | Dr | CH | 5 | DS | |
| 696 | | F. T. Thomas | 1065 | | 90 | | Lmstone | Niagara | | | | | | Dr | DwE | | DS | |
| 697 | | H. J. Schulte | 1075 | | | | | | | | | | | Dr | | | DS | |
| 698* | | H. Arthur | 1061 | 55 | 80 | | Lmstone | Niagara | | | | 1936 | | Dr | DwE | | S | |
| 699 | | E. H. Mittle | 1063 | - | 30 | | Gl.drift | | 23 | | | | | Dug | | 36 | DS | |
| 700* | | M. Wildman | 1061 | 100 | 112 | | Lmstone | Niagara | 8 | | | | | Dr | PjE | 6 | DS | |
| 701* | | J. C. Townsley | 1062 | 80 | 85 | | Lmstone | Niagara | | | | | | Dr | PjW | | DS | |
| 702L | 69 | R. Townsley | 1065 | 76 | 101 | | Lmstone | Niagara | 75 | 15 | Sml | 4-10-48 | | Dr | CH | 5 | DS | |
| 703 | | J. O. Conner | 1061 | | 100 | | Lmstone | Niagara | | | | | | Dr | EjE | 6 | DS | |
| 704* | | W. Barber | 1060 | 60 | 80 | | Lmstone | Niagara | | | | | | Dr | PjE | 6 | S | |
| 705 | | C. McMillen | 1064 | | | | | | | | | | | Dr | | | DS | |
| 706* | | D. Engle | 1060 | 55 | 80 | | Lmstone | Niagara | | | | | | Dr | PjW | | DS | |
| 707 | | L. Lillick | 1063 | | 100 | | Lmstone | Niagara | | | | | | Dr | DwE | 5½ | DS | |
| 708 | | H. Hamman | 1064 | | | | | | | | | | | Dr | PjE | | DS | |
| 709L | 70 | P. Townsley | 1059 | 75 | 85 | | Lmstone | Niagara | 50 | 15 | 5 | 3-18-48 | | Dr | | 5 | DS | |
| 710 | | R. Townsley | 1060 | | | | | | | | | | | Dr | | 5 | | |
| 711* | | Mr. Rittenour | 1061 | 70 | 100 | | Lmstone | Niagara | | | | | | Dr | CH | 6 | S | |
| 712* | | F Townsley | 1060 | 40 | 70 | | Lmstone | Niagara | 10 | | | | | DDr | | | DS | |
| 713* | | R. Collins | 1018 | 75 | 55 | | Lmstone | Niagara | 16 | | | | | Dr | PjE | 6 | DS | |
| 714* | | A. B. Patterson | 1005 | 25 | 37 | | Lmstone | Niagara | | | | | | Dr | PjE | 6 | DS | |
| 715 | | M. R Collins | 1039 | | 45 | | Lmstone | Niagara | 15 | | | | | Dr | CH | 6 | DS | |
| 716 | | M. Burrell | 1040 | | | | | | | | | | | Dr | | | S | |
| 717 | | A. B. Patterson | 940 | - | | | Gl.drift | | Flow | | | | | Spr | DH | | DS | |
| 718* | | A. D. Hamma | 1040 | 20 | 95 | | Lmstone | Niagara | 12 | | | | | DDr | DwE | 6 | DS | |
| 719 | | J. A. Vest | 1020 | - | 36 | | Gl.drift | | 30 | | | | | Dug | CH | 48 | DS | |
| 720 | | J. A. Vest | 1020 | - | | | Gl.drift | | Flow | | | | | Spr | DH | | DS | |
| 721 | | State of Ohio | 940 | | | | Lmstone | Niagara | | | | | | Dr | CH | 6 | PS | |
| 722 | | Mr. Milton | 944 | | | | Lmstone | Niagara | | | | | | Dr | CH | | DS | |
| 723 | | Mr. Earsler | 1040 | | 50 | | Lmstone | Niagara | 6 | | | | | Dr | CH | 6 | DS | |
| 724* | | G. A. Pfiefer | 1025 | 4 | 78 | | Lmstone | Niagara | 66 | | | | | Dr | EjE | 4¼ | DS | |
| 725L | 24 | V. of Cedarville | 1036 | 8 | 100 | | Lmstone | Niagara | 90 | 20 | 60 | | | Dr | TE | 5 | PS | |
| 726 | | D. R Johnson | 1064 | 20 | 64 | | Lmstone | Niagara | 6 | | | | | Dr | CH | | DS | |
| 727* | | R. Dobbin | 1053 | 20 | 60 | | Lmstone | Niagara | | | | 1945 | | Dr | | | DS | |
| 728 | | M. Shorade | 1061 | | | | | | | | | | | Dr | CH | 5 | DS | |
| 729* | | I. V. Vehinger | 1058 | 20 | 60 | | Lmstone | Niagara | | | | | | Dr | | | DS | |
| 730* | | I. V. Vehinger | 1058 | 20 | 60 | | Lmstone | Niagara | | | | | | Dr | CH | | S | |
| 731* | | F. Marbison | 1062 | 20 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 732 | | O. Dobbin | 1060 | | | | Lmstone | Niagara | | | | | | Dr | | 4¼ | DS | |
| 733L | 71 | G. Hartman | 1058 | 35 | 40 | | Lmstone | Niagara | 30 | 10 | | 9-2-44 | | Dr | CH | 5 | DS | |
| 734* | | F. Dobbin | 1062 | 40 | 75 | | Lmstone | Niagara | | | | | | Dr | CH | | S | |
| 735* | | P. Dobbin | 1057 | 40 | 75 | | Lmstone | Niagara | | | | | | Dr | | | DS | |
| 736* | | H. Smith | 1061 | 30 | 100 | | Lmstone | Niagara | 5 | | | 1933 | | Dr | DwE | 6 | DS | |
| 737 | | J. Klontz | 992 | | | | | | | | | | | Dr | CH | | DS | |
| 739* | | A. M. Peterson | 1030 | 5 | 62 | | Lmstone | Niagara | 5 | | | 1929 | | Dr | SwE | 4¼ | DS | |
| 740* | | B. T. Williamson | 1063 | 30 | 80 | | Lmstone | Niagara | | | | | | Dr | CH | 6 | DS | |
| 741* | | M. J. Stormont | 1061 | 28 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 742 | | C. H. Stormont | 1062 | 30 | 80 | | Lmstone | Niagara | | | | | | Dr | PjE | 6 | DS | |
| 743L | 62 | J. H. Thordson | 1063 | 25 | 60 | | Lmstone | Niagara | 20 | 10 | | 9-27-44 | A | Dr | SwE | 5 | DS | |
| 744L | 106 | J. H. Thordson | 1065 | 11 | 38 | | Lmstone | Niagara | 1 | 25 | 15 | 5-20-48 | | Dr | CH | 5 | S | |
| 745* | | Mr. Myers | 1066 | 30 | 80 | | Lmstone | Niagara | | | | | | Dr | PjE | 4¼ | DS | |
| 746* | | H. C. Crestwell | 1062 | 14 | 64 | | Lmstone | Niagara | 12 | | | | | Dr | PjE | 4¼ | DS | |
| 747 | | I. C. Stormont | 1061 | | | | Lmstone | Niagara | 15 | | | | | Dr | CH | | DS | |
| 748 | | Mr. Diffendal | 1065 | | | | Lmstone | Niagara | | | | | | Dr | CH | | DS | |
| 749* | | W. Williamson | 1064 | 17 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 750 | | J. H. Thordson | 1065 | 17 | 45 | | Lmstone | Niagara | 6 | | | | | Dr | CH | | DS | |
| 751* | | L. B. Straley | 1066 | 12 | 35 | | Lmstone | Niagara | 4 | | | | | Dr | SwE | 5½ | DS | |
| 752* | | Mr. Burba | 1062 | 18 | 45 | | Lmstone | Niagara | | | | | | Dr | CH | | DS | |
| 753* | | M. Hopping | 1061 | 20 | 45 | | Lmstone | Niagara | 15 | | | | | Dr | CH | 6 | DS | |
| 754 | | M. Hopping | 1060 | 20 | 60 | | Lmstone | Niagara | 14 | | | | | Dr | SwE | 5 | DS | |
| 755* | | J. C. Rakestraw | 1058 | 11 | 56 | | Lmstone | Niagara | | | | | | Dr | CH | | S | |
| 756* | | C. Manor | 1059 | 6 | 80 | | Lmstone | Niagara | 6 | | | | | Dr | SwE | 6 | DS | |
| 757* | | Mr. Crumrine | 1040 | 20 | 20 | | Gl.drift | | 10 | | | | | Dug | CH | | DS | |
| 759 | | Mr. Andrews | 1053 | | | | | | | | | | | Dr | CH | 5 | DS | |
| 760* | | J. A. McCampbell | 1042 | 30 | 50 | | Lmstone | Niagara | 15 | | | | | Dr | PjE | 5 | DS | |
| 761 | | H. D. Straley | 1043 | 48 | 92 | | Lmstone | Niagara | 14 | | | 1911 | | Dr | DwE | [illegible] | DS | |
| 762 | | D. Pence | 1020 | | | | | | | | | | | Dr | CH | 4¼ | DS | |
| 763* | | R. L. Haines | 1040 | 90 | 120 | | Lmstone | Niagara | | | | | | Dr | CH | 4¼ | DS | |
| 765* | | R. L. Haines | 1025 | 84 | 110 | | Lmstone | Niagara | 20 | 1½ | | 1944 | | Dr | PjE | 5½ | S | |
| 766* | | R. L. Haines | 1040 | - | 30 | | Gl.drift | | 12 | 6 | 4 | 1946 | | Dr | CH | 5½ | PS | |
| 940 | | G. Phillips | 1066 | - | | | Gl.drift | | 15 | | | | | Dug | SwE | | DS | |
| 941 | | E. G. Oglesbee | 1062 | | | | | | | | | | | Dr | CH | 5 | DS | |
| 942 | | D. C. Jobe | 1062 | - | 22 | | Gl.drift | | 18 | | | | | Dug | CW | 36 | DS | |
| 943 | | E. G. Oglesbee | 1062 | | | | | | | | | | | Dr | PjE | 5 | DS | |
| 1238L | 164 | Pennsylvania R.R. | 1063 | 85 | 195 | | Lmstone | Niagara | Flow | 15 | 65 | 10-26-45 | | Dr | | | T | |
| 1246* | | Loyd Wildman | 1085 | 122 | 127 | | Lmstone | Niagara | 40 | 10 | Sml | 5-7-49 | | Dr | CH | 5 | DS | |
| 1247* | | Edgar Little | 1062 | 70 | 92 | | Lmstone | Niagara | 80 | 18 | 7 | 3-7-49 | | Dr | SwE | 5 | DS | |
| 1248* | | Gossard School | 1067 | 90 | 130 | | Lmstone | Niagara | | | | | | Dr | CH | 4 | PS | |

Table 8 (Continued)

New Jasper and Caesar Creek Townships

| Number | File Number (Ohio Water Resources Board) | Owner or name | Elevation of well (feet above sea level) | Depth to bedrock (feet) | Depth of well (feet) | Principal water-bearing bed: Depth water encountered (ft) | Principal water-bearing bed: Character of material | Principal water-bearing bed: Geologic horizon | Static water level (feet below land surface) | Yield (g.p.m.) | Drawdown (feet) | Date | Quality of water | Type of well | Method of lift | Diameter of well (inches) | Use | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| New Jasper Township | | | | | | | | | | | | | | | | | | |
| 767* | | E. Faust | 1062 | 19 | 67 | | Lmstone | Niagara | 12 | 20 | 32 | 1945 | | Dr | CH | 5½ | DS | |
| 768 | | J. R Turnbull | 1020 | | | | | | | | | | | Dr | CH | 4 | DS | |
| 769 | | W. E. Jones | 1000 | - | 20 | | Gl.drift | | 12 | | | | | Dug | - | 48 | - | |
| 770 | | H. Turner | 1040 | - | 20 | | Gl.drift | | 10 | | | | | Dug | SwE | 48 | DS | |
| 771* | | W. M. Fudge | 1030 | 72 | 76 | | Lmstone | Niagara | 38 | 6 | 5 | 1945 | | Dr | | 5 | S | |
| 772 | | A. Greeve | 1025 | - | 180 | | Lmstone | Niagara | | | | | | Dr | CH | 4½ | DS | |
| 773* | | Wm. Fudge | 1030 | 12 | 57 | | Lmstone | Niagara | | | | | | Dr | | 5 | DS | |
| 774 | | H. S. Dean | 983 | | 84 | | Lmstone | Niagara | | | | | | Dr | CH | 4½ | S | |
| 776* | | M. Bogart | 1021 | 102 | 125 | | Lmstone | Clinton | 27 | 20 | | 1936 | | Dr | PjE | 5½ | S | |
| 777* | | O. C. Reck | 1020 | - | 84 | | Gl.drift | | 13 | 30 | 9 | 1946 | | Dr | SwE | 5 | DS | |
| 778* | | T. E. Darling | 1020 | 35 | 64 | | Lmstone | Niagara | 10 | 6 | 10 | 1941 | | Dr | CH | 5½ | DS | |
| 779* | | J. Albin | 1047 | 120 | 165 | | Gl.drift | | | | | 1930 | | Dr | | 5½ | DS | |
| 780* | | H. Brokefield | 1048 | | | | | | | | | | | Dr | DwE | | DS | |
| 781 | | P. Crestwell | 1022 | | | | | | | | | | | Dr | SwE | | DS | |
| 782 | | P. Crestwell | 1010 | | | | | | | | | | | Dr | CH | 4½ | DS | |
| 783 | | C. Riley | 1021 | - | 31 | | Gl.drift | | 12 | | | | | Dug | CH | 36 | DS | |
| 784 | | C. A. Beckett | 1021 | - | 27 | | Gl.drift | | | | | 1900 | | DDr | CH | 6 | DS | |
| 785 | | M. Ford | 1023 | - | 38 | | Gl.drift | | 16 | | | 1916 | | Dr | PjE | 6 | DS | |
| 786 | | O. Conklin | 1022 | | | | | | | | | | | Dr | DwE | 6 | DS | |
| 787 | | R. Hopping | 1018 | | | | | | | | | | | Dr | CH | | DS | |
| 788 | | N. Buttsinger | 980 | - | | | Gl.drift | | | | | | | Dug | CH | 48 | DS | |
| 789 | | W J. Boots | 980 | - | 86 | | Gl.drift | | 65 | | | | | Dr | CH | 4½ | DS | |
| 790 | | D. S. Hargrave | 1005 | 70 | 172 | | Lmstone | Clinton | 30 | | | | | Dr | PjE | 4½ | DS | |
| 791 | | W. H. Allbrich | 1020 | | | | | | | | | | | Dr | CH | | DS | |
| 792* | | H. Harness | 1000 | 49 | 70 | | Lmstone | Niagara | 5 | 60 | 6 | 1945 | | Dr | | 5½ | DS | |
| 793 | | A. D. Smith | 980 | - | | | Gl.drift | | 15 | | | | | Dug | CH | 42 | DS | |
| 794 | | E. Wooley | 1000 | - | 32 | | Gl.drift | | | | | | | Dug | CH | | DS | |
| 795 | | J. Fudge | 1020 | | | | | | | | | | | Dr | CH | | DS | |
| 796* | | E. Smith | 1020 | 50 | 85 | | Lmstone | Niagara | | | | | | Dr | PjE | 5½ | DS | |
| 797* | | H. Smith | 1025 | - | 103 | | Gl.drift | | | 15 | | 1936 | | Dr | | 5½ | DS | |
| 798 | | E. Dean | 1041 | - | | | Gl.drift | | | | | | | Dug | CH | | DS | |
| 799 | | E. Dean | 1050 | - | 34 | | Gl.drift | | 6 | | | | | Dug | CH | | DS | |
| 800* | | W. J. Boots | 980 | 32 | 76 | | Lmstone | Clinton | 17 | | | | | Dr | CH | 5 | DS | |
| 801 | | E. Humphrey | 1000 | | | | | | | | | | | Dr | SwE | 5 | DS | |
| 802 | | D. Matthews | 1000 | - | 38 | | Gl.drift | | | | | | | Dug | CH | 36 | DS | |
| 803* | | D. Ratliff | 1027 | - | 80 | | Gl.drift | | 24 | | | | | Dr | CH | 6 | DS | |
| 804* | | T. E. Sanders | 1027 | - | 86 | | Gl.drift | | | | | | | Dr | CH | 6 | DS | |
| 805* | | O. Clark | 1000 | - | 88 | | Gl.drift | | 58 | 14 | 2 | 1941 | | Dr | | 5½ | DS | |
| 806 | | W. F Brown | 1010 | - | 32 | | Gl.drift | | | | | | | Dug | CH | 36 | DS | |
| 808* | | F St. John | 1020 | - | 63 | | Gl.drift | | | | | | | Dr | CG | 6 | S | |
| 810 | | E. H. Houston | 1040 | - | 63 | | Gl.drift | | | | | | | Dr | CH | 4½ | DS | |
| 811 | | M. R. Stillwell | 1020 | - | 70 | | Gl.drift | | | | | | | Dr | PjE | | DS | |
| 812* | | G. Conklin | 1042 | - | 83 | | Gl.drift | | 8 | 7 | | 1936 | | Dr | | 5½ | DS | |
| 813 | | R. H. Sutton | 1044 | - | 122 | | Gl.drift | | 35 | | | 1910 | | Dr | DwE | 4½ | DS | |
| 814 | | C. H. Sooger | 971 | - | 14 | | Gl.Drift | | 4 | | | | | Dug | CH | 30 | DS | |
| 815 | | G. Davis | 1020 | - | 80 | | Gl.drift | | 7 | | | | | Dr | PjE | 5½ | S | |
| 816 | | R. Spahr | 1024 | - | 85 | | Gl.drift | | 15 | | | | | Dr | PjE | 6 | S | |
| 817 | | E. White | 1020 | - | | | Gl.drift | | | | | | | Dug | CH | 36 | DS | |
| 818 | | D. Fudge | 1000 | - | | | Gl.drift | | | | | | | Dr | CH | 5 | S | |
| 819 | | R. Fudge | 1002 | - | 80 | | Gl.drift | | 26 | | | | | Dr | EjE | 6 | DS | |
| 820 | | A. Hollingsworth | 960 | | 80 | | Lmstone | Clinton | | | | | | Dr | PjE | 4½ | DS | |
| 821 | | A. D. Thomas | 980 | - | 26 | | Gl.drift | | 21 | | | | | Dug | CH | 36 | DS | |
| 822 | | M. Boots | 980 | - | 30 | | Gl.drift | | 24 | | | | | Dug | CH | 48 | DS | |
| 823 | | A. D. Thomas | 990 | - | 100 | | Gl.drift | | | | | | | Dr | CH | 6 | DS | |
| 824 | | D. Keiter | 1000 | - | 70 | | Gl.drift | | 26 | | | | | Dr | CH | | DS | |
| 825 | | H. S. Buckwalter | 1000 | - | 23 | | Gl.drift | | 4 | | | | | Dug | CH | 36 | DS | |
| 826* | | J. Baxla | 1022 | - | 158 | | Gl.drift | | 17 | 10 | 27 | 1944 | | Dr | CH | 5 | DS | |
| 827* | | G. M. Barnett | 1021 | - | 167 | | Gl.drift | | 31 | 20 | 16 | 1944 | | Dr | | 5 | DS | |
| 828* | | Mt.Tabor School | 1023 | - | 180 | | Gl.drift | | | | | | | Dr | CH | 5 | PS | |
| 829 | | L. Jones | 1000 | - | | | Gl.drift | | | | | | | Dr | CH | | DS | |
| 830 | | M. Fawcett | 1019 | | | | | | | | | | | Dr | CH | 4½ | 3 | |
| 831* | | R. Sutton | 1020 | - | 96 | | Gl.drift | | 25 | 20 | Sml | 1945 | | Dr | CH | 5½ | DS | |
| 832* | | E. H. Bogard | 1021 | 80 | 163 | | Lmstone | Clinton | | | | | | Dr | CG | 5 | DS | |
| 833* | | D. A. Powers | 1020 | - | 59 | | Gl.drift | | 20 | | | | | Dr | PjE | 5½ | DS | |
| 1263* | | S. E. Anderson | 1025 | 38 | 50 | | Lmstone | Niagara | | | | 1912 | | Dr | CH | 4 | DS | |
| 1264* | | Jesse Taylor | 1023 | 113 | 198 | | Lmstone | Niagara | | | | 1914 | | Dr | PjE | 4 | DS | |
| 1271* | | Grant St. John | 1024 | 24 | 92 | | Lmstone | Niagara | | | | 1914 | | Dr | PjE | 4 | DS | |
| 1272* | | Mrs. Managan | 1020 | 88 | 155 | | Lmstone | Niagara | | | | 1913 | | Dr | - | 4 | - | Abandoned |
| 1280* | | Will Watson | 1022 | 92 | 96 | | Lmstone | Niagara | | | | 1915 | | Dr | PjE | 4 | DS | |
| Caesar Creek Township | | | | | | | | | | | | | | | | | | |
| 834* | | G. K. Heintz | 1022 | 155 | 155 | | Gl.drift | | 60 | 2 | | 1946 | | Dr | DwE | 6 | DS | |
| 835 | | E. R. Waldeck | 943 | - | 20 | | Gl.drift | | 18 | | | | | Dug | CH | 48 | DS | |
| 836* | | D. Buckwalter | 999 | - | 73 | | Gl.drift | | 22 | | | | | Dr | DwE | 5 | DS | |
| 837 | | W. Stearns | 1006 | - | 20 | | Gl.drift | | 12 | | | | | Dug | SwE | 48 | DS | |
| 838* | | A. F. Faulkner | 995 | - | 114 | | Gl.drift | | 22 | 20 | 12 | 1946 | | Dr | DwE | 5 | DS | |
| 839* | | E. C. Detrich | 1021 | - | 107 | | Gl.drift | | 28 | 6 | 28 | 1944 | | Dr | SwE | 5½ | DS | |
| 840L | 56 | A. Lumpkin | 902 | 55 | 80 | | Shale | Richmond | 40 | 3½ | | 3-2-48 | A | Dr | PjE | 4½ | DS | |
| 841 | | J. L. Stroup | 941 | | | | | | | | | | | Dr | CH | 5 | DS | |
| 842 | | E. Ireland | 960 | - | | | Gl.drift | | | | | | | Dug | SwE | | DS | |
| 843 | | Home Loan Co. | 961 | | | | | | | | | | | Dr | CH | | DS | |
| 844 | | L. V. Doren | 948 | - | 96 | | Gl.drift | | 8 | | | | | Dr | CH | 6 | DS | |
| 845 | | L. A. Early | 960 | - | 87 | | Gl.drift | | | | | 1914 | | Dr | SwE | 5 | DS | |

**Caesar Creek Township**

| Number | File Number (Ohio Water Resources Board) | Owner or name | Elevation at well (feet above sea level) | Depth to bedrock (feet) | Depth of well (feet) | Principal water-bearing bed: Depth water encountered (ft) | Principal water-bearing bed: Character of material | Principal water-bearing bed: Geologic horizon | Static water level (feet below land surface) | Yield (g.p.m.) | Drawdown (feet) | Date | Quality of water | Type of well | Method of lift | Diameter of well (inches) | Use | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Caesar Creek Township (Continued)** | | | | | | | | | | | | | | | | | | |
| 846 | | R. E. King | 977 | - | | | Gl.drift | | | | | | | Dr | CH | | DS | |
| 847 | | F. H. Middleton | 980 | - | 18 | | Gl.drift | | 15 | | | | | Dug | CH | 12 | DS | |
| 848* | | F. H. Middleton | 990 | - | 128 | | Gl.drift | | | | | | | Dr | PjG | 5 | S | |
| 849* | | J. L. Thomas | 1002 | - | 230 | | Gl.drift | | 55 | 20 | 20 | 1945 | | Dr | PjE | 6 | DS | |
| 850 | | F. B. Hiney | 1000 | - | | | Gl.drift | | | | | | | DDr | SwE | | DS | |
| 851 | | Buckwalter Bros. | 1010 | - | 36 | | Gl.drift | | 16 | | | | | Dug | PjW | 48 | DS | |
| 852* | | M. L. Beal | 1018 | - | 37 | | Gl.drift | | 12 | 4 | 16 | 1943 | | Dr | PjW | 5½ | DS | |
| 853 | | L. Beal | 1020 | - | 35 | | Gl.drift | | | | | | | Dug | CH | 48 | DS | |
| 854 | | E. Dean | 1020 | - | | | Gl.drift | | | | | | | Dug | CH | 36 | DS | |
| 855* | | C.L.O'Brien | 925 | - | 135M | | Gl.drift | | 45M | | | 4-2-48 | | Dr | EjE | 6 | DS | |
| 856 | | B. Hawkins | 940 | - | 63 | | Gl.drift | | 26 | | | | | Dr | DwE | 6 | DS | |
| 857* | | H. Marshall | 967 | - | 54 | | Gl.drift | | 26 | 3 | 27 | 1944 | | Dr | EjE | 5½ | DS | |
| 858 | | C. Springs | 960 | | | | | | | | | | | Dr | CH | 5 | DS | |
| 859 | | Maple Corners Sch. | 967 | | | | | | | | | | | Dr | CH | 5 | PS | |
| 860 | | E. A. Beam | 980 | - | 92 | | Gl.drift | | 50 | 7½ | 10 | 1937 | | Dr | DwE | 5½ | S | |
| 861* | | H. Lickliter | 981 | - | 76 | | Gl.drift | | 46 | 12 | 21 | 1946 | | Dr | PjE | 5 | S | |
| 862 | | J. Henry | 965 | - | 132 | | Gl.drift | | | | | | | Dr | PjE | | DS | |
| 863 | | L. Harnes | 1002 | - | 54 | | Gl.drift | | 22 | | | | | Dr | PjE | 4¼ | DS | |
| 864* | | M. J. McKay | 1006 | - | 93 | | Gl.drift | | 15 | 7 | 41 | 1946 | | Dr | PjG | 6 | DS | |
| 865* | | B. Ellis | 1021 | - | 86 | | Gl.drift | | | | | 1929 | | Dr | | | | |
| 866* | | N. J. Sutton | 1020 | - | 190 | | Gl.drift | | 56 | 15 | 20 | 1946 | | Dr | | 6 | DS | |
| 867 | | E. Peterson | 1018 | - | 28 | | Gl.drift | | 7 | | | | | Dr | SwE | 6 | DS | |
| 868* | | J. Heintz | 1016 | 95 | 165 | | Shale | Richmond | 28 | 12 | 11 | 1947 | | Dr | DwE | 5 | DS | |
| 869* | | R. Beal | 1018 | - | 79 | | Gl.drift | | 5 | 20 | 7 | 1941 | | Dr | | 5½ | DS | |
| 870* | | W. R. Beal | 1021 | 86 | 109 | | Lmstone | Clinton | 23 | 12 | 4 | 1940 | | Dr | CH | 5 | S | |
| 871* | | G. Darling | 1023 | - | 77 | | Gl.drift | | 35 | 15 | 4 | 1944 | | Dr | | 5 | | |
| 872* | | O. Jones | 1021 | 78 | 86 | | Lmstone | Clinton | 27 | | | | | Dr | PjE | 6 | DS | |
| 873* | | M. L. Jones | 1027 | 42 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 874 | | E. Heintz | 1026 | 80 | 101 | | Lmstone | Clinton | 10 | | | | | Dr | SwE | 4¼ | DS | |
| 875 | | J. Heintz | 1027 | 84 | 100 | | Lmstone | Clinton | 7 | 20 | 29 | 1945 | | Dr | | 5½ | DS | |
| 876* | | C. Hollingsworth | 1022 | | | | | | | | | | | Dr | CH | 5 | DS | |
| 877 | | E. A. Beam | 940 | - | 73 | | Gl.drift | | 15 | | | | | Dr | EjE | 4¼ | DS | |
| 878* | | R. G. DeVoe | 960 | - | 72 | | Gl.drift | | 45 | 300 | 12 | 1938 | | Dr | CH | 4¼ | DS | |
| 879* | | J. N. Wiens | 962 | | | | | | | | | | | Dr | PjE | 6 | DS | |
| 880 | | H. Lickliter | 960 | - | 125 | | Gl.drift | | | | | | | Dr | CH | | DS | |
| 881* | | E. M. Marshall | 978 | 292 | 1725 | | Lmstone? | Trenton | 220 | | | 1-8-40 | | ✧ | | | | |
| 882* | | L. Smith | 988 | - | 140 | | Gl.drift | | 28 | 20 | 5 | 1943 | | Dr | CH | 5 | DS | |
| 883 | | M. Middleton | 996 | - | 27 | | Gl.drift | | 14 | | | | | Dug | CH | 42 | DS | |
| 884 | | J. T. Smith | 996 | - | 23 | | Gl.drift | | 12 | | | | | Dug | SwE | 24 | DS | |
| 885 | | E. Oglesbee | 1002 | - | 32 | | Gl.drift | | 10 | | | | | Dug | SwE | 48 | DS | |
| 886* | | W. C. Miller | 1000 | - | 30 | | Gl.drift | | 15 | | | | | Dug | SwE | 24 | DS | |
| 887* | | F. Faulkner | 1002 | - | 75 | | Gl.drift | | 25 | 1 | 44 | 1940 | | Dr | CH | 5 | DS | |
| 888 | | W. H. Smith | 1002 | - | 44 | | Gl.drift | | 7 | | | | | Dug | SwE | | DS | |
| 889 | | C. C. Bartlett | 1000 | - | | | Gl.drift | | | | | | | Dug | CH | 36 | DS | |
| 890* | | Caesar Cr.Hi.Sch. | 1003 | - | 158 | | Gl.drift | | 108 | 10 | Sml | 1947 | | Dr | CH | 6 | DS | |
| 891 | | M. Oglesbee | 1000 | - | 20 | | Gl.drift | | 10 | | | | | Dug | CH | 42 | DS | |
| 892 | | B. B. Bowell | 1002 | - | 32 | | Gl.drift | | 15 | | | | | Dug | SwE | | DS | |
| 893* | | W. M. Henry | 1004 | 173 | 1958 | | | | | | | | | ✧ | | | | |
| 894L | 58 | R. Middleton | 1015 | - | 28 | | Gravel | | | 5 | | 4-5-48 | | Dr | | 6 | DS | |
| 895 | | L. Middleton | 1000 | | | | | | | | | | | Dr | CH | 5 | DS | |
| 896 | | W. L. Cline | 1008 | | | | | | | | | | | Dr | SwE | 6 | DS | |
| 897 | | S. DeVoe | 1020 | 40 | 107 | | Lmstone | Niagara | 22 | | | | | Dr | PjG | | S | |
| 898 | | F. Faulkner | 1021 | | | | | | | | | | | Dr | CH | | S | |
| 899 | | F. Faulkner | 1020 | | 70 | | Lmstone | Niagara | | | | | | Dr | CH | 4 | DS | |
| 900 | | L. Woolery | 1024 | | | | | | | | | | | Dr | CH | 5 | DS | |
| 901* | | G. Babb | 1022 | 30 | 86 | | Lmstone | Niagara | 3 | 35 | Sml | 1947 | | Dr | | 5½ | | |
| 903* | | H. Conklin | 1020 | - | 89 | | Gl.drift | | 12 | 10 | 41 | 1944 | | Dr | CH | 5 | DS | |
| 904 | | C. Babb | 1013 | - | 100 | | Gl.drift | | | | | | | Dr | CH | | DS | |
| 905 | | H. Ringer | 990 | - | | | Gl.drift | | 2 | | | | | Dug | CH | 36 | DS | |
| 906* | | G. M. Strayer | 1022 | - | 110 | | Gl.drift | | 18 | 5 | 62 | 1945 | | Dr | CH | 6 | S | |
| 908* | | W. Woods | 1023 | - | 102 | | Gl.drift | | | 20 | | 1943 | | Dr | | 5 | | |
| 909* | | C. Mason | 1022 | - | 132 | | Gl.drift | | 17 | 20 | 28 | 1945 | | Dr | | 5 | | |
| 910* | | F. Lewis | 1021 | 85 | 118 | | Lmstone | Clinton | 8 | 10 | | 1940 | | Dr | PjE | 5½ | DS | |
| 922 | | R. Lewis | 980 | | | | | | | | | | | Dr | PjE | | DS | |
| 912* | | H. Deger | 954 | 40 | 54 | | Shale | Richmond | 25 | 20 | 15 | 1944 | | Dr | | | DS | |
| 913* | | R. Michael | 929 | - | 60 | | Gl.drift | | | | | | | Dr | CH | 5½ | DS | |
| 914* | | L. Hartsook | 987 | - | 141 | | Gl.drift | | 60 | 2 | | 1944 | | Dr | CH | 6½ | DS | |
| 915 | | A. Pitzer | 982 | | | | | | | | | | | Dr | CH | | S | |
| 916 | | L. F. Gray | 955 | - | | | Gl.drift | | | | | | | Dug | CH | 48 | DS | |
| 917L | 146 | J. Wallace | 980 | - | 77 | | Gravel | | 37 | 5 | Sml | 7-16-48 | A | Dr | CH | 5 | DS | |
| 919* | | Wm. Atkinson | 980 | - | 109 | | Gl.drift | | 33 | | | 1946 | | Dr | EjE | 4¼ | DS | |
| 920 | | J. Beam | 982 | - | 85 | | Gl.drift | | | | | | | Dr | CH | 6 | DS | |
| 921 | | Newhope Sch. | 983 | | | | | | | | | | | Dr | CH | 5 | PS | |
| 922 | | J. Beam | 970 | - | 85 | | Gl.drift | | | | | | | Dr | EjE | 6 | S | |
| 923 | | J. Faray | 981 | - | | | Gl.drift | | | | | | | Dug | CH | 36 | DS | |
| 924 | | T. Faulkner | 998 | | | | | | | | | | | Dr | CH | 4¼ | DS | |
| 925 | | R. Haines | 1002 | - | 18 | | Gl.drift | | 4 | | | | | Dug | CH | 48 | DS | |
| 926 | | J. Naxley | 1000 | | 155 | | Shale | Richmond | | | | | | Dr | CH | 6 | DS | |
| 927 | | J. Garyic | 1004 | | | | | | | | | | | Dr | CH | 6 | DS | |
| 928 | | D. Linkhart | 1006 | - | 100 | | Gl.drift | | 15 | | | | | Dr | DwE | 4¼ | DS | |

Table 8 (Continued)

Caesar Creek and Ross Townships

| Number | File Number (Ohio Water Resources Board) | Owner or name | Elevation at well (feet above sea level) | Depth to bedrock (feet) | Depth of well (feet) | Principal water-bearing bed: Depth water encountered (ft) | Principal water-bearing bed: Character of material | Principal water-bearing bed: Geologic horizon | Static water level (feet below land surface) | Yield (g.p.m.) | Drawdown (feet) | Date | Quality of water | Type of well | Method of lift | Diameter of well (inches) | Use | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Caesar Creek Township (Continued) | | | | | | | | | | | | | | | | | | |
| 929* | | S. F. Bone | 1021 | - | 89 | | Gl.drift | | | | | | | Dr | PjE | | DS | |
| 930 | | S. DeVoe | 1024 | - | 118 | | Gl.drift | | | | | | | Dr | CH | 6 | S | |
| 931 | | S. DeVoe | 1023 | - | 189 | | Gl.drift | | | | | | | Dr | | | | |
| 932* | | S. DeVoe | 1022 | - | 118 | | Gl.drift | | | | | | | Dr | CH | | DS | |
| 1229L | 144 | H. Siefert | | - | 40 | | Sand | | 25 | 3 | 14 | 7-29-48 | | Dr | | 5½ | DS | |
| Ross Township | | | | | | | | | | | | | | | | | | |
| 934 | | W. Boone | 1098 | | 30 | | Lmstone | Niagara | 15 | | | | | Dr | CH | 6 | DS | |
| 935 | | W. Boone | 1080 | | 80 | | Lmstone | Niagara | 35 | | | | | Dr | CH | 4¼ | DS | |
| 936 | | J. W. Butcher | 1083 | - | 28 | | Gl.drift | | 25 | | | | | Dug | CH | | DS | |
| 938 | | L. Snograss | 1086 | - | 31 | | Gl.drift | | | | | | | Dug | CH | 36 | DS | |
| 939* | | H. A. Smith | 1102 | - | 190 | | Gl.drift | | 12 | | | | | Dr | PjE | 6 | DS | |
| 946* | | C. McDorman | 1087 | 97 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 947* | | L. McDorman | 1100 | 135 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 948 | | J. H. Thomson | 1112 | - | 120 | | Gl.drift | | 40 | | | | | Dr | CH | | DS | |
| 949* | | R. Johnson | 1080 | - | 125 | | Gl.drift | | | | | 1943 | | Dr | | 5 | DS | |
| 950* | | K. Johnson | 1102 | 45 | 50 | | Lmstone | Niagara | | | | 1934 | | Dr | | 4¼ | | |
| 951* | | F. Clark | 1093 | - | 99 | | Gl.drift | | 7 | 15 | 43 | 1944 | | Dr | | 5½ | | |
| 952* | | K. M. Johnson | 1090 | 31 | 58 | | Lmstone | Niagara | | | | 1925 | | Dr | CH | 4¼ | DS | |
| 953* | | F. Clark | 1105 | - | 84 | | Gl.drift | | 15 | 15 | 7 | 1944 | | Dr | | 5½ | | |
| 954* | | L. Little | 1115 | - | 46 | | Gl.drift | | | | | | | Dr | CH | 5 | DS | |
| 955* | | W. P. Matthews | 1061 | 35 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 956* | | W. P. Matthews | 1062 | 40 | 85 | | Lmstone | Niagara | | | | | | Dr | SwE | 5 | DS | |
| 957* | | W. P. Matthews | 1058 | 30 | 100 | | Lmstone | Niagara | | | | | | Dr | EjE | 4¼ | DS | |
| 958* | | W. P. Matthews | 1066 | 25 | 50 | | Lmstone | Niagara | 25 | | | | | Dr | EjE | | S | |
| 959 | | W. P. Matthews | 1066 | 15 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 961 | | C. H. Glass | 1102 | | 119 | | Lmstone | Niagara | | | | | | Dr | CH | 6 | DS | |
| 962* | | M. A. Oliver | 1104 | - | 77 | | Gl.drift | | 16 | 23 | Sml | 1945 | | Dr | | 5½ | DS | |
| 963* | | G. W. Glass | 1095 | 95 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 964 | | H. E. Blackenship | 1103 | - | 24 | | Gl.drift | | 6 | | | | | Dug | CH | 36 | DS | |
| 965 | | D. T. Hildebran | 1118 | - | 22 | | Gl.drift | | 16 | | | | | Dug | CH | 42 | DS | |
| 966 | | O. H. Elam | 1113 | - | 25 | | Gl.drift | | | | | | | Dug | CH | 36 | DS | |
| 967 | | M. Knecht | 1120 | - | | | Gl.drift | | | | | | | Dug | CH | | DS | |
| 968 | | P. West | 1103 | - | 30 | | Gl.drift | | | | | | | Dug | PjE | 48 | DS | |
| 969 | | C. Routzong | 1085 | | 135 | | Lmstone | Niagara | | | | | | Dr | CH | 6 | DS | |
| 971 | | L. Evans | 1102 | - | 24 | | Gl.drift | | | | | | | Dug | CH | 48 | DS | |
| 972 | | H. Daley | 1104 | - | | | Gl.drift | | | | | | | Dug | CH | | DS | |
| 973 | | K. Gordon | 1109 | - | 24 | | Gl.drift | | | | | | | Dug | CH | 36 | DS | |
| 974 | | R. Gordon | 1102 | | | | | | | | | | | Dr | CH | 4 | DS | |
| 975* | | H. C. Cresswell | 1072 | 14 | 54 | | Lmstone | Niagara | 12 | | | | | Dr | PjE | 5 | DS | |
| 976 | | K. Bull | 1069 | | | | | | | | | | | Dr | CH | 5 | DS | |
| 977 | | C. Sites | 1067 | | 68 | | | | | | | | | Dr | CH | 5 | DS | |
| 978* | | R. Reed | 1067 | 25 | 60 | | Lmstone | Niagara | | | | | | Dr | CH | 6 | DS | |
| 979* | | W. J. Fannin | 1067 | 25 | 40 | | Lmstone | Niagara | | | | | | Dr | CH | 6 | DS | |
| 980* | | O. T. Marshall | 1069 | 40 | 65 | | Lmstone | Niagara | 3 | | | | | Dr | SwE | 5 | DS | |
| 981 | | R. Ott | 1082 | | | | | | | | | | | Dr | SwE | 5 | DS | |
| 982* | | O. Evans | 1085 | 92 | 100 | | Lmstone | Niagara | 4 | | | | | Dr | CH | 6 | DS | |
| 983 | | E. L. Ritenour | 1081 | | 132 | | Lmstone | Niagara | 6 | | | | | Dr | SwE | 6 | DS | |
| 984* | | K. Ritenour | 1098 | - | 63 | | Gl.drift | | 4 | 30 | 6 | 1945 | | Dr | | | DS | |
| 985* | | M. L. Long | 1090 | - | 61 | | Gl.drift | | 10 | 20 | 5 | 1946 | | Dr | CH | 6 | DS | |
| 987* | | F. S. Cherryholmes | 1097 | 203 | 205 | | Lmstone | Niagara | 25 | 15 | 25 | 1945 | | Dr | | 5 | DS | |
| 989 | | E. Stoops | 1099 | - | | | Gl.drift | | | | | | | Dug | PjW | | DS | |
| 990L | 73 | H. Brakefield | 1064 | 10 | 70 | | Lmstone | Niagara | | 10 | | 7-15-44 | | Dr | | 5 | S | |
| 991 | | C. A. Atley | 1062 | - | 16 | | Gl.drift | | 8 | | | | | Dug | CH | 36 | DS | |
| 992* | | E. Atley | 1062 | 14 | 40 | | Lmstone | Niagara | | | | 1945 | | Dr | | | DS | |
| 993L | 72 | A. J. Gordon | 1067 | - | 25 | | Gl.drift | | 15 | 10 | | 5-43 | | Dr | | 5 | DS | |
| 994* | | P. Harper | 1082 | 61M | 64M | | Lmstone | Niagara | 13M | | | 4-48 | | DDr | SwE | | DS | |
| 995 | | J. L. Spahr | 1072 | - | 28 | | Gl.drift | | 10 | | | | | Dug | SwE | | DS | |
| 996 | | L. B. Edgington | 1076 | - | 55 | | Gl.drift | | | | | | | Dr | PjE | | DS | |
| 997 | | J. L. Lewis | 1078 | - | 37 | | Gl.drift | | 6 | | | | | Dr | CH | 5½ | DS | |
| 998* | | C. A. Paullin | 1078 | - | 61 | | Gl.drift | | | | | | | Dr | | | | |
| 999* | | H. Brakefield | 1082 | - | 99 | | Gl.drift | | | | | | | Dr | | | DS | |
| 1000* | | J. P. Paullin | 1106 | 76 | 80 | | Lmstone | Niagara | | | | 1913 | | Dr | CH | 4 | DS | |
| 1001* | | R. St. John | 1102 | - | 114 | | Gl.drift | | 20 | 12 | 38 | 1945 | | Dr | | 5½ | | |
| 1002* | | M. J. Bingamon | 1053 | 17 | 17 | | Gl.drift | | 7 | | | | | Dug | SwE | | DS | |
| 1003* | | E. Atley | 1062 | 22 | 22 | | Gl.drift | | | | | | | Dug | SwE | | DS | |
| 1004* | | J. C. Spahr | 1065 | 30 | 56 | | Lmstone | Niagara | 12 | 20 | 16 | 1942 | | Dr | | | DS | |
| 1005 | | S. M. Bryan | 1058 | - | 26 | | Gl.drift | | 15 | | | | | Dug | CH | 48 | DS | |
| 1006* | | H. Smith | 1056 | 20 | 74 | | Lmstone | Niagara | 10 | 20 | 20 | 1945 | | Dr | CH | 5½ | DS | |
| 1007 | | P. A. Wigal | 1048 | | | | | | | | | | | Dr | | | | |
| 1008 | | H. Brickel | 1065 | | | | | | | | | | | Dr | CH | | DS | |
| 1009* | | C. W. Matthews | 1078 | 42M | 43M | | Lmstone | Niagara | 6 M | | | 4-48 | | Dr | SwE | 4¼ | DS | |
| 1010* | | Dr, Henry | 1075 | 36 | 83 | | Lmstone | Niagara | 8 | 20 | 30 | 1945 | | Dr | | 5 | DS | |
| 1011 | | C. Lemmon | 1082 | | 125 | | Lmstone | Niagara | | | | 1908 | | Dr | CH | | DS | |
| 1012* | | J. Tidd | 1080 | 67 | 74 | | Lmstone | Niagara | | | | | | Dr | | | DS | |
| 1013 | | Goodbar | 1090 | | | | | | | | | | | Dr | EjE | 4¼ | DS | |
| 1014 | | A. Wigal | 1102 | | 115 | | Lmstone | Niagara | 8 | | | | | Dr | SwE | 6 | DS | |
| 1015 | | Dr. Syferd | 1102 | | | | | | | | | | | Dr | | | DS | |
| 1016* | | D. Heintz | 1100 | 90 | 95 | | Lmstone | Niagara | 12 | 12 | 32 | 1945 | | Dr | CH | 5½ | DS | |
| 1017L | 142 | J. E. Syferd | 1078 | 81 | 100 | | Lmstone | Niagara | 22 | 20 | 10 | 6-30-48 | A | Dr | CH | 5 | DS | |
| 1018 | | A. Wilt | 1102 | | | | | | | | | | | Dr | | | DS | |
| 1249* | | Walter Stewart | 1082 | 116 | 122 | | Lmstone | Niagara | | | | 1917 | | Dr | DwE | 4 | DS | |

Table 8 (Continued)

| Number | File Number (Ohio Water Resources Board) | Owner or name | Elevation at well (feet above sea level) | Depth to bedrock (feet) | Depth of well (feet) | Principal water-bearing bed: Depth water encountered (ft) | Principal water-bearing bed: Character of material | Principal water-bearing bed: Geologic horizon | Static water level (feet below land surface) | Yield (g.p.m.) | Drawdown (feet) | Date | Quality of water | Type of well | Method of lift | Diameter of well (inches) | Use | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ross and Silver Creek Townships** | | | | | | | | | | | | | | | | | | |
| Ross Township (Continued) | | | | | | | | | | | | | | | | | | |
| 1250* | | H. Cummings | 1103 | 93 | 125 | | Lmstone | Niagara | | | | 1910 | | Dr | PjE | 4 | DS | |
| 1251* | | Harry McDorman | 1084 | 114 | 128 | | Lmstone | Niagara | | | | 1915 | | Dr | CH | 4 | DS | |
| 1252* | | John Deffandall | 1094 | - | 94 | | Gravel | | | | | 1913 | | Dr | DwE | 4 | DS | |
| 1253* | | Tom Andrews | 1085 | 90 | 125 | | Lmstone | Niagara | | | | 1917 | | Dr | PjE | 4 | DS | |
| 1254* | | Adie Cummings | 1086 | 101 | 124 | | Lmstone | Niagara | | | | 1909 | | Dr | PjE | 4 | DS | |
| 1255* | | J. C. Talbert | 1082 | 121 | 139 | | Lmstone | Niagara | | | | 1909 | | Dr | CH | 4 | DS | |
| 1256* | | Ross Twp. School | 1082 | 92 | 134 | | Lmstone | Niagara | | | | 1915 | | Dr | DwE | 4 | DS | |
| 1257* | | Elmer Shabley | 1063 | 13 | 34 | | Lmstone | Niagara | | | | 1908 | | Dr | CH | 4 | DS | |
| 1258* | | Wm. McDorman | 1106 | 136 | 163 | | Lmstone | Niagara | | | | 1912 | | Dr | CH | 4 | DS | |
| 1259* | | Uriah Paullin | 1100 | 102 | 118 | | Lmstone | Niagara | | | | 1909 | | Dr | CH | 4 | DS | |
| 1260* | | W. H. Lackey | 1065 | 35 | 66 | | Lmstone | Niagara | | | | 1914 | | Dr | CH | 4 | DS | |
| 1261* | | George Clines | 1096 | 56 | 84 | | Lmstone | Niagara | | | | 1907 | | Dr | CH | 4 | DS | |
| Silver Creek Township | | | | | | | | | | | | | | | | | | |
| 1019* | | Geo. Lampert | 1050 | 40 | 40 | | Gl.drift | | 9 | 14 | 17 | 1945 | | Dr | | 6 | DS | |
| 1020* | | N. Lampert | 1050 | 33 | 66 | | Lmstone | Niagara | 20 | 14 | 12 | 1943 | | Dr | DwE | 6¼ | DS | |
| 1021* | | G. Tobin | 1045 | 26 | 61 | | Lmstone | Niagara | 6 | 17 | 6 | 1945 | | Dr | | 5½ | DS | |
| 1022 | | G. Lampert | 1045 | | | | | | | | | | | Dr | CH | 4¼ | DS | |
| 1023* | | R. Than | 1040 | 29 | 100 | | Lmstone | Niagara | 27 | 7 | 9 | 1943 | | Dr | EjE | 6¼ | DS | |
| 1024* | | R. Adams | 1042 | 33 | 94 | | Lmstone | Niagara | 21 | 15 | 19 | 1947 | | Dr | | 5½ | DS | |
| 1025* | | N. Apahr | 1040 | 42 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 1926* | | E. Cavender | 1040 | 12 | 40 | | Lmstone | Niagara | 12 | | | | | Dr | CH | 5½ | DS | |
| 1027 | | M. Cavender | 1056 | 40 | 60 | | Lmstone | Niagara | | | | | | Dr | CH | 6 | DS | |
| 1028* | | B. Smith | 1045 | - | 54 | | Gl.drift | | 30 | 15 | 2 | | | Dr | | 5½ | DS | |
| 1029* | | W. Watson | 1050 | - | 63 | | Gl.drift | | | | | 1932 | | Dr | | 4¼ | | |
| 1030 | | M. Watson | 1050 | | 120 | | Lmstone | Niagara | | | | | | Dr | CH | 8 | DS | |
| 1031 | | G. Blankenship | 1049 | | 75 | | Lmstone | Niagara | | | | | | Dr | PjE | 5 | DS | |
| 1032* | | A. Gordon | 1058 | 42 | 87 | | Lmstone | Niagara | | | | 1930 | | Dr | | 4¼ | DS | |
| 1033 | | Mr. Rockshold | 1060 | 62 | 70 | | Lmstone | Niagara | | | | 1926 | | Dr | | 4 | | |
| 1034* | | O. C. Spahr | 1060 | 40 | 64 | | Lmstone | Niagara | 25 | | | | | Dr | SwE | 5 | DS | |
| 1035* | | Mr. Klatt | 1061 | 46 | 67 | | Lmstone | Niagara | | | | | | Dr | | 4¼ | | |
| 1036* | | Hotel | 1061 | 36 | 52 | | Lmstone | Niagara | | | | 1930 | | Dr | | 4¼ | | |
| 1037* | | M. Vermillion | 1064 | - | 51 | | Gl.drift | | | 4 | | 1944 | | Dr | | | DS | |
| 1038* | | H. Smith | 1063 | 28 | 88 | | Lmstone | Niagara | 10 | 18 | 30 | 1945 | | Dr | | 5½ | DS | |
| 1040 | | E. Sutton | 1105 | | 125 | | Lmstone | Niagara | 20 | | | 1920 | | Dr | CH | 4¼ | DS | |
| 1041* | | Jamestown Can.Co. | 1076 | 94 | 94 | | Gl.drift | | | | | | | Dr | | 5½ | | |
| 1042 | | J. E. Taylor | 1075 | - | 35 | | Gl.drift | | 10 | | | | | Dug | SwE | 48 | DS | |
| 1043* | | E. Cline | 1100 | 100 | | | Lmstone | Niagara | | | | | | Dr | DwE | 6 | DS | |
| 1045 | | J. E. Moore | 1104 | 75 | 100 | | Lmstone | Niagara | 26 | | | | | Dr | EjE | 5 | DS | |
| 1046* | | B. J. Moore | 1102 | - | 72 | | Gl.drift | | 22 | 15 | Sml | 1947 | | Dr | SwE | 5 | DS | |
| 1047 | | W. Allen | 1082 | 40 | 100 | | Lmstone | Niagara | | | | | | Dr | CH | 5 | DS | |
| 1048 | | C. O'Brien | 1100 | - | 66 | | Gl.drift | | 28 | 10 | 13 | 1938 | | Dr | | 4¼ | DS | |
| 1049 | | P. Garringer | 1100 | | | | | | | | | | | Dr | CH | | DS | |
| 1050 | | W. C. Hughes | 1080 | | 101 | | Lmstone | Niagara | | | | | | Dr | CH | 5 | DS | |
| 1051 | | G. Little | 1100 | | 178 | | Lmstone | Niagara | | | | | | Dr | CH | 5 | DS | |
| 1052 | | G. Bishop | 1100 | - | 52 | | Gl.drift | | 10 | | | | | Dr | PjE | | DS | |
| 1053L | 61 | F. F. Steiner | 1100 | - | 74 | | Gl.drift | | 30 | 10 | | 7-11-44 | | Dr | SwE | 5 | DS | |
| 1054* | | R. F. Gordon | 1100 | 76 | 98 | | Lmstone | Niagara | | | | 1924 | | Dr | | 4¼ | | |
| 1055* | | P. Schaefer | 1094 | 60 | | | Lmstone | Niagara | | | | | | Dr | CH | 4¼ | DS | |
| 1056* | | G. Gordon | 1085 | 81 | 90 | | Lmstone | Niagara | 20 | 20 | 10 | 1945 | | Dr | PjE | 5 | DS | |
| 1057* | | G. Gordon | 1082 | 50 | 80 | | Lmstone | Niagara | 14 | 12 | 39 | 1945 | | Dr | | 5 | DS | |
| 1058* | | W. L. Bryan | 1081 | 51 | 99 | | Lmstone | Niagara | 11 | 30 | 5 | 1945 | | Dr | | 5½ | DS | |
| 1060 | | W. Finney | 1103 | | 140 | | Lmstone | Niagara | 16 | | | | | Dr | CH | 4¼ | DS | |
| 1061* | | P. Blakely | 1100 | 57 | 90 | | Lmstone | Niagara | 25 | 20 | 5 | 1944 | | Dr | | 5½ | | |
| 1062* | | F. C. Garner | 1100 | 66 | 120 | | Lmstone | Niagara | 27 | 5 | 13 | 1939 | | Dr | PjE | 6 | DS | |
| 1063* | | Eulis Hatfield | 1082 | 68 | 74 | | Lmstone | Niagara | | | | 1907 | | Dr | EjE | 4 | DS | |
| 1064* | | A. M. Bryan | 1084 | 39 | 86 | | Lmstone | Niagara | 13 | 25 | 11 | 1944 | | Dr | | 6 | DS | |
| 1065* | | O. Clark | 1088 | 50 | 124 | | Lmstone | Niagara | | | | | | Dr | DwE | 6 | DS | |
| 1067* | | W. Garringer | 1084 | 66 | 111 | | Lmstone | Niagara | 48 | 14 | 44 | 1947 | | Dr | | 6 | DS | |
| 1068* | | R. T. Brown | 1081 | 40 | | | Lmstone | Niagara | | | | | | Dr | CH | 5 | DS | |
| 1069* | | P. Garringer | 1081 | 52 | 94 | | Lmstone | Niagara | 16 | 12 | 33 | 1945 | | Dr | | 5½ | DS | |
| 1070 | | J. Shirk | 1075 | 45 | 90 | | Lmstone | Niagara | 12 | | 9 | | | Dr | SwE | 4 | DS | |
| 1071 | | H. O. Poole | 1082 | | 346 | | Lmstone | Clinton | | | | | | Dr | CH | | DS | |
| 1072* | | A. B. Garringer | 1095 | 52 | 91 | | Lmstone | Niagara | 30 | 15 | Sml | 1945 | | Dr | CH | 5½ | DS | |
| 1073* | | A. T. Garringer | 1097 | 40 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 1074 | | G. M. Jenks | 1085 | | 110 | | Lmstone | Niagara | | | | | | Dr | CH | 6 | DS | |
| 1075* | | G. M. Jenks | 1085 | 39 | 102 | | Lmstone | Niagara | 12 | 20 | 16 | 1946 | | Dr | SwE | 5 | DS | |
| 1076* | | G. Garringer | 1076 | 30 | 115 | | Lmstone | Niagara | 4 | 12 | Sml | 1945 | | Dr | SwE | 5 | DS | |
| 1077 | | B. Jones | 1080 | - | 100 | | Gl.drift | | | | | | | Dr | CH | 5 | S | |
| 1078* | | D. M. Fudge | 1042 | - | 81 | | Gl.drift | | | | | | | Dr | CH | 4½ | DS | |
| 1079 | | D. M. Fudge | 1040 | - | 25 | | Gl.drift | | 10 | | | | | Dug | SwE | 60 | DS | |
| 1080 | | D. M. Fudge | 1045 | - | 92 | | Gl.drift | | 20 | | | | | Dr | CH | 4½ | S | |
| 1082* | | A. Dean | 1076 | - | 87 | | Gl.drift | | 14 | 8 | 40 | 1945 | | Dr | | 5½ | DS | |
| 1083* | | J. Sanders | 1043 | 31 | 56 | | Lmstone | Niagara | | | | 1931 | | DDr | | 5½ | | |
| 1084 | | R. Gordon | 1042 | | | | | | | | | | | Dr | CH | 4¼ | DS | |
| 1085 | | M. R. Fudge | 1047 | - | 30 | | Gl.drift | | 15 | | | | | Dug | CH | 48 | DS | |
| 1087 | | D. Ross | 1080 | - | 123 | | Gl.drift | | 27 | | | | | Dr | CH | 6 | DS | |
| 1089 | | F. H. Glass | 1090 | ? | 112 | | | | 30 | | | | | Dr | DwE | 6 | DS | |
| 1090* | | F. H. Glass | 1090 | - | 90 | | Gl.drift | | 23 | | | 1936 | | Dr | CH | | DS | |
| 1091 | | T. Bradshell | 1040 | | | | | | | | | | | Dr | CH | 4 | DS | |
| 1092L | 103 | E. Reynolds | 1042 | - | 51 | | Gl.drift | | 8 | 14 | 9 | 6 4-48 | | Dr | | 5½ | DS | |
| 1093 | | R. E. DeVoe | 1040 | - | 49 | | Gl.drift | | 28 | | | 1911 | | Dr | DwE | 4¼ | DS | |

Table 8 (Continued)

Silver Creek and Jefferson Townships

| Number | File Number (Ohio Water Resources Board) | Owner or name | Elevation at well (feet above sea level) | Depth to bedrock (feet) | Depth of well (feet) | Principal water-bearing bed: Depth water encountered (ft.) | Character of material | Geologic horizon | Static water level (feet below land surface) | Yield (g.p.m.) | Drawdown (feet) | Date | Quality of water | Type of well | Method of lift | Diameter of well (inches) | Use | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Silver Creek Township (Continued) | | | | | | | | | | | | | | | | | | |
| 1094* | | H. Miller | 1040 | - | 54 | | Gl.drift | | 15 | 14 | 10 | 1942 | | Dr | | 5½ | DS | |
| 1095 | | E. H. Huston | 1040 | | | | | | | | | | | Dr | CH | | DS | |
| 1096 | | O. C. Bowers | 1042 | - | 100 | | Gl.drift | | Flow | | | | | Dr | CH | | DS | |
| 1097* | | B. Mendonall | 1020 | - | 90 | | Gl.drift | | | | | 1923 | | Dr | | | | |
| 1098* | | Vandervart farm | 1020 | 62 | 124 | | Shale | Richmond | | | | 1935 | | Dr | | 5½ | Irr | |
| 1099 | | H. Thomas | 1021 | - | | | Gl.drift | | | | | | | Dug | CH | | DS | |
| 1100 | | O. M. Phillips | 1025 | - | 110 | | Gl.drift | | 25 | | | | | Dr | PjE | 5 | DS | |
| 1101L | 104 | C. E. Moorman | 1047 | - | 78 | | Sand | | 3 | 15 | 14 | 6-1-48 | | Dr | CH | 5½ | DS | |
| 1102L | 105 | J. E. Hite | 1054 | - | 54 | | Gl.drift | | 4 | 14 | 17 | 6-2-48 | | Dr | | 5½ | DS | |
| 1103* | | D. Tidd | 1035 | 92 | 118 | | Lmstone | Niagara | 30 | 20 | 10 | 1945 | | Dr | PjE | 5½ | DS | |
| 1104* | | W. Sheridan | 1040 | 80 | 100 | | Lmstone | Niagara | 20 | 10 | 6 | 1945 | | Dr | CH | 5½ | DS | |
| 1105* | | W. H. Traute | 1040 | 95 | 134 | | Lmstone | Niagara | 25 | | | 1945 | | Dr | PjE | 5½ | DS | |
| 1106* | | C. Hollingsworth | 1044 | 100 | 112 | | Lmstone | Niagara | | | | 1940 | | Dr | PjE | 5 | DS | |
| 1107 | | J. Bales | 1047 | | 88 | | Lmstone | Niagara | | | | | | Dr | CH | 4¼ | DS | |
| 1108 | | H. Faulkner | 1057 | - | 60 | | Gl.drift | | | | | | | Dr | CH | 6 | S | |
| 1109* | | R. Franklin | 1080 | 80 | 96 | | Lmstone | Niagara | | | | 1924 | | Dr | DwE | 4¼ | DS | |
| 1110 | | A. F. Gary | 1080 | - | 60 | | Gl.drift | | 11 | | | | | Dr | SwE | 6 | DS | |
| 1111* | | A. L. Smith | 1076 | 76 | 89 | | Lmstone | Niagara | | | | 1915 | | Dr | PjE | 4 | DS | |
| 1112* | | H. F. Keach | 1080 | 100 | 108 | | Lmstone | Niagara | 24 | 15 | 1 | 1947 | | Dr | EjE | 5½ | DS | |
| 1113 | | W. F. Lewis | 1100 | - | 90 | | Gl.drift | | 22 | | | | | Dr | SwE | 4¼ | DS | |
| 1114 | | E. L. Baker | 1089 | | 103 | | Lmstone | Niagara | 27 | | | | | Dr | EjE | 5 | DS | |
| 1115* | | H. K. Jette | 1085 | 38 | 68 | | Lmstone | Niagara | | | | | | Dr | CH | 4¼ | DS | |
| 1116* | | J. Urbin | 1083 | 67 | 91 | | Lmstone | Niagara | 12 | 20 | 18 | 1939 | | Dr | CH | 5½ | DS | |
| 1117 | | E. Garringer | 1075 | 45 | 104 | | Lmstone | Niagara | 4 | | | | | Dr | SwE | 5 | DS | |
| 1118 | | I. Clemmar | 1075 | | 93 | | Lmstone | Niagara | | | | | | Dr | SwE | 6 | DS | |
| 1119 | | J. A. Evans | 1075 | | | | | | | | | | | Dr | CH | | DS | |
| 1120* | | J. M. Hewitt | 1076 | 42 | 81 | | Lmstone | Niagara | Flow | 60 | 20 | 1935 | | Dr | CH | 5½ | S | |
| 1121 | | S. Garringer | 1075 | | | | | | | | | | | Dr | CH | 4¼ | PS | |
| 1122 | | O. Rhoades | 1072 | - | 23 | | Gl.drift | | 17 | | | | | Dug | CH | 36 | DS | |
| 1123 | | C. E. Pickering | 1070 | | | | | | | | | | | Dr | CH | 4¼ | | Abandoned - sulphur. |
| 1124 | | E. Bowers | 1070 | | | | | | | | | | | Dr | CH | | DS | |
| 1239L | 34 | Jamestown | 1065 | 28 | 192 | | Lmstone | Niagara | 28 | | | | | Dr | TE | 8 | PS | |
| 1265* | | Seymour Wade | 1005 | 50 | 80 | | Lmstone | Niagara | | | | 1915 | | Dr | - | 4 | - | Abandoned |
| 1267* | | Justus M. Glass | 1100 | 90 | 112 | | Lmstone | Niagara | | | | 1913 | | Dr | EjE | 4 | DS | |
| 1268* | | Milton Bryan | 1082 | 44 | 88 | | Lmstone | Niagara | | | | 1910 | | Dr | PjE | 4 | DS | |
| 1269* | | George Weimer | 1062 | 72 | 88 | | Lmstone | Niagara | | | | 1918 | | Dr | PjE | 4 | DS | |
| 1270* | | J. L. Ginn | 1085 | 85 | 118 | | Lmstone | Niagara | | | | 1913 | | Dr | PjE | 4 | DS | |
| 1273* | | Carl Conery | 1040 | 40 | 42 | | Lmstone | Niagara | | | | 1912 | | Dr | CH | 4 | DS | |
| 1274* | | James Ireland | 1080 | 47 | 52 | | Lmstone | Niagara | | | | 1906 | | Dr | PjE | 4 | DS | |
| 1275* | | W. O. Bullock | 1083 | 63 | 95 | | Lmstone | Niagara | | | | 1905 | | Dr | PjE | 4 | DS | |
| 1276* | | D. S. Smith | 1055 | 108 | 111 | | Lmstone | Niagara | | | | 1913 | | Dr | PjW | 4 | DS | |
| 1277* | | C. B. Smith | 1085 | 75 | 107 | | Lmstone | Niagara | | | | 1918 | | Dr | EjE | 4 | DS | |
| 1278* | | W. O. Bullock | 1080 | 87 | 135 | | Lmstone | Niagara | | | | 1916 | | Dr | - | 4 | - | Abandoned |
| 1279* | | Albert Garringer | 1089 | - | 69 | | Gravel | | | | | 1913 | | Dr | PjE | 4 | DS | |
| 1281* | | C. B. Franklin | 1087 | 77 | 101 | | Lmstone | Niagara | | | | 1917 | | Dr | EjE | 4 | DS | |
| 1282* | | Elander Jenkins | 1079 | 75 | 83 | | Lmstone | Niagara | | | | 1909 | | Dr | - | 4 | - | |
| 1283* | | Seymour Wade | 1098 | 38 | 80 | | Lmstone | Niagara | | | | 1907 | | Dr | EjE | 4 | DS | |
| Jefferson Township | | | | | | | | | | | | | | | | | | |
| 1125 | | B. H. Hargrave | 1082 | - | 105 | | Gl.drift | | 18 | | | | | Dr | CH | 4¼ | DS | |
| 1127* | | John Robison | 1044 | 19 | 23 | | Lmstone | Niagara | | | | 1905 | | Dr | CH | 4 | DS | |
| 1128* | | M. Sesslar | 1042 | 25 | 75 | | Lmstone | Niagara | 6 | 15 | 7 | 1941 | | Dr | PjE | 5½ | DS | |
| 1129 | | E. B. Gregory | 1078 | | | | | | | | | | | Dr | SwE | | DS | |
| 1130* | | W. Beard | 1092 | - | 20 | | Gl.drift | | | | | | | Dr | CH | | S | |
| 1131 | | E. S. Smith | 1093 | | | | | | | | | | | Dr | CH | | DS | |
| 1132 | | S. R. Bales | 1025 | | | | | | | | | | | Dr | CH | 5 | DS | |
| 1133* | | Wm. Bales | 1030 | 38 | 50 | | Lmstone | Niagara | 3 | | | | | Dr | CH | | DS | |
| 1134* | | C. Hollingsworth | 1041 | 40 | 58 | | Lmstone | Niagara | | | | | | Dr | PH | | DS | |
| 1135 | | C. H. Hollingsworth | 1043 | - | 27 | | Gl.drift | | | | | | | Dug | CH | 36 | DS | |
| 1136* | | E. Hite | 1044 | - | 37 | | Gl.drift | | 4 | 15 | 15 | 1943 | | Dr | | 5 | DS | |
| 1137* | | J. E. Hite | 1044 | 16 | 16 | | Gl.drift | | | | | | | Dug | | | DS | |
| 1138* | | A. Lewis | 1049 | 40 | 44 | | Lmstone | Niagara | | | | | | Dr | CH | 6 | DS | |
| 1139* | | A. Lewis | 1048 | 34 | 35 | | Lmstone | Niagara | 5 | 2 | | 1943 | | DDr | CH | 5 | DS | |
| 1140* | | A. Lewis | 1044 | 40 | 54 | | Lmstone | Niagara | 10 | | | | | Dr | SwE | 6 | DS | |
| 1141 | | A. Lewis | 1043 | - | | | Gl.drift | | | | | | | Dug | CH | | DS | |
| 1143* | | S. Fudge | 1062 | 40 | 70 | | Lmstone | Niagara | | | | | | Dr | CH | 4¼ | DS | |
| 1144* | | I. C. Adsit | 1100 | 82 | | | Lmstone | Niagara | | | | | | Dr | | | | |
| 1145 | | F. Lewis | 1101 | | 100 | | Lmstone | Niagara | | | | | | Dr | CH | 5 | DS | |
| 1146 | | C. O. Carter | 1090 | | 60 | | Lmstone | Niagara | | | | | | Dr | PjE | 4¼ | S | |
| 1147 | | L. H. Steiner | 1084 | | | | | | | | | | | Dr | CH | 5 | DS | |
| 1148 | | C. E. Miley | 1083 | | | | | | | | | | | Dr | CH | | DS | |
| 1150 | | W. Persinger | 1062 | 60 | 86 | | Lmstone | Niagara | 11 | | | | | Dr | SwE | 4¼ | DS | |
| 1151 | | R. Matthews | 1075 | | 26 | | Gl.drift | | 10 | | | | | Dug | PjE | 48 | DS | |
| 1152 | | H. Hargrave | 1075 | - | 23 | | Gl.drift | | 12 | | | | | Dug | PjE | 40 | DS | |
| 1153 | | V. McPherson | 1065 | | | | | | | | | | | Dr | CH | 4¼ | DS | |
| 1154 | | O. M. Gray | 1062 | | | | | | | | | | | Dr | CH | 5 | DS | |
| 1155 | | B. Beard | 1062 | | 22 | | Gl.drift | | 10 | | | | | Dug | SwE | 48 | DS | |
| 1156* | | L. V. Ellis | 1041 | 25 | 52 | | Lmstone | Niagara | 12 | 25 | | 1944 | | DDr | | 6 | DS | |
| 1157* | | D. Ellis | 1041 | 26 | 91 | | Lmstone | Niagara | 15 | 15 | 5 | 1945 | | Dr | | 5½ | DS | |
| 1158 | | D. Ellis | 1038 | 53 | 88 | | Lmstone | Niagara | 20 | 15 | 18 | 1945 | | Dr | CH | 5½ | DS | |
| 1159* | | L. V. Ellis | 1034 | - | 47 | | Gl.drift | | 12 | 15 | 15 | 1944 | | Dr | | 6 | DS | |
| 1160* | | O. J. Ellis | 1035 | | 28 | | Gl.drift | | 8 | 14 | 9 | 1946 | | Dr | PjE | 6 | DS | |

Table 8 (Continued)

Jefferson Township

| Number | File Number (Ohio Water Resources Board) | Owner or name | Elevation at well (feet above sea level) | Depth to bedrock (feet) | Depth of well (feet) | Principal water-bearing bed: Depth water encountered (ft.) | Principal water-bearing bed: Character of material | Principal water-bearing bed: Geologic horizon | Static water level (feet below land surface) | Yield (g.p.m.) | Drawdown (feet) | Date | Quality of water | Type of well | Method of lift | Diameter of well (inches) | Use | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Jefferson Township (Continued)** | | | | | | | | | | | | | | | | | | |
| 1161* | | H. Babb | 1035 | 45 | 67 | | Lmstone | Niagara | 12 | 15 | 18 | 1947 | | Dr | | 5½ | DS | |
| 1162* | | H. J. Babb | 1030 | 40 | 60 | | Lmstone | Niagara | 8 | 9 | 52 | 1943 | | Dr | | 5½ | DS | |
| 1163* | | L. V. Ellis | 1026 | 22 | 51 | | Lmstone | Niagara | 9 | 6 | 18 | 1944 | | Dr | | 6 | DS | |
| 1164 | | A. Hollingsworth | 1028 | | | | | | | | | | | Dr | CH | 5 | S | |
| 1165 | | L. Thornton | 1040 | - | | | Gl.drift | | | | | | | Dug | CH | | DS | |
| 1166* | | O. Bradd | 1040 | 19 | 21 | | Lmstone | Niagara | 6 | 14 | 21 | 1946 | | Dr | CH | 6 | S | |
| 1167* | | E. Johnson | 1040 | 51 | 90 | | Lmstone | Niagara | 8 | 20 | 17 | 1943 | | Dr | CH | 5 | DS | |
| 1168 | | H. Johnson | 1044 | | 90 | | Lmstone | Niagara | | | | | | Dr | CH | 4¼ | DS | |
| 1169L | 161 | C. J. Schliep | 1025 | 80 | 134 | | Lmstone | Clinton | 15 | 2 | | 6-24-48 | | Dr | DwE | 5½ | DS | |
| 1170* | | L. V. Ellis | 1023 | | 73 | | Gl.drift | | 11 | 20 | 5 | 1944 | | Dr | CH | 6 | DS | |
| 1171* | | W. Beard | 1030 | - | 80 | | Gl.drift | | | | | | | Dr | CH | 6 | DS | |
| 1173* | | F. Smith | 1044 | | 86 | | Gl.drift | | 20 | 5 | | 1943 | | Dr | | | DS | |
| 1174L | 101 | G. Adams | 1045 | - | 89 | | Sand | | 15 | 20 | 15 | 5-21-48 | A | Dr | PjE | 5½ | DS | |
| 1175* | | F. Burr | 1049 | - | 63 | | Gl.drift | | | 15 | | 1931 | | Dr | | 4¼ | DS | |
| 1176* | | W. Henderson | 1062 | 12 | 36 | | Lmstone | Niagara | | | | | | Dr | CH | 4¼ | S | |
| 1177* | | F. Carpenter | 1065 | 40 | 88 | | Lmstone | Niagara | 11 | 14 | 43 | 1945 | | Dr | SwE | 5½ | DS | |
| 1178 | | J. Ary | 1055 | - | 18 | | Gl.drift | | | | | | | Dug | CH | | DS | |
| 1180 | | R. F. Brown | 1062 | - | 90 | | Gl.drift | | | | | | | Dr | CH | 5 | DS | |
| 1181* | | Cemetery | 1064 | 69 | 124 | | Lmstone | Niagara | | | | 1930 | | Dr | CH | | PS | |
| 1182* | | Bd.of Education | 1082 | 72 | 136 | | Lmstone | Niagara | | | | 1939 | | Dr | | 5½ | PS | |
| 1183* | | W. H. Doster | 1100 | 75 | 93 | | Lmstone | Niagara | 34 | 15 | 2 | 1944 | | Dr | CH | 5½ | DS | |
| 1184* | | H. Lucas | 1080 | 61 | 78 | | Lmstone | Niagara | 24 | 5 | 10 | 1942 | | Dr | | 4¼ | DS | |
| 1185* | | J. Jackson | 1084 | 76 | 88 | | Lmstone | Niagara | | | | | | Dr | | 4¼ | DS | |
| 1186* | | C. Wade | 1095 | 50? | 88 | | Lmstone | Niagara | | | | | | Dr | | 5 | DS | |
| 1187 | | H. Liming | 1098 | | | | | | | | | | | Dr | SwE | 5 | DS | |
| 1188 | | L. Hussey | 1085 | 90 | 95 | | Lmstone | Niagara | | | | | | Dr | SwE | 5 | DS | |
| 1189 | | G. Meddock | 1082 | 60 | 66 | | Lmstone | Niagara | 17 | | | | | Dr | DwE | 5 | DS | |
| 1190* | | J. Vanard | 1085 | 60 | 65 | | Lmstone | Niagara | | | | | | Dr | CH | 5 | DS | |
| 1191 | | L. Fannin | 1077 | | | | | | 10 | | | | | Dr | SwE | | DS | |
| 1192 | | G. Sheridan | 1077 | - | | | Gl.drift | | | | | | | Dug | CH | | DS | |
| 1193 | | A. C. Morrow | 1062 | | | | | | | | | | | Dr | CH | | DS | |
| 1194 | | W. M. Henry | 1061 | - | | | Gl.drift | | | | | | | Dug | CH | 36 | DS | |
| 1195 | | B. L. Smith | 1080 | | | | | | | | | | | Dr | CH | 6 | S | |
| 1196* | | F. Thompson | 1055 | 50 | 55 | | Lmstone | Niagara | 3 | | | | | Dr | SwE | 6 | DS | |
| 1197 | | D. Brakesfield | 1035 | - | 26 | | Gl.drift | | 13 | | | | | Dug | CH | 48 | DS | |
| 1198 | | S. DeVoe | 1024 | | | | | | | | | | | Dr | CH | | S | |
| 1200 | | D. Neal | 1020 | | | | | | | | | | | Dr | CH | | DS | |
| 1201* | | R. Lewis | 1037 | 69 | 80 | | Shale | Richmond | | | | 1923 | | Dr | PjE | 4¼ | S | |
| 1202 | | A. D. Vandervoort | 1030 | | | | | | | | | | | Dr | CH | 4¼ | DS | |
| 1203* | | O. Jenks | 1040 | | | | Lmstone | Niagara | 8 | 2 | | 1946 | | Dr | | 5 | DS | |
| 1204 | | F. L. Early | 1034 | | | | Lmstone | Niagara | 8 | | | | | Dr | CH | | DS | |
| 1205 | | M. Kline | 1035 | - | 30 | | Gl.drift | | 6 | | | | | Dr | PjE | 4¼ | DS | |
| 1206* | | W. Sprinkle | 1036 | 38 | 71 | | Lmstone | Niagara | 12 | 10 | 24 | 1941 | | Dr | CW | 4¼ | DS | |
| 1207* | | J. Hite | 1042 | 116 | | | Lmstone | Clinton | | | | | | Dr | CH | | DS | |
| 1208* | | F M. Woods | 1042 | 62 | 110 | | Lmstone | Niagara | | | | 1930 | | Dr | PjE | 5 | DS | |
| 1209 | | R. Garringer | 1043 | | | | | | | | | | | Dr | | | DS | |
| 1210* | | J. McDonald | 1043 | 30 | | | Lmstone | Niagara | | | | | | Dr | SwE | 5 | DS | |
| 1211 | | H. Martin | 1045 | 60 | 75 | | Lmstone | Niagara | | | | | | Dr | PjE | 6 | S | |
| 1212* | | G. Davis | 1063 | 47 | 82 | | Lmstone | Niagara | 7 | 200 | 26 | 1947 | | Dr | | 5½ | DS | |
| 1213* | | H. S. Rowe | 1062 | 37 | 89 | | Lmstone | Niagara | 12 | 14 | 16 | 1945 | | Dr | SwE | 5½ | DS | |
| 1214* | | R. Jones | 1083 | 64 | 114 | | Lmstone | Niagara | 18 | 15 | 96 | 1944 | | Dr | PjE | 5½ | DS | |
| 1215 | | A. Brakefield | 1058 | | | | | | | | | | | Dr | CH | | S | |
| 1216 | | O. Ellis | 1042 | | | | | | | | | | | Dr | CH | 4¼ | DS | |
| 1217 | | C. Ream | 1079 | | | | | | | | | | | Dr | CH | 6 | S | |
| 1218 | | D. Jones | 1087 | | | | | | | | | | | Dr | CH | | DS | |
| 1219 | | J. Zimmerman | 1070 | | 90 | | Lmstone | Niagara | 6 | | | | | Dr | CH | 6 | DS | |
| 1220 | | B. H. Hargrave | 1079 | | | | Gl.drift | | | | | | | Dug | CH | 36 | DS | |
| 1222 | | A. Johnson | 1062 | | | | | | | | | | | Dr | | | DS | |
| 1223* | | J. W. Zimmerman | 1067 | 65 | 74 | | Lmstone | Niagara | 19 | | | 1930 | | Dr | DwE | 6 | DS | |
| 1224 | | J. Chitty | 1064 | | | | | | | | | | | Dr | SwE | | DS | |
| 1225* | | J. Chitty | 1065 | 56 | 82 | | Lmstone | Niagara | | | | 1931 | | Dr | CH | 4¼ | DS | |
| 1226* | | J. F. Cline | 1082 | 52 | 77 | | Lmstone | Niagara | | | | | | Dr | CH | 5 | S | |
| 1284* | | Charles Thomas | 1064 | 44 | 91 | | Lmstone | Niagara | | | | 1905 | | Dr | CH | 4 | DS | |
| 1285* | | Thompson Ross | 1086 | 56 | 125 | | Lmstone | Niagara | | | | 1908 | | Dr | PjE | 4 | DS | |
| 1286* | | John Jenks | 1098 | - | 82 | | Gravel | | | | | 1908 | | Dr | EjE | 4 | DS | |
| 1287* | | Joe Robison | 1050 | 30 | 37 | | Lmstone | Niagara | | | | 1911 | | Dr | PjE | 4 | DS | |
| 1288* | | Rose O'Day | 1077 | 47 | 66 | | Lmstone | Niagara | | | | 1913 | | Dr | EjE | 4 | DS | |
| 1289* | | Frank Harness | 1084 | 58 | 66 | | Lmstone | Niagara | | | | 1913 | | Dr | PjE | 4 | DS | |
| 1290* | | Albert Oglesbee | 1045 | - | 70 | | Gravel | | | | | 1914 | | Dr | PjE | 4 | DS | |
| 1291* | | Will Oglesbee | 1064 | 44 | 84 | | Lmstone | Niagara | | | | 1905 | | Dr | EjE | 4 | DS | |
| 1292* | | Dave Irvin | 1076 | 52 | 62 | | Lmstone | Niagara | | | | 1908 | | Dr | EjE | 4 | DS | |
| 1293* | | Ben Anderson | 1085 | 70 | 87 | | Lmstone | Niagara | | | | 1912 | | Dr | EjE | 4 | DS | |


MAP OF
THE CONSOLIDATED ROCK FORMATIONS OF
GREENE COUNTY, OHIO
WITH DESCRIPTION OF THEIR WATER-BEARING PROPERTIES
AND SHOWING CONTOURS ON THE BEDROCK SURFACE
ELEVATIONS IN FEET ABOVE SEA LEVEL
CONTOUR INTERVAL 50 FEET
SCALE IN MILES
1 1/2 0 1 2 3 4
GEOLOGY BY S. E. NORRIS
PUBLISHED BY
STATE OF OHIO
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER
IN COOPERATION WITH
U. S. GEOLOGICAL SURVEY
JANUARY 1950
EXPLANATION
NIAGARA AND CLINTON GROUPS
(LIMESTONES AND DOLOMITES PREDOMINATE. TWO PRINCIPAL AQUIFERS ARE PRESENT, SEPARATED BY IMPERMEABLE OSGOOD SHALE. GENERALLY GOOD WATER SUPPLIES FOR FARM AND DOMESTIC REQUIREMENTS. WELLS ORDINARILY YIELD 5 TO 15 G.P.M. AFTER PENETRATING THESE ROCKS ABOUT 25 FEET. A FEW WELLS YIELD 50 TO 150 G.P.M. OR MORE. IMPORTANT SPRING HORIZONS IN NIAGARA GROUP AND AT BASE OF SYSTEM. TOTAL HARDNESS RANGES FROM ABOUT 350 P.P.M. TO ABOUT 400 P.P.M.)
SILURIAN
RICHMOND AND MAYSVILLE GROUPS
(INTERBEDDED PLASTIC SHALES AND THIN LIMESTONE LAYERS. WELLS GENERALLY YIELD LESS THAN 5 G.P.M. MANY WELLS GO DRY. WHERE WATER IS PRESENT IT GENERALLY OCCURS IN TOP FEW FEET OF STRATA. WATER IS SOMETIMES HIGH IN SULFIDE AND/OR CHLORIDE.)
ORDOVICIAN
LOCATION OF BEDROCK DATA:
70
LOCATION OF WELLS FROM WHICH BEDROCK DATA WERE OBTAINED. NUMBER SHOWS DEPTH IN FEET TO BEDROCK. NUMBER FOLLOWED BY + SIGN INDICATES WELL FINISHED IN UNCONSOLIDATED FORMATIONS, BEDROCK NOT HAVING BEEN REACHED.
OUTCROP OF SILURIAN ROCKS.
OUTCROP OF ORDOVICIAN ROCKS.
NOTE: TOPOGRAPHY (PRINTED IN BROWN) FROM U. S. GEOLOGICAL SURVEY TOPOGRAPHIC MAPS OF THE DAYTON, SPRINGFIELD, SOUTH CHARLESTON, WAYNESVILLE, XENIA, AND OCTA QUADRANGLES. CONTOUR INTERVAL 20 FEET.
J. C. KROLCZYK - DRAFTSMAN
WRIGHT-PATTERSON AIR FORCE BASE
FAIRBORN
Yellow Springs
Cedarville
XENIA
Jamestown
Bowersville
Spring Valley
Bellbrook
BATH
MIAMI
BEAVER CREEK
CEDARVILLE
ROSS
XENIA
NEW JASPER
SILVER CREEK
SPRING VALLEY
CAESAR CREEK
JEFFERSON
84°05'
84°00'
83°55'
83°50'
83°45'
83°40'
83°35'
39° 50'
39° 45'
39° 40'
39° 35'

# MAP OF THE ALLUVIAL AND GLACIAL DEPOSITS OF GREENE COUNTY, OHIO

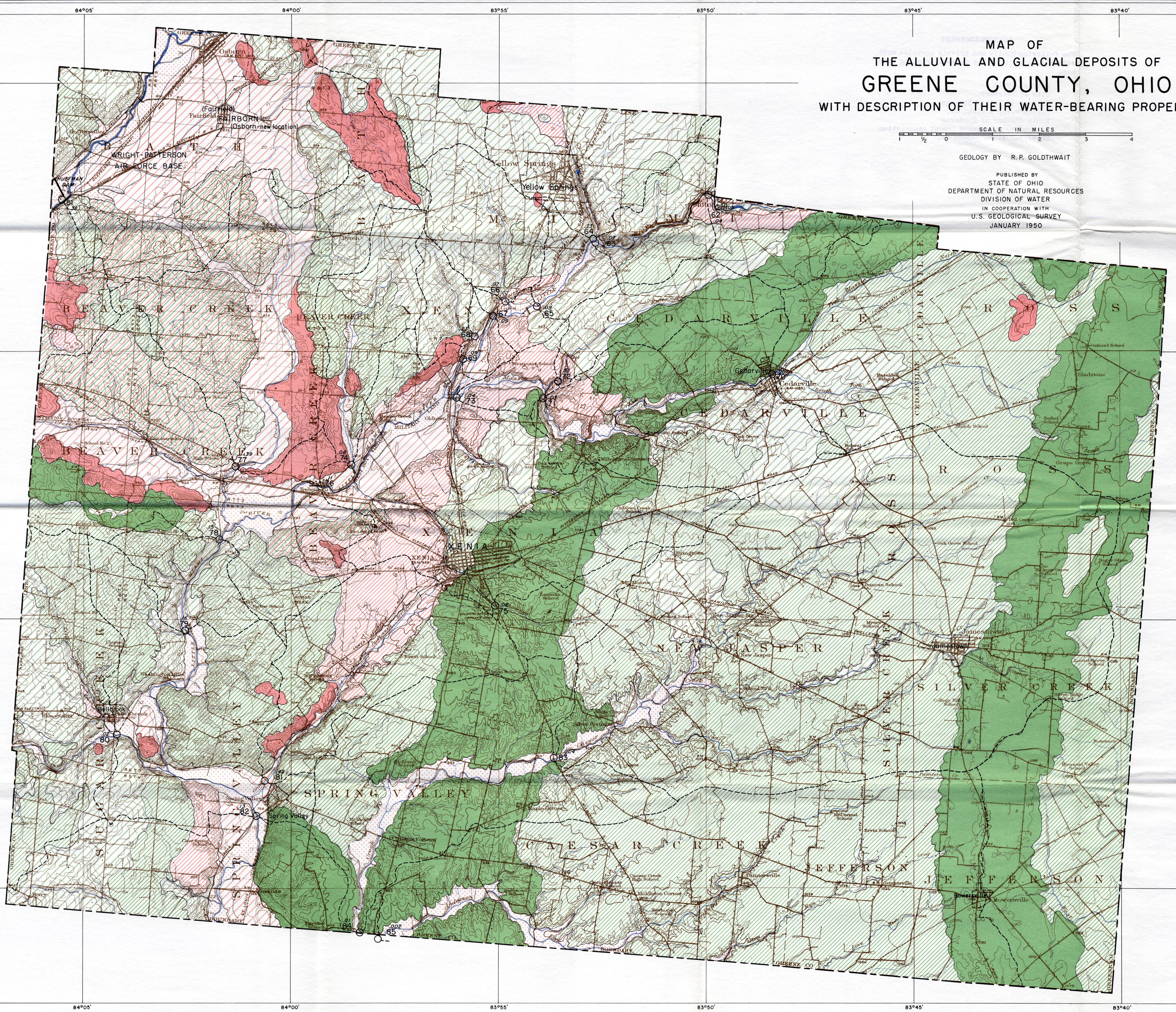
## WITH DESCRIPTION OF THEIR WATER-BEARING PROPERTIES

SCALE IN MILES

1 ½ 0 1 2 3 4

GEOLOGY BY R.P. GOLDTHWAIT

PUBLISHED BY
STATE OF OHIO
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER
IN COOPERATION WITH
U.S. GEOLOGICAL SURVEY
JANUARY 1950




## EXPLANATION

QUATERNARY

**RECENT**

**ALLUVIAL DEPOSITS**
(SILTS AND GRAVELS DEPOSITED BY THE PRESENT RIVERS ON THEIR FLOOD PLAINS. BECAUSE THESE DEPOSITS ARE THIN AND GENERALLY NOT VERY PERMEABLE, WATER SUPPLIES ARE MEAGER AND WELLS PENETRATE THROUGH TO THE UNDERLYING FORMATIONS, WHICH GENERALLY CONSIST OF VALLEY-TRAIN DEPOSITS.)

**PLEISTOCENE (WISCONSIN STAGE)**

**VALLEY TRAIN**
(OUTWASH DEPOSITS OF SAND AND GRAVEL LAID DOWN IN THE VALLEYS BY FLOODING MELTWATER FROM THE GLACIER. THESE DEPOSITS ARE GENERALLY VERY PERMEABLE AND THEY YIELD THE LARGEST GROUND-WATER SUPPLIES IN THE COUNTY. THE BEST YIELDS ARE OBTAINED FROM WELLS RECEIVING INFILTRATION FROM STREAMS. SOME WELLS YIELD MORE THAN 2,000 G.P.M. TOTAL HARDNESS AVERAGES OVER 300 P.P.M., IRON CONTENT GENERALLY ABOVE 0.3 P.P.M.)

**OUTWASH PLAIN**
(OUTWASH DEPOSITS OF SAND AND GRAVEL, SIMILAR IN ORIGIN TO THOSE OF THE VALLEY TRAIN, BUT OCCURRING AS UPLAND AREAS. THESE DEPOSITS GENERALLY DO NOT RECEIVE INFILTRATION FROM MAJOR STREAMS AND CONSEQUENTLY THE SUSTAINED YIELDS OF WELLS IN THESE DEPOSITS ARE NOT AS GREAT AS IN THE VALLEY-TRAIN DEPOSITS. THE WATER TABLE IN OUTWASH-PLAIN DEPOSITS IS GENERALLY AT A GREATER DEPTH BELOW THE SURFACE THAN IN OTHER AQUIFERS.)

**KAMES AND KAME MORAINE**
(SAND AND GRAVEL DEPOSITED AS HILLS AND RIDGES AT THE EDGES OF THE GLACIER. GROUND-WATER CONDITIONS IN THESE DEPOSITS ARE GENERALLY COMPARABLE TO THOSE OF THE OUTWASH-PLAIN DEPOSITS.)

**THIN GROUND MORAINE**
(TILL, COMMONLY CALLED "CLAY" OR "HARDPAN," GENERALLY LESS THAN 20 FEET IN THICKNESS, DEPOSITED DIRECTLY BY THE ICE. BEDROCK IS EXPOSED IN MANY PLACES. MOST WATER SUPPLIES IN THESE AREAS ARE OBTAINED FROM THE UNDERLYING BEDROCK FORMATIONS; WHERE WATER SUPPLIES ARE OBTAINED FROM THE GROUND MORAINE THEY ARE GENERALLY FROM DUG WELLS. WATER FROM THE GROUND MORAINE IS GENERALLY HIGHER IN IRON CONTENT AND TOTAL HARDNESS THAN WATER FROM OTHER AQUIFERS.)

**THICK GROUND MORAINE**
(TILL GENERALLY MORE THAN 20 FEET IN THICKNESS, AND CONTAINING BURIED SAND OR GRAVEL BEDS IN SOME PLACES. WATER SUPPLIES MEAGER IN THE TILL, BUT GOOD SUPPLIES FOR FARM USE GENERALLY AVAILABLE FROM INCLUDED SAND OR GRAVEL LAYERS.)

**GROUND MORAINE OVERLYING SAND AND GRAVEL**
(TILL OVERLYING GENERALLY THICK AND EXTENSIVE OUTWASH DEPOSITS. THIS SEQUENCE INDICATES A READVANCE OF THE ICE SHEET AFTER THE DEPOSITION OF THE OUTWASH MATERIALS. GENERALLY GOOD WATER SUPPLIES FROM UNDERLYING SANDS AND GRAVELS SUFFICIENT FOR FARM AND LIMITED INDUSTRIAL OR MUNICIPAL PURPOSES.)

**END MORAINE**
(THICK TILL, GENERALLY STONY OR SANDY, WITH INTERBEDDED SAND OR GRAVEL LAYERS IN PLACES, DEPOSITED AS HILLS AND RIDGES AT THE EDGES OF THE GLACIER. WATER SUPPLIES FOR FARM USE OBTAINED GENERALLY FROM DUG WELLS. BEST SUPPLIES IN INTERBEDDED SAND OR GRAVEL LAYERS.)

.23
64

OUTLINE OF DRAINAGE AREAS AND LOCATION OF STATIONS WHERE DISCHARGE MEASUREMENTS WERE MADE.
[64] STATION NUMBER.
[.23] DISCHARGE IN CUBIC FEET PER SECOND PER SQUARE MILE.

NOTE: TOPOGRAPHY (PRINTED IN BROWN) FROM U.S. GEOLOGICAL SURVEY TOPOGRAPHIC MAPS OF THE DAYTON, SPRINGFIELD, SOUTH CHARLESTON, WAYNESVILLE, XENIA, AND OCTA QUADRANGLES. CONTOUR INTERVAL 20 FEET.

J. C. KROLCZYK - DRAFTSMAN